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Affect, inflammation, and health in urban at-risk civilians

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ABSTRACT

Positive and negative affect are both associated with health outcomes. Using validated measures, we examined associations between affect, self-reported measures of health, and objective measures of systemic inflammation in a cross-sectional sample of outpatient subjects recruited from an urban county hospital. Participants (n = 1055) recruited from the Grady Trauma Project in Atlanta, GA underwent standardized interviews including self-report measures of psychiatric symptoms and physical health. A subset (n = 246) consented to an assay of serum C-reactive protein (CRP). Regression models including positive affect as the predictor variable with covariates of age, gender, income, trauma load, depression and PTSD symptoms, were significantly associated with physical health domain scales of the Short Form-36 Health Survey (SF-36) of general health ($R^2 = 0.212$; $p < 0.001$) and physical functioning ($R^2 = 0.154$; $p = 0.013$). No association was observed using negative affect as the predictor variable. While greater serum CRP concentrations were associated with less positive affect ($r = -0.137$; $p = 0.038$), this relationship did not remain significant ($p = 0.250$) when controlling for demographic variables, body mass index, trauma load, and psychiatric symptoms. Future studies using larger samples or samples with more variance for CRP and positive and negative affect may be helpful in investigating the relationship between CRP and positive and negative affect. Our results support the hypothesis that positive affect contributes beneficially to physical health. Development of strategies to enhance positive affect in at-risk populations may be a meaningful way to improve their health.

1. Introduction

The literature examining negative affective states and their resulting outcomes has historically greatly outweighed comparable studies of positive affective states (Diener et al., 1999). Through large community samples, much evidence has accrued in the medical literature describing the association of psychiatric disorders such as depression, that are characterized by negative affective state, with large global disability burdens including coronary heart disease (Hemingway and Marmot, 1999) and diabetes (Golden et al., 2004). Conversely, a growing body of data examining the impact of positive affect on human biology has demonstrated a modest, but beneficial, influence of positive affect on biomarkers of autonomic, neuroendocrine, and immune physiology (Dockray and Steptoe, 2010), measures of general physical health (Pressman and Cohen, 2005; Rasmussen et al., 2009) and health or disease progression in clinical populations of patients with diabetes (Robertson et al., 2012) or cardiovascular disease (Huffman et al., 2017).

The relationships between affect and health have been consistently observed in a variety of international studies across socioeconomic and racial/ethnic cohorts. An overall higher life satisfaction score in a cohort of healthy Finnish adults from the Finnish Twin Study was negatively related to mortality (Koivumaa-Honkanen et al., 2000). Lack of positive affect was associated with increased mortality in a British community sample recruited as part of the Health and Lifestyle Study (Huppert and Whittington, 1995) as well as a North Carolina cohort of urban and rural-dwelling, African-American and white elders (Blazer and Hybels, 2004). In the same North Carolina cohort, it was also found that while increasing scores on a depressive scale were associated with increased risk of stroke, increasing scores on a positive affect scale were even more strongly associated with decreased risk of stroke (Ostir et al., 2001). In a Mexican-American elder cohort, lack of positive affect, rather than increased negative affect, was predictive for development of physical disability (Ostir et al., 2000).

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A recent meta-analysis of prospective observational cohort studies examining the association between positive well-being and mortality found positive affect and positive-trait-like disposition to be associated with reduced mortality in both healthy and ill populations (Chida and Steptoe, 2008). More significantly, this association was found to be independent of the effect of negative affect, consistent with previous studies identifying an independent effect of positive affect on health (Diener et al., 1985).

In the present study, we examined the relationship between positive and negative affect and self-reported subjective health using the Short Form Health Survey (SF-36) in a predominantly African-American, heavily trauma-exposed and impoverished population recruited from the primary care waiting rooms of a large county hospital. We hypothesized that increasing positive affect would be associated with better health outcomes, and conversely, that increasing negative affect would be associated with worsened health outcomes. To test this hypothesis, we developed a statistical model accounting for the effects of demographic factors, depressive symptoms, and post-traumatic stress symptoms, as our study cohort has high rates of current and lifetime prevalence of major depressive disorder and post-traumatic stress disorder (PTSD) (Gillespie et al., 2009). In addition to our subjective measurement of health and its association with positive and negative affect, we also examined the association of positive and negative affect with an objective measure of health, serum C-reactive protein (CRP) level, a biomarker of systemic inflammation linked to increased medical and psychiatric risk (Miller et al., 2009; Penninx et al., 2003) in a subsample of study participants.

2. Methods

2.1. Study design and participants

Participants in the current study were recruited as a part of the Grady Trauma Project, a 5-year National Institutes of Health-funded study of risk factors and resilience in PTSD (Bradley et al., 2011; Gillespie et al., 2009). Data were collected between 2009 and 2014. Participants were recruited from general primary care and obstetric/gynecologic clinic waiting rooms during normal business hours at Grady Memorial Hospital, a large, publically-funded county hospital serving a low-income, primarily African-American population in Atlanta, Georgia.

Inclusion criteria included English-language fluency and ability to give informed consent. Verbal and written consent was obtained for all participants. Trained interviewers approached participants while they were waiting for medical appointments. Approximately 60% of participants approached at this phase agreed to participate. Study participants completed a series of self-report questions verbally, in cooperation with study interviewers, over a period of 45–75 min (dependent on participants' trauma history and current symptom reports). All procedures in this study were approved by the institutional review boards of Emory University School of Medicine and Grady Memorial Hospital, Atlanta, Georgia.

Our sample (N = 1055) includes individuals who completed self-report affect and health outcome measures. However, as participants were allowed to decline questions they did not wish to answer, or did not complete all measures due to the time constraints inherent to interviewing in a clinical waiting room, the number of participants for each individual analyses varies. A subgroup of participants (n = 246) who completed this initial interview was invited to participate in a secondary phase of the study that included structured interviews, history & physical examination, laboratory measurements, and physiologic studies that comprised additional study areas of the Grady Trauma Project. This included venipuncture to assess serum CRP levels during the secondary phase of the study that occurred on average 1–2 weeks post-initial assessment. Body Mass Index (BMI) was calculated based on measurements obtained at the time of physician history and physical exam (mean = 32.05, SD = 7.87, range 18.38–70.41).

Table 1
Demographic characteristics of total sample and serum CRP subsample in frequency (n) and percentage (%), and mean ± SD for the total sample and serum CRP subsample.

Demographics.	Total Sample (n = 1055)		Serum CRP Sample (n = 246)	
	N	%	N	%
Sex				
Female	699	66.3	105	42.7
Male	355	33.7	141	57.3
Race				
African-American	972	92.1	226	91.9
Hispanic	6	0.6	2	0.8
Asian	2	0.2	1	0.4
Caucasian	45	4.3	11	4.5
Mixed	15	1.4	4	1.6
Other	12	1.1	2	0.8
Employment				
Unemployed	812	77.5	197	80.1
Employed	236	22.5	49	19.9
Education				
< 12th grade	257	24.4	62	25.2
12th grade or HS Graduate	368	34.9	90	36.6
GED	57	5.4	19	7.7
Some College or Tech School	230	21.8	48	19.5
Tech School Grad	44	4.2	11	4.5
College Graduate	77	7.3	13	5.3
Graduate School	15	1.4	2	0.8
Income				
$0–249	309	29.3	79	32.1
$250–499	96	9.1	32	13.0
$500–999	293	27.8	68	27.6
$1000–1999	221	20.9	46	18.7
$2000 or more	110	10.4	14	5.7
Mean ± SD	Mean (SD)	Range	Mean (SD)	Range
Age	42.5 (12.3)	18–65	41.1 (12.2)	18–65
PANAS positive	37.2 (9.4)	10–50	39.6 (8.7)	10–50
PANAS negative	21.8 (9.1)	10–50	22.0 (9.7)	10–49
Overall trauma exposure (TEI)	5.1 (3.9)	0–14	5.5 (3.3)	0–14
Depressive Symptom Severity (BDI)	15.7 (12.5)	0–58	15.7 (13.0)	0–57
PTSD Symptom Severity (PSS)	13.7 (12.4)	0–50	15.5 (12.7)	0–50
Body Mass Index (BMI)	–	–	32.1 (7.87)	18–70
Serum CRP	–	–	5.1 (4.8)	0.03–18.8

General Sample: Does not sum to 1055; Sex: 1 subject did not report; Race: 3 subjects did not report; Employment: 7 subjects did not report; Education: 7 subjects did not report; Income: 26 subjects did not report; CRP Sample: Does not sum to 246; Sex: 0 subject did not report; Race: 16 subjects did not report; Employment: 0 subjects did not report; Education: 1 subjects did not report; Income: 7 subjects did not report.

2.2. Psychological measures

A full description of the battery of self-report measures obtained during the interview has previously been described (Gillespie et al., 2009). See Table 1 for detailed descriptive statistics on psychological measures. Demographic information was assessed using a locally-developed demographics form (Gillespie et al., 2009). Trauma exposure was measured using the Traumatic Events Inventory (TEI; Gillespie et al., 2009), a 14-item screening measure of the total number of different types of trauma an individual has been exposed to in their lifetime (e.g., domestic violence, serious car accident, child abuse). Symptoms of depression were assessed with the Beck Depression