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BRIEF REPORT

Perceived Social Support and Chronic Inflammation: The Moderating Role of Self-Esteem

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Objective: Social support is one of the strongest psychosocial predictors of physical health. However, is this the case for everyone? On the basis of recent research suggesting that self-esteem can moderate the psychological effects of social support, the present research investigated whether self-esteem would moderate the health benefits of social support. **Method:** A national sample of middle-aged adults ($N = 949$) completed self-report questionnaires on perceived social support, self-esteem, sociodemographic information, and health related behaviors. Two years later, they provided a blood sample that was analyzed for C-reactive protein (CRP), a marker of inflammation. **Results:** The effect of perceived social support on inflammation was moderated by self-esteem. Specifically, perceived social support predicted lower CRP for people with high self-esteem, whereas it was not significantly associated with CRP for those with low self-esteem. These results held even after controlling for sociodemographic information, health related behaviors, and medication usage. **Conclusion:** Self-esteem is a key variable that may modulate the link between social support and inflammation.

Keywords: social support, self-esteem, C-reactive protein, inflammation

Supplemental materials: <http://dx.doi.org/10.1037/hea0000746.supp>

Perceived social support—the belief that one can rely on others for social support—is one of the strongest psychosocial predictors of health outcomes (House, Landis, & Umberson, 1988). Decades of research show that people who believe others will provide necessary support or aid have better mental and physical health, and lower rates of morbidity and mortality (Cohen, 2004). In a meta-analysis, perceived social support was found to be associated with a 50% reduction in mortality rates, an effect size greater than common risk factors such as obesity (Holt-Lunstad, Smith, & Layton, 2010).

Despite the well-documented health benefits of perceived social support, much less is known about the psychological mechanisms underlying the link between perceived support and health (Cohen & Wills, 1985; Thoits, 2011). This gap in knowledge makes identifying the precise mechanisms for effective interventions difficult (Walton, 2014), and unfortunately, social support interventions to date have produced mixed results (see Hogan, Linden, & Najarian, 2002). The present research attempts to fill in this knowledge gap by examining how a key psychological construct—self-esteem—influences the effects of perceived support on health.

Emerging research on self-esteem suggests that the availability of support may not have the same benefits for everyone. Studies show that individuals low in self-esteem (LSEs) feel anxious about being accepted by their family, friends, and romantic partners (Murray, Holmes, MacDonald, & Ellsworth, 1998). Even after receiving a compliment from close others, LSEs report feeling insecure (Marigold, Holmes, & Ross, 2007). Because they expect rejection in the future, LSEs are quick to interpret positive interpersonal events in ways that validate their negative self-views (Murray, Rose, Bellavia, Holmes, & Kusche, 2002). In contrast, individuals high in self-esteem (HSEs) appreciate their partners' positive regard and affections and use them as a resource for self-affirmation (Murray et al., 1998). Unlike LSEs, HSEs benefit from compliments and positive interpersonal events as they validate and bolster their positive self-views (Marigold et al., 2007).

Taken together, the preceding findings suggest that perceived support can have different meanings and downstream consequences for HSEs and LSEs. Specifically, for HSEs, higher levels of perceived support should mean that they can rely on others to thrive (Cohen & Wills, 1985; Feeney & Collins, 2015). In contrast, LSEs may not necessarily reap the benefits of perceived support, because they are inclined to interpret the availability of supportive others as validation of their flaws (e.g., "Others are helping me because I am flawed"), to feel uncomfortable relying on others, and to think that others will eventually grow tired of helping them (Marigold et al., 2007; Murray et al., 1998).

To test whether the different reactions of HSEs and LSEs to their available support would have health effects, the present

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research focused on chronic inflammation as a key health outcome. Chronic inflammation is a potent driver of diseases (Kiecolt-Glaser, Gouin, & Hantsoo, 2010; Ridker, 2009). Particularly, elevated levels of C-reactive protein (CRP), a biomarker of chronic inflammation, is associated with an increased risk for chronic diseases including cardiovascular disease, type 2 diabetes, cancers, and Alzheimer's disease (Ershler & Keller, 2000; Ridker, 2009).

Social support is associated with lower levels of inflammatory markers, including CRP (Kiecolt-Glaser et al., 2010; Uchino et al., 2018). For instance, pregnant women with low perceived support during their third trimester had higher CRP throughout the pregnancy, compared with those with higher perceived support (Coussons-Read, Okun, & Nettles, 2007). This relationship has been corroborated by a recent meta-analysis (Uchino et al., 2018), though some studies have reported no relation between perceived support and CRP (e.g., McDade, Hawkey, & Cacioppo, 2006). To better understand such discrepant results, the present study explored a potential moderator (i.e., self-esteem) that can further explain the effects of perceived support on inflammation.

Thus, the goal of the present research was to examine whether the health benefits of perceived support on inflammation is moderated by self-esteem. On the basis of prior work on social support (Cohen & Wills, 1985; Feeney & Collins, 2015) and research on self-esteem (Marigold et al., 2007), we hypothesized perceived support to be linked with lower inflammation for HSEs. This should be the case because the availability of support to HSEs means that they can rely on others to thrive (Feeney & Collins, 2015). On the other hand, because LSEs tend to feel uncomfortable relying on others and attribute negative meaning to support (Marigold et al., 2007), we predicted that LSEs would not reap the health benefits of perceived support.

Method

Participants and Procedure

The data for our study came from the Survey of Midlife Development in the United States (MIDUS II). Participants were healthy English-speaking adults living in the United States ($N = 4,963$), with their ages ranging from 28 to 84 years ($M = 55.4$). They had originally participated in the National Survey of Midlife Development in the United States (MIDUS) in 1995 and 1996 and were recruited again to participate in MIDUS II as a follow-up study (response rate: 75%). The survey assessed a variety of variables including sociodemographic information, psychosocial factors, and health assessments. A subsample of MIDUS II participants ($N = 1,054$) subsequently participated in a Biomarker study, during which they provided blood samples and were assessed for physical health and physiological function. Data collection for the Biomarker study (i.e., CRP measurement) occurred on average 2 years after the completion of the MIDUS II survey (see Dienberg Love, Seeman, Weinstein, & Ryff, 2010 for a detailed description of the Biomarker study).

Measures

Perceived social support. Participants rated perceived support from their close others (i.e., family, friends, and spouse). Specifically, they responded to 14 items (four items each for

family and friends and six items for spouse) on a four-point scale (1 = *a lot*, 4 = *not at all*). Example items included "How much do your friends (does your family/spouse) really care about you?" and "How much can you rely on your friends (family/spouse) for help if you have a serious problem?" We reverse-coded and averaged the items to create a composite perceived social support variable, with higher scores reflecting higher perceived social support ($\alpha = .87$, $M = 3.48$, $SD = .46$).

C-Reactive Protein (CRP). Our marker of inflammation was CRP, an acute phase protein synthesized in response to inflammatory stimulation (Ridker, 2009). CRP was measured from plasma with a particle enhanced immunonephelometric assay (BNII nephelometer from Dade Behring, Deerfield, IL). The laboratory intra- and interassay coefficients of variance were in acceptable ranges for CRP (4.4% and 5.7%).

Self-esteem. Participants responded to seven items from the Rosenberg (1965)'s self-esteem scale on a seven-point scale ranging from 1 (*strongly agree*) to 7 (*strongly disagree*). Example items include "At times I feel that I am no good at all" and "I take a positive attitude toward myself (reverse-coded)." We summed the items to create a self-esteem composite, with higher scores reflecting higher levels of self-esteem ($\alpha = .76$, $M = 37.67$, $SD = 7.40$).

Covariates. On the basis of prior work, we controlled for factors that have been associated with inflammation. Our sociodemographic covariates were age, gender, household income, and highest level of education (1 = *some grade school*, 12 = *PhD, MD, etc.*). Health covariates (measured at the time of the blood draw) included body mass index, cigarette smoking status (i.e., never-smoked dummy coded as referent category, former-smokers, current-smokers), alcohol consumption (i.e., number of drinks in the last month), and physical activity (i.e., engaging in regular exercise or physical activity for 20 min or more at least three times per week). We also controlled for depressive symptoms using the Center for Epidemiological Studies Depression Scale (Radloff, 1977) and medication usages for hypertension, cholesterol, corticosteroids, and antidepressants, as they have been shown to have anti-inflammatory properties (O'Connor et al., 2009).

Results

First, individuals with CRP values over 10 $\mu\text{g/mL}$ ($N = 26$; $< 3.3\%$) were excluded as such values may indicate the presence of an acute infection (Pearson et al., 2003). Then, CRP was log-transformed to achieve normal distributions. Table S1 in the Supplemental Material presents zero-order and partial correlations among all key variables.

To test our prediction that the relation between social support and inflammation would be moderated by self-esteem, we conducted a series of multiple regression analyses, in which we included standardized variables of perceived social support and self-esteem and their interaction term as predictors of CRP. The models sequentially controlled for the following covariates: (1) sociodemographic factors; (2) physical health status; (3) depression and depression medication use; and (4) medication uses for cholesterol, corticosteroids, and blood pressure. The results of these analyses are summarized in Table S2 in the online supplemental material. Consistent with our hypothesis, the Perceived Support \times Self-Esteem interaction reached significance in Model 1 ($\beta = -.08$, $t(801) = -2.11$, $p = .035$), Model 2 ($\beta = -.07$,

$t(796) = -2.02, p = .044$), and Model 3 ($\beta = -.07, t(794) = -2.02, p = .043$) and marginal significance in Model 4 ($\beta = -.07, t(791) = -1.89, p = .059$). For all models, as self-esteem increased, the effect of perceived support on CRP increased. Probing this interaction further, simple slopes analyses indicated that for HSEs (one standard deviation above mean), perceived support was related to lower CRP (all $ps < .01$); however, this pattern was not observed among LSEs (one standard deviation below mean; all $ps > .86$). In addition, in all models, perceived support did not significantly predict CRP levels, potentially reflecting the small effect size observed in prior work (see Uchino et al., 2018 for a meta-analysis), as well as some inconsistency in the literature in which some studies find a significant correlation between social support and CRP (e.g., Kiecolt-Glaser et al., 2010), whereas others do not (e.g., McDade et al., 2006).

Discussion

The present research examined how self-esteem influences the health benefits of perceived support on inflammation. The results showed that as self-esteem increased, the salubrious effect of perceived support on CRP also increased. Specifically, for individuals with higher self-esteem, perceived support was related to lower CRP. However, perceived support was not significantly correlated with CRP for individuals with lower self-esteem. These findings are consistent with research indicating that compared with HSEs, LSEs do not tend to reap the benefits of positive interpersonal events (Marigold et al., 2007; Murray et al., 1998). Further, the present study extends prior research by demonstrating that self-esteem moderates the salubrious effects of social support on a key inflammatory marker—CRP.

Broadly, our findings provide insight into the link between perceived support and health. Although there is robust evidence that perceived support promotes health (Cohen, 2004), it is less clear whether everyone benefits from the belief that others are around to give them support. Further, by highlighting a key individual difference variable that moderates the effectiveness of perceived support, these findings contribute to identifying the precise mechanisms for effective interventions (Walton, 2014). For instance, it is possible that interventions that leverage perceived support to promote health outcomes may not be effective for LSEs. Instead, given their tendency to attribute negative meaning to support, LSEs may benefit from strategies that help them make positive meaning out of their support (Lee & Ybarra, 2017; Marigold, Holmes, & Ross, 2010).

Furthermore, future research should examine how our findings generalize to different models of social support. For instance, stress buffering models posit that the belief that one can rely on others for support buffers stress by bolstering one's perceived ability to cope with a stressor (e.g., Cohen & Wills, 1985). Given that HSEs and LSEs ascribe different meanings to their support, it is likely that they also make different appraisals in response to stressors (e.g., "I can rely on others to overcome this adversity"), which can have varying health consequences. Alternatively, other models of social support argue that perceived support should lead to health benefits, even in the absence of a stressor (e.g., Cohen & Wills, 1985; Lakey & Orehek, 2011). Given that self-esteem influences the experience of positive affect or sense of self-worth from everyday interactions (without stressors), our findings may

also speak to the main effect models or other related models of social support (Feeney & Collins, 2015; Lakey & Orehek, 2011).

In sum, the present research demonstrated that the health benefits of perceived support are moderated by self-esteem. People with a positive self-view believe they can rely on others for support and have less inflammation. However, the same benefits do not seem to apply to those with a negative self-view. By identifying who may and who may not benefit from believing that social support is available to them, these findings could contribute to developing effective intervention strategies to reduce stress-related inflammation.

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