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Emotional and instrumental support during childhood and biological dysregulation in midlife☆

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ABSTRACT

Objective. To determine whether greater emotional and instrumental support during childhood is associated with less dysregulation across multiple physiological systems in midlife.

Methods. Data are from participants in the second wave of the Midlife in the United States study (2004–2005) who participated in a clinic-based assessment of health status. Emotional and instrumental support was measured using a seven-item scale ($\alpha = 0.89$) based on participant retrospective self-report. Biological dysregulation was assessed using an allostatic load (AL) score constructed from 24 measures across seven physiological systems ($N = 1236$, aged 34–84 years).

Results. Emotional and instrumental support in childhood was associated with lower AL in a monotonic fashion: compared to individuals in the lowest quartile of support, respondents in the second, third, and fourth quartiles had −0.08 (standard deviation (SD) = 0.08), −0.13 (SD = 0.08) and −0.21 (SD = 0.08) units lower AL, adjusting for age, sex, and race. This pattern was maintained after adjustment for reporting bias, childhood socioeconomic disadvantage, past-year depression, and physician-diagnosed cardiovascular disease or diabetes ($p \leq 0.01$). The inflammation and metabolic-lipid subscales showed the strongest associations.

Conclusions. Greater emotional and instrumental support in childhood was associated with less biological dysregulation in midlife, even after accounting for socioeconomic disadvantage in childhood and other potential confounders.

Introduction

A large and compelling body of research shows that individuals who experience adversity during childhood and adolescence face increased risk for a wide range of chronic diseases of aging (Johnson et al., 2013; Shonkoff et al., 2009). To date, less research has focused on protective factors during childhood that may promote good health or decrease susceptibility to chronic diseases later in life. Social support, which refers to the perception that one is cared for and can rely on others for assistance, is recognized as a determinant of morbidity and mortality (Berkman and Krishna, 2014; Uchino, 2009). In children and adolescents, support from the family and others is associated with positive psychological and behavioral outcomes (Resnick et al., 1997; Viner et al., 2012). However, we have limited evidence about whether the benefits from supportive relationships during childhood or adolescence extend to protect against adult chronic diseases of aging, and the specific biological processes that are influenced by supportive relationships early in life.

A few prospective studies show that feelings of warmth and closeness with parents (Russek and Schwartz, 1997) and parental academic involvement (i.e., a form of instrumental support) (Westerlund et al., 2013) predicts health-related outcomes in midlife including cardiovascular diseases, alcoholism, and allostatic load (AL) (i.e., a measure of cumulative dysregulation across physiological systems (McEwen and Stellar, 1993)). Other research has shown that positive parental relationships can buffer against the impact of low childhood socioeconomic

Abbreviations: AL, allostatic load; CTQ, Childhood Trauma Questionnaire; CVD, cardiovascular disease; GEE, generalized estimating equations; MIDUS, Midlife in the United States; SES, socioeconomic status; SD, standard deviation.

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status (SES) on pro-inflammatory signaling (Chen et al., 2011) and metabolic syndrome (Miller et al., 2011b) in adulthood. We are not aware of any prior studies that have examined the association between emotional and instrumental support during childhood and AL in midlife. We hypothesized that individuals with greater emotional and instrumental support would have lower AL, and that this relationship would be evident across physiological systems. Confirmation of this hypothesis could provide evidence to support increased attention to protective factors within childhood social environments for the primary prevention of adult diseases.

Methods

Sample

Participants were men and women from the second wave of the Midlife in the United States (MIDUS) study. MIDUS was initiated in 1994–1995 to investigate the dynamics between social, psychological, behavioral factors and health, and enrolled 7108 non-institutionalized individuals, aged from 25 to 74 years, from across 48 states through random digit dialing. The sample included twin pairs and siblings (Brim et al., 2004). Among the original participants, 4963 (70%) individuals were followed-up at the second wave (2004–2005), and 592 African Americans from Milwaukee were recruited at this time (Radler and Ryff, 2010). Participants who completed the MIDUSII survey and were able to travel ($N = 3191$) were invited to participate in a biomarker project, and 1255 agreed to participate. Participants stayed overnight at a research clinic. On Day 1, participants completed the medical history and physical exam, and the collection period for the 12 h urine specimen began at 7 p.m. On Day 2, participants completed the 12 h urine specimen collection (7 am) and provided a fasting blood specimen. A comparison of these participants to the overall sample is detailed elsewhere (Dienberg Love et al., 2010).

Of the 1255 participants, 13 had missing data on AL, 3 were missing information on childhood emotional and instrumental support, and 3 had missing data on covariates. Excluding participants with missing data yielded a sample of 1236, with 392 of the participants being siblings or twins. See Table A1 for comparison of included and excluded participants. Participants provided informed consent, and the study was approved by Institutional Review Boards at participating institutions.

Measures

Childhood emotional and instrumental support

Experiences of emotional and instrumental support during childhood and adolescence were retrospectively assessed with seven items from the Childhood Trauma Questionnaire (CTQ) (Bernstein and Fink, 1998; Bernstein et al., 1994) administered at the biomarker project (see Table A2 for items) which asked participants to reflect on experiences as child or teenager (no ages specified). These questions asked respondents to report on emotional and instrumental support from family as well as other people outside of the home. All response options ranged from 1 (never true) to 5 (very often true). Specifically, emotional support was measured using five items from the Emotional Neglect subscale that reflected positive experiences of nurturance and affection (e.g., family as source of strength; family members looked out for each other; $\alpha = 0.89$). Instrumental support was measured using two items from the Physical Neglect subscale that assessed positive experiences of direct assistance (e.g., someone to take care and protect child; to take child to the doctor; $\alpha = 0.62$). We combined the emotional and instrumental support items, and using factor analysis we established the presence of a single factor with good internal consistency reliability ($\alpha = 0.89$). Responses were averaged to derive an overall score (range: 1 to 5). Quartiles were created such that the bottom quartile reflected low childhood emotional and instrumental support and the top quartile represented high support.

Allostatic load

AL, a multisystem dysregulation index, was calculated as the sum of risk scores across seven physiological systems including the sympathetic, the parasympathetic, the hypothalamic–pituitary adrenal axis, the inflammation system, the cardiovascular, the glucose metabolism, and the lipid metabolism. We operationalized AL following prior MIDUS studies (Chen et al., 2012; Gruenewald et al., 2012), and the biomarker indicators for each system are listed in Table S3. Details of the computation of AL are reported elsewhere (Chen et al., 2012; Gruenewald et al., 2012). The seven physiological systems included in the MIDUS AL score have substantial overlap with indices of cumulative biological risk in other studies with different samples (Bird et al., 2010; Juster et al., 2010; Merkin et al., 2009). Furthermore, the selected indicators/systems have been shown to be associated with chronic disease (Cooney et al., 2009, 2010; Danesh et al., 1998; de Koning et al., 2007; Muntner et al., 2005; Prospective Studies Collaboration, 2007; Stamler et al., 1993).

A risk score for each system was constructed as the proportion of biomarker indicators for that system that fell within the high risk quartile ranges. Consistent with prior MIDUS research, the seven physiological system risk scores were only calculated for participants with information on at least half of the system's biomarkers, and were scaled to range from 0 to 1. Specifically, the AL score was only calculated when we had information on at least one outcome in the SNS and the HPA systems (i.e., these two systems only included 2 markers), at least two outcomes in the cardiovascular, metabolic-glucose metabolism, and parasympathetic nervous system (i.e., these three systems included 3 or 4 markers), and on at least three outcomes in the metabolic-lipids and inflammation systems (i.e., these two systems included 5 markers). AL was computed by summing risk scores across all seven systems to create an overall score ranging from 0 to 7, with higher scores indicating greater risk. AL was only calculated for participants with data on at least six systems. A total of 144 participants lacked one or more biomarker for a specific system; this includes 119 participants who had AL calculated based on six instead of seven systems, and 25 participants whose AL was calculated based on all seven systems but had missing data on less than half of the biomarkers for a specific system.

Covariates

Childhood support reporting bias score. The Minimization/Denial subscale of the CTQ (Bernstein and Fink, 1998; Bernstein et al., 1994) is comprised of three items to assess tendency to exaggerate their reports of positive childhood experiences due to social desirability or other reasons (e.g., "I had the perfect childhood"). Response options range from 1: never true to 5: very often true. The highest response (5) was scored as 1, and other responses were scored as 0. Items were summed to create an overall score (range: 0–3), with higher scores reflecting greater bias.

Childhood SES disadvantage score. Following prior MIDUS research (Gruenewald et al., 2012; Karlamangla et al., 2013; Tsenkova et al., 2014), a childhood socioeconomic disadvantage score was constructed by summing across three retrospectively reported indicators of SES in participants' childhood and adolescence: family finances (worse off than others = 2; same as average family = 1; better off than others = 0), highest parental education (less than high school = 2; high school = 1; college or more = 0), and welfare for ≥6 months (ever = 2; never = 0).

Major depression. Past-year major depression was assessed using the Composite International Diagnostic Interview Short Form (Kessler et al., 1998), which is based on criteria specified in DSM-III-R (American Psychiatric Association, 1987). This measure has been validated and shows high test–retest reliability and criterion and construct validity (Aalto-Setala et al., 2002; Blazer et al., 1994).

History of cardiovascular diseases and diabetes. Medical history was queried as part of the in-depth clinical assessment. Participants who reported at least one of the following conditions were considered as having history of cardiovascular disease (CVD) and diabetes: physician-diagnosed heart diseases, stroke or diabetes.

Demographics. Demographic covariates included participants' age at MIDUSII, sex, and race.

Statistical analyses

All analyses were performed in SAS 9.3. Chi-square and analysis of variance tests were used to examine distribution of AL and covariates in the full analytic sample and across quartiles of childhood emotional and instrumental support.

To investigate whether higher levels of childhood emotional and instrumental support predicted lower AL in adulthood adjusting for covariates, generalized estimating equations (GEE) with identity link and normal distribution were used to model AL with quartiles of childhood emotional and instrumental support as the independent variable, accounting for family clustering. A series of GEE models were used to examine effect of potential confounding. The base model adjusted for demographic characteristics including age, sex, and race.