

Conscientiousness and Health-Related Behaviors: A Meta-Analysis of the Leading Behavioral Contributors to Mortality

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Previous research has established conscientiousness as a predictor of longevity (H. S. Friedman et al., 1993; L. R. Martin & H. S. Friedman, 2000). To better understand this relationship, the authors conducted a meta-analysis of conscientiousness-related traits and the leading behavioral contributors to mortality in the United States (tobacco use, diet and activity patterns, excessive alcohol use, violence, risky sexual behavior, risky driving, suicide, and drug use). Data sources were located by combining conscientiousness-related terms and relevant health-related behavior terms in database searches as well as by retrieving dissertations and requesting unpublished data from electronic mailing lists. The resulting database contained 194 studies that were quantitatively synthesized. Results showed that conscientiousness-related traits were negatively related to all risky health-related behaviors and positively related to all beneficial health-related behaviors. This study demonstrates the importance of conscientiousness' contribution to the health process through its relationship to health-related behaviors.

Conscientiousness refers to individual differences in the propensity to follow socially prescribed norms for impulse control, to be task- and goal-directed, to be planful, to delay gratification, and to follow norms and rules (John & Srivastava, 1999). Despite being identified as a potentially important health-related trait (Friedman, 2000; Roberts & Bogg, 2004), the scope and importance of the relationship between conscientiousness and the health process has not been fully explored. For example, in a longitudinal study of childhood conscientiousness and longevity using data from the Terman Life Cycle Study of gifted children, Friedman et al. (1993) found an effect larger in magnitude than the effects of chemotherapy on breast cancer survival and coronary bypass surgery on 5-year survival (Meyer et al., 2001).

The relationship between conscientiousness and the health process has been overshadowed, in part because much more research attention has been focused on the health implications of other personality dimensions, such as hostility, depression, and neuroticism (e.g., Brandon & Loftin, 1991; Camatta & Nagoshi, 1995; Friedman, Tucker, & Reise, 1995; Kirkcaldy & Furnham, 1991; Potgieter & Venter, 1995; Walter, Nagoshi, Muntaner, & Haertzen, 1990). Conscientiousness faces the additional obstacle of only recently being identified as an independent domain, given the advent of the Big Five Taxonomy of traits (Goldberg, 1993). The

Big Five Taxonomy organizes personality traits into five broad domains: Extraversion, Agreeableness, Conscientiousness, Emotional Stability, and Openness to Experience (or, Intellect; see Goldberg, 1993). Because of their relative newness, traits from the Big Five Taxonomy have only recently been the focus of empirical research linking them to health-related behaviors (e.g., Anderson & McLean, 1997; Arthur & Graziano, 1996; Hampson, Andrews, Barckley, Lichtenstein, & Lee, 2000).

This is not to say that traits related to the domain of Conscientiousness have been ignored in previous research. In fact, the opposite is true. Many studies have explored the relationships between personality traits and health behaviors using measures of personality that predate the Big Five Taxonomy. These personality inventories typically contain personality scales that tap into the Big Five, including Conscientiousness (P. T. Costa, Busch, Zonderman, & McCrae, 1986; P. T. Costa & McCrae, 1985, 1988; McCrae, Costa, & Busch, 1986; McCrae, Costa, & Piedmont, 1993; Piedmont, McCrae, & Costa, 1991). One unexplored possibility is to use the links between Conscientiousness and older measures of personality to classify various scales into the domain of Conscientiousness (Goldberg, 1999). Subsequently, research findings showing the relationship between conscientiousness-related traits and health-related behaviors can be extracted.

The goal of the present study is to use the known relationships between personality measures and the Big Five domain of Conscientiousness to organize and synthesize previous research linking conscientiousness-related traits to health. Specifically, we use meta-analytic techniques to estimate the relationship of conscientiousness-related traits and behaviors that are among the leading contributors to poor health and mortality (McGinnis & Foege, 1993). Meta-analytic methods have a number of advantages over primary data collection. In the present study, the greatest benefit was derived from the incorporation of accumulated insights from years of trait research, which allowed for the coherent synthesis of studies using pre-five-factor measures of conscientiousness-related traits.

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In the following sections, we review the role of conscientiousness in the health process, including relevant theories and models, the known links between conscientiousness and health behaviors, and the design and scope of the present study.

The Role of Conscientiousness in the Health Process

There is little in terms of explicit theory or modeling that attempts to explain the mechanisms or systems that tie conscientiousness to the health process. This is not surprising, considering how conscientiousness has only recently been identified as a likely contributor to important health outcomes (Friedman, 2000; Roberts & Bogg, 2004). However, in spite of the lack of a testable health model that explicitly requires the inclusion of conscientiousness, a number of researchers have created models that can accommodate conscientiousness and other personality constructs.

Specifically, the health process model put forth by Adler and Matthews (1994) provides a conceptual framework for understanding the relations between individual dispositions (i.e., personality), social environmental factors (e.g., socioeconomic status, family structure), health-related behaviors, psychophysiological mechanisms (e.g., cardiovascular reactivity), and disease. According to the model, personality traits act on health outcomes through their action on social environmental factors, health-related behaviors, and psychophysiological mechanisms. To our knowledge, conscientiousness-related traits have been linked to social environmental factors, such as marriage and work (e.g., Roberts & Bogg, 2004; Roberts, Caspi, & Moffitt, 2003), and to health behaviors but not directly to psychophysiological mechanisms.

Using data from the Mills Longitudinal Study of Women, Roberts and Bogg (2004) found that social responsibility (a facet of conscientiousness) at age 21 predicted the social environmental factors of divorce (negatively) and number of children (positively), and the health-related behaviors of marijuana and tobacco use (negatively), 20 and 30 years later. In a longitudinal study of work-related outcomes, Roberts, Caspi, and Moffitt (2003) found that constraint (a facet of conscientiousness) at age 18 positively predicted measures of occupational attainment, work satisfaction, work involvement, and financial security at age 26. Conscientiousness-related traits have been shown to be related to additional social environmental factors that contribute to positive health outcomes, such as high socioeconomic status (Judge, Higgins, Thoresen, & Barrick, 1999), marital stability (Cramer, 1993; Kelly & Conley, 1987), and greater religiosity (MacDonald, 2000).

Although there is a paucity of evidence linking conscientiousness and psychophysiological mechanisms, conscientiousness-related traits—in particular, disinhibition and impulsivity—have been linked to a variety of biological factors, including cortical arousal, neurotransmitter activity, testosterone, and gene expression (Zuckerman, 2003). Research has shown relations between a number of these biological factors and drug use, sexual activity, and violence, suggesting a psychobiological route to these health-related behaviors—a route that is not explicitly accounted for in the health process model proposed by Adler and Matthews (1994).

Initial evidence also suggests that conscientiousness' effect on health-related behaviors may be unaffected by other cognitive measures. In a test of the theory of planned behavior and its relation to the Big Five in the prediction of exercise, Conner and Abraham (2001) found Conscientiousness' prospective relation to

exercise behavior to be unmediated by behavioral intentions, control, attitudes, norms, anticipated affective reaction, and the other Big Five domains.

For the purposes of this meta-analytic review, the scope of investigation only covers the relations between conscientiousness-related traits (individual dispositions) and health-related behaviors. Social environmental, psychobiological, and other cognitive factors, although important, are not among the points of emphasis here.

Health-related behaviors are now considered the primary factors contributing to poor health outcomes, such as cardiovascular disease and cancer (McGinnis & Foege, 1993). In the United States, the leading behavioral contributors to mortality are tobacco use, diet and level of physical activity, excessive alcohol use, shootings (divided into violence and suicide for the purposes of this investigation; see Method section), risky sexual behavior, risky driving and vehicular accidents, and illicit drug use (McGinnis & Foege, 1993). These behaviors are relevant to health and longevity through their relations to cardiovascular disease, cancer, AIDS, and accidental deaths. For example, findings from the Cardiovascular Health Study have shown that when assessed at a 7-year follow-up, the healthy subjects among the 5,888 participants age 65 and older were those who did not smoke, had a lower waist circumference, and exercised (Burke et al., 2001).

Two theoretical perspectives are useful in providing an account of the interplay between these important health-related behaviors and conscientiousness-related traits. The first, put forth by Clark and Watson (1999) in their "Big Three" framework (extraversion/positive emotionality, neuroticism/negative emotionality, and disinhibition vs. constraint), provides insights into the types of behaviors associated with the temperament factor of disinhibition versus constraint. Clark and Watson (1999) argued that

disinhibited individuals are impulsive and somewhat reckless and are oriented primarily toward the feelings and sensations of the immediate moment; conversely, constrained individuals plan carefully, avoid risk or danger, and are controlled more strongly by the longer-term implications of their behavior. (p. 403)

Clearly, disinhibition overlaps with a lack of conscientiousness and can be assumed to reflect the temperamental core of this trait domain. Therefore, to the extent that disinhibition–constraint is linked to health behaviors, we can assume that conscientiousness will be as well. This leads to straightforward hypotheses about the relationship of conscientiousness-related traits to the health process.

First, individuals low in constraint should be more likely to engage in behaviors, such as alcohol use, drug use, inactivity, risky sex, risky driving, suicide, tobacco use, violence, and unhealthy eating, that have immediately gratifying effects or are characterized by a disregard for future consequences. Second, and in relation to the health process more broadly, individuals who are high in constraint should experience more health-protective benefits as a result of being more careful, less risky, and more concerned with the accumulated effects of their behaviors (e.g., diet and exercise).

The trait of impulse control, or *self-control* (often measured by disinhibition, impulsiveness, and control scales; see Table 1)—whose definition maps almost directly onto the Big Three domain of disinhibition versus constraint—has been linked to lower tobacco consumption (Clark & Watson, 1999; Watson & Clark,

Table 1
Major Personality Measures Coded for Six Facets of Conscientiousness

Industriousness	Order	Responsibility	Self-Control	Traditionalism	Virtue
Adjective Checklist: Achievement, Endurance	16 PF: Control, Self-Disciplined	California Psychological Inventory: Conformity, Responsibility, Socialization California Q-set: Item 2	Adjective Checklist: Self-Control	16 PF: Conforming, Conscientious, Uninhibited	California Psychological Inventory: Self-Control
California Psychological Inventory: Achievement via Conformance	Adjective Checklist: Order	California Q-set: Item 2	Barratt Impulsivity Scale	Adjective Checklist: Lability	California Q-set: Items 41, 70
California Q-set: Item 71	Bentler Psychological Inventory: Conscientiousness	Eysenck Personality Questionnaire: Psychoticism	California Psychological Inventory: Impulsivity	Bentler Psychological Inventory: Social conformity	Hogan Personality Inventory: Prudence: Perfect
Multidimensional Personality Questionnaire: Achievement	California Q-set: Item 6	Hogan Personality Inventory: Prudence; Prudence: Avoids Trouble, Good attachment	California Q-set: Items 25, 53	California Q-set: Items 7, 39, 62, 65	
Personality Research Form: Achievement	Hogan Personality Inventory: Prudence: Mastery	Jackson Personality Inventory: Responsibility	Eysenck Impulsiveness Scale	Jackson Personality Inventory: Conformity	
	NEO-FFI, NEO-PI, NEO-PI-R: Conscientiousness	Karolinska Scale of Personality: Socialization	Eysenck Personality Inventory: Impulsivity	Multidimensional Personality Questionnaire: Traditionalism	
	Personality Research Form: Order	MMPI: Psychopathic deviate	Eysenck Personality Questionnaire: Impulsivity		
	Tridimensional Personality Questionnaire: Disorderly/regimented, order	Terman Life Cycle Study: Conscientiousness	Hogan Personality Inventory: Prudence: Not Experience Seeking		
			Karolinska Scale of Personality: Impulsiveness, Monotony Avoidance		
			Multidimensional Personality Questionnaire: Control, Constraint, Harm Avoidance		
			Personality Research Form: Impulsivity		
			Rosenbaum Self-Control Questionnaire		
			Schalling Impulsivity Scale		
			Sensation Seeking Scale: Disinhibition		
			Tridimensional Personality Questionnaire: Impulsive/rigid, Novelty seeking: Impulsiveness		

Note. 16 PF = 16 Personality Factor Questionnaire; NEO-FFI = NEO-Five-Factor Inventory; NEO-PI = NEO-Personality Inventory; NEO-PI-R = NEO-Personality Inventory—Revised; MMPI = Minnesota Multiphasic Personality Inventory.

1993), lower drug and alcohol use (Caspi et al., 1997; Clark & Watson, 1999; Cooper, Agocha, Sheldon, 2000; Shedler & Block, 1990; Sher & Trull, 1994; Watson & Clark, 1993), lower rates of violent and criminal activity (Caspi et al., 1997; Halperin et al., 1995; Krueger et al., 1994; Luengo, Otero, Carillo-de-la-Pena, & Miron, 1994; Spence, Losoff, & Robbins, 1991), decreased likelihood to consider and attempt to commit suicide (Apter, Plutchik, & van Praag, 1993; Horesh, Gothelf, Ofek, Weizman, & Apter, 1999), less risky sexual and driving behavior (Caspi et al., 1997; Clark & Watson, 1999; Cooper et al., 2000; N. G. Martin & Boomsma, 1989; H. R. White & Johnson, 1988), and fewer problems with obesity (Chalmers, Bowyer, & Olenick, 1990). With the exception of activity level, the health-related behaviors investigated in these studies require some degree of restraint to avoid the behavior. Therefore, we would expect the self-control (i.e., constraint) facet of conscientiousness to be a strong predictor of excessive alcohol use, drug use, risky sex, risky driving, suicide, violence, tobacco use, and unhealthy eating.

The second perspective on the relationships between conscientiousness-related traits and health-related behaviors comes from problem-behavior theory (Donovan, Jessor, & Costa, 1991; Jessor, Chase, & Donovan, 1980). In problem-behavior theory, health-related behaviors are accounted for by the interaction of three systems: the personality system, the perceived environment system, and the behavior system. Underlying all three systems is a dimension of conventionality–unconventionality—“an orientation toward, commitment to, and involvement in the prevailing values, standards of behavior, and established institutions” (Donovan et al., 1991, p. 52). This definition, and the theory itself, is related to, in part, several aspects of Conscientiousness, such as the propensities to uphold social norms and traditions (i.e., traditionalism), avoid trouble, and not let others down (i.e., responsibility).

Empirical research based on problem-behavior theory supports the hypothesis that the personality component of conventionality–unconventionality plays an important role in determining health-related behaviors. For example, conventional adolescents were more likely to adopt more health-promoting behaviors, such as exercising regularly, using seat belts, and eating healthier food (Donovan et al., 1991). In other words, to the extent individuals are more conventional, they should exhibit less involvement in non-normative health-degrading behaviors and more involvement or adherence to health-maintaining and health-promoting behaviors.

Responsibility (avoiding trouble, being reliable) is the conscientiousness-related trait that is most closely associated with problem-behavior theory that has received the most empirical attention in relation to health-related behaviors. Research focusing on the responsibility facet of conscientiousness (often measured by the Psychoticism Scale of the Eysenck Personality Questionnaire) has shown that it is associated with lower tobacco and alcohol consumption (Tucker et al., 1995), less suicidal ideation and suicidal behavior (Lolas, Gomez, & Suarez, 1991), and better exercise habits (Arai & Hisamichi, 1998; Hogan, 1989). We expected responsibility to show strong relations to excessive alcohol use, drug use, risky sex, risky driving, suicide, violence, and tobacco use. Responsibility’s relation to activity and unhealthy eating might be attenuated by the less socially deviant nature of engagement in the health-degrading components of those behaviors. For

example, there is a greater stigma attached to smoking in a restaurant than eating a cheeseburger in one.

Though the two perspectives outlined above provide indications as to how conscientiousness and health-related behaviors are associated, it is necessary to address the extent to which traits subsumed under these models fit the domain of Conscientiousness and whether there are other aspects of Conscientiousness not identified in these models. Recent research of interest confirms that the personality traits of self-control, conventionality, and responsibility do belong to the domain of Conscientiousness and that additional traits complete the domain.

Specifically, Roberts, Chernyshenko, Stark, and Goldberg (2004) factor analyzed scales from seven different personality inventories thought to tap into conscientiousness. They identified 36 measures of conscientiousness that were best subsumed by six factors: Self-Control, Traditionalism (conventionality), Responsibility, Industriousness, Order, and Virtue. *Self-control* is defined as the propensity to inhibit impulsive thoughts, feelings, and behaviors; *traditionalism* refers to characteristic levels of conventionality and norm adherence; *responsibility* is defined as reliability and socialization; *industriousness* refers to characteristic levels of achievement and persistence; *order* refers to being organized, efficient, and regimented; and *virtue* is defined by an adherence to a strong moral grounding. The facets of self-control, traditionalism, and responsibility correspond closely to the traits identified in both Clark and Watson’s (1999) Big Three framework and problem-behavior theory.

This comprehensive mapping of the structure of Conscientiousness also adds the traits of order, industriousness, and virtue as potential predictors of health-related behaviors. Order (which is captured by a number of five-factor scales of Conscientiousness, i.e., Abridged Big Five-Dimensional Circumplex) has been shown to be negatively related to alcohol consumption (Cook, Young, Taylor, & Bedford, 1998) and risky driving (Arthur & Graziano, 1996; Booth-Kewley & Vickers, 1994) and to be positively related to good diet and exercise behaviors (Booth-Kewley & Vickers, 1994). We were unable to locate a comprehensive investigation of the magnitude of the relationships between industriousness and virtue and the health-related behaviors discussed above.

On the basis of theory and empirical research, we expected at least four domains of Conscientiousness—Order, Responsibility, Traditionalism, and Self-Control—to be negatively related to most risky health behaviors and positively related to most positive health behaviors, with the Big Three framework and problem-behavior theory indicating stronger relations for Self-Control, Responsibility, and Traditionalism than for Order. In addition to providing more refined estimates of the relationships between Order, Self-Control, Traditionalism, and Responsibility and health-related behaviors, we also investigate the other domains of the factor structure of Conscientiousness measures—Industriousness and Virtue—and their relevance to health-related behaviors (Roberts, Chernyshenko, et al., 2004).

The Need for a Meta-Analytic Approach

A meta-analysis of the relationship between conscientiousness and the health-related behaviors serves several purposes. First, it integrates voluminous research that has not been synthesized to date. Most previous research linking conscientiousness-related

traits to health-related behaviors has focused on predicting a single behavior, such as tobacco consumption. Although focusing on one behavior can be fruitful, it limits one's understanding of the scope of the effect of conscientiousness across the family of health-related behaviors. Clearly, avoiding most, if not all, of the risky health-related behaviors described above denotes some level of conscientiousness. Unlike previous research, which has ignored the commonalities across health behaviors (cf. Cooper, Wood, Orcutt, & Albino, 2003), we test the relationship between conscientiousness-related traits and all of the leading behavioral risk factors related to poor health outcomes.

Much of the research linking conscientiousness to health behaviors is found in journals dedicated to studying specific behaviors, such as tobacco smoking, accident prevention, excessive alcohol consumption, and diet and exercise. To date, findings across conscientiousness-related traits or across the identified behaviors have not been examined to determine how pervasive the influence of conscientiousness-related traits is across the leading behavioral contributors to mortality. Therefore, the effect of conscientiousness on the health process remains hidden in topical journals that appeal to researchers dedicated to understanding the predictors of specific health behaviors. The present meta-analysis brings together studies from diverse areas of research to systematically determine the influence of conscientiousness on the health process. A meta-analysis also can provide more certain information about the size of the relationship between conscientiousness and health-related behaviors. It should be noted however, that the dominant type of assessment used in addressing these research questions has been self-report. This necessarily puts some interpretive limits on the estimates derived from the analyses.

In addition to examining the average effect within each health-related behavior, we test whether facet of conscientiousness and type of measurement outcome moderate the relationship between conscientiousness and health-related behaviors. As was described above, different facets of conscientiousness (as measured by different personality scales) should have different levels of predictive validity. We test for variations in predictive validity by coding each study's personality scale(s) according to Roberts, Chernyshenko, et al.'s (2004) six-factor structure of Conscientiousness.

Many of the health behaviors identified above are often rated in terms of frequency, amount, or other variations in the enactment of the behavior. For example, risky sexual behaviors are often measured with items designed to assess condom use, the number of sexual partners over a certain period of time, as well as various risky sexual acts (e.g., intercourse with an intravenous drug user). For each health-related behavior, we code subcategories based on similar measurement outcomes. Although these analyses are exploratory, they may provide a preliminary understanding of the relative efficacy of various modes of health-related behavior assessment.

We also test whether the sample characteristic of age moderates the relationships, with the prediction that the relationships should be smaller in older samples. We test the effect of age because research has shown conscientiousness-related traits increase with age, even in adulthood (Helson & Kwan, 2000), whereas engagement in risky health behaviors decreases with age (Roberts & Bogg, 2004). This developmental combination may skew the distribution of both predictor and outcome, making it likely to find smaller relationships in older samples.

Method

Literature Search

The literature was initially searched via PsycINFO and PubMed online databases by combining conscientiousness-related terms and terms related to the behaviors described above. Specifically, the terms of *conscientiousness*, *impulse control*, *impulsivity*, *self-control*, *psychoticism*, and *disinhibition* were chosen for their prevalence among the taxonomy of traits related to conscientiousness measured by researchers. In addition, to try to capture more studies that fit into the factor structure identified by Roberts, Chernyshenko, et al. (2004), searches were conducted using the names of personality inventories and their relevant subscales. These included the 16 Personality Factor Questionnaire, the Adjective Checklist, the Big Five Inventory, the Bentler Psychological Inventory, the California Psychological Inventory, the California Q-set, the Eysenck Personality Inventory and the Eysenck Personality Questionnaire, the Hogan Personality Inventory, the Jackson Personality Inventory, the Karolinska Scale of Personality, the Minnesota Multiphasic Personality Inventory, the Multidimensional Personality Questionnaire, the NEO, the Personality Research Form, the Sensation-Seeking Scale, and the Tridimensional Personality Questionnaire. The terms chosen for the leading behavioral contributors of mortality—as derived by McGinnis and Foege (1993)—were as follows: for tobacco use, *tobacco*, *smoking*; for unhealthy eating, *eating*, *obesity*, *diet*; for activity, *exercise*, *physical activity*, *fitness*; for excessive alcohol use, *alcohol*, *alcohol use*, *alcohol abuse*; for firearms-related deaths, *violence*, *suicide*, *murder*, *homicide*, as indicators of firearms-related deaths; for risky sexual behavior, *sex*, *risky sex*; for driving, *driving*, *risky driving*; and for drug use, *drug*, *drug use*, *drug abuse*, *substance use*, *substance abuse*. Additional searches were conducted for dissertations using the same search strings. Once an initial body of literature was identified on the basis of the inclusion criteria, searches then were conducted using the reference lists from relevant articles. In addition, searches were performed on the names of authors from relevant articles. Requests also were made of personality and health psychology electronic mailing lists for unpublished data.

As mentioned previously, the lack of firearms-specific research required that we divide that category into suicide and violence categories. This split is justified by research showing that suicide makes up more than half of deaths attributed to firearms and that homicide—a clear indicator of violent behavior—constitutes nearly half of deaths related to firearms (McGinnis & Foege, 1993). As is discussed later in the description of moderator analyses, several studies in the violence domain were divided further into subcategories, including “aggressive delinquent acts,” a behavioral domain not commonly grouped with health-related behaviors. Studies in this subcategory were included and analyzed on the basis of the findings of recent research showing delinquency among adolescents to have a largely unmediated relation (controlling for health-related behaviors and demographic factors) to general health status, somatic complaints (e.g., shortness of breath), and chronic conditions (e.g., asthma; Junger, Stroebe, & van der Laan, 2001).

The final body of literature for the study, displayed in Table 2, was composed of 194 studies, with 26 studies (13%) published in 2000 or later, 120 studies (62%) published in 1990–1999, 32 studies (16%) published in 1980–1989, 15 studies (8%) published in 1970–1979, zero studies published in 1960–1969, and one study (< 1%) published in 1950–1959. Twenty studies (10%) were either dissertations or unpublished studies.

An article was included if it provided (a) a relevant facet of conscientiousness as described above; (b) a measurable health-related behavior (e.g., frequency or quantity of behavior or, at the very least, presence of the behavior, not attitudes, values, or predispositions); (c) data presented in the form of correlations, *t* tests, comparable means with standard deviations, *d* values, or other convertible statistics; (d) an *N* for the sample used for the

(text continues on page 906)

Table 2
 Study Information (Author, Year, Sample Size, Conscientiousness-Related Measure, Behavioral Measure or Indicator, and Effect Size) by Health-Related Outcome

Author(s)	Year	N ^a	Conscientiousness measure	Activity	Behavioral measure	Effect (r) ^b
Arai & Hisamichi	1998	18,112	EPQ-R: Psychoticism		Days per week of exercise	.03
Brandon & Lofin	1991	17	Self-Control Questionnaire		Maximal oxygen consumption (VO ₂ max)	.42
Conner & Abraham	2001	123	BFI: Conscientiousness NEO-FFI: Conscientiousness		Frequency of exercise in a week	.31
Courneya et al.	1999	300	NEO-FFI: Conscientiousness		Godin Leisure Time Exercise Questionnaire: Leisure Score Index	.23
Courneya & Hellsten	1998	264	NEO-FFI: Conscientiousness		Godin Leisure Time Exercise Questionnaire: Leisure Score Index	.15
Donovan et al.	1991	1,585	Conventional-unconventionality		Frequency of exercise by oneself or in organized activities or sports outside of physical education classes	.24
Hogan	1989	97	HPI: Prudence: Good attachment Mastery Perfect Avoids Trouble Not Experience Seeking		Muscular strength (grip strength, medicine ball throw) Endurance (1.5 mile run, pull-ups to exhaustion)	.10
Marks & Lutgendorf	1999	97	BFI: Conscientiousness		Personal Lifestyle Questionnaire: Exercise	.21
Renfrow & Bolton	1979	46	16 PF: Conscientious Uninhibited Controlled		Study measure of aerobic capacity	.25
Roberts	2003 (unpublished)	735	Adjective-based conscientiousness scale		BRFSS: Exercise	.22
Schnurr et al.	1990	156	Study measures: Inhibited Self-driving Pragmatic Lacks purpose Habitual Self-Control		Average quantity of kcal/week of exercise based on five separate assessments	-.03
Schroder & Schwarzer	2003 (unpublished)	179			Composite measure of exercise	.24
Sharp	1974/1975 (unpublished)	100	MMPI: Psychopathic deviate		Time in 12-min run, estimate of VO ₂ max from Astrand-Rhyming bike test	.03
Tucker et al.	1995	972	Terman Life Cycle Study: Conscientiousness		Dichotomous participation in at least one physical activity coded as "high level"	.00
Vingerhoets et al. Weber	1990 1953	978 246	DPI: Rigidity MMPI: Psychopathic deviate		Exercising at least twice a week Physical efficiency profile (mean of sit-ups in 2 min pull-ups, 100-yard pick-a-back run, and 300-yard shuttle run) Physical Activity Scale	-.02 .06
Yeung & Hemsley	1997	252	EPQ-R: Psychoticism			-.02
Alterman et al.	1990	98	Sensation-Seeking Scale: Disinhibition	Excessive alcohol use	Frequency of alcohol consumption Frequency of intoxication Number of drinks per drinking occasion	-.43
Arneklev et al.	1993	394	Low self-control, impulsivity		Absolute ounces of alcohol consumed per day Drinking more than two or three alcoholic beverages in a week (dichotomous)	-.16
G. M. Barnes et al.	1999	1,095	Seven-item impulsivity scale Psychopathic States Inventory: Impulsivity		Total daily average alcohol consumption in ounces	-.23

Table 2 (continued)

Author(s)	Year	N ^a	Conscientiousness measure	Excessive alcohol use (continued)	Behavioral measure	Effect (r) ^b
Beckwith	1986	530	Study-derived factor of Discipline	Dichotomous use of alcohol consumption		-.20
Camatta & Nagoshi	1995	128	Eysenck 1.7: Impulsiveness	Quantity-frequency measure of alcohol consumption		-.22
Caspi et al.	1995	857	MPQ: Control, Traditionalism	Diagnostic Interview Schedule: Alcohol		-.27
Chalmers et al.	1990	259	ACL: Achievement Endurance Lability Order Self-Control	Outpatient problem drinkers vs. matched community controls		-.16
Cheripitel Clapper et al.	1993 1994	1,137 575	Risk taking/impulsivity Sensation-Seeking Scale: Disinhibition	Quantity-frequency measure of alcohol consumption Age of first alcohol use Age of first intoxication		-.22 -.39
Colder & Chassin	1997	427	Eysenck: Impulsiveness	Quantity-frequency measure of alcohol consumption Quantity-frequency measure of alcohol consumption Alcohol dependency and social problems		-.28
Cook et al.	1998	891	CPI: Achievement via Conformance Conformity Responsibility Self-Control Socialization	Frequency of alcohol consumption in a week		-.10
Cooper et al.	2000	1,666	Eysenck eight-item impulsivity scale	Composite of frequencies of drinking to intoxication and consuming five or more drinks		-.23
Crocker	2003 (unpublished)	677	BFI: Conscientiousness	Average number of drinks consumed per week during the semester		-.09
Donovan et al.	1983	593	Tolerance of Deviance Value on Achievement	Problem drinkers (intoxicated six or more times, or experienced two or more negative consequences in one of six life areas in the past year) vs. non-problem drinkers		-.18
Duncan	2003 (unpublished)	137	BFI: Conscientiousness	Frequency of drinking more than is appropriate		-.07
Earleywine & Finn	1991	107	CPI: Socialization	Frequency of alcohol consumption in a week		-.30
Earleywine et al.	1990	202	Sensation-Seeking Scale: Disinhibition CPI: Socialization	Number of standard drinks per drinking occasion Frequency of alcohol consumption in a week		-.26
Finn et al.	2000	433	Sensation-Seeking Scale: Disinhibition	Number of standard drinks per drinking occasion Number of standard drinks per drinking occasion Greatest number of drinks per occasion in past 6 months Michigan Alcohol Screening Test Midlife occurrence of drinking fairly heavy or to excess		-.24 -.12
Friedman, Tucker, Schwartz, et al.	1995	1,138	Childhood conscientiousness	Frequency of alcohol consumption		-.31
Grau & Ortet	1999	149	KSP: Impulsiveness, Socialization EPQ-R: Psychoticism	Quantity of alcohol consumption		-.69
Greene et al.	2000	724	Sensation-Seeking Scale: Disinhibition	Composite of quantity, frequency, and intoxication		-.28
Hallman et al.	1991	58	EPQ: Psychoticism Eysenck IVE: Impulsiveness	Clinical alcoholics vs. controls		-.28
Hampson et al.	2001	297	KSP: Impulsiveness, Monotony Avoidance, Socialization Block Ego Control Scale Value on Achievement	Quantity-frequency measure of alcohol consumption		-.30

(table continues)

Table 2 (continued)

Author(s)	Year	N ^a	Conscientiousness measure	Excessive alcohol use (continued)	Behavioral measure	Effect (r) ^b
Hindelang	1972	337	MMPI: Psychopathic deviate	Frequency of alcohol consumption	Frequency of alcohol consumption	-.34
Hutchinson et al.	1998	203	CPI: Responsibility, Self-Control Eysenck 1.7: Impulsiveness	CPI: Responsibility, Self-Control Socialization	Frequency of intoxication Frequency of alcohol consumption and heavy alcohol use	-.25
Jackson & Matthews	1988	88	EPI: Impulsivity		Problems with alcohol use	-.43
Justus et al.	2000	410	CPI: Socialization Eysenck IVE: Impulsiveness MMPI: Psychopathic deviate MPQ: Control		Social habitual consumption of alcohol Frequency of alcohol consumption in a week Quantity of alcohol consumption in a week Largest number of drinks on single occasion in past 6 months	-.23
Kashdan et al.	2003 (unpublished)	421	Sensation-Seeking Scale: Disinhibition NEO-FFI: Conscientiousness		Average weekly alcohol consumption	-.14
Kohn & Coulas	1985	78	Sensation-Seeking Scale: Disinhibition		Frequency of alcohol consumption	-.34
Kopstein	1999 (unpublished)	2,565	Sensation-Seeking Scale: Disinhibition		Current alcohol use Binge alcohol use (consuming at least three drinks in a row in the 2 weeks prior to the survey)	-.27
La Grange et al.	1995	88	EPQ: Psychoticism		Student Alcohol and Drug Use Survey: Alcohol use	-.31
Lejoyeux et al.	1998	60	Sensation-Seeking Scale: Disinhibition Barratt Impulsivity Scale		DSM-IV alcohol diagnosis	-.04
LoCastro et al.	2000	485	Sensation-Seeking Scale: Disinhibition EPI: Impulsivity		Average number of drinks per day Frequency of experiencing 1 or more of 13 alcohol-related problems (e.g., drunk too often)	-.12
Loper et al.	1973	180	MMPI: Psychopathic deviate		Prealcoholics vs. controls	-.28
C. A. Martin et al.	1997	220	ARCMS: Impulsivity, sociopathy		Modified Personal History Questionnaire: Alcohol use	-.13
E. D. Martin & Sher	1994	467	NEO-FFI: Conscientiousness		DSM-III-R alcohol diagnosis: past only vs. never met lifetime criteria for alcohol use disorder	-.22
W. R. Martin et al.	1977	107	Maturation Scale: Impulsivity, Sociopathy		DSM-III-R alcohol diagnosis: 12 month vs. never met lifetime criteria for alcohol use disorder	-.49
McGue et al.	1999	1,842	MPQ: Achievement, Constraint, Control, Traditionalism		Identified alcoholics vs. controls	-.08
Meadows	1996 (unpublished)	598	EASI-III: Impulsivity		DSM-III-R alcohol diagnosis Global and 30-day consumption of alcohol	-.33
Musgrave-Musquart et al.	1997	161	NEO-PI-R: Conscientiousness		Frequency of alcohol consumption in a week	-.13
Nagoshi	1999	142	Eysenck 1.7: Impulsiveness		Frequency of alcohol use in past year Frequency of five or more drinks in a sitting	-.27
Nagoshi et al.	1992	108	EPQ: Psychoticism Eysenck 1.7: Impulsiveness		Quantity of alcohol consumption Problems with alcohol use Diagnostic Interview Schedule: Alcohol	-.24
Nagoshi et al.	1991	199	Eysenck IVE: Impulsiveness		Quantity of alcohol consumption in g/month	-.12
Patock-Peckham et al.	1998	263	Eysenck 1.7: Impulsiveness		Frequency of alcohol use in past year Frequency of intoxication Quantity of alcohol consumption Problems with alcohol use	-.20

Table 2 (continued)

Author(s)	Year	N ^a	Conscientiousness measure	Behavioral measure	Effect (r) ^b
Excessive alcohol use (continued)					
Peluso et al.	1999	198	Cognitive self-control	Study-derived drinking factor component	-.23
Plutchik & Plutchik	1989	100	Study measure of socialization	Brief version of Michigan Alcohol Screening Test	-.21
Ripa et al.	2001	691	Sensation-Seeking Scale: Disinhibition	Number of drinks per week	-.23
Roberts	2003	735	Adjective-based conscientiousness scale	BRFSS: Alcohol use	-.31
Schall et al.	(unpublished) 1992	598	CPI: Socialization EPQ: Psychoticism Sensation-Seeking Scale: Disinhibition	Quantity of alcohol (in ounces) consumed during previous 4 weeks	-.28
Selzer et al.	1977	558	CPI: Responsibility, Self-Control	Michigan Alcohol Screening Test	-.28
Sharkansky & Finn	1998	120	MPQ: Control	Laboratory alcohol consumption Patterns of alcohol consumption each day of the week Number of alcoholic drinks consumed in a week Alcohol consumption	-.02
Slack	1994/1995 (unpublished)	1,493	BFI: Conscientiousness GTS: Disinhibition	DSM-III-R alcohol diagnosis	-.36
Soldz & Valliant	1999	162	NEO-PI: Conscientiousness Study-derived factor of observer rating of conscientiousness-related traits	DSM-III-R alcohol diagnosis	-.17
Soloff et al.	2000	33	Barratt Impulsiveness Scale Eysenck I.6: Impulsiveness MPQ: Constraint	Alcohol use disorder (DSM-IV lifetime diagnosis of alcohol abuse and alcohol dependence) vs. non-alcohol use disorder	-.54
J. A. Stein et al.	1987	654	BPI: Conscientiousness, social conformity	Frequency of alcohol consumption	-.25
Stewart et al.	2001	154	NEO-FFI: Conscientiousness	Average quantity of alcohol consumed per drinking occasion	-.22
Stuart	1997/1998 (unpublished)	86	Eysenck I.7: Impulsiveness	Rutgers Alcohol Problem Index	-.35
Vingerhoets et al.	1990	978	DPI: Rigidity	Short Michigan Alcoholism Screening Test	-.06
Vollrath et al.	1999	656	NEO-FFI: Conscientiousness	Quantity-Frequency Index: Alcohol	-.18
von Knorring, Orelund, & von Knorring	1987	1,000	EPI: Impulsiveness KSP: Impulsiveness	Consuming fewer than 45 drinks per month Frequency of intoxication	-.11
von Knorring, von Knorring, et al.	1987	193	KSP: Impulsiveness, Monotony Avoidance, Socialization	Frequency of alcohol consumption	-.14
Waldeck & Miller	1997	282	Chapman Scale: Impulsivity/nonconformity	Type I (late onset) and Type II (early onset) alcoholics vs. healthy controls	-.35
Whipple & Noble	1991	38	16 PF: Self-Disciplined, Conforming, Control MMPI: Psychopathic deviate TPQ: Novelty seeking: Disorderly/regimented, impulsive/reflective CPI: Impulsivity	Frequency of alcohol consumption DSM-III-R alcohol diagnosis	.02
Wood et al.	1995	1,189	CPI: Impulsivity	Frequency of alcohol consumption Frequency of intoxication	-.18
Zhang et al.	1997	625	Psychopathic State Inventory: Impulsivity	Quantity-frequency measure of alcohol consumption	-.23
Drug use					
Allen et al.	1998	58	BIS-11 Eysenck IVE: Impulsiveness Impulsivity Inventory	Past substance dependence disorder group (based on Structured Clinical Interview for the DSM-III-R diagnosis) vs. normal group	-.22
Block et al.	1988	105	California Q-set: Items 2, 6, 7, 25, 39, 41, 53, 62, 65, 70, 71	Frequency of marijuana use Frequency of hard drug (amphetamines, barbiturates, cocaine, or hallucinogens) use	-.37

(table continues)

Table 2 (continued)

Author(s)	Year	N ^a	Conscientiousness measure	Drug use (continued)	Behavioral measure	Effect (r) ^b
Brook et al.	1986	356	Study measure of conventionality—unconventionality	Stage of drug use (legal, marijuana, other illicit drugs)		-.41
Brooks	2002 (unpublished)	352	Adolescent Self-Reporting Rating Scale: Impulse control	Thirty-day recall of dichotomous use of cigarettes, alcohol, or marijuana		-.09
Caspi et al.	1995	857	MPQ: Control, Traditionalism	Diagnostic Interview Schedule: Marijuana		-.22
Chernyshenko	2002/2003 (unpublished)	539	Study measures of industriousness, order, responsibility, self-control, traditionalism, and virtue	HBC: Substance use		-.27
Colder & Stice	1998	1,669	GTS: Impulsivity	Frequency of alcohol consumption; heavy drinking, intoxication, and use of marijuana, stimulants, downers, inhalants, and hallucinogens		-.36
Eisen et al.	1992	48	BASIS-32: Impulsive	Alcohol/drug problem (based on Michigan Alcoholism Screening Test, drinking quantity, drug use and impact questionnaires, and clinical reports) vs. no problem		-.58
Farrell & Sullivan	2000	531	WAI: Impulse control, responsibility	Problem Behavior Frequency Scale: Drug use frequency		-.32
Ge & Conger	1999	406	MPQ: Constraint	Substance use problems: frequency of problems ranging from frequent drunkenness to being picked up by police for drug or alcohol problems over past 12 months		-.14
Goldstein & Sappington	1977	66	MMPI: Psychopathic deviate	Pre-users of marijuana and hallucinogens vs. controls		-.25
Greene et al.	2000	724	Sensation-Seeking Scale: Disinhibition	Frequency of use of marijuana, uppers, downers, LSD, tranquilizers, opiates, and cocaine/crack in past 90 days		-.49
Hindelang	1972	337	MMPI: Psychopathic deviate CPI: Responsibility, Self-Control, Socialization	Frequency of marijuana use over past year Frequency of sniffing glue over past year Frequency of using heroin over past year		-.21
Huq & Mahmud	1994	948	EPQ: Psychoticism	Frequency of using heroin over last year		-.40
Jessor et al.	1980	10,405	Tolerance of Deviance	Drug treatment program attendees vs. normal controls		-.39
Kashdan et al.	2003 (unpublished)	421	NEO-FFI: Conscientiousness	Involvement in Marijuana Scale Frequency of marijuana consumption Frequency of cocaine consumption Frequency of amphetamine consumption Frequency of opioid consumption Frequency of marijuana consumption Current marijuana use Heavy marijuana use (smoking marijuana at least six times in the month prior to the survey)		-.22
Kohn & Coulas	1985	78	Sensation-Seeking Scale: Disinhibition	Drug consumers (consuming alcohol, hashish, cocaine, and/or heroin at least 2-3 times per week) vs. nonconsumers		-.37
Kopstein	1999 (unpublished)	2,565	Sensation-Seeking Scale: Disinhibition	Antisocial Behavior Questionnaire: Drug Consumption Modified Personal History Questionnaire: Marijuana use, narcotics use, polysubstance use		-.26
Lopez-Torrecillas et al.	2000	124	Rosenbaum Self-Control Questionnaire	DSM-III-R drug abuse diagnosis DSM-III-R alcohol and drug abuse diagnoses		-.16
Luengo, Otero, et al.	1994	1,041	Eysenck 1.7: Impulsiveness	Diagnostic Interview Schedule: marijuana, barbiturate, amphetamine, cocaine, opioid, hallucinogens		-.15
C. A. Martin et al.	1997	220	ARCMS: Impulsivity	Hallucinogen user vs. nonuser		-.19
McGue et al.	1999	1,856	MPQ: Achievement, Constraint, Control, Traditionalism	Substance delinquency (frequency of alcohol, cigarette, marijuana, or hard drug use in past 4 weeks)		-.15
Nagoshi et al.	1992	108	EPQ: Psychoticism			-.13
Nishith et al.	1994	80	Eysenck 1.7: Impulsiveness			-.52
Pfefferbaum & Woods	1994	296	EPQ: Psychoticism CPI: Self-Control, Socialization			-.38

Table 2 (continued)

Author(s)	Year	N ^a	Conscientiousness measure	Behavioral measure	Effect (r) ^b
Ripa et al.	2001	691	Sensation-Seeking Scale: Disinhibition	Frequency of cannabis consumption	-.23
Roberts	2003	735	Adjective-based conscientiousness scale	Frequency of "other drug" consumption	-.30
Roberts & Bogg	(unpublished)	99	CPI: Social responsibility composite	Frequency of marijuana consumption	-.28
Satinder & Black	1984	48	Sensation-Seeking Scale: Disinhibition	Marijuana users vs. nonusers	-.60
Shammugam	1979	434	EPQ: Psychoticism	Consumption of marijuana, amphetamines, barbiturates, tranquilizers, or opium	-.13
Shoal & Giancola	2003	311	MPQ: Constraint	Frequency of use 20 different substances	-.33
Slack	1994/1995	1,493	BFI: Conscientiousness GTS: Disinhibition	Frequency of marijuana use	-.17
Soldz & Valliant	1999	162	NEO-PI: Conscientiousness Study-derived factor of observer rating of conscientiousness-related traits	Frequency of Ecstasy use	
J. A. Stein et al.	1987	654	BPI: Conscientiousness, social conformity	Frequency of inhalants use	
Stuart	1997/1998	86	Eysenck 1.7: Impulsiveness	Frequency of cocaine use	
Vitaro et al.	(unpublished) 1998	506	Eysenck IVE: Impulsiveness Social Behavior Questionnaire: Impulsivity	Frequency of narcotics use	
von Knorring, Orelund, & von Knorring	1987	1,062	EPI: Impulsiveness KSP: Impulsiveness	Frequency of marijuana use	-.37
Vukov et al.	1995	354	TPQ: Novelty seeking: Impulsiveness vs. reflection, disorderliness vs. regimentation	Frequency of hard drug use	-.39
Wagner	1993	355	Study measure of impulsivity	Marijuana consumption in past year	
Wills & Cleary	1999	1,190	Tolerance of Deviance Study measures of cautiousness, good self-control, and poor self-control	Drug Abuse Screening Test score	-.08
Wills et al.	1994	430	Achievement orientation Modified Eysenck Impulsiveness Scale Order orientation	Personal Experiences Screening Questionnaire: Problem Severity Scale (frequency of problems associated with drug use over past 12 months)	-.11
Wills et al.	1998	949	Self-Control Rating Schedule Tolerance of Deviance Value on Achievement Modified Eysenck Impulsiveness Scale	Mixed drug abuse (consumption of cannabis, glue, amphetamines, or opioids and alcohol)	-.18
				Opiate addicts vs. controls	-.19
				12-month frequency of marijuana use	-.20
				12-month frequency of hard drug use	
				Frequency of alcohol, marijuana, and tobacco use	-.20
				Frequency of alcohol, marijuana, and tobacco use	-.20
				Frequency of alcohol, marijuana, and tobacco use	-.27

(table continues)

Table 2 (continued)

Author(s)	Year	N ^a	Conscientiousness measure	Behavioral measure	Effect (r) ^b
Drug use (continued)					
Wong et al.	1997	969	Sensation-Seeking Scale: Disinhibition	Frequency of organic solvent, cannabis, heroin, tranquilizer, or narcotics use in past 6 months	-.28
Wood et al.	1995	1,189	CPI: Impulsivity	Dichotomous use of marijuana in past 4 weeks Frequency of marijuana use Dichotomous use of hard drugs (cocaine, crack, speed, downers, heroin, LSD, PCP) in past 4 weeks Frequency of hard drug (cocaine, crack, speed, downers, heroin, LSD, PCP) use	-.06
Unhealthy eating					
Beckwith	1986	530	Study-derived factor of Discipline	Average amount and frequency of food consumption in a day	-.29
Carey et al.	1988	42	BSQ/MCTQ: Persistence/attention span	Obesity (95th or above percentile wt./ht.)	-.27
Chalmers et al.	1990	246	ACL: Achievement Endurance Lability Order Self-Control	Outpatient obese group vs. matched community controls	-.13
Donovan et al.	1991	1,585	Conventional/unconventional	Attention to a healthy diet (seeing that diet is balanced, limiting the amount of fat in the food)	-.28
Dorman	1984/1985 (unpublished)	40	CPI: Socialization	Healthful food preferences (choice of foods with lower sodium content, less saturated fat, or more complex carbohydrates)	-.23
Friedman, Tucker, Schwartz, et al.	1995	1,044	Terman Life Cycle Study: Conscientiousness	Obese—20% or more above ideal body weight (based on Metropolitan Insurance Company tables)	-.03
Lazarus & Galassi	1994	52	EDI: Perfectionism	Obese binge eaters vs. nonbinge eaters	-.33
Li	1995	170	EPQ: Psychoticism	Simple obesity	-.25
Michaud	2002 (unpublished)	473	NEO-FFI: Conscientiousness	Body mass index	.08
Roberts	2003 (unpublished)	735	Adjective-based conscientiousness scale	BRFSS: Diet	-.19
Schroder & Schwarzer	2003 (unpublished)	179	Habitual Self-Control	Body mass index	-.02
Vingerhoets et al.	1990	978	DPI: Rigidity	Maintaining a desirable weight (between 90%–130% of the ideal weight)	.03
Williamson et al.	1985	30	MMPI: Psychopathic deviate	Obese—20% or more above ideal body weight (based on Metropolitan Insurance Company tables) vs. controls	-.37
Yeung & Hemsley	1997	252	EPQ-R: Psychoticism	Body mass index	-.04
Risky driving					
Arthur & Graziano	1996	477	NEO-FFI: Conscientiousness	Involvement in an at-fault traffic accident (based on police determination)	-.16
Booth-Kewley & Vickers	1994	176	NEO-PI: Conscientiousness NEO-FFI: Conscientiousness	Number of moving violation tickets HBC: Traffic risk taking	-.28
Caspi et al.	1995	846	MPQ: Control, Traditionalism	Dangerous driving habits	-.12

Table 2 (continued)

Author(s)	Year	N ^a	Conscientiousness measure	Risky driving (continued)	Behavioral measure	Effect (r) ^b
Cavatola et al.	2003	138	MMPI: Psychopathic deviate		One-time conviction of drinking-and-driving-related offense	-.21
Donovan	1993	1,056	Psychosocial unconventionalality		Multiple convictions of drinking-and-driving-related offenses Drinking and driving—frequency in the past year of the following behaviors: driving within an hour of having 1–2 drinks, driving within an hour of having 3+ drinks, driving when high or lightheaded from drinking, driving when coordination was already affected, and drinking while driving	-.56
Donovan et al. Furnham & Saipe	1991 1993	1,585 73	Conventionality—unconventionality Sensation-Seeking Scale: Disinhibition		Frequency of safety belt usage in a car Conviction for non-alcohol-related driving offense	-.27 -.12
Greene et al.	2000	724	Sensation-Seeking Scale: Disinhibition		Number of recorded accidents Frequency of driving over 80 miles per hr (mph; 128.72 km/h), driving more than 20 mph (32.18 km/h), over the speed limit, and passing in a no-passing zone	-.48
Hampson et al.	2001	297	Block Ego Control Scale Value on Achievement		Frequency of driving under the influence and being a passenger of a driver under the influence in the past year Riding in a car with an intoxicated driver or driving a car while intoxicated	-.24
Hindelang	1972	337	MMPI: Psychopathic deviate CPI: Responsibility, Self-Control, Socialization		Frequency of drag racing on street in excess of 20 mph (32.18 km/h) over the speed limit over past year Frequency of driving while strongly under the influence of alcohol or drugs over past year	-.17
Homant et al.	1993	69	Sensation-Seeking Scale: Disinhibition		Frequency of being in hit-and-run accidents over past year Self report of initiating high-speed police pursuit in past 12 months Police department record of initiating high-speed pursuit in past 2 years that resulted in damage to a police vehicle	-.24
Leaman & Fitch N. G. Martin & Boomsma	1987 1989	242 364	Eysenck IVE: Impulsiveness EPQ: Psychoticism		Driving a motorcycle of at least 100 cc Willingness to drive 1 hr after consuming .75 g EtOH/kg body weight Willingness to drive 2 hr after consuming .75 g EtOH/kg body weight	-.09 -.04
Pfefferbaum & Woods Ripa et al.	1994 2001	296 691	CPI: Self-Control, Socialization Sensation-Seeking Scale: Disinhibition		Willingness to drive 3 hr after consuming .75 g EtOH/kg body weight Joyriding Drunk driving Speeding HBC: Traffic risk taking	-.22 -.16
Roberts	2003 (unpublished)	735	Adjective-based conscientiousness scale			-.25
Selzer et al. Stacy et al.	1977 1991	575 614	CPI: Responsibility, Self-Control Social conformity		Drunken driving conviction group vs. controls Frequency of drunk driving Arrest or conviction for driving while intoxicated	-.11 -.22
Trimpop & Kirkcaldy	1997	120	Sensation-Seeking Scale: Disinhibition		Convicted of at least one moving violation (speeding, traffic ticket, reckless driving, alcohol while driving, running a red light, etc.) Involvement in at least one traffic accident	-.25
Vavrik	1997	100	JPI: Conformity, responsibility PRF: Achievement, impulsivity, order		High-risk drivers (two or more at fault accidents in the past 2 years) vs. low-risk drivers	.03
Vollrath et al.	1999	656	NEO-FFI: Conscientiousness		Frequency of drunk driving	-.05

(table continues)

Table 2 (continued)

Author(s)	Year	N ^a	Conscientiousness measure	Risky sex	Behavioral measure	Effect (<i>r</i>) ^b
Arnett G. E. Barnes et al.	1990 1984	145 307	Sensation-Seeking Scale: Disinhibition EPQ: Psychoticism		Sex without contraception group vs. sex with contraception group Dichotomous participation in intercourse	-.23 -.01
Bogaert	1993	375	EPQ: Psychoticism		Dichotomous participation in oral-genital contact Dichotomous participation in male homosexual acts Dichotomous participation in group sex Age of first intercourse	.00
Bogaert & Fisher	1995	215	EPQ: Psychoticism		Maximum number of sexual partners in a month Number of sexual partners in lifetime	-.21
Breakwell	1996	209	Modified Eysenck impulsivity scale		Maximum number of sexual partners in a month Number of sexual partners in lifetime Number of sexual partners in past 6 months Age of first intercourse	-.27
Caspi et al.	1995	842	MPQ: Control, Traditionalism		Unsafe sex: intercourse with five or more different partners in past 12 months; never or seldom uses a condom	-.15
Clift et al.	1993	503	Eysenck 1.7: Impulsiveness		Have a regular heterosexual partner Used condom with regular, heterosexual partner during last intercourse	-.13
Cooper et al.	2000	1,666	Eysenck eight-item impulsivity scale		Have casual heterosexual partner(s) in past year Used condom(s) with casual heterosexual partner(s) in past year Used condom with casual heterosexual partner during last intercourse	-.12
F. M. Costa et al.	1996	971	Expectation for achievement Intolerance of deviance		Frequency of high-risk HIV behaviors: anal intercourse; one-night stands; intercourse with a stranger or prostitute; intercourse in exchange for drugs or money; and intercourse with someone who has had many partners, used IV drugs, or is HIV positive Index of contraceptive use, regularity of any contraceptive use, or condom use in the past year, use of contraception at last intercourse	-.10
Crocker	2003 (unpublished)	640	BFI: Conscientiousness		Frequency of unprotected (no condom) sex during semester	-.04
Fontaine	1994	74	EPQ-R: Psychoticism		Sexual relations with a bisexual Oral sex	-.33
Greene et al.	2000	724	Sensation-Seeking Scale: Disinhibition		Sexual relations with an intravenous drug user Sexual relations with someone who "sleeps around"	-.25
Hernandez & DiClemente	1992	123	Rosenbaum Self-Control Scale		One-night stand (i.e., meet someone, have sexual intercourse, and do not continue into a relationship) Unprotected (no condom) anal intercourse Sexual relations with different partners Sexual relations with people met on holiday Composite of number of partners in past 6 months and 2 years and frequency of condom use during sexual intercourse	-.15
Hindelang	1972	337	Sensation-Seeking Scale: Disinhibition MMPI: Psychopathic deviate CPI: Responsibility, Self-Control, Socialization		High-risk sexual behavior group vs. low-risk sexual behavior group Frequency of promiscuous activities over past year Frequency of visiting a prostitute in past year	-.17

Table 2 (continued)

Author(s)	Year	N ^a	Conscientiousness measure	Behavioral measure	Effect (<i>r</i>) ^b
			<i>Risky sex (continued)</i>		
Horvath & Zuckerman	1993	447	Eysenck: Narrow Impulsivity Scale Sensation-Seeking Scale: Disinhibition	Risky sexual behavior (females: number of heterosexual partners, frequency of anal intercourse, nonuse of condoms by partners, nonuse of spermicide; males: lifetime number of heterosexual partners, lifetime number of homosexual partners, frequency of receptive anal intercourse, and nonuse of condoms)	-.13
Justus et al.	2000	410	CPI: Socialization Eysenck IVE: Impulsiveness MMPI: Psychopathic deviate MPQ: Control	Frequency of one-night stands in past 12 months Frequency of intercourse over past 12 months with a man or woman just met	-.21
Malamuth	1986	155	Sensation-Seeking Scale: Disinhibition EPQ: Psychoticism	Dichotomous participation in various sexual acts including kissing, fondling of breasts, intercourse, and oral sex	.03
C. A. Martin et al.	1997	220	ARCMS: Impulsivity	Modified Personal History Questionnaire: Sexual activity	-.19
Meadows	1996 (unpublished)	598	EASI-III: Impulsivity	Global condom use—lifetime condom use Frequency of condom use in past 30 days Condom use at first intercourse after high school graduation Condom use at first intercourse with most recent partner Condom use at most recent intercourse	-.24
J. D. Miller	2002 (unpublished)	210	NEO-PI-R: Conscientiousness; competence, order, dutifulness, achievement striving, self-discipline, deliberation	Age of first intercourse Condom use	-.05
Ripa et al.	2001	691	Sensation-Seeking Scale: Disinhibition	Dichotomous intercourse Number of sexual partners in lifetime Sexual Behavior Scale score Number of sexually transmitted diseases	-.22
Schafer et al.	1994	698	Impulsivity, Risk-Taking, and Sensation-Seeking Scale	Condom use in a risky sexual situation No-condom with new partner group vs. condom with new partner group	-.02
Vollrath et al.	1999	656	NEO-FFI: Conscientiousness	Frequency of starting a new sexual relationship, having sex with a person just met, and having unprotected sex with a new sexual partner	-.12
H. R. White & Johnson	1988	844	PRF: Impulsivity Sensation-Seeking Scale: Disinhibition	Virgin status	-.13
Wright & Reise	1997	350	NEO-FFI: Conscientiousness	Sociosexual Orientation Inventory: Sexual relations	-.11
			<i>Suicide</i>		
Angst & Clayton Cabiles	1998 1996 (unpublished)	2,786 95	Freiburg Personality Inventory: Inhibition Barratt Impulsivity Scale Dimensions of Temperament: Impulsivity	Completed suicide attempters vs. controls High lethality suicide attempters (e.g., hanging, firearms, and explosives) vs. nonattempter controls Low lethality suicide attempters (e.g., analgesics, poisoning) vs. nonattempter controls	-.02 -.10
Duberstein et al. Eliason	1994 2000/2001 (unpublished)	101 40	NEO-PI: Conscientiousness Impulsivity Rigidity	Completed suicide attempters vs. controls Suicide attempters vs. nonattempter controls	.07 -.49

(table continues)

Table 2 (continued)

Author(s)	Year	N ^a	Conscientiousness measure	Behavioral measure	Effect (r) ^b
			Suicide (continued)		
Horesh et al.	1997	62	Impulsivity Control Scale	Suicidal inpatients (ideation or attempt) vs. nonsuicidal controls	-.50
Kashden et al.	1993	43	Gordon Diagnostic System: Attention, impulsivity	Suicidal inpatients (ideation or attempt) vs. nonsuicidal controls	-.22
Lehnert et al.	1994	427	Offer Self Image Questionnaire: Impulse Control Scale	Suicide attempters vs. nonattempter controls	-.20
Lennings	1994	397	Schalling Impulsivity Scale	BDI (Item 9) current suicidal ideation	-.02
Lester	1987	174	EPQ: Psychoticism	Prior suicidal ideation	-.25
				Prior suicide threats	
Lester	1990	145	Impulsivity Scale	Prior suicide attempts	-.13
				BDI (Item 9) current suicidal ideation	
				Prior suicidal ideation	
				Prior suicide threats	
Lester	1993	145	Dysfunctional Impulsivity	Prior (single) suicide attempt	-.18
				BDI (Item 9) current suicidal ideation	
				Prior suicidal ideation	
				Prior suicide threats	
Mann et al.	1999	203	Barratt Impulsivity Scale	Suicide attempters vs. nonattempters	-.14
C. A. Martin et al.	1997	220	ARCMS: Impulsivity, sociopathy	BDI/DSM-IV composite of suicide ideation	-.18
Nordstrom et al.	1995	62	EPQ: Psychoticism	Suicide attempters vs. nonattempters	-.31
			KSP: Impulsivity, Monotony Avoidance, Socialization		
			Nonconformity		
Pendse et al.	1999	46	KSP: Impulsivity, Monotony Avoidance, Socialization	Suicide attempters vs. nonattempter controls	-.27
Roberts	2003	735	Adjective-based conscientiousness scale	BRFSS: Suicide ideation or attempt	-.17
	(unpublished)				
Sadowski	1994/1995	85	BIS-11	Suicide attempters vs. nonattempter controls	-.43
	(unpublished)			Suicide ideators vs. nonideator controls	
D. Stein et al.	1998	136	Suicide Potential Scale (composite scale of patient, parents, and therapist interviews regarding general tendency toward anxiety, depression, aggression, and impulsivity): Impulsivity	Single suicide attempters vs. controls	-.49
			NEO-PI-R: Conscientiousness	Multiple suicide attempters vs. controls	
Velting	1999	185		Adult Suicidal Ideation Questionnaire	-.33
			Tobacco use		
Allan et al.	1995	205	EPQ: Psychoticism	Number of cigarettes smoked per day	-.22
Arai et al.	1997	18,426	EPQ-R: Psychoticism	Smokers vs. nonsmokers	-.08
Arneklev et al.	1993	394	Low self-control, impulsivity	Smoke tobacco products (dichotomous)	-.10
Beckwith	1986	530	Study-derived factor of Discipline	Use of tobacco products in past 12 months (dichotomous)	-.30
Bickel et al.	1999	45	EPQ: Impulsivity	Smokers vs. never smokers	-.14
Canals et al.	1997	290	EPQ: Psychoticism	Light smokers (smoke 1-9 cigarettes per day) vs. nonsmokers	-.15
				Moderate to heavy smokers (smoke 10 or more cigarettes per day) vs. nonsmokers	
Carton et al.	1994	164	Sensation-Seeking Scale: Disinhibition	Smokers vs. nonsmokers	-.24
Crocker	2003	618	BFI: Conscientiousness	Frequency of cigarette smoking	-.15
	(unpublished)				
Friedman, Tucker, Schwartz, et al.	1995	689	Terman Life Cycle Study: Conscientiousness	Lifetime occurrence of smoking in cigarette-years (i.e., total number of years smoked × average number of cigarettes smoked per day in those years)	-.13
Geist & Herrmann	1990	287	ACL: Endurance, Order, Self-Control	Smokers vs. nonsmokers	-.06

Table 2 (continued)

Author(s)	Year	N ^a	Conscientiousness measure	Tobacco use (continued)	Behavioral measure	Effect (r) ^b
Golding et al.	1983	178	EPQ: Psychoticism		Smokers vs. nonsmokers	-.38
Greene et al.	2000	724	Sensation-Seeking Scale: Disinhibition		Composite score of number of cigarettes smoked per day and years of smoking	-.32
Heaven	1989	193	EPQ: Psychoticism		Smoke tobacco products (dichotomous)	-.13
Jacobs & Spilken	1971	150	Boston University Personality Inventory: Impulsivity		Heavy smokers (smoke a pack or more per day) vs. nonsmokers	-.29
Jamison	1979	1,282	EPQ: Psychoticism		Composite of smoking during school hours, buying cigarettes to smoke them, and smoking cigarettes	-.28
Jansevics	1994/1995 (unpublished)	50	NEO-PI-R: Conscientiousness		Light smokers (smoke 1-5 cigarettes at least 4 days per week) vs. nonsmokers	.07
Jorm et al.	1999	2,011	EPQ-R: Psychoticism		Heavy smokers (smoke 20 or more cigarettes daily) vs. nonsmokers	-.14
Kashdan et al.	2003 (unpublished)	421	NEO-FFI: Conscientiousness		Smokers vs. nonsmokers	-.15
Kassel et al.	1994	207	EPI: Impulsivity Sensation-Seeking Scale: Disinhibition		Regular smokers vs. nonsmokers Chippers (smoke 1-5 cigarettes at least 4 days a week) vs. nonsmokers	-.19
Kohn & Coulas	1985	78	Sensation-Seeking Scale: Disinhibition		Frequency of tobacco product use	-.22
Kopstein	1999 (unpublished)	2,565	Sensation-Seeking Scale: Disinhibition		Smoke less than half pack per day in past month (dichotomous) Smoke more than half pack per day in past month (dichotomous)	-.25
La Grange et al.	1995	88	EPQ: Psychoticism Sensation-Seeking Scale: Disinhibition		Student Alcohol and Drug Use Survey: Tobacco product use	-.19
Lipkus et al.	1994	4,646	MMPI: Psychopathic deviate		Ever smokers vs. never smokers	-.16
C. A. Martin et al.	1997	220	ARCMS: Impulsivity		Modified Personal History Questionnaire: Nicotine use	-.20
Mitchell	1999	40	ACL: Order, Self-Control BIS-11		Regular smokers (15 or more cigarettes per day) vs. never smokers	-.25
Musgrave-Musquart et al.	1997	161	EPI: Impulsivity Sensation-Seeking Scale: Disinhibition TPQ: Novelty seeking: Impulsiveness vs. reflection, disorderliness vs. regimentation		Daily use of cigarettes, pipes/cigars, chewing/dipping	-.11
Nagoshi et al.	1992	108	NEO-PI-R: Conscientiousness		Diagnostic Interview Schedule: Cigarettes	-.10
Parkes	1984	270	EPQ: Psychoticism		Smokers vs. nonsmokers	-.09
Reynolds & Nichols	1976	852	CPI: Achievement via Conformance, Responsibility, Socialization, Self-Control		Frequency of smoking cigarettes	-.21
Ripa et al.	2001	691	Sensation-Seeking Scale: Disinhibition		Smoke tobacco products (dichotomous)	-.06
Robbins et al.	1971	85	MMPI: Psychopathic deviate		Number of cigarettes smoked per day	-.32
Roberts	2003 (unpublished)	735	Adjective-based conscientiousness scale		Level of smoking BRFSS: Tobacco use	-.37
Roberts & Bogg	2004	99	CPI: Social responsibility composite		Frequency of tobacco consumption	-.30
Seltzer & Oechlsli	1985	1,127	EPQ: Psychoticism		Smokers vs. nonsmokers	-.07
Sjuwola	1989	578	EPQ: Psychoticism		Smokers vs. nonsmokers	-.15
Slack	1994/1995 (unpublished)	1,493	BFI: Conscientiousness GTS: Disinhibition		Frequency of cigarette use	-.24
Soldz & Valliant	1999	162	NEO-PI: Conscientiousness Study-derived factor of observer rating of conscientiousness-related traits		"Pack-years" of smoking	-.15

(table continues)

Table 2 (continued)

Author(s)	Year	N ^a	Conscientiousness measure	Behavioral measure	Effect (r) ^b
Spielberger et al.	1995	747	EPQ: Psychoticism	Smokers vs. nonsmokers Smokeless tobacco users vs. nonusers	-.13 -.13
Spielberger & Jacobs	1982	862	Eysenck 1.7: Impulsiveness EPQ: Psychoticism	Smokers vs. nonsmokers	-.09
Vingerhoets et al.	1990	978	DPI: Rigidity	Smoking cigarettes	-.03
Vollrath et al.	1999	656	NEO-FFI: Conscientiousness	Number of cigarettes smoked per day	-.15
Wakefield	1989	403	EPQ: Psychoticism	Smoke tobacco products (dichotomous)	-.09
Waldeck & Miller	1997	282	Chapman Scale: Impulsivity/nonconformity	Frequency of tobacco product use	-.23
A. F. Williams	1973	386	PRF: Impulsivity, order	Number of days in past 7 when cigarettes were smoked	-.18
J. H. Williams et al.	1996	360	EPQ: Psychoticism	Smokers vs. nonsmokers	-.19
Wood et al.	1995	1,189	CPI: Impulsivity	Dichotomous use of tobacco products in past 4 weeks Frequency of tobacco product use	-.26
Violence					
Allsopp & Feldman	1974	197	EPQ: Psychoticism	Frequency of antisocial behavior (as assessed by a revised Antisocial Behavior Questionnaire), ranging from distracting school behavior to breaking into private property or stealing something	-.41
G. E. Barnes et al.	1984	307	EPQ: Psychoticism	Forcing someone to do something sexual he or she did not want to do	-.05
Barnett & Hamberger	1992	135	CPI: Achievement via Conformance, Responsibility, Socialization, Self-Control	Maritally violent group (having engaged in more than two acts of "minor" physical violence (e.g., manhandling), or engaging in one act of severe violence (e.g., kicking) toward partner vs. nonviolent maritally satisfied group)	-.41
Caspi et al.	1995	846	MPQ: Control, traditionalism	Violent crime conviction (dichotomous)	-.12
Colder & Chassin	1997	371	Eysenck: Impulsiveness	Property (steal or try to steal something with value >\$50) or person (hit or threatened to hit someone) offenses in past 6 months, based on National Youth Survey Delinquency Scale	-.23
Dykeman et al.	1996	280	Junior Impulsiveness Questionnaire	Conflict Tactics Scale—School Violent Behavior Form: Frequency of Violent Behavior	-.33
Eysenck & McGurk	1980	1,016	EPQ: Psychoticism	Delinquents (held at a detention center) vs. nondelinquent	-.35
Farrington	1989	411	Eysenck IVE: Impulsiveness Study measures: high impulsivity, lack of concentration, high laziness	Teenage violence (between ages 16 and 18): fighting, carrying and using weapons, fighting police officers Adult violence (age 32): fist fights	-.10
Ge & Conger	1999	406	MPQ: Constraint	Convictions for violence (between ages 10 and 32): serious assault, robbery, and threatening behavior	-.21
Hindelang	1972	337	MMPI: Psychopathic deviate CPI: Responsibility, Self-Control, Socialization	Frequency of delinquent behaviors, ranging from cutting classes to attacking someone with a weapon, over the past year Frequency of theft greater than \$10 in past year Frequency of property destruction greater than \$10 in past year Frequency of engaging in fist fights with an individual in past year Frequency of engaging in gang fist fights in past year Frequency of engaging in fights with an individual using a weapon in past year	-.22
				Frequency of engaging in gang fights with weapons in past year Frequency of shaking down others for money in past year Frequency of forcing sexual attention on a girl against her will in past year	

Table 2 (continued)

Author(s)	Year	N ^a	Conscientiousness measure	Behavioral measure	Effect (r) ^b
Krueger et al.	1994	862	Violence (continued) MPQ: Constraint, Control, Traditionalism	Self-report of one or more of 43 illegal acts in the past 12 months Informant report of antisocial (e.g., fighting), illegal (e.g., stealing), alcohol, or drug problems	-.19
Luengo, Carillo-de-la-Pena, et al.	1994	1,226	BIS-10 Eysenck 1.6: Impulsiveness	Contact with police resulting in filing of a standard incident form Court convictions (except for routine traffic offenses) Frequency of vandalism affecting public or private property Frequency of theft Frequency of aggression toward other people Frequency of rule-breaking behavior (behavior banned to minors, or trifling offenses)	-.25
Lynam et al.	1993	214	Study-derived composite Impulsivity Index	Frequency scale of delinquency (ranging from vandalism at home to multiple instances of stealing cars, breaking and entering, or selling drugs)	-.35
Malamuth	1986	155	EPQ: Psychoticism	Sexual aggression (dichotomous; e.g., "I have had sexual intercourse with a woman when she didn't want to because I used some degree of physical force [twisting her arm, holding her down, etc.]")	-.15
C. A. Martin et al.	1997	220	ARCMS: Impulsivity, sociopathy	Modified Personal History Questionnaire: Conduct disorder behaviors	-.27
J. D. Miller (unpublished)	2002	210	NEO-PI-R: Conscientiousness; competence, order, dutifulness, achievement striving, self-discipline, deliberation	Frequency of crime/delinquency, ranging from driving drunk or high to burglary to attacking another person to being arrested	-.15
Pfefferbaum & Woods	1994	296	CPI: Self-Control, Socialization	Frequency of property delinquency in past year (ranging from petty theft to criminal vandalism)	-.32
Preston (unpublished)	1998/1999	56	NEO-PI-R: Conscientiousness; competence, order, dutifulness, achievement striving, self-discipline, deliberation	Frequency of interpersonal delinquency in past year (ranging from hitting an instructor or supervisor to using a gun, knife, or other weapon to get something from someone else)	-.20
Rigby et al. Roberts (unpublished)	1989 2003	115 735	The Children's Impulsiveness Scale Adjective-based conscientiousness scale	Reactive violence—unplanned violence in response to an intense emotional state Instrumental violence/delinquent behavior—violence or delinquent behavior enacted for personal gain Self-Reported Delinquency Scale BRFSS: Violence	-.54 -.20
Sommer et al.	1992	452	Barron Ego Strength Scale EPQ-R: Psychoticism	Six-item scale from Conflict Tactics Scale reflecting moderately severe forms of spousal abuse	-.27
Spence et al.	1991	318	Study Impulsiveness Scale	For men, frequency of (a) falsely saying flattering things, (b) trying to get date drunk, (c) getting into a "wrestling match", (d) ignoring date's protests and continuing sexual behaviors, or (e) using physical restraint to make a date have sex; for women, frequency of having a date (a) falsely say flattering things, (b) get date drunk, (c) get into a "wrestling match," (d) ignore protests and continue his sexual behaviors, or (e) use physical restraint to force sex	-.29
Stuart (unpublished)	1997/1998	86	Eysenck 1.7: Impulsiveness	Engaged in at least one act of violence toward wife	-.41

(table continues)

Table 2 (continued)

Author(s)	Year	N ^a	Conscientiousness measure	Behavioral measure	Effect (<i>r</i>) ^b
J. L. White et al.	1994	401	Violence (continued) California Child Q-set; Ego undercontrol Eysenck Impulsivity Scale Teacher-Rated Impulsivity Scale	Delinquency: from stealing money from mother's purse to serious offenses, such as car theft and breaking and entering	-.32
Zhang et al.	1997	625	Psychopathic State Inventory; Impulsivity	Prevalence of attacking someone with the idea of seriously hurting or killing someone in the past 12 months	-.29

Note. EPQ-R = Eysenck Personality Questionnaire—Revised; BFI = Big Five Inventory; NEO-FFI = NEO-Five-Factor Inventory; HPI = Hogan Personality Inventory; 16 PF = 16 Personality Factor Questionnaire; BRFSS = Behavioral Risk Factor Surveillance System; MMPI = Minnesota Multiphasic Personality Inventory; MPIQ = Multidimensional Personality Questionnaire; ACL = Adjective Checklist; CPI = California Psychological Inventory; KSP = Karolinska Scale of Personality; EPQ = Eysenck Personality Questionnaire; Eysenck IVE = Eysenck Impulsiveness, Venturesomeness, and Empathy Scales; DSM-IV = *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.); American Psychiatric Association, 1994; EPI = Eysenck Personality Inventory; ARCMS = Addiction Research Center Maturity Scale; DSM-III-R = *Diagnostic and Statistical Manual of Mental Disorders* (3rd ed., rev.); American Psychiatric Association, 1987; EASI-III = Emotional, Activity, Sociability, and Impulsivity—III; NEO-PI-R = NEO-Personality Inventory—Revised; GTS = General Temperament Survey; NEO-PI = NEO-Personality Inventory; TPQ = Tridimensional Personality Questionnaire; BIS-11 = Barratt Impulsivity Scale—11; BASIS-32 = Behavior and Symptom Identification Scale—32; WAI = Weinberger Adjustment Inventory; HBC = Health Behavior Checklist; BSQ/MCTQ = Body Shape Questionnaire/Middle Childhood Temperament Questionnaire; EDI = Eating Disorder Inventory; JPI = Jackson Personality Inventory; PRF = Personality Research Form; BDI = Beck Depression Inventory; BIS-10 = Barratt Impulsivity Scale—10.

^aTotal sample size for all measures within a behavioral domain for a specific study. ^bThe average effect for all measures within a behavioral domain for a specific study.

statistic; (e) age data; and (f) in the case of quasi-experimental designs (not unusual in alcohol, tobacco, and drug research), a control subsample.

Of the 194 studies analyzed, 124 provided correlational data, 65 provided means and standard deviations that were transformed into correlations, and 5 provided other statistics that required transformation (i.e., *t* tests). Ten studies used longitudinal designs in which behavioral outcomes were predicted from prior personality ratings. Sixty-nine studies used quasi-experimental designs, comparing a group of nonusers or controls to a group of users or enactors of the behavior. Twenty-three studies used diagnoses, inpatient status, or other clinical distinctions for part of the sample.

Study Moderators

We coded the studies on the basis of the system of Conscientiousness described below (Roberts, Chernyshenko, et al., 2004). In addition, each study was coded for its measurement outcome (described below), age (below age 30, above age 30), and statistical method used to derive the data (e.g., derived from means and standard deviations, *t* tests). We calculated agreement for the type of Conscientiousness trait (see below). Because of the redundant and self-evident nature of the behavioral measures, it was only necessary to calculate the reliability ratings for the conscientiousness-related traits. As such, only Tim Bogg coded the measurement outcomes associated with each health-related behavior. For age, each study was coded (again, by one rater) below or above age 30 on the basis of the age at which the health-related behavior was assessed. Because the vast majority of studies were cross-sectional in design, the coded age was typically the same age as when the corresponding personality measure was administered.

Conscientiousness-related personality scales. To test whether certain types of conscientiousness measures affected the relationship between conscientiousness and health behaviors, we used a recent analysis of conscientiousness-related personality scales (Roberts, Chernyshenko, et al., 2004). In this study, 36 scales from seven different personality inventories thought to tap into conscientiousness were factor analyzed, resulting in six factors: Order, Self-Control, Responsibility, Industriousness, Traditionalism, and Virtue. We used these six factors as the basis for organizing and categorizing existing personality scales into different facets of conscientiousness. For the scales analyzed in Roberts, Chernyshenko, et al. (2004), this consisted of simply coding these scales according to the results of the factor analysis. For additional scales not examined by Roberts, Chernyshenko, et al. (2004), we used descriptions of the measures and known empirical correlations to categorize the scales into one of the six domains of Conscientiousness. Table 1 provides an overview of how major personality measures and inventories were coded for each of the six Conscientiousness facets in the present study.

In addition to those inventories described in Table 1, measures coded for Industriousness included various achievement, concentration, discipline, laziness, purpose, and self-driving scales. For Order, additional measures included conscientiousness (as indicated by the factor structure derived by Roberts, Chernyshenko, et al., 2004, in which general trait measures of Conscientiousness loaded on Order), order, rigidity, and inattention scales. For Responsibility, additional measures included sociopathy and social conformity scales. For Self-Control, additional measures included impulsivity, impulsiveness, inhibition, and control scales. For Traditionalism, additional measures included conventionality, conformity, rebelliousness, and tolerance of deviance scales. No additional measures were coded for Virtue.

Reliability of ratings for the codings of Conscientiousness was checked via intraclass correlation and was found to be quite high ($r = .89$). All remaining discrepancies were resolved through discussion.

Activity. For activity, the various measures were coded into two categories: frequency and quantity of exercise (63%) and fitness level (37%). The frequency and quantity of exercise category was represented by

measurement outcomes such as fast walking for 20 min per week, jogging for 20 min per week, and exercising five or more times in a week. Fitness level was represented by measurement outcomes such as muscular strength, endurance, and cardiovascular responses (e.g., maximal oxygen consumption).

Excessive alcohol use. For excessive alcohol use, the measures were coded into two categories: heavy drinking (46%) and quantity and frequency of consumption (54%). Heavy drinking was represented by measurement outcomes such as *DSM-IV* (American Psychiatric Association, 1994) alcohol diagnosis, problem drinking (e.g., alcoholism, impairment, increased tolerance), and the frequency of consuming more than five drinks in a sitting. Quantity and frequency of consumption was represented by measurement outcomes such as the number of drinks consumed in a typical day, use of alcohol in past 4 weeks, and the frequency of alcohol use in the past year.

Drug use. Drug use was coded into two primary categories: marijuana use (31%) and opiate/heroin use (9%). The remainder of the drug use domain was coded as polysubstance use (reflecting measures that did not readily discriminate between various types of drugs). Marijuana use was represented by measurement outcomes such as being given a *DSM-III-R* (American Psychiatric Association, 1987) 12-month marijuana use diagnosis, marijuana use in the past 4 weeks, and frequency of cannabis use in the past 12 months. Opiate/heroin use was represented by measurement outcomes such as lifetime occurrence of opioid use, opiate addiction, and frequency of heroin use over the past year.

Unhealthy eating. For unhealthy eating, the measures were coded into two categories: food selection (21%) and obesity, weight, and mass (79%). Food selection was represented by measurement outcomes such as healthful food preferences (i.e., low sodium content, less saturated fat, or more complex carbohydrates). Obesity, weight, and mass was represented by measurement outcomes such as a body mass index greater than 25 kg/m², being at least 20% overweight according to Metropolitan Insurance Company norms, and maintaining a desirable weight (i.e., between 90% and 130% of ideal weight).

Risky driving. For risky driving, the outcomes were coded into two categories: drunk driving/riding (46%) and speeding, hazardous driving, and vehicular accidents (54%). Drunk driving/riding was represented by measurement outcomes such as an arrest or conviction for driving while intoxicated, frequency of drunk driving, and riding in a car with an intoxicated driver. Speeding, hazardous driving, and vehicular accidents was represented by measurement outcomes such as the frequency of joyriding, drag racing, and being in two or more at-fault accidents in the past year.

Risky sex. For risky sex, the outcomes were coded into three categories: number of partners (24%), protected (35%), and risky acts and partners (41%). Number of partners was represented by measurement outcomes such as the number of sexual partners in a lifetime and the maximum number of sexual partners in a month. Protected was represented by measurement outcomes such as never or seldom using a condom and the use of a condom with a regular, heterosexual partner during last intercourse. Risky acts and partners was represented by measurement outcomes such as the frequency of group sex and having sexual relations with an intravenous drug user.

Suicide. For suicide, the outcomes were coded into two categories: attempted/completed (50%) and ideation and risk factors (50%). Attempted/completed was represented by measures such as the frequency of one or more suicide attempts and completed suicide. The ideation and risk factors category was represented by measurement outcomes such as a Suicide Behavior Questionnaire diagnosis of current suicidal risk and overt suicidal ideation with a definite plan to act.

Tobacco use. For tobacco use, the outcomes were coded into two categories: smoke/not smoke (60%) and quantity and frequency (40%). Smoke/not smoke was represented by measurement outcomes assessing differences between smokers and nonsmokers. Quantity and frequency was

represented by measurement outcomes assessing the amount and rate of tobacco product consumption.

Violence. For violence, the outcomes were coded into four categories: aggressive delinquent acts (45%); conviction, detention, and incarceration (12%); interpersonal aggression (31%); and sexual aggression (12%). The aggressive delinquent acts category was represented by measurement outcomes such as vandalism and property destruction. Conviction, detention, and incarceration was represented by measurement outcomes such as a violent crime conviction and a conviction for violence between the ages of 10 and 32. Interpersonal aggression was represented by measurement outcomes such as fist fighting and using a weapon in an attack. Sexual aggression was represented by measurement outcomes such as sexual assault and forcing sexual attention.

Data Analysis

We followed the systems described by Hedges and Olkin (1985) and Lipsey and Wilson (2001) to quantitatively synthesize the relationship between conscientiousness-related traits and the health-related behaviors. For all analyses, we used a fixed-effects model because we had hypothesized that variability between studies could, in part, be explained by variables used for our moderator analyses (i.e., facet of conscientiousness, type of measurement outcome, and age above and below 30 years). Effect sizes consisted of Fisher's z -transformed correlation coefficients. If studies reported effects in different metrics (e.g., t tests, means), they were transformed into correlation coefficients using formulas provided by Rosenthal (1991). To establish grand mean estimates of the relationship between conscientiousness and health-related behaviors, the z -transformed correlation coefficients were weighted by the inverse of the variance. The estimated average correlations were then obtained through a z -to- r transformation of the effect size estimates. Confidence intervals and tests of heterogeneity were calculated using formulas from Hedges and Olkin. Each behavioral domain was analyzed separately and can be considered to have generated its own meta-analysis. All analyses were computed using a meta-analysis software package (Biostat, 2000). In Table 2, the correlation for each study is the average effect (r) for all measures within a behavioral domain for that specific study.

For each of the moderators within each health-related behavior, between-groups heterogeneity (Q_B) analyses were conducted. This test is the meta-analytic equivalent of analysis of variance. Effect sizes were grouped by moderator (e.g., age above vs. below 30 years) within each health-related behavior. The Q_B analyses partition the overall Q statistic (the weighted sum of squares of the individual effects sizes around the grand mean) for each health-related behavior such that Q_B represents the weighted sum of squares of the mean effect sizes for each group around the grand mean (Lipsey & Wilson, 2001). All between-groups health-related behavior moderator analyses were conducted in a pairwise fashion.

In addition, for each behavioral category, we tested the likelihood of data censoring using a trim and fill procedure, which addresses problems associated with any form of data censoring, including publication bias (Duval & Tweedie, 2000). The trim and fill procedure is a nonparametric statistical technique that examines the symmetry and distribution of effect sizes plotted by the inverse of the variance or standard error. This technique first estimates the number of studies that may be missing because of data censoring. Then, the trim and fill procedure calculates hypothetical effects for potentially omitted studies and then reestimates the average effect size and confidence intervals on the basis of the influence of studies that would have been included in the analyses if they had been published. For effect sizes that were predominantly in the negative direction (i.e., all domains except activity), the program required that we first reversed the sign of all the effects before running the trim and fill analyses.

The trim and fill procedure was performed with the DVVID library (Biggerstaff, 2000) using the S-Plus statistical computing program. This program generates three estimators of missing studies, L_0 , R_0 , and Q_0 . We

used the L_0 estimator because it is the most robust estimator (Duval & Tweedie, 2000).

Results

For clarity and consistency, the effects were coded so that they represented the relationship between positive aspects of conscientiousness (e.g., restraint; discipline; self-control or, the inverse of psychoticism; disinhibition) and the health-deleterious aspects of the behavioral categories (e.g., smoking cigarettes, drunk driving). The exception to this rule is activity, given that no studies used measures to assess inactivity. Therefore, results for activity should be interpreted as representing the relationship between positive aspects of conscientiousness and the health-promoting aspects of the behavioral category.

Overall Relationships Between Health Behaviors and Conscientiousness-Related Traits

Table 3 shows the average correlation, number of studies, total sample size, 95% confidence interval, and heterogeneity statistic for the relationship between conscientiousness and each behavioral domain. According to the 95% confidence intervals, conscientiousness-related traits significantly predicted each behavioral domain (i.e., zero was not included in the interval). The largest predictive relationship found between conscientiousness-related traits and a behavioral domain was for drug use ($r = -.28$), whereas the smallest was for activity ($r = .05$). Correlations for the behavioral domains of excessive alcohol use, unhealthy eating, risky driving, risky sex, suicide, tobacco use, and violence ranged from $-.12$ to $-.25$. Tests of heterogeneity for each behavioral domain were significant ($p < .05$), indicating the appropriateness of moderator analyses. To avoid capitalizing on chance, a more conservative significance level ($p < .01$) was used for all the moderator analyses (i.e., Q_B).

The trim and fill analyses (L_0) revealed no significant effect of data censoring on the average correlations for each domain. None of the confidence intervals for the behavioral categories included zero.

Relationships Between Health Behaviors and Conscientiousness-Related Traits Moderated by Facet of Conscientiousness

We expected the six facets of conscientiousness to show variability in their relations to the health behavior domains. Table 4 shows the average correlation for each of the six factors of conscientiousness and each behavioral domain. Subscripts accompany each effect size to indicate significant differences ($p < .01$) based on paired between-groups heterogeneity analyses of variance.

In line with our hypotheses, Self-Control and Traditionalism were the most consistent predictors of health behaviors. The domains of Responsibility and Virtue also were consistent predictors of most of the health-related behaviors for which they were coded. The domain of Responsibility was the most variable: Responsibility was tied for strongest predictor of suicide ($r = -.25$) and violence ($r = -.26$), was the second strongest predictor of drug use ($r = -.32$), yet was one of the weakest predictors of activity ($r = .03$).

Industriousness and Order generally showed smaller predictive relations to the health-related behaviors, with the notable exception of the stronger relationship between Industriousness and activity ($r = .18$). The effect sizes for Industriousness ranged from $-.06$ to $-.22$, and the effect sizes for Order ranged in magnitude from $.01$ to $-.22$. As we expected, these trait domains tended to show lower levels of predictive validity than the other four factors.

Relationships Between Health Behaviors and Conscientiousness-Related Traits Moderated by Measurement Outcome

Each health behavior was assessed using a variety of methods and measures. The second moderator we considered was the type of measurement outcome used to assess the behavior. Table 5 shows the average correlation, number of samples, total sample size, and 95% confidence interval for the measurement outcomes associated with each behavioral domain. The relationship between conscientiousness and health behaviors was moderated by type of outcome in seven health behavior domains: activity, excessive alcohol use, drug use, unhealthy eating, risky driving, suicide, and violence.

Table 3
Average Correlations for Conscientiousness-Related Traits and Health-Related Behaviors, With Number of Studies, Ns for Sample, 95% Confidence Intervals (CIs), and Q Statistics

Health behavior	r	No. of studies	N	95% CI		Q
				Lower	Upper	
Activity	.05	17	24,259	.04	.07	136.80
Excessive alcohol use	-.25	65	32,137	-.25	-.24	1,109.89
Drug use	-.28	44	36,573	-.29	-.27	662.21
Unhealthy eating	-.13	14	6,356	-.16	-.11	126.78
Risky driving	-.25	21	10,171	-.27	-.24	422.63
Risky sex	-.13	25	12,410	-.15	-.11	76.75
Suicide	-.12	19	6,087	-.14	-.09	123.47
Tobacco use	-.14	46	46,725	-.15	-.13	352.83
Violence	-.25	25	10,277	-.26	-.24	119.22

Note. All tests for heterogeneity were significant at $p < .05$.

Table 4
Average Correlations for Conscientiousness-Related Traits and Health-Related Behaviors by Facet of Conscientiousness

Health behavior	Facet of Conscientiousness					
	Industriousness	Order	Responsibility	Self-Control	Traditionalism	Virtue
Activity	.18 _{a,b}	.08 _{b,c}	.03 _c	.07 _{b,c}	.23 _a	—
Excessive alcohol use	-.08 _d	-.15 _c	-.18 _c	-.29 _a	-.21 _b	-.25 _{a,b}
Drug use	-.12 _d	-.14 _d	-.32 _b	-.24 _c	-.35 _a	-.25 _c
Unhealthy eating	-.22 _a	.01 _b †	-.05 _b	-.08 _b †	-.25 _a	—
Risky driving	-.10 _c	-.11 _c	-.16 _c	-.25 _b	-.34 _a	-.13 _c
Risky sex	-.13 _{a,b}	-.08 _b	-.12 _{a,b}	-.15 _a	-.09 _{a,b}	—
Suicide	—	-.22 _{a,b}	-.25 _a	-.10 _b	—	—
Tobacco use	-.21 _a	-.11 _b	-.12 _b	-.21 _a	—	—
Violence	-.14 _b	-.14 _b	-.26 _a	-.26 _a	-.16 _b	-.28 _a

Note. A dash indicates the factor was not coded or the coefficient was derived from one sample. Correlations with different subscripts differ significantly at $p < .01$, based on paired between-groups heterogeneity analyses of variance.

† Confidence interval includes zero.

The smallest overall relationship between conscientiousness and health behaviors was for activity level. As can be seen in Table 5, the type of measurement outcome moderated this effect ($Q_B = 6.12, p < .01$). In this case, studies that assessed activity level through self-report questions concerning how much and how often a person exercised were largely unrelated to conscientiousness ($r = .05$). In contrast, studies that focused on fitness level assessed as strength, endurance, and flexibility,

had effect sizes more consistent with the other health-behavior domains ($r = .13$).

The second domain that showed a significant moderator effect by outcome was excessive alcohol use. Conscientiousness-related traits predicted the frequency and quantity measures better than measures assessing clinical, socially disruptive, and other destructive drinking patterns ($r_s = -.27$ and $-.23$, respectively; $Q_B = 26.30, p < .01$).

Table 5
Average Correlations for Conscientiousness-Related Traits and Health-Related Behaviors by Outcome

Health behavior	Outcome	r	No. of samples	N	95% CI	
					Lower	Upper
Activity	Exercise (frequency/quantity)	.05 _a	12	23,553	.04	.06
	Fitness level	.13 _b	7	1,070	.07	.19
Excessive alcohol use	Heavy drinking	-.23 _a	35	17,338	-.25	-.22
	Quantity/frequency	-.27 _b	41	20,748	-.28	-.26
Drug use	Marijuana use	-.33 _b	17	20,325	-.34	-.32
	Opiate/heroin use	-.22 _a	5	2,189	-.25	-.18
	Polysubstance use	-.24 _a	36	20,810	-.25	-.23
Unhealthy eating	Food selection	-.25 _b	3	2,850	-.28	-.23
	Obesity/weight/mass	-.02 _a †	11	3,506	-.06	.01
Risky driving	Drunk driving/riding	-.28 _b	11	6,298	-.30	-.26
	Speeding/hazardous driving/accidents	-.25 _a	13	5,625	-.26	-.22
Risky sex	Number of partners	-.15	8	3,324	-.18	-.12
	Protected	-.11	12	6,975	-.13	-.09
	Risky acts/partners	-.15	14	6,351	-.17	-.12
Suicide	Attempted/completed	-.08 _a	11	4,221	-.11	-.05
	Ideation/risk factors	-.20 _b	11	2,220	-.24	-.16
Tobacco use	Smoke/not smoke	-.15	29	19,252	-.16	-.13
	Quantity/frequency	-.13	19	29,352	-.14	-.12
Violence	Aggressive delinquent acts	-.26 _b	15	6,057	-.28	-.24
	Conviction/detention/incarceration	-.20 _a	4	3,135	-.23	-.17
	Interpersonal aggression	-.26 _b	10	3,904	-.29	-.24
	Sexual aggression	-.17 _a	4	1,117	-.23	-.12

Note. Correlations with different subscripts differ significantly at $p < .01$, based on paired between-groups heterogeneity analyses of variance.

† Confidence interval (CI) includes zero.

The third domain that showed a significant moderator effect was drug use. Marijuana use showed stronger relations to conscientiousness-related traits than opiate/heroin use and poly-substance use ($r_s = -.33, -.22, \text{ and } -.24$ respectively; $Q_Bs = 34.15 \text{ and } 119.99, p < .01$).

The fourth domain that showed a significant moderator effect was unhealthy eating. In this case, conscientiousness-related traits predicted measures assessing the selection and consumption of unhealthy food to a greater extent than measures assessing body mass, obesity, weight, and so forth ($r_s = -.25 \text{ and } -.02$, respectively; $Q_B = 91.76, p < .01$). The prediction of physiological outcomes from conscientiousness-related traits is most likely complicated by other factors, such as genetics and physiology, which also account for levels of obesity.

The fifth domain, risky driving, also showed a significant moderator effect by measurement outcome. Conscientiousness-related traits predicted measures assessing drunk driving or being the passenger in a vehicle driven by someone who was intoxicated to a greater extent than measures assessing speeding, accident involvement, or other hazardous driving behaviors ($r_s = -.28 \text{ and } -.25$, respectively; $Q_B = 6.40, p < .01$).

The type of measurement outcome also moderated the effect of conscientiousness on suicide. Specifically, conscientiousness-related traits predicted measures assessing suicidal ideation and risk factors better than measures assessing attempted or completed suicides ($r_s = -.20 \text{ and } -.08$, respectively; $Q_B = 20.06, p < .01$).

Finally, the effect of conscientiousness on violence was moderated by type of measurement outcome. Conscientiousness-related traits predicted measures assessing aggressive delinquent acts (e.g., conduct disorders, vandalism, physical threats) better than measures assessing violent crime convictions, detention, and incarceration and measures assessing date rape,

forced sexual acts, and other sexual violence ($r_s = -.26, -.20, \text{ and } -.17$; $Q_B = 10.12 \text{ and } 8.94$, respectively, $p < .01$). Similarly, conscientiousness-related traits predicted measures assessing interpersonal aggression (e.g., fighting, using a weapon in an attack) better than measures assessing violent crime convictions, detention, and incarceration and measures assessing date rape, forced sexual acts, and other sexual violence ($r_s = -.26, -.20, \text{ and } -.17$; $Q_B = 9.87 \text{ and } 9.18$, respectively, $p < .01$).

Relationships Between Health Behaviors and Conscientiousness-Related Traits Moderated by Age

We hypothesized that age-related trends showing increases in conscientiousness-related traits and decreases in the enactment of health-degrading behaviors should result in smaller predictive relationships in older samples. Table 6 shows the average correlation, number of samples, total sample size, and 95% confidence interval for each behavioral domain by age above and below 30 years. We found evidence to support our hypothesis for the domains of excessive alcohol use, drug use, unhealthy eating, risky driving, and tobacco use (all $Q_Bs > 6.64, p < .01$). The same pattern was found for activity, but in this case, the change in magnitude indicates a drop in a health-promoting behavior. In general, studies that relied on samples over the age of 30 reported smaller effect sizes.

Discussion

This meta-analysis demonstrates that the personality dimension of Conscientiousness is associated with the most important health-related behaviors. Friedman et al. (1993) first identified conscientiousness as a predictor of longevity. Subsequent follow-ups to the

Table 6
Average Correlations for Conscientiousness-Related Traits and Health-Related Behaviors by Age Below and Above 30 Years

Health behavior	Age	r	No. of samples	N	95% CI	
					Lower	Upper
Activity	< 30	.21 _a	8	3,450	.18	.24
	> 30	.03 _b	9	20,809	.01	.04
Excessive alcohol use	< 30	-.28 _a	42	22,175	-.29	-.27
	> 30	-.15 _b	23	9,962	-.17	-.13
Drug use	< 30	-.29 _a	38	32,905	-.30	-.28
	> 30	-.18 _b	6	3,002	-.21	-.14
Unhealthy eating	< 30	-.18 _a	9	4,649	-.20	-.15
	> 30	-.02 _{b,†}	5	1,707	-.07	-.03
Risky driving	< 30	-.27 _a	18	8,836	-.28	-.26
	> 30	-.14 _b	3	1,335	-.20	-.09
Risky sex	< 30	-.13	23	10,873	-.15	-.11
	> 30	-.12	3	1,537	-.17	-.07
Suicide	< 30	-.11	14	5,613	-.14	-.09
	> 30	-.19	5	474	-.27	-.10
Tobacco use	< 30	-.21 _a	30	16,794	-.22	-.19
	> 30	-.10 _b	16	29,931	-.11	-.09
Violence	< 30	-.25	22	9,604	-.25	-.23
	> 30	-.32	3	673	-.38	-.26

Note. Correlations with different subscripts differ significantly at $p < .01$, based on paired between-groups heterogeneity analyses of variance.

† Confidence interval (CI) includes zero.

Terman data by Friedman and colleagues, as well as studies by many others, have examined the relationship between facets of conscientiousness and various health-related factors (e.g., Cooper et al., 2000; Tucker et al., 1995). Before the present meta-analysis, no study had examined the relationship of conscientiousness to the set of health behaviors most strongly associated with the leading contributors to mortality. Although not tested directly, the findings of this study suggest the importance of investigating how conscientiousness is related to health outcomes through its effect on the behaviors known to affect health and mortality.

In line with the health process model by Adler and Matthews (1994) and the assertion by Contrada, Cather, and O'Leary (1999) that behaviors should play a significant role in mediating the relationship between personality and disease, this study establishes a consistent set of relationships between conscientiousness-related traits and health-related behaviors. Complementing research on hostility, which is primarily related to coronary heart disease (T. Q. Miller, Smith, Turner, Guijarro, & Hallet, 1996), and anxiety, which is primarily related to HIV risk and drug use (Blumberg & Dickey, 2003; Strain, 2002), conscientiousness has been shown to be related to these domains through its effect on the behaviors related to cardiovascular health (such as tobacco consumption, exercise, and healthy eating), as well as through its relation to risky sexual behaviors and illicit drug use. In addition, conscientiousness predicts other significant health-related contributors to mortality—getting in car accidents, exhibiting violent behaviors, and committing suicide. These latter behaviors tend to receive less attention in the field of personality and health, though they are just as important in contributing to mortality (McGinnis & Foege, 1993). However, unlike personality traits such as hostility and anxiety, conscientiousness is associated with all of these health-related behaviors. There appear to be multiple pathways for individuals lacking in conscientiousness to experience poor health outcomes.

Moderators of the Conscientiousness–Health Behavior Relationship

For each health-related behavior, the heterogeneity statistics indicated the effects could vary with the inclusion of a moderator variable. The moderator analyses assessed the type of conscientiousness measure used to predict the health behaviors, the measurement outcome within each health-related behavior, and age. We found significant moderated relationships for each of these sets of moderators.

The first set of moderator analyses revealed important distinctions among the facets of conscientiousness. Because the Big Five has only recently been developed and has not had much of an opportunity to shape assessment practices, the typical approach to understanding and measuring conscientiousness is to use some unitary measure (e.g., Goldberg, 1992), which, as shown by Roberts, Bogg, Walton, Chernyshenko, and Stark (2004), is best subsumed under the order facet. Only recently have investigators moved to a more deliberate and systematic assessment of conscientiousness to take advantage of the well-known increment in validity that is gained by using more specific levels of measurement (e.g., Ashton, 1998; Mershon & Gorsuch, 1988; Paunonen, 1998; Paunonen & Ashton, 2001). It is clear from our analyses of the factors of Conscientiousness that increases in predictive valid-

ity can be achieved when specific facets of conscientiousness are used rather than pooling all measures into one large domain measure (i.e., relying on a measure of order as a proxy for the larger domain of Conscientiousness).

As indicated by the frameworks of Clark and Watson (1999) and Donovan et al. (1991), the facets of responsibility, self-control, and traditionalism showed the strongest predictions across the behavioral domains. The responsibility and self-control facets had already shown important relations to health behaviors. In contrast, very few models of conscientiousness include facets related to traditionalism (with the exception of the conventionality–unconventionality domain put forth by Donovan et al., 1991). Nonetheless, it appears to be among the best conscientiousness-related predictors of risky health behaviors. We also found consistent predictions (where available) for the facet of virtue, indicating its likely utility in accounting for individual differences in health-related behaviors, in spite of its absence from even the most progressive frameworks for conscientiousness and behavior. In contrast, we found that one facet of conscientiousness that has shown strong predictive relations to work-related behaviors, industriousness (Hough & Ones, 2002), had lower relative relations to health-related behaviors. It should be noted that the facet of order accounted for some predictive validity in each behavioral domain for which it was coded, with the exception of unhealthy eating, but it rarely rose to the level of the other facets. This finding is significant for researchers using shorter measures of the Big Five, as the order facet appears to be the primary construct assessed by these short measures of the Big Five trait of Conscientiousness (Roberts, Chernyshenko, et al., 2004).

The relationship between conscientiousness and health-related behaviors was moderated by type of measurement outcome in seven domains: activity, excessive alcohol use, drug use, unhealthy eating, risky driving, suicide, and violence. With the exceptions of activity level and risky driving, it appears that the effect of conscientiousness was lower for studies that focused on dichotomous outcomes (e.g., diagnosis of alcoholism, committed suicide) or complex outcomes that are most likely determined by multiple factors (e.g., body mass index). The results for the activity domain showed that typical self-report studies of activity level might underestimate the relationship with conscientiousness, possibly because of the socially desirable nature of the domain and inaccurate reporting. In contrast, studies of fitness that assess actual physical abilities show a larger effect size. For excessive alcohol use, the smaller relation for the measurement outcome of heavy drinking may be due to range restriction, as heavy drinking is typically assessed as a dichotomous outcome (e.g., diagnosis), or this may be due to the fact that clinical levels of drinking may be a more complex outcome saturated by other constructs that are comorbid with heavy drinking, such as depression (Burns & Teesson, 2002). Similarly, the dichotomous outcomes of attempted or completed suicides demonstrated lower predictive validity, most likely because the distribution of individuals is skewed toward not attempting suicide or because of range restriction.

The pattern across type of measurement outcome reconfirms two relatively well-known rules of assessment. Dichotomous outcomes tend to attenuate correlations, and behaviors are typically complex and overdetermined. Future research may benefit from using measurement outcomes with high fidelity, restricted content, and a continuous scale.

Finally, as was hypothesized on the basis of trends in previous research (Helson & Kwan, 2000), we found the predictive relationship between conscientiousness-related traits and activity, excessive alcohol use, drug use, unhealthy eating, risky driving, and tobacco use to be smaller in samples above age 30. For the health-related behaviors that showed decreases with age, there may be floor and ceiling effects that lessen the size of the relationships. If people increase in conscientiousness throughout the life course (Roberts, Robins, Caspi, & Trzessniewski, 2003) and discontinue risky health behaviors (Roberts & Bogg, 2004), then one possibility is that the base rate for the behaviors becomes so low as to preclude a correlation. The opposite finding for activity suggests that activity levels and fitness decrease after age 30, a finding that reflects evidence of declines in activity levels that begin shortly after adolescence and continue throughout adulthood (P. M. Barnes & Schoenborn, 2003). Overall, the results provide a rough sketch of how the relationships between health behaviors and conscientiousness-related traits shape each other over time.

The broader developmental picture that emerges from the age differences in predictive validity is one of transaction between conscientiousness and health-related behaviors. It is possible that changes in the behaviors contribute to the changes in conscientiousness. The acts of quitting smoking, eating well, and diminishing one's drug and excessive alcohol consumption may contribute to the increases in conscientiousness found across the life course (Roberts & Bogg, 2004). In turn, gains in conscientiousness may contribute to decreases in risky health behaviors.

Limitations, Implications, Conclusions

This is the most comprehensive study to date demonstrating the importance of the personality trait domain of Conscientiousness in the health process. Three points merit emphasis: (a) The effects of conscientiousness-related traits were consistent across health-related behaviors, (b) the effect sizes were as large or larger than many other risk factors for health (Meyer et al., 2001), and (c) the sheer amount of data synthesized provides increased confidence in the nature of the findings. Nonetheless, the study has limitations particular to the method of meta-analysis and to the domain studied.

As is appropriate in any meta-analysis, we made attempts to account for data censoring by securing as many unpublished data sources as possible and by using statistical tools to account for the possible effects of excluded studies. Although the trim and fill analyses showed no significant effect of data censoring, the small number of studies available for some of the health-related behaviors merits some caution. In particular, the domains of activity and unhealthy eating—the two most important health-related behaviors—generated the fewest number of studies. It is clear these domains are ripe for additional primary research concerning the magnitude of their relationship to conscientiousness-related traits.

It also should be noted that not all of the studies used the highest quality measures of personality or health behaviors, nor did they use study designs that permitted the clearest inferences. Almost all studies used self-reports and were cross-

sectional in nature. This is a weakness of the primary research and, by extension, the results of the present meta-analysis. The extent to which observer, online, or prospective studies might replicate findings such as these is an open and important issue for personality and health-related behavior research. Future research should concentrate on gathering observer and experience sampling ratings (e.g., act frequency, daily diary) of personality and actual behaviors and aggregate them over time to provide a more definitive test of the relationship between conscientiousness and health-related behaviors.

Finally, very few studies used a measure created to comprehensively assess conscientiousness, leaving the question open as to whether more recent efforts at investigating the lower order structure of Conscientiousness might demonstrate consistent or higher levels of predictive validity across the health-related behaviors (e.g., Roberts, Bogg, et al., 2004). Furthermore, existing measures of personality emphasize specific aspects of conscientiousness over others. For example, in our coding for facets of conscientiousness, it became clear that many investigators prefer to use measures of self-control in research pertaining to health-related behaviors. Although this preference is a matter of professional judgment, it would appear to be limiting—especially given our findings for the other facets—if the goal is to understand the multiple complex relationships between various health behaviors and conscientiousness, let alone personality in general.

Similarly, it became clear that some of the health-related behaviors require more attention than others. In particular, as indicated by the lower number of studies for the domains of activity, unhealthy eating, and suicide, more research is needed linking these health-related behaviors to conscientiousness-related traits. Alcohol, drug, and tobacco use have received a disproportionate amount of attention, especially in conjunction with self-control, impulsivity, and impulse control measures. While these behavioral domains are important to health, the others are critical to complete understanding of health.

In spite of the limitations, the results of this study send a clear message: Conscientiousness consistently predicts the most important health-related behaviors. It should be noted that a comprehensive analysis of the overall relations of the other five-factor dimensions to the health-related behaviors addressed in this study is not currently available, leaving those relations largely unknown and, in many cases, unexplored. The insights derived from this study suggest the potential value of intervention programs that focus on individuals who demonstrate a lack of conscientiousness in conjunction with unhealthy behaviors. It also invites alternative intervention ideas, such as targeting a broad range of conscientiousness-related behaviors, in addition to specific health behaviors. Although causal relations cannot be inferred from the correlational analyses contained in this meta-analysis, it seems reasonable to expect that if conscientiousness can be changed then it should have an effect on the full spectrum of health behaviors.

With the advent of modern medicine, we have entered a phase of history in which most of the primary reasons for premature mortality have behavioral substrates. This study suggests the obvious inference that if behaviors contribute to mortality, then psychological factors, like conscientiousness, or the lack thereof, should be among the factors associated with important health outcomes.

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