

PERSONALITY AND INFLAMMATION: THE PROTECTIVE EFFECT OF OPENNESS TO EXPERIENCE

Background: Prior research found reduced mortality in coronary heart patients with higher scores on the Openness to Experience domain and its facets. Decreased C-reactive protein level (CRP) levels may be one mechanism by which higher Openness to Experience leads to decreased mortality. Thus, the current study aimed to test the association between the Openness to Experience domain and its facets, as assessed by the NEO Personality Inventory-Revised, and CRP in a sample of 165 healthy Black and White, male and female community volunteers.

Methods: Blood samples were taken before and after a 40-minute mental stress protocol. BMI and education were significant predictors of CRP and, in addition to age, were included as covariates in all analyses. Race and sex were tested as possible moderating variables.

Results: In a mixed effects model the main effect of time (pre/post-stress), Openness to Experience (O) and their interaction were not significant predictors of CRP. However, results showed a significant race \times O effect on CRP ($P=.03$). In Blacks, higher Openness to Experience domain ($r=-.41$, $P<.01$), aesthetics facet ($r=-.30$, $P=.01$), feelings facet ($r=-.41$, $P<.01$), and ideas facet ($r=-.38$, $P<.01$) scores were associated with lower mean CRP levels. In contrast, among White participants, neither the Openness to Experience domain nor its related facets were associated with CRP.

Discussion: The Openness to Experience domain and its facets may be associated with markers of the inflammatory process among Blacks but not Whites. (*Ethn Dis.* 2010;20:11-14)

Key Words: Coronary Heart Disease, C-reactive Protein, Openness to Experience

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INTRODUCTION

Of the Big-Five personality domains, Openness to Experience has received the least attention. Individuals who score highly in the personality domain of openness to experience are characterized as being more willing to entertain novel ideas and interests and experience positive and negative emotions more intensely. In contrast, low scorers tend to behave more conservatively, hold more conventional values, and experience a narrower range of affect than high scorers.¹ Recently, our group showed that Openness to Experience and its lower-order facets, feelings and actions, were related to cardiac deaths and all cause mortality.² These findings warrant exploring the biological correlates of the broad Openness domain as well as its facets—investigations that may potentially unveil mechanisms linking Openness to mortality.

Contemporary models of atherogenesis emphasize the importance of the inflammatory process in the etiology and progression of coronary artery disease.³ C-reactive protein (CRP) is one of the several acute phase proteins that increase during systemic inflammation. Patients with elevated levels of CRP are at an increased risk for diabetes,⁴⁻⁶ hypertension and early cardiovascular disease (CVD).⁷⁻¹³ Various negative personality traits such as depression, anger and hostility that predict coronary artery disease, have been associated with increased CRP;¹⁴⁻¹⁶ however, little is known about how positive factors such as Openness are related to the inflammatory process. High Openness to Experience could contribute to lower mortality via its association to lower levels of CRP.

Another prominent index of CVD risk is race. Black men and women in the United States have among the highest prevalence of hypertension in the world.¹⁷ Compared to their White counterparts, Black men and women have a greater rate of nonfatal stroke, fatal stroke, heart disease death and end-stage kidney disease, differences that are not better accounted for by education or socioeconomic status.¹⁷ Research helping to elucidate mechanisms contributing to racial differences in CVD risk is needed. Our previous study showing an association between Openness and mortality was in a homogenous White (94.5%), male (74.5%) sample that did not allow for an adequate examination of race and sex interaction effects.²

Therefore, the present study aimed to explore the association between the Openness to Experience domain and CRP in approximately equal groups of Black and White, males and females. Race and sex differences in the effect of Openness on CRP were also examined.

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Table 1. Descriptions of high and low scorers on NEO PI-R Openness to Experience domain subfacets

Facet	Description
Fantasy	high scorers: have vivid imaginations and an active fantasy life, daydream not simply to escape but as a way of creating for themselves an interesting inner world low scorers: are more prosaic and prefer to keep their minds on the task at hand
Aesthetics	high scorers: have a deep appreciation for art and beauty, they are moved by poetry, absorbed in music, and intrigued by art. low scorers: are relatively insensitive to and uninterested in art and beauty
Feelings	high scorers: experience deeper and more differentiated emotional states and feel both happiness and unhappiness more intensely than do others low scorers: have somewhat blunted affects and do not believe that feeling states are of much importance
Actions	high scorers: prefer novelty and variety to familiarity and routine; over time, may engage in a series of different hobbies low scorers: find change difficult and prefer to stick with the tried-and-true
Ideas	high scorers: enjoy both philosophical arguments and brain teasers; does not necessarily imply high intelligence, although it can contribute to the development of intellectual potential low scorers: have limited capacity and, if highly intelligent, narrowly focus their resources on limited topics
Values	high scorers: are ready to reexamine social, political, and religious values; may be considered the opposite of dogmatic low scorers: tend to accept authority and honor tradition and as a consequence are generally conservative, regardless of political party affiliation

METHODS

This study used data collected in a research program that aimed to identify biobehavioral factors involved in the etiology and pathogenesis of CVD.^{17–20} The Openness to Experience domain and its related facets (see Table 1 for description of the facets) were assessed using the NEO Personality Inventory-Revised¹ in a sample of 165 healthy Black ($n=94$) and White ($n=71$), male ($n=91$) and female ($n=74$) community volunteers. Blood samples were taken before and after a 40-minute mental stress protocol for C-reactive protein level (CRP) analysis. CRP measurements were done using EIA (ELISA) Kit from ALPCO Diagnostics (Cat No 30-9710s). The detection limit of the assay was 0.12 ng/mL. CRP data were missing for 26 participants; missing data were associated with sex (17 females, 9 males; $\chi^2=5.26$, $P=.02$) but not race. Participants who were missing CRP data were excluded from analyses.

ANALYSIS

Mixed effects models were used to model change in log transformed CRP levels over time, from baseline to post stress. In addition, mixed effects models

allow for the simultaneous test of the between subjects effects, or differences in mean CRP levels between individuals. Age, BMI and participants' self-reported education were tested as possible covariates. Race and sex were included in mixed effects models as moderating variables. All non-significant higher order interaction terms were dropped from the final model.

RESULTS

Although Blacks had lower Openness domain scores than Whites, only the values facet was significantly different between the groups (Table 1). BMI ($r=.31$, $P<.01$) and education ($r=-.22$, $P<.01$) were significant predictors of CRP; however, age was not associated with CRP ($P=.07$). Similarly, sex was also a non-significant predictor of CRP and race differences in CRP only approached significance ($P=.07$), Blacks tending to have lower mean CRP than whites.

In a mixed effects model, the main effect of time (pre/post-stress), Openness and their interaction were not significant predictors of CRP. Further, the sex x Openness interaction effect was also not significant. However, results showed a significant race x Openness effect on

CRP ($F_{(1,130)}=4.61$, $P=.034$). To simplify the interpretation of the findings, mixed effects model analyses were followed by Pearson partial correlations using age, BMI and education as covariates, which show the association between the Openness domain (and its facets) and mean CRP. In Blacks, higher Openness domain ($r=-.41$, $P<.01$), aesthetics facet ($r=-.30$, $P=.01$), feelings facet ($r=-.41$, $P<.01$), and ideas facet ($r=-.38$, $p<.01$) scores were associated with lower mean CRP levels (Table 2). In contrast, among White participants, neither the Openness domain nor its facets were associated with mean CRP.

DISCUSSION

In a healthy sample of men and women, higher Openness to Experience was associated with lower levels of C-reactive protein (CRP); however, this effect was only in Blacks. For Whites, Openness was not associated with CRP. These effects were independent of age, BMI, and education. These findings suggest that, for Blacks, Openness to Experience may be a protective factor against inflammatory conditions that increase risk for cardiovascular disease (CVD) or confer a poorer prognosis once CVD is present.

Table 2. Mean Openness domain and facet t-scores by race

Label	Blacks		Whites		P-value
	Mean	Std Dev	Mean	Std Dev	
Openness domain	51.48	9.67	54.08	9.45	.08
Fantasy	50.88	9.85	53.76	9.36	.06
Aesthetics	54.03	8.77	54.80	9.27	ns
Feelings	50.40	8.68	51.45	9.57	ns
Actions	50.90	8.55	53.03	9.17	ns
Ideas	51.67	9.64	51.89	9.39	ns
Values	46.75	9.4	50.07	10.52	.04

It is unclear at present what mechanisms may link Openness to Experience with CRP levels. Our previous study examining the effects of this domain on mortality identified the feelings facet as being a particularly significant factor in longevity.² Similarly, in the present study, the feelings facet had the most pronounced effect on CRP among all the facets. Constructs conceptually similar to low Openness to feelings, such as alexithymia and the repressive coping style, have been associated with impairments in the recognition of both pleasant and unpleasant emotions.²¹ Deficits in emotional awareness may be a central aspect of the Openness domain that links it to health.

There are several possible physiological, behavioral, social or cognitive mechanisms through which low emotional awareness may lead to disease.²² Low emotional awareness may predispose individuals to an excessive stress-induced sympathetic activation, a factor shown to influence circulating inflam-

matory markers.²³ Difficulty identifying feelings and restricted range in affective experience has been linked to heightened physiological arousal and other known behavioral risk factors such as social isolation and heavy alcohol use.²⁴⁻²⁶ Furthermore, deficits in emotional awareness may contribute to negative affective states such as depression and anxiety, psychological factors that are associated with elevated CRP.^{22,27}

Why Openness was associated with CRP among Blacks and not Whites is unclear. Previous research suggests that psychological factors such as depressive symptoms, hostility, self-identify, coping behaviors, mastery and control, may have more of an impact on physiological outcomes among Blacks than Whites.^{18,28,29} These previous studies did not specifically focus on the Openness domain. Therefore, future studies replicating the effects of the Openness domain on CRP levels are needed to determine the significance of these race specific findings. Nevertheless, these

Table 3. Pearson partial correlations by race for Openness to Experience domain and facet scores with CRP level at baseline and post-stress controlling for age, BMI, and education

	Openness	Fantasy	Aesthetics	Feelings	Actions	Ideas	Values
Blacks							
Mean CRP	-.411	-.154	-.304	-.412	-.201	-.377	-.113
P-value	<.01	.19	.01	<.01	.09	<.01	.34
Whites							
Mean CRP	.138	.095	.068	.100	.006	.187	.008
P-value	.30	.48	.61	.46	.96	.16	.95

These findings suggest that, for Blacks, Openness to Experience may be a protective factor against inflammatory conditions that increase risk for cardiovascular disease (CVD)...

preliminary results provide further documentation of the Openness domain's importance in relation to health.

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