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Evaluating the Role of Mindfulness in Terms of Asthma-Related Outcomes and Depression and Anxiety Symptomatology among Individuals with Asthma

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Abstract

The aim of the current study was to examine the unique role of mindfulness skills in terms of: (1) asthma-related outcomes (i.e., asthma control, asthma quality of life); (2) depression symptoms; and (3) anxiety symptomatology (i.e., anxiety sensitivity, panic symptoms, global anxiety) among non-smoking adults with current asthma. Participants were 61 (61.9% female; $M_{age} = 34.72$ years, $SD = 13.58$, range = 18–65) non-smoking adults with current asthma who completed a battery of self-report measures. Results indicated that, after controlling for the effects of race and age, greater ability to describe present moment experiences was significantly associated with better asthma-related quality of life and lower levels of anxiety symptoms. Though mindfulness skills together were associated with lower levels of panic symptoms, there were no significant individual associations between specific skills and panic symptoms. Greater nonjudgment of present moment experiences was associated with lower levels of anxiety and anxiety sensitivity. Greater nonreactivity was significantly associated with lower levels of depression symptoms and anxiety sensitivity. Lastly, a greater ability to observe present moment experiences was associated with lower levels of anxiety sensitivity. Mindfulness was not significantly associated with asthma control. These findings suggest that it may be useful to target the mindfulness skills of describing, nonjudgment, and nonreactivity among individuals with asthma, particularly those with elevated levels of anxiety and depression, in order to improve psychological and asthma-related outcomes.

Keywords

anxiety; asthma; depression; mindfulness; quality of life

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Elevated anxiety and depression among those with asthma (Goodwin et al., 2010; Opolski & Wilson, 2005) is associated with a number of negative asthma-related outcomes (Afari, Schmalting, Barnhart & Buchwald, 2001; Deshmukh et al., 2008; Eisner, Katz, Lactao, & Irbarren, 2005; Kullowatz et al., 2007). Mindfulness, conceptualized as a trait-like factor that can be increased through formal or informal practices (Brown & Ryan, 2003; Baer, Smith, & Allen, 2004), may be associated with lower levels of mood and anxiety symptomatology and risk factors for these disorders among individuals with asthma (Keng, Smoski, & Robins, 2011). Trait mindfulness is operationalized in two ways: (1) as a unidimensional construct representing global present moment awareness (Brown & Ryan, 2003; Chiesa, 2013; Kumar et al., 2008), and (2) as a multidimensional construct that consists of five related, yet distinct, skills: (1) Observing present moment experiences; (2) Describing present moment experience; (3) Acting with Awareness; (4) Nonjudgment; and (5) Nonreactivity (Baer et al., 2004; Baer et al., 2006). The current study uses this multidimensional construct of trait mindfulness because it can identify specific targets to guide future intervention efforts and allow researchers to better examine mechanisms of action behind such interventions. Greater levels of mindfulness are associated with lower levels of psychopathology (Keng, Smoski, & Robins, 2011), along with decreased symptom severity, improved quality of life, and reductions in mood disturbances and stress across numerous chronic illness populations (Bohlmeijer et al., 2010; Carlson et al., 2005; Sephton et al., 2007).

Compared to the growing number of studies on the effects of mindfulness in chronic disease, there are few studies explicitly examining the association between mindfulness, particularly mindfulness skills, and asthma. Pbert and colleagues (2012) found that, compared to those in the control condition, individuals in a mindfulness-based stress reduction (MBSR) group demonstrated 12-month improvements in asthma-related quality of life, perceived stress, and decreased use of short-acting bronchodilators despite no significant changes in lung function. Among young adults with asthma, Kraemer, McLeish and Johnson (2014) found that greater use of the skill of Acting with Awareness, compared to other mindfulness skills, was associated with fewer panic symptoms and reduced anxiety sensitivity (AS). Higher levels of global mindfulness have also been shown to be associated with better asthma-related quality of life and an increase in the odds of having an asthma diagnosis, persistent dry cough, and wheezing among adolescents and college students (Cillessen, van de Ven, & Karremans, 2017; Shi et al., 2017).

Taken together, there no studies, to date, examining the role of mindfulness skills, as opposed to global mindfulness, in asthma-related outcomes. Thus, the aim of the current study was to examine the unique role of mindfulness skills in terms of: (1) asthma-related outcomes (i.e., asthma control, asthma-related quality of life); (2) depression symptoms; and (3) anxiety symptomatology (i.e., general anxiety symptoms, panic symptoms, and AS) among non-smoking adults with current asthma. Due to the relatively specific association between asthma and panic psychopathology (Hasler et al., 2005), panic symptoms and AS, a risk factor for panic psychopathology, were included as outcomes to provide further specificity beyond general anxiety symptoms. Based on the limited work on mindfulness skills and other chronic illnesses (Garland, Campbell, Samuels, & Carlson, 2013; McCracken et al., 2007; Veehof et al., 2011), it was hypothesized that, after controlling for the effects of race and age, the mindfulness skills of Acting with Awareness and

Nonjudgment would be significantly associated with: (1) increased asthma control and quality of life; (2) fewer symptoms of depression; and (3) lower levels of AS, fewer panic symptoms, and lower levels of anxiety. Race and age were selected as covariates due to their associations with asthma as well as mood and anxiety symptoms (Christensen et al., 1999; DeMarco, Locatelli, Sunyer, & Burney, 2000; Ray, Thamer, Fadillioglu, & Gergen, 1998; Smith et al., 2006).

Method

Participants

Participants were 61 non-smoking adults with current asthma (61.9% female; $M_{age} = 34.72$ years, $SD = 13.58$, range = 18–65). For inclusion in the study, participants had to: (a) be between the ages of 18 and 65; (b) be a nonsmoker (see Measures section for more detail); (c) self-report a physician diagnosis of asthma; and (d) meet the cutoff score for an asthma diagnosis on the Asthma Screening Questionnaire (i.e., score ≥ 4 ; Shin et al., 2010). 54.8% of the sample self-identified as African American, 41.9% as Caucasian, and 3.2% as Other. One participant reported Hispanic ethnicity. Participants were, on average, 16.48 ($SD = 14.13$) years of age when diagnosed with asthma. Participants reported a mean Asthma Control Test (Nathan et al., 2004) score of 15.98 ($SD = 4.54$), indicating poorly controlled asthma.

Measures

Smoking Status.—Biochemical verification of smoking status was completed by carbon monoxide (CO) analysis of breath samples assessed using a Bedfont Micro 4 Smokerlyzer CO Monitor (Model EC50; coVita, Haddonfield, NJ). Research indicates that 5 ppm is an optimal cutoff score for reliably discriminating non-smoking status (Perkins, Karelitz, & Jao, 2013). Obtained values below this cutoff were considered indicative of being a non-smoker.

Asthma Screening Questionnaire (ASQ).—The ASQ is a six-item screening questionnaire that assesses four dimensions of asthma symptoms: cough, chest tightness, wheeze, and shortness of breath in four situations that commonly elicit asthma symptoms. Research indicates that a score of ≥ 4 on the ASQ reliably discriminates between those with and without asthma (96% sensitivity, 100% specificity; Shin et al., 2010). Internal consistency for the current study was good ($\alpha = .81$).

Asthma Control Test (ACT).—The ACT (Nathan et al., 2004) is a 5-item self-report measure that assesses the frequency of symptoms (e.g., *‘How often have you had shortness of breath?’*) and functional impairment due to symptoms (e.g., *‘How much of the time did your asthma keep you from getting as much done at work or at home?’*) within the past 4 weeks. The ACT shows good reliability and is able to discriminate between groups of patients with different levels of asthma control (Nathan et al., 2004). Internal consistency for the current sample was good ($\alpha = .86$).

Asthma Quality of Life Questionnaire (AQLQ).—The AQLQ (Juniper et al., 1992) is a 32-item self-report measure that assesses health-related quality of life. The AQLQ has demonstrated good internal consistency and discriminant validity (Juniper et al., 1993). Internal consistency for the current sample was excellent ($\alpha = .97$).

Center for Epidemiological Studies Depression Scale (CES-D).—The CES-D is a 20-item self-report measure that assesses symptoms of major depressive disorder (Radloff, 1977). There is a large body of literature that supports the excellent psychometric properties of the CES-D (Radloff, 1977; Radloff, 2002). Internal consistency for the current sample was good ($\alpha = .87$).

Anxiety Sensitivity Index-3 (ASI-3).—The ASI-3 (Taylor et al., 2007) is an 18-item self-report measure that assesses the degree to which participants fear the negative consequences associated with anxiety symptoms. The ASI-3 has demonstrated the strongest psychometric properties of any current measure of anxiety sensitivity (Taylor et al., 2007). Internal consistency for the current sample was excellent ($\alpha = .92$).

Inventory of Depression and Anxiety Symptoms (IDAS).—The IDAS is a 64-item self-report measure that assesses specific symptom dimensions of major depression and anxiety disorders (Watson et al., 2007). The IDAS shows strong convergent, discriminant, criterion, and incremental validity (Watson et al., 2008). Only the panic subscale (IDAS-Panic) was used in the current study (e.g., “*I felt dizzy or light-headed*”). Internal consistency in the current sample was acceptable ($\alpha = .79$).

Depression Anxiety Stress Scale (DASS).—The DASS is a 42-item self-report measure that assesses symptoms of depression, anxiety, and general stress (Lovibond & Lovibond, 1995). The DASS has demonstrated good convergent and discriminant validity and internal consistency in both clinical and non-clinical populations (Anthony et al., 1998; Lovibond & Lovibond, 1995). Only the anxiety subscale (DASS-Anxiety) was used in the current study to assess global anxiety symptoms. Internal consistency in the current sample was good ($\alpha = .88$).

Five Facet Mindfulness Questionnaire (FFMQ).—The FFMQ (Baer et al., 2006) is a 39-item self-report measure that assesses the tendency to be mindful in everyday life. Participants indicate, on a 5-point Likert-type scale (1 = *never or very rarely true* to 5 = *very often or always true*), the degree to which they engage in five specific mindfulness skills: (1) Observing (e.g., “*When I’m walking, I deliberately notice the sensations of my body moving*.”); (2) Describing (e.g., “*I’m good at finding words to describe my feelings*.”); (3) Acting with Awareness (e.g., “*When I do things, my mind wanders off and I’m easily distracted*.” - Reverse scored); (4) Nonjudgment (e.g., “*I criticize myself for having irrational or inappropriate emotions*.” - Reverse scored); and (5) Nonreactivity (e.g., “*I perceive my feelings and emotions without having to react to them*.”). Internal consistency in the current sample was acceptable to good (α range = .78 - .87).

Procedure

Participants were recruited from the community via advertisements placed in public areas, healthcare provider waiting rooms, in local newspapers, and on community-oriented websites (e.g., Craigslist). Interested individuals were first screened for eligibility by phone. Potentially eligible participants were then scheduled for an individual appointment by a trained research assistant. Upon arrival to the study session, participants first provided informed, written consent. Non-smoking status was then biochemically verified via CO analysis. Eligible participants then completed the battery of self-report measures. Following completion of the study, participants were compensated \$25 for their time and effort. The Institutional Review Board approved all study materials and procedures prior to the collection of data.

Data Analytic Plan

First, to determine the associations between all study variables, zero-order correlations were computed. Next, hierarchical multiple regressions analyses were performed to examine the incremental utility of the five mindfulness skills, above and beyond age and race, in terms of depression symptoms, anxiety symptomatology, and asthma-related symptoms (Cohen, Cohen, West, & Aiken, 2003). Separate models were constructed for asthma control, asthma-related quality of life, depression symptoms, anxiety symptoms, panic symptoms, and AS. In each model, age and race were entered simultaneously as covariates at step one to control for these theoretically relevant factors. At the second step of the model, the five mindfulness skills were entered simultaneously at step two of the model in order to estimate the amount of variance accounted for by these variables.

Results

Zero-Order Correlations

See Table 1 for descriptive statistics for all study variables and Table 2 for associations between the predictor and criterion variables. There were no significant associations between Observing and any study variables. Describing was significantly negatively associated with age, depressive symptoms, anxiety symptoms, panic symptoms, and AS, and positively associated with asthma control and asthma-related quality of life. Acting with Awareness was significantly correlated with AS. Nonjudgment was significantly associated with anxiety symptoms, AS, depressive symptoms and panic symptoms. Nonreactivity was significantly negatively associated with age, and depressive symptoms, and positively associated with asthma control and asthma quality of life.

Regression Analyses

See Table 3 regression results for all study outcomes. In terms of asthma control, step one of the model was significant and accounted for 28.7% of the variance. Age was the only significant variable at step one. The second step of the model was not significant. In terms of asthma-related quality of life, step one of the model was significant and accounted for 44.7% of the variance. Age and race were significant variables at this step. The second step of the

model accounted for a non-significant 12.2% of unique variance ($p = .058$), though Describing emerged as a significant individual variable ($\beta = .35$, $t = 2.46$, $p < .05$).

In terms of depression symptoms, step one of the model was not significant. Step two of the model accounted for 33.0% of variance, and Nonjudgment ($\beta = -.34$, $t = -2.51$, $p < .05$) and Nonreactivity ($\beta = -.74$, $t = -2.36$, $p < .05$) were the only significant variables. In terms of anxiety symptoms, step one of the model was not significant. Step two accounted for 30.0% of variance, and Describing ($\beta = -.46$, $t = -2.77$, $p < .01$) and Nonjudgment ($\beta = -.38$, $t = -2.79$, $p < .01$) were significant variables. For panic symptoms, step one of the model accounted for 17.0% of the variance, and age was the only significant variable. Step two of the model was significant and accounted for 19.3% of unique variance. There were no significant individual variables at step two (Describing; $\beta = .32$, $t = 1.89$, $p = .07$). In terms of AS, step one of the model was not significant. Step two of the model was significant and accounted for 45.9% of unique variance. Observing ($\beta = .50$, $t = 3.14$, $p < .01$), Nonjudgment ($\beta = -.35$, $t = -2.72$, $p < .01$), and Nonreactivity ($\beta = -.36$, $t = -2.30$, $p < .05$) were significant variables at step two.

Discussion

The aim of the current study was to examine the unique role of specific mindfulness skills in terms of asthma-related outcomes, depression symptoms, and anxiety symptoms. In terms of asthma-related outcomes, the skill of Describing was associated with asthma-related quality of life, such that individuals who were able to accurately describe their internal experiences were more likely to report greater asthma-related quality of life. Inconsistent with prediction, however, specific mindfulness skills were not significantly associated with asthma control. These findings are partially consistent with those of Pbert et al.'s (2012) study, and suggest that mindfulness skills may not improve the physiological symptoms associated with asthma, but rather improve how one reacts to these symptoms and perceive they are impacting daily functioning.

Partially consistent with prediction, greater Nonjudgment and Nonreactivity were associated with decreased depression symptoms. Thus, for individuals with asthma, the ability to accept and take a nonreactive stance towards internal sensations may be the most valuable skills for mitigating depressive symptoms. This finding is generally consistent with previous work in community and college samples (Cash & Whittingham, 2010; Barnes & Lynn, 2010), suggesting that there may not be differential associations for individuals with asthma.

In terms of anxiety-related symptoms, greater use of the skill of Describing was associated with fewer general anxiety symptoms and lower levels of AS. These results suggest that individuals with asthma who are able to describe and label their internal sensations are less likely to experience general anxiety, and possibly panic symptoms, and are less likely to fear of arousal-related sensations, which could decrease the risk for developing anxiety and mood psychopathology. Greater use of the skill of Observing was significantly associated with higher levels of AS, which is consistent with previous work (Baer et al., 2008; Luberto et al., 2011), and suggests that simply observing internal experiences, without nonjudgmental awareness, may be harmful. Further, higher levels of the skill of

Nonjudgment were associated with lower levels of general anxiety symptoms and AS. The skill of Nonreactivity was significantly associated with AS, such that individuals with asthma who are able to notice internal sensations without automatically reacting to them are less likely to fear those sensations. Inconsistent with prediction, the skill of Acting with Awareness was not associated with any anxiety-related symptoms.

Taken together, the skill of Describing, as opposed to the hypothesized Acting with Awareness skill, was particularly important in terms of asthma-related quality of life and anxiety-related symptoms. These findings are in contrast to past work, which found that the Acting with Awareness skill was associated with anxiety sensitivity and panic symptoms among young adults with asthma (Kraemer et al., 2014). Importantly, participants in the Kraemer et al. (2014) study had well-controlled asthma, whereas participants in the current study reported relatively poor asthma control. Thus, it may be the case that there are differential associations based on asthma control and severity. It is possible that, for individuals with poorly controlled asthma, the most important first step when an internal sensation arises is to be able to accurately describe or label that sensation in order to effectively discern the best course of action (e.g., rescue inhaler versus behavioral coping strategy). For an individual with severe asthma, the inability to effectively describe or label sensations may lead to the under- or over-utilization of healthcare services, or increased anxiety, all of which are detrimental for asthma outcomes (Rietveld & Brosschot, 1999; Thoren & Petermann, 2000).

There are a number of limitations that warrant consideration. First, the cross-sectional nature of the current study precludes the ability to infer causal relationships. Second, the current study relied solely on self-report measures. Thus, there is a possibility of reporting errors and shared method variance. Future work may benefit from utilizing a multi-method approach, perhaps by behaviorally manipulating mindfulness through experimental designs (e.g., brief mindfulness meditation; Erisman & Roemer, 2010). Third, asthma diagnosis was not objectively verified. While a validated asthma screening measure was used to determine an asthma diagnosis for study inclusion, it will nonetheless be important for future work to objectively verify asthma diagnoses. Fourth, while depressive and anxiety symptoms were examined, this study did not determine whether participants had any comorbid psychiatric diagnoses. Thus, it is unclear whether there are differential associations between mindfulness and asthma-related outcomes among individuals with an anxiety or depressive disorder. Lastly, the study utilized a small sample size, which may have limited our ability to detect patterns of associations between study variables.

Taken together, the present findings indicate that greater use of the mindfulness skills of Describing, Nonjudgment, and Nonreactivity, but not Acting with Awareness, were associated with better asthma-related quality of life and fewer symptoms of depression and anxiety. These findings suggest that it may be useful to target these specific mindfulness skills among individuals with asthma, particularly those with elevated levels of anxiety and depression, in order to improve psychological and asthma-related outcomes. There is some evidence that mindfulness-based interventions may be effective for depression and anxiety in primary care settings (e.g., Finucane & Mercer, 2006). In addition, abbreviated mindfulness-

based interventions may be just as effective as the full length protocols (Carmody & Baer, 2009), suggesting that these treatments may be easily implemented in clinical settings.

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Table 1.

Descriptive Statistics for all Study Variables

	Mean	SD	Observed Range
Age	34.72	13.58	18–65
Asthma Control	15.98	4.54	6–25
Quality of Life	4.50	1.30	1.28–6.97
Depression	18.40	9.02	1–35
Anxiety	10.40	8.17	0–35
Panic Symptoms	15.32	5.39	8–30
Anxiety Sensitivity	23.72	15.74	0–57
Observing	26.98	6.85	11–40
Describing	29.42	6.51	13–40
Awareness	28.28	6.83	12–40
Nonjudgment	29.43	6.78	13–40
Nonreactivity	20.89	5.52	7–31

Note. Asthma Control: Asthma Control Test (ACT; Nathan et al., 2004); Quality of life: Asthma Quality of Life Questionnaire (AQLQ; Juniper et al., 1992); Depression: Center for Epidemiologic Studies Depression (CES-D; Radloff, 1977); Anxiety: Depression Anxiety Stress Scale-Anxiety subscale (DASS-Anxiety; Lovibond & Lovibond, 1995); Panic Symptoms: Inventory of Depression and Anxiety Symptoms-Panic subscale (IDAS-Panic; Watson et al., 2007); Anxiety Sensitivity: Anxiety Sensitivity Index-3 (ASI-3; Taylor et al., 2007); Observe: Five Facet Mindfulness Questionnaire-Observe subscale (FFMQ-Observe; Baer et al., 2006); Describe: Five Facet Mindfulness Questionnaire-Describe subscale (FFMQ-Describe; Baer et al., 2006); Awareness: Five Facet Mindfulness Questionnaire-Acting with Awareness subscale (FFMQ-Aware; Baer et al., 2006); Nonjudgment: Five Facet Mindfulness Questionnaire-Nonjudgment subscale (FFMQ-Nonjudgment; Baer et al., 2006); Nonreactivity: Five Facet Mindfulness Questionnaire-Nonreactivity subscale (FFMQ-Nonreactivity; Baer et al., 2006).

Table 2.

Intercorrelations among all study variables

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Age	–	–.26*	–.51**	–.53**	.34*	.25	.35**	.10	–.19	–.30*	.21	.05	–.36**
2. Race		–	.32*	.53**	–.09	–.25	–.30*	–.10	–.07	–.04	–.13	.12	.13
3. Asthma Control			–	.85**	–.30*	–.29*	–.58**	–.26*	.20	.33*	–.16	–.00	.49**
4. Quality of Life				–	–.32*	–.32*	–.62*	–.33*	–.02	.33*	–.10	.10	.37**
5. Depression					–	.55**	.44**	.61**	–.06	–.37**	–.25	–.42**	–.34*
6. Anxiety						–	.72**	.58**	.08	–.32*	–.24	–.44**	–.04
7. Panic Symptoms							–	.51**	.05	–.34**	–.23	–.30*	–.15
8. Anxiety Sensitivity								–	.16	–.30*	–.28*	–.49**	–.14
9. Observing									–	.51**	–.06	–.32*	.58**
10. Describing										–	.34**	.09	.47**
11. Awareness											–	.42**	–.19
12. Nonjudgment												–	–.13
13. Nonreactivity													–

** = $p < .01$,* = $p < .05$

Note. Race coded as 1 = African American or Multiracial, 2 = Caucasian

Table 3.

Mindfulness Skills Predicting All Study Outcomes

	R²	t (each predictor)	β	sr²	p
Criterion Variable: Asthma Control					
Step 1	.31				.00**
Age		−3.86	−.45	.19	.00**
Race		1.92	.23	.05	.06
Step 2	.11				.12
Observing		−.37	−.06	.00	.71
Describing		1.15	.18	.02	.26
Awareness		−.94	−.14	.01	.35
Nonjudgment		.42	.06	.00	.67
Nonreactivity		1.81	.28	.04	.08
Criterion Variable: Asthma-Related Quality of Life					
Step 1	.45				.00**
Age		−3.17	−.38	.02	.00**
Race		3.50	.42	.01	.00**
Step 2	.12				.07
Observe		−1.62	−.24	.03	.13
Describe		2.46	.35	.07	.02*
Awareness		−1.03	−.15	.01	.31
Nonjudgment		.61	.08	.00	.55
Nonreactivity		1.40	.20	.02	.17
Criterion Variable: Depression Symptom					
Step 1	.11				.06
Age		2.44	.35	.11	.02*
Race		.34	.05	.00	.73
Step 2	.33				.00**
Observing		.52	.08	.00	.61
Describing		.08	.01	.00	.94
Awareness		−1.84	−.29	.04	.07
Nonjudgment		−2.51	−.34	.08	.02*
Nonreactivity		−2.36	−.37	.07	.02*
Criterion Variable: Anxiety Symptoms					
Step 1	.10				.07
Age		1.11	.15	.02	.27
Race		−1.66	−.23	.05	.10
Step 2	.30				.00**
Observing		1.10	.18	.02	.28
Describing		−2.77	−.46	.10	.01**

	R²	t (each predictor)	β	sr²	p
Awareness		.63	.10	.01	.53
Nonjudgment		−2.79	−.38	.10	.01 **
Nonreactivity		.43	.07	.00	.67
Criterion Variable: Panic Symptoms					
Step 1	.17				.01 *
Age		2.03	.26	.07	.05 *
Race		−1.97	−.26	.06	.05
Step 2	.19				.03 *
Observing		1.80	.31	.04	.08
Describing		−1.89	−.32	.05	.07
Awareness		−.57	−.09	.00	.57
Nonjudgment		−.98	−.14	.01	.33
Nonreactivity		−1.23	−.20	.02	.23
Criterion Variable: Anxiety Sensitivity					
Step 1	.02				.58
Age		.61	.09	.01	.54
Race		−.67	−.10	.01	.50
Step 2	.46				.00 **
Observing		3.14	.50	.11	.01 **
Describing		−2.48	−.39	.07	.02 *
Awareness		−.41	−.06	.00	.68
Nonjudgment		−2.72	−.35	.09	.00 **
Nonreactivity		−2.30	−.36	.06	.03 *

** = $p < .01$,

* = $p < .05$

Note. β = standardized beta weight; sr² = squared semi-partial correlation; race coded as 1 = African American or Multiracial, 2 = Caucasian