

ORIGINAL INVESTIGATION

Perceived Sex Discrimination Amplifies the Effect of Antagonism on Cigarette Smoking

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ABSTRACT

Introduction: Compared to men, the decline in smoking during the past few decades has been slower for women, and smoking-related morbidity and mortality has increased substantially. Identifying sex-specific risk factors will inform more targeted intervention/prevention efforts. The purpose of this research is to examine the interactive effect of psychological (trait antagonism) and social (perceived sex discrimination) factors on current cigarette smoking and whether these effects differ by sex.

Methods: Participants in the Healthy Aging in Neighborhoods of Diversity across the Life Span study (HANDLS; $N = 454$) and participants in the Health and Retirement Study (HRS; $N = 8,155$) completed measures of antagonism, perceived sex discrimination, and reported whether they smoked currently. Logistic regressions were used to predict smoking from antagonism, discrimination, and their interaction.

Results: Antagonism was associated with an increased risk of smoking. For women, there was an interaction between antagonism and discrimination: among women who perceived sex discrimination, every standard deviation increase in antagonism was associated with a 2.5 increased risk of current smoking in HANDLS (odds ratio [OR] = 2.54, 95% confidence interval [CI] = 1.46–4.39) and an almost 1.5 increased risk in HRS ($OR = 1.43$, 95% CI = 1.18–1.73). This interaction was not significant for men in either sample.

Conclusion: In 2 independent samples, perceived sex discrimination amplified the effect of antagonism on cigarette smoking for women but not men. A hostile disposition and a perceived hostile social environment have a synergistic effect on current cigarette smoking for women.

INTRODUCTION

Although women have an overall lower prevalence of cigarette smoking compared to men (15.6% vs. 28%, respectively), the decline in the smoking rate over the past few decades has been slower for women (% change 1965–2009 = 47.2% for women vs. 54.7% for men (American Lung Association, 2011). Over this same time period, the relative risk of death from lung cancer and other smoking-related illnesses has increased more dramatically for women than men (Thun et al., 2013). This increase stems in part from changes in smoking patterns (initiation, quantity, duration) among women in more recent generations (Burns et al., 1997). Men and women also react differently to quitting: Compared to men, women experience more withdrawal craving (Dickmann, Mooney, Allen, Hanson, & Hatsukami, 2009) and more negative emotionality (Hogle & Curtin, 2006), symptoms that may be heightened during menstruation (Carpenter, Upadhyaya, LaRowe, Saladin, & Brady,

2006). Although many factors are known to increase risk of smoking, less is known about sex-specific factors and the multiplicative effect of such risks. Identifying risk/protective factors, particularly sex-specific ones, is crucial for developing more effective prevention and intervention programs.

Among the psychological factors that increase risk of smoking, personality traits—an individual's characteristic ways of thinking, feeling, and behaving—have been associated with a number of health-risk behaviors (Etter, 2010). The five-factor model (FFM) of personality, which defines personality traits along five broad dimensions, has been particularly useful in identifying how these individual differences are related to health outcomes and health-risk behaviors, including smoking. In particular, individuals who score higher on trait antagonism (the opposite pole of agreeableness) have an increased risk of smoking. Within the FFM, antagonism is defined as a general tendency to be mistrustful, cynical, manipulative, self-centered, and arrogant (McCrae & Costa, 2010). Current and former

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smokers score higher on antagonism compared to never smokers (Terracciano & Costa, 2004) and antagonism has been associated with increased risk for alcohol abuse (Hopwood et al., 2007) and use of illicit substances (Sutin, Evans, & Zonderman, 2013). Antagonism-related constructs, such as trait anger, have also been associated with difficulty quitting and increased risk of relapse (al'Absi, Carr, & Bongard, 2007). Although men tend to score slightly higher in antagonism than women, the correlates of antagonism generally do not differ by sex. For example, the association between antagonism and aggressive behavior is similar for men and women (Seibert, Miller, Pryor, Reidy, & Zeichner, 2010), as is the association between antagonism and risk of metabolic syndrome (Sutin et al., 2010). Further, the association between antagonism-related traits and smoking initiation does not differ by sex (Welch & Poulton, 2009).

In addition to factors associated with the individual, aspects of the social environment, such as the experience of discrimination, have also been implicated in health-risk behaviors. For example, African Americans who perceive racial/ethnic discrimination have greater odds of current smoking (Borrell, Artazcoz et al., 2010; Purnell et al., 2012). The prevalence of smoking also tends to be higher among other minority groups at high risk for discrimination (Greene & Britton, 2012; Lee, Griffin, & Melvin, 2009). Smoking is hypothesized to be one mechanism for coping with discrimination and the psychological distress (e.g., depressive symptoms, anger) that often accompanies such experiences (Purnell et al., 2012). Perceived sex discrimination may evoke similar processes (Zucker & Landry, 2007), and there is evidence that women who perceive sexism are more likely to smoke (Borrell, Diez Roux et al., 2010). In addition, the association between discrimination and smoking behavior may vary by sex. In a study of Hispanic youth, for example, perceived racial discrimination was associated with smoking for girls but not boys (Lorenzo-Blanco, Unger, Ritt-Olson, Soto, & Baezconde-Garbanati, 2011).

Antagonism and discrimination have both been implicated in smoking as main effects, but it is possible that these two risk factors may also have an interactive effect. That is, a psychological vulnerability combined with an environmental stressor may increase risk of smoking above the main effects. Such an approach has been applied to understanding other health-risk behaviors and outcomes. For example, personality traits and stressful life events synergistically increase risk of major depression (Kendler, Kuhn, & Prescott, 2004). To our knowledge, however, this framework has yet to be used to examine how personality traits and perceived discrimination interact to predict health-related behaviors.

To that end, the present study examines whether experiencing discrimination based on sex and a disposition toward antagonism has a synergistic effect on risk of current smoking. We expect a main effect of both antagonism and discrimination, such that those who are antagonistic or those who experience sex discrimination will be at greater risk for smoking. In addition to these main effects, we expect an interaction, such that those who are both antagonistic and experience sex discrimination will be at the greatest risk of smoking. This interaction should be apparent for women but not for men. Because interactions can be difficult to detect and to replicate, we tested these hypotheses in two large samples of adults. We focus on sex differences because women are now dying from smoking-related illness at nearly the same rate as men (Thun et al., 2013). The increase in smoking-related morbidity and mortality for women

points to the critical need to identify factors associated with smoking, especially factors that may be sex-specific.

METHODS

Samples

Healthy Aging in Neighborhoods of Diversity Across the Life Span

Participants were drawn from the Healthy Aging in Neighborhoods of Diversity across the Life Span (HANDLS) study (Evans et al., 2010). HANDLS is a population-based longitudinal study designed to disentangle the effects of race and socio-economic status on morbidity and mortality. To be included, participants had to be between 30 and 64 years old, be able to give informed consent, be able to perform at least five of the measures (medical history, physical performance, cognitive testing, dietary recall, audio questionnaire, body composition, carotid Doppler, or pulse wave velocity), and have a valid picture identification; exclusion criteria included pregnancy at time of entry and being within 6 months of cancer treatment. Participants were recruited as a fixed cohort from an area probability sample of 12 census segments in Baltimore, MD. From the total HANDLS cohort ($N = 3,721$), 454 participants had valid antagonism, discrimination, and smoking assessments (see Measures section). Detailed information about the subsample with the personality assessment can be found elsewhere (Sutin, Costa, Evans, & Zonderman, 2013). This sample was 64% female, 54% African American, and 50% were living below 125% of the federal poverty line, which is similar to the composition of the overall HANDLS cohort (Evans et al., 2010). The average age was 49.69 (SD = 8.66) years.

Health and Retirement Study

Participants were also drawn from the Health and Retirement Study (HRS), a nationally representative longitudinal study of Americans ages 50 and older (Health and Retirement Study, 2010). In 2006, HRS implemented an enhanced face-to-face interview that included a psychosocial questionnaire (Clarke, Fisher, House, Smith, & Weir, 2008). Half of the HRS participants completed the enhanced interview in 2006; the other half completed it in 2008. Across the 2006 and 2008 interviews ($N = 14,575$), a total of 8,155 participants had valid antagonism, discrimination, and smoking assessments (see Measures section). This sample was 50% female, 13% African American, had an average of 12.49 (SD = 3.00) years of education and an average age of 67.99 (SD = 10.14) years.

Measures

Antagonism

In HANDLS, participants completed the agreeableness scale of the Revised NEO Personality Inventory (Costa & McCrae, 1992); the opposite pole of agreeableness is antagonism (Costa & McCrae, 1992). This scale has 48 items (e.g., "Being perfectly honest is a bad way to do business.") that participants rated from 1 (strongly disagree) to 5 (strongly agree). The alpha reliability for this scale was .83. Raw scores were converted to T-scores ($M = 5$, $SD = 1$) based on combined-sex norms. In HRS, antagonism was measured with five items from the Cook-Medley Hostility Inventory (Clarke et al., 2008; Cook & Medley, 1954). Participants rated the extent to which they agreed with five statements (e.g., "I think most people would lie in order to get ahead.") on a scale from 1

Discrimination, antagonism, and smoking

(strongly disagree) to 6 (strongly agree). The alpha reliability for this scale was .79. Previous research has found a correlation of .49 between the NEO antagonism scale and the full version of the Cook-Medley Hostility Inventory (Barefoot, Dodge, Peterson, Dahlstrom, & Williams, 1989). These two scales thus measure similar, but not identical constructs.

Sex Discrimination

Participants in both studies were asked about their everyday experience with discrimination (Kessler, Mickelson, & Williams, 1999; Williams, Yu, Jackson, & Anderson, 1997). Participants in HANDLS were asked, "How often do you experience discrimination based on your gender?" The response scale ranged from 1 (not at all) to 4 (a lot). In HRS, participants rated five items related to the everyday experience of discrimination (e.g., "You are treated with less courtesy or respect than other people.") on a scale from 1 (almost everyday) to 6 (never). After rating those items, participants were asked the reasons they thought those experiences happened to them. Participants could ascribe their experiences to sex, ancestry, race, age, weight, physical disability, other aspect of physical appearance, sexual orientation, or other reason. Participants could choose more than one category. Participants who endorsed sex were coded as having experienced sex discrimination; participants who did not endorse this item were scored as not having experienced such discrimination. Measures of discrimination, such as the ones used in this research, generally do not differentiate between discrimination based on biological differences and discrimination based on social constructions of differences between the sexes. As such, this form of discrimination could be referred to as either "sex" discrimination or "gender" discrimination. In the present research we were unable to disentangle the two; for consistency within the paper, we refer to it as sex discrimination, but the term gender discrimination could be used as well.

Smoking

In both HANDLS and HRS, participants were asked a series of questions about their history of cigarette smoking, including "Do you smoke cigarettes now?" Participants who responded yes were coded as current smokers and those who responded no were coded as non-smokers.

Statistical Approach

Logistic regression was used to test whether antagonism, discrimination, and their interaction were associated with an increased risk of smoking. Specifically, the main effects of trait antagonism and perceived sex discrimination were included to predict current cigarette smoking, as was an interaction between antagonism and discrimination. The logistic regressions were run separately for men and women and controlled for age, ethnicity, and poverty status (HANDLS) or education (HRS). We ran the analyses separately by sex because the meaning of sex discrimination likely differs between men and women.

RESULTS

In HANDLS and HRS, respectively, 41% and 24% of participants were current smokers. In HANDLS, the percentage of men (44%) and women (40%) who were current smokers was similar ($\chi^2 = .76$, *ns*). There was a significant difference

in HRS: 27% of women were current smokers compared to 20% of men ($\chi^2 = 51.46$, $p < .01$). This difference is an unusual finding because the prevalence of smoking in the general population is higher for men than for women. This difference may be due to the composition of the HRS sample. HRS included Americans over the age of 50 and their spouses, who could be of any age. As such, there were over three times as many women than men under the age of 50 and there were more women than men between the ages of 50 and 70. Since younger adults are more likely to be current smokers than older adults, the higher percentage of women smokers in HRS is likely due to age.

As expected, there were sex differences in perceived sex discrimination in both samples: A greater percentage of women (37% and 17%, respectively, for HANDLS and HRS) reported having experienced sex discrimination than men (28% and 6%, for HANDLS and HRS; $\chi^2 = 4.60$ and 411.95, both $ps < .05$). Antagonism had a mean of 5.97 (SD = .92; range 1.56–7.96) in HANDLS and a mean of 3.04 (SD = 1.15; range 1–6) in HRS; the scale was scored in the direction of higher antagonism in both samples. The association between sex discrimination and smoking was significant in HRS ($r = .05$, $p < .01$) but not in HANDLS ($r = .08$, *ns*). Antagonism correlated with smoking in both samples ($rs = .16$ and $.10$, both $ps < .01$, respectively for HANDLS and HRS). Antagonism was uncorrelated with sex discrimination in either sample ($rs = -.04$ and $.01$, both *ns*, respectively for HANDLS and HRS).

Table 1 shows the results of the logistic regressions. In both samples, antagonism was associated with an increased risk of smoking among women: every standard deviation increase in antagonism was associated with an almost 50% increased risk of smoking in HANDLS and an almost 20% increased risk of smoking in HRS. For men, antagonism was associated with an increased risk of smoking in HRS, but not in HANDLS. In contrast to antagonism, perceiving discrimination based on sex was unrelated to risk of smoking in either sample for either sex.

There was, however, an interaction between antagonism and sex discrimination: Women who scored higher in antagonism and who had experienced sex discrimination had a much higher risk of smoking (Table 1). Indeed, among women who reported that they had been discriminated against on the basis of their sex, every standard deviation increase in antagonism was associated with a 2.5 times increased risk of smoking in HANDLS (odds ratio [OR] = 2.54, 95% CI = 1.46–4.39) and an almost 1.5 times increased risk in HRS (OR = 1.43, 95% CI = 1.18–1.73). The interaction between antagonism and sex discrimination was not significant for men in either sample (Table 1). These effects were virtually identical in both samples when perceived discrimination based on other characteristics (e.g., race, age, sexual orientation, etc.) was controlled for in the analysis.

DISCUSSION

Across two independent samples, trait antagonism and perceived sex discrimination synergistically increased risk of smoking among women; this association did not hold for men. These findings suggest that an antagonistic personality trait combined with a perceived antagonism within their environment has a multiplicative effect on risk of smoking for women.

A growing body of research has implicated discrimination in a number of health-risk behaviors and outcomes. Much of this research has focused on the effect of perceived racial

Table 1. Logistic Regression Predicting Risk of Current Smoking

	Women	Men
HANDLS		
Age	0.98 (0.96–1.01)	0.98 (0.94–1.02)
Ethnicity	1.41 (0.81–2.44)	2.29 (1.09–4.81)*
Poverty status	1.53 (0.89–2.63)	3.45 (1.70–7.01)**
Sex discrimination	1.15 (0.90–1.47)	1.01 (0.70–1.43)
Antagonism	1.48 (1.12–1.96)**	1.19 (0.80–1.77)
Antagonism × discrimination	1.60 (1.15–2.24)**	0.84 (0.55–1.27)
HRS		
Age	0.54 (0.50–0.58)**	0.46 (0.41–0.50)**
Ethnicity	1.09 (0.90–1.33)	1.64 (1.30–2.06)**
Education	0.90 (0.87–0.92)**	0.92 (0.90–0.95)**
Sex discrimination	1.05 (0.87–1.27)	1.07 (0.78–1.47)
Antagonism	1.16 (1.07–1.25)**	1.16 (1.07–1.27)**
Antagonism × discrimination	1.24 (1.02–1.51)*	1.09 (0.78–1.51)

Note. $N = 454$ for the Health Aging in Neighborhoods of Diversity across the Life Span (HANDLS) and $N = 8,155$ for the Health and Retirement Study (HRS). Table shows odds ratios (95% confidence interval). HANDLS data were collected between 2005 and 2009 in Baltimore City. HRS data were collected in 2006 and 2008 nationwide in the United States.

* $p < .05$.

** $p < .01$.

discrimination. African American adults who perceive racial discrimination, for example, have higher levels of inflammation than those who do not perceive such discrimination (Lewis, Aiello, Leurgans, Kelly, & Barnes, 2010), and Asian Americans who perceive racial discrimination report lower health-related quality of life (Gee & Ponce, 2010). The effects of discrimination also extend to mental health. Latino and Asian American college students who report discrimination based on their race have higher levels of psychological distress, anxiety, and depression (Hwang & Goto, 2008), as do community-dwelling African Americans (English, Lambert, Evans, & Zonderman, 2013). Such experiences ultimately shape the way individuals pursue health care: Those who perceive racial discrimination report less trust in the health care system (Armstrong et al., 2013) and are less likely to get routine health screenings (Harris et al., 2012; Mouton et al., 2010). The association between discrimination and health is not limited to racial/ethnic discrimination; perceived sex discrimination is also associated with poor health practices (Zucker & Landry, 2007).

Discrimination has been differentiated from other forms of stress because it is by nature inherently demeaning and highly personal (Landrine & Klonoff, 1996). Smoking may be one strategy that individuals use to cope with this stress. For example, individuals who experience discrimination also tend to have higher levels of psychological distress, which, in turn, is associated with risk of smoking. This mediating effect has been found for both perceived racial discrimination (Purnell et al., 2012) and perceived sexism (Zucker & Landry, 2007).

In the present study, however, there was not a main effect of discrimination on current cigarette smoking. Instead, sex discrimination amplified the association between trait antagonism and risk for smoking among women. Antagonism has long been implicated in health outcomes (Costa, Stone, McCrae, Dembroski, & Williams, 1987) and health-risk behaviors, such as smoking (Terracciano & Costa, 2004). Individuals who score high in antagonism-related traits may be more likely to engage in health-risk behaviors because they value societal norms and expectations less than more agreeable individuals (Chassin,

Flora, & King, 2004). In addition, among their motives for smoking, individuals high in antagonism tend to report smoking as a means to reduce anger and regulate negative moods (Gilbert, Sharpe, Ramanaiah, Detwiler, & Anderson, 2000). For these individuals, smoking may thus be used as a way of regulating the anger and negative emotions evoked by experiencing sex discrimination. The need for an emotion-regulation strategy combined with a basic mistrust of public health messages may contribute to the greater risk of smoking among antagonistic individuals who experience discrimination.

It should be noted that the present research was unable to determine the direction of causality of the effects and thus alternative explanations should be considered. For example, nicotine is a powerful drug that could change an individual's psychological functioning (Picciotto, Brunzell, & Caldaroni, 2002), including personality traits like antagonism. As such, it is possible that smoking increases antagonism. Antagonism, however, has been identified as risk factor for smoking initiation: Antagonism-related traits measured early in elementary school have been associated with smoking initiation in high school (Hampson, Tildesley, Andrews, Luyckx, & Mroczek, 2010). It is also possible that people who smoke may be at greater risk of being discriminated against or are more likely to perceive discrimination. Further, the discrimination measure in each study did not distinguish between perceptions of discrimination and objectively documented discrimination. It is possible that being sensitive to discrimination and potential discriminatory experiences is more detrimental with regards to smoking than the discriminatory act itself. An ecologically valid measure of "objective" discrimination, however, is difficult to conceptualize and validate, and it may be that the perception of discrimination is what is most important for health. Such possibilities are impossible to disentangle with cross-sectional self-report data.

Despite the limitations of such data, the present research identified an interaction that replicated across two diverse samples that used two different measures of antagonism and two different measures of perceived sex discrimination. Future research could address the interactive role of antagonism and

perceived discrimination on smoking initiation. The present samples were composed entirely of adults who started smoking before the assessments. It would be worthwhile to test whether this association contributes to smoking initiation, attempts to quit, and/or motivation to continue smoking. Future research could also test the mechanisms that contribute to this association. Based on previous research, women who are antagonistic and experience sex discrimination may be more likely to smoke because they use smoking for emotion regulation and they may also be less likely to pay attention to public health messages about smoking. This hypothesis, however, could not be tested with the current data.

Finally, sex differences have been identified in a variety of processes relevant for health. For example, sex differences in the neurobiology of stress and coping (Andreano & Cahill, 2006, 2009) may contribute to the documented sex differences in withdrawal (Dickmann et al., 2009) and potential differences in response to discriminatory experiences (Borrell, Artazcoz et al., 2010). A next step is to identify whether psychological and social factors associated with smoking are also sex-specific. Such knowledge is important for identifying populations that may be at increased risk of smoking and can also help inform interventions for smoking cessation. Antagonism-related traits have been found to exacerbate the negative emotionality that typically accompanies tobacco withdrawal (Quinn et al., 2013) and difficult social experiences, such as discrimination, may exacerbate this emotional response even more. A great deal of research has documented these separate effects. Individuals, however, experience the world through both their psychological functioning and their social experiences. The task now is to understand whether/how these factors combine to contribute to health and health-risk behaviors and if these combinations are sex-specific. The present research suggests that for women, a hostile disposition and a perceived hostile social environment increase risk for current smoking.

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DECLARATION OF INTERESTS

None declared.

REFERENCES

- al'Absi, M., Carr, S. B., & Bongard, S. (2007). Anger and psychobiological changes during smoking abstinence and in response to acute stress: Prediction of smoking relapse. *International Journal of Psychophysiology*, *66*, 109–115. doi:10.1016/j.ijpsycho.2007.03.016
- American Lung Association. (2011). *Trends in tobacco use*. Washington, DC: American Lung Association, Research Program Services, Epidemiology and Statistics Unit.
- Andreano, J. M., & Cahill, L. (2006). Glucocorticoid release and memory consolidation in men and women. *Psychological Science*, *17*, 466–470.
- Andreano, J. M., & Cahill, L. (2009). Sex influences on the neurobiology of learning and memory. *Learning and Memory*, *16*, 248–266. doi:10.1101/lm.918309
- Armstrong, K., Putt, M., Halbert, C. H., Grande, D., Schwartz, J. S., Liao, K., ... Shea, J. A. (2013). Prior experiences of racial discrimination and racial differences in health care system distrust. *Medical Care*, *51*, 144–150. doi:10.1097/MLR.0b013e31827310a1
- Barefoot, J. C., Dodge, K. A., Peterson, B. L., Dahlstrom, W. G., & Williams, R. B. (1989). The Cook-Medley hostility scale: Item content and ability to predict survival. *Psychosomatic Medicine*, *51*, 46–57.
- Borrell, C., Artazcoz, L., Gil-González, D., Pérez, G., Rohlf, I., & Pérez, K. (2010). Perceived sexism as a health determinant in Spain. *Journal of Womens Health*, *19*, 741–750. doi:10.1089/jwh.2009.159
- Borrell, L. N., Diez Roux, A. V., Jacobs, D. R., Shea, S., Jackson, S. A., Shrager, S., & Blumenthal, R. S. (2010). Perceived racial/ethnic discrimination, smoking and alcohol consumption in the multi-ethnic study of atherosclerosis (MESA). *Preventive Medicine*, *51*, 307–312. doi:10.1016/j.ypmed.2010.05.017
- Burns, D. M., Lee, L., Shen, L. Z., Gilpin, E., Tolley, H. D., Vaughn, J., & Shanks, T. G. (1997). *Cigarette smoking behavior in the United States*. Bethesda, MD: NIH. Publication no. 97–4213.
- Carpenter, M. J., Upadhyaya, H. P., LaRowe, S. D., Saladin, M. E., & Brady, K. T. (2006). Menstrual cycle phase effects on nicotine withdrawal and cigarette craving: A review. *Nicotine and Tobacco Research*, *8*, 627–638. doi:10.1080/14622200600910793
- Chassin, L., Flora, D. B., & King, K. M. (2004). Trajectories of alcohol and drug use and dependence from adolescence to adulthood: The effects of familial alcoholism and personality. *Journal of Abnormal Psychology*, *113*, 483–498.
- Clarke, P., Fisher, G., House, J., Smith, J., & Weir, D. (2008). *Guide to content of the HRS psychosocial leave-behind participant lifestyle questionnaires: 2004 & 2006*. Ann Arbor, MI: University of Michigan.
- Cook, W. W., & Medley, D. M. (1954). Proposed hostility and pharisaic-virtue scales for the MMPI. *The Journal of Applied Psychology*, *38*, 414–418.
- Costa, P. T., Jr., & McCrae, R. R. (1992). *Revised NEO Personality Inventory (NEO-PI-R) and the NEO Five-Factor Inventory (NEO-FFI) professional manual*. Odessa, FL: Psychological Assessment Resources.
- Costa, P. T., Stone, S. V., McCrae, R. R., Dembroski, T. M., & Williams, R. B. (1987). Hostility, agreeableness-antagonism, and coronary heart disease. *Holistic Medicine*, *2*, 161–167.
- Dickmann, P. J., Mooney, M. E., Allen, S. S., Hanson, K., & Hatsukami, D. K. (2009). Nicotine withdrawal and craving in adolescents: Effects of sex and hormonal contraceptive use. *Addictive Behavior*, *34*(6–7), 620–623. doi:10.1016/j.addbeh.2009.03.033
- English, D., Lambert, S. F., Evans, M. K., & Zonderman, A. B. (2013). Community racial composition, racial discrimination, and depressive symptoms in African Americans. *Manuscript submitted for publication*.
- Etter, J. F. (2010). Smoking and Cloninger's Temperament and Character Inventory. *Nicotine and Tobacco Research*, *12*, 919–926. doi:10.1093/ntr/ntq116
- Evans, M. K., Lepkowski, J. M., Powe, N. R., LaVeist, T., Kuczmarski, M. F., & Zonderman, A. B. (2010). Healthy aging in neighborhoods of diversity across the life span (HANDLS): Overcoming barriers to implementing a longitudinal, epidemiologic, urban study of health, race, and socioeconomic status. *Ethnicity and Disease*, *20*, 267–275.

- Gee, G. C., & Ponce, N. (2010). Associations between racial discrimination, limited English proficiency, and health-related quality of life among 6 Asian ethnic groups in California. *American Journal of Public Health, 100*, 888–895. doi:10.2105/AJPH.2009.178012
- Gilbert, D. G., Sharpe, J. P., Ramanaiah, N. V., Detwiler, F. R. J., & Anderson, A. (2000). Development of a situation x trait adaptive response (STAR) model-based smoking motivation questionnaire. *Personality and Individual Differences, 29*, 65–84.
- Greene, D. C., & Britton, P. J. (2012). Lesbian, gay, bisexual, and transgender smokers: Correlations with external health control, health expectations, and shame-focused coping. *Journal of LGBT Issues in Counseling, 6*, 202–228.
- Hampson, S. E., Tildesley, E., Andrews, J. A., Luyckx, K., & Mroczek, D. K. (2010). The relation of change in hostility and sociability during childhood to substance use in mid adolescence. *Journal of Research in Personality, 44*, 103–114. doi:10.1016/j.jrp.2009.12.006
- Harris, R., Cormack, D., Tobias, M., Yeh, L. C., Talamaiavao, N., Minster, J., & Timutimu, R. (2012). Self-reported experience of racial discrimination and health care use in New Zealand: Results from the 2006/07 New Zealand Health Survey. *American Journal of Public Health, 102*, 1012–1019. doi:10.2105/AJPH.2011.300626
- Health and Retirement Study (2012). *2006 and 2010 Core Public Use Dataset*. Ann Arbor, MI: University of Michigan. Produced and distributed by the University of Michigan with funding from the National Institute on Aging (grant number NIA U01AG009740).
- Hogle, J. M., & Curtin, J. J. (2006). Sex differences in negative affective response during nicotine withdrawal. *Psychophysiology, 43*, 344–356. doi:10.1111/j.1469-8986.2006.00406.x
- Hopwood, C. J., Morey, L. C., Skodol, A. E., Stout, R. L., Yen, S., Ansell, E. B., ... McGlashan, T. H. (2007). Five-factor model personality traits associated with alcohol-related diagnoses in a clinical sample. *Journal of Studies on Alcohol and Drugs, 68*, 455–460.
- Hwang, W. C., & Goto, S. (2008). The impact of perceived racial discrimination on the mental health of Asian American and Latino college students. *Cultural Diversity and Ethnic Minority Psychology, 14*, 326–335. doi:10.1037/1099-9809.14.4.326
- Kendler, K. S., Kuhn, J., & Prescott, C. A. (2004). The interrelationship of neuroticism, sex, and stressful life events in the prediction of episodes of major depression. *American Journal of Psychiatry, 161*, 631–636.
- Kessler, R. C., Mickelson, K. D., & Williams, D. R. (1999). The prevalence, distribution, and mental health correlates of perceived discrimination in the United States. *Journal of Health and Social Behavior, 40*, 208–230.
- Landrine, H., & Klonoff, E. A. (1996). The schedule of racist events: A measure of racial discrimination and a study of its negative physical and mental health consequences. *Journal of Black Psychology, 22*, 144–168.
- Lee, J. G., Griffin, G. K., & Melvin, C. L. (2009). Tobacco use among sexual minorities in the USA, 1987 to May 2007: A systematic review. *Tobacco Control, 18*, 275–282. doi:10.1136/tc.2008.028241
- Lewis, T. T., Aiello, A. E., Leurgans, S., Kelly, J., & Barnes, L. L. (2010). Self-reported experiences of everyday discrimination are associated with elevated C-reactive protein levels in older African-American adults. *Brain, Behavior, and Immunity, 24*, 438–443.
- Lorenzo-Blanco, E. I., Unger, J. B., Ritt-Olson, A., Soto, D., & Baezconde-Garbanati, L. (2011). Acculturation, gender, depression, and cigarette smoking among U.S. Hispanic youth: The mediating role of perceived discrimination. *Journal of Youth and Adolescence, 40*, 1519–1533. doi:10.1007/s10964-011-9633-y
- McCrae, R. R., & Costa, P. T. (2010). *NEO Inventories for the NEO Personality Inventory-3, NEO Five-Factor Inventory-3, and NEO Personality Inventory-Revised Professional Manual*. Lutz, FL: PAR.
- Mouton, C. P., Carter-Nolan, P. L., Makambi, K. H., Taylor, T. R., Palmer, J. R., Rosenberg, L., & Adams-Campbell, L. L. (2010). Impact of perceived racial discrimination on health screening in black women. *Journal of Health Care for the Poor Underserved, 21*, 287–300. doi:10.1353/hpu.0.0273
- Picciotto, M. R., Brunzell, D. H., & Caldarone, B. J. (2002). Effect of nicotine and nicotinic receptors on anxiety and depression. *Neuroreport, 13*, 1097–1106.
- Purnell, J. Q., Peppone, L. J., Alcaraz, K., McQueen, A., Guido, J. J., Carroll, J. K., ... Morrow, G. R. (2012). Perceived discrimination, psychological distress, and current smoking status: Results from the Behavioral Risk Factor Surveillance System Reactions to Race module, 2004–2008. *American Journal of Public Health, 102*, 844–851. doi:10.2105/AJPH.2012.300694
- Quinn, A., Sekimura, S., Pang, R., Trujillo, M., Kahler, C. W., & Leventhal, A. M. (2013). Hostility as a predictor of affective changes during acute tobacco withdrawal. *Nicotine & Tobacco Research*. doi:10.1093/ntr/ntt151
- Seibert, L. A., Miller, J. D., Pryor, L. R., Reidy, D. E., & Zeichner, A. (2010). Personality and laboratory-based aggression: Comparing the predictive power of the Five-Factor Model, BIS/BAS, and impulsivity across context. *Journal of Research in Personality, 44*, 13–21.
- Sutin, A. R., Costa, P. T., Evans, M. K., & Zonderman, A. B. (2013). Personality assessment in a diverse urban sample. *Psychological Assessment, 25*, 1007–1012.
- Sutin, A. R., Costa, P. T., Uda, M., Ferrucci, L., Schlessinger, D., & Terracciano, A. (2010). Personality and metabolic syndrome. *Age, 32*, 513–519.
- Sutin, A. R., Evans, M. K., & Zonderman, A. B. (2013). Personality traits and illicit substances: The moderating role of poverty. *Drug and Alcohol Dependence, 131*, 247–251. doi: 10.1016/j.drugalcdep.2012.10.020
- Terracciano, A., & Costa, P. T., Jr. (2004). Smoking and the five-factor model of personality. *Addiction, 99*, 472–481.
- Thun, M. J., Carter, B. D., Feskanich, D., Freedman, N. D., Prentice, R., Lopez, A. D., ... Gapstur, S. M. (2013). 50-year trends in smoking-related mortality in the United States. *New England Journal of Medicine, 368*, 351–364. doi:10.1056/NEJMs1211127
- Welch, D., & Poulton, R. (2009). Personality influences on change in smoking behavior. *Health Psychology, 28*, 292–299. doi:10.1037/a0013471
- Williams, D. R., Yu, Y., Jackson, J. S., & Anderson, N. B. (1997). Racial differences in physical and mental health. Socio-economic status, stress and discrimination. *Journal of Health Psychology, 2*, 335–351.
- Zucker, A. N., & Landry, L. J. (2007). Embodied discrimination: The relation of sexism and distress to women's drinking and smoking behaviors. *Sex Roles, 56*, 193–203.