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Depressive Symptoms and Compromised Parenting in Low-Income Mothers of Infants and Toddlers: Distal and Proximal Risks

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Abstract

Low-income mothers develop depressive symptoms at higher rates than the general population, adding to the existing risk that economic hardship places on their infants and toddlers. Emphasizing a few key intervention targets, an approach that is especially relevant to mothers when depressive symptoms compromise their energy and concentration, can improve interventions with populations facing adversity. The goal of this study was to identify contextual risk factors that significantly contributed to depressive symptoms and that, in combination with depressive symptoms, were associated with compromised parenting. Using baseline data from 251 ethnically diverse mothers from six Early Head Start programs in the Northeastern and Southeastern US, who were recruited for a clinical trial of an in-home intervention, Belsky's ecological framework of distal to proximal levels of influence was used to organize risk factors for depressive symptoms in hierarchical regression models. Under stress, mothers of toddlers reported more severe depressive symptoms than mothers of infants, supporting the need for depressive symptom screening and monitoring past the immediate postpartum period. Multivariate models revealed intervention targets that can focus depression prevention and intervention efforts, including helping mothers reduce chronic day-to-day stressors and conflicts with significant others, and to

effectively handle challenging toddler behaviors, especially in the face of regional disciplinary norms. Presence of a live-in partner was linked to more effective parenting, regardless of participants' depressive symptom severity.

Keywords

maternal depression; risk factors; low income; intervention targets; parenting

During the infant and toddler periods of rapid brain growth, neurocognitive, psychomotor and social-emotional development is dependent on consistent developmental support from a caregiver, most often the mother. Good parenting includes child-centered conversation, developmentally supportive play, modeling of emotions, comforting touch, socialization, and instruction in how to channel discomfort and aggression (Field, Diego, & Hernandez-Reif, 2009; NICHD Early Child Care Research Network, 1999).

Maternal depressive symptoms disrupt the cognitive and emotional development of infants and toddlers through the mediating effect of compromised parenting (National Research Council & Institute of Medicine, 2009). Depressive symptoms reduce maternal attention and developmentally stimulating play, which are mainstays of infant-toddler learning and language acquisition (Fava et al., 2010; Newland, Crnic, Cox, & Mills-Koonce, 2013; Taylor & Budescu, 2013). Even maternal depressive symptoms that fall short of a clinical diagnosis have been associated with infant-toddler developmental delays, childhood conduct and learning disorders, and depression in adolescence and adulthood (American Psychiatric Association, 2000; Campbell, Morgan-Lopez, Cox, & McLoyd, 2009; Feder et al., 2009; Halligan, Murray, Martins, & Cooper, 2007; Shaw, Hyde, & Brennan, 2012). Depressive symptoms are more prevalent in low-income mothers than in women in the general population (48–51% vs. 8–20%; Ammerman et al., 2009; Kessler et al., 2003; Shim, Baltrus, Ye, & Rust, 2011). Because many low-income infants and toddlers lag behind middle-income children in language acquisition and learning skills, depressive symptoms in their mothers place these children at even greater risk (Knitzer, Theberge, & Johnson, 2008).

Maternal depressive symptoms respond well to intervention that is culturally relevant and accounts for the constraints of poverty (Beeber et al., 2010; Grote et al., 2009). However, reducing mothers' symptoms does not appear to prevent negative child outcomes unless mothers increase positive involvement and developmental stimulation (Forman et al., 2007). Thus, intervention offered to mothers during the developmentally sensitive infant-toddler era needs to both reduce the sources of depressive symptoms and strengthen parenting (Field et al., 2009; Knitzer et al., 2008; NICHD Early Child Care Research Network, 1999).

To date, only a few randomized trials have combined depressive symptom reduction and parenting efficacy in the same intervention (van Doesum, Riksen-Walraven, Hosman, & Hoefnagels, 2008), and fewer still have tested the combination in low-income mothers (Beeber et al., 2010, 2013). Successful adaptations have brought therapy to the home, tailored content for mothers' cultural and literacy specifications, and streamlined content to conserve mothers' energy (Ammerman, Peugh, Putnam, & VanGinkel, 2012; Beeber et al., 2013). Streamlining interventions by focusing on the most salient contributors to depressive

symptoms and compromised parenting has shown promise (Bakermans-Kranenburg, Van Ijzendoorn & Juffer, 2003). The purpose of this analysis was to identify the most significant risks associated with depressive symptoms and compromised parenting in low-income mothers, in order to focus intervention on those risks.

Framework of Determinants of Depression and Parenting Risk

An array of factors threatens the mental health and parenting of low-income mothers (Newland et al., 2013). Belsky's (1980, 1993) framework of nested contexts helps organize the risks to a mother and child according to potential influence. Moving from distal to proximal, these contexts are the *macrosystem*, or the large social fabric that includes sociocultural ideologies and cultural beliefs; the *exosystem*, or community social systems that directly influence day to day living; the *microsystem*, or the close relationships that the mother and child have with the father, partner, kin and friends; and, finally, the *ontogenic level* that includes the individual characteristics of the mother and child. Problems at each level call for different intervention strategies.

Figure 1 presents the four levels and the variables used to operationalize them in this study. The *macrosystem* level was represented by the mother's geographic location, self-defined race/ethnicity, degree of economic hardship, and educational attainment. These were considered intersecting determinants of mothers' positions within the larger social and cultural systems, rather than isolated or additive characteristics (Berger & Guidroz, 2009). We intended to capture the complexity with which combinations of factors could produce negative outcomes. For example, the degree to which low income mothers experience psychological distress and difficulty parenting has varied depending on whether others of their race/ethnicity viewed economic hardship as a day-to-day reality or a personal failing (McLoyd, 1990). Likewise, mothers may experience additional hardship in certain areas of the United States. Different regions vary in economic prosperity, access to education, job availability, and expressions of racial/ethnic discrimination, as well as the prevailing values and beliefs that shape parenting practices (Kotelchuck, 2006).

At the *exosystem* level, exposure to violence and housing instability are neighborhood risks that could affect mothers on a day-to-day basis. Neighborhoods with low-cost housing have been associated with violence, household disruptions, increased depressive symptoms and the erosion of positive parenting (Vernon-Feagans, Garrett-Peters, Willoughby, & Mill-Koonce, 2012). Yet, in such neighborhoods, parenting characterized by authoritarian styles, high vigilance and close monitoring has been associated with positive child outcomes (Ceballo, Kennedy, Bregman, & Epstein-Ngo, 2012; Odgers et al., 2012). Low income mothers may repeatedly relocate because of eviction or to find safer housing (Adam & Chase-Lansdale, 2002), disrupting community connections that provide social support (Coldwell, Pike, & Dunn, 2006).

In the *microsystem*, risk factors within the mother's closest relationships were included: absence of a live-in partner, family conflict, low satisfaction and high conflict in social support, and having a child with a disability or chronic health problems. Raising a child without help from a partner, high levels of family conflict, and low-quality, conflicted social

support in the context of chronic stressors have been implicated in the development and persistence of depressive symptoms and compromised parenting (Beeber & Canuso, 2005; Edwards et al., 2012; Osborne, Berger, & Magnuson, 2012). These factors often occur in clusters. For low-income mothers without partners, the process of procuring everyday necessities such as food, housing, childcare and transportation may become overwhelmingly stressful and has been linked to persistence of depressive symptoms (Casey et al., 2004; Hall, Rayens, & Peden, 2008). When the needs of a child with health problems or disabilities are added to other chronic stressors, the risk for serious depressive symptoms increases (Singer, 2006).

Finally, at the most proximal or *ontogenic* level, we included maternal age and physical health status and the age and gender of the child. Becoming a mother at a young age may interrupt schooling, perpetuate economic hardship, and increase the risk of developing depressive symptoms (Campbell, Matestic, von Stauffenberg, Mohan, & Kirchner, 2007). Poor maternal physical health and limited opportunities for healthy habits are associated with increased stress and depressive symptom severity (Kneipp, Welch, Wood, Yucha, & Yarandi, 2007).

The age of the child can be a risk factor. Mothers with multiple risk factors are likely to have postpartum depressive symptoms that persist past 12 months of infant age (Beeghly et al., 2003). Mothers with persistent symptoms have reported increasing difficulty interacting positively with their children as they reached 24–36 months old (Campbell et al., 2007), suggesting that toddlers' need for complex stimulation and emotional-behavioral regulation exceeded depressed mothers' limited energy and concentration. The gender of the child appears to be a risk factor as well. Boys from low-income families have been more challenging to mothers and more vulnerable to developing problems with social competence and behavior (Vallotton et al., 2012).

Hypotheses

Hypothesis 1: More severe risks in the four system levels will be associated with greater maternal depressive symptom severity, with maternal chronic stress moderating these relationships.

Hypothesis 2: More severe risks and greater maternal depressive symptom severity will be associated with more severely compromised parenting, with maternal depressive symptom severity moderating these relationships.

Methods

Sample

The sample consisted of 251 pairs of mothers and their Early Head Start (EHS) infants or toddlers recruited for a clinical trial of an in-home intervention from 2004 to 2011 (Beeber et al., 2013). EHS provides child enrichment and support for low-income families from the perinatal period through the child's third year of life. The mothers had children enrolled in EHS programs in urban, suburban and rural areas of the Southeastern and Northeastern US.

Initial eligibility was determined by the mother's score of 16 or higher on the Center for Epidemiological Studies Depression scale (CES-D). This widely used screening instrument for depressive symptoms asks mothers to indicate how many days in the last week they have experienced symptoms, using a 4-point scale, with total scores ranging from 0 to 60 (Radloff, 1977). A score of 16 or higher indicates the presence of significant levels of depressive symptoms (Vega, Kolody, Valle, & Hough, 1986). The CES-D has shown consistently adequate sensitivity, reliability and concurrent and predictive validity in multiethnic and low-income samples (Beeber et al., 2010; Campo-Arias, Diaz-Martinez, Rueda-Jaimes, Cadena-Afanador, & Hernandez, 2007).

Mothers were screened if they were at least 15 years of age; the oldest was 44 years old. Mothers receiving mental health or addiction counseling, psychotropic medication, or whose primary language was not English were excluded due to the potential of these characteristics to mask or compete with measurement of the effect of the talk therapy intervention. Of the 827 mothers screened, 429 (52%) reported significant depressive symptom severity (CES-D 16). A total of 226 (52.7%) mothers who scored 16 on the CES-D were enrolled in the primary study. To increase variability for this analysis, baseline data from the 226 symptomatic mothers prior to random assignment was augmented with data from 25 mothers from the same sites who were screened and met all eligibility criteria but scored in the asymptomatic range (less than 16 on the CES-D), for a total sample size of 251 for this analysis.

At baseline, all mothers were given clinical depression evaluations using the Hamilton Rating Scale for Depression (HRSD; Hamilton, 1960) and the Structured Clinical Interview for DSM-IV-R (SCID-R; Spitzer, Williams, Gibbon, & First, 1992). The average score on the HRSD was 15.1 (*SD* 8.2). The cut point of 17 indicates significant depressive symptoms. Mothers scored as high as 35 (53 maximum possible); 22.3% of the sample met criteria for major depressive episode (MDE) and 33.5% had minor depression (significant sad mood or loss of pleasure but fewer than five additional symptoms; American Psychiatric Association, 2000). Additional characteristics of the sample and descriptive data on the study variables are presented in Table 1. Previous reports describe the intervention and procedures for safety and referral to treatment (Beeber et al., 2013).

Measures

Macrosystem factors—Concepts, variables, and descriptions of measures are presented in Table 2. Geographic location (Northeastern vs. Southeastern US) was determined by the mother's data collection site. Self-defined race/ethnicity (white vs. other), degree of economic hardship and maternal education were obtained by the Family Information Interview (FII), a structured interview guide with questions about maternal, child, and family demographics, a detailed description of the household members, questions about the mother's close relationships, income, neighborhood characteristics, and maternal activities such as time spent caring for child health problems and other responsibilities.

Using detailed family income data from the mother, economic hardship was determined by the income-to-needs ratio, which has shown sensitivity to child outcomes (Barnett, 2008). Total family income for a given year was divided by the government poverty threshold for

the family size and number of children younger than 18 who were supported that year (NICHD Early Child Care Research Network, 1999). Lower values indicate less income relative to need. Maternal education was represented by number of years of school completed as reported by the mother in the FII.

Exosystem factors—The FII was used to gather information about neighborhood factors. Frequency of household moves was the number of times the mother reported moving in the previous year. Exposure to violence was coded as Yes/No using questions adapted from the EHS National Evaluation Study (Beeber et al., 2007, 2008a; Beeber, Perreira, & Schwartz, 2008b).

Microsystem factors—Partnered status was gathered by several questions in the FII. Family conflict was measured by the conflict subscale of the Family Environment Scale (FES; Moos & Moos, 2002). The 5-item subscale yields scores ranging from 5 to 20, with higher scores representing more open conflict. Internal consistency of the FES subscales has varied, with Cronbach alpha coefficients from .64 to .80. Values above .60 have been described as acceptable when justified by the breadth of the construct represented by the subscale (Charalampous, Kokkinos, & Panayiotou, 2013). In this study, Cronbach alpha was .62.

Maternal chronic stress was measured by the Everyday Stressors Index (ESI), a 20-item measure of chronic daily stressors developed for use with low-income mothers that has demonstrated good reliability and validity (Hall et al., 2008); in this sample, the instrument produced a Cronbach alpha of .85.

Child disabilities and health problems were coded as Yes/No using interview questions in the FII from the EHS National Evaluation Study (Beeber et al., 2007, 2008a, 2008b). Satisfaction and conflict with social support transactions were measured by the Interpersonal Relationship Inventory (IPRI; Tilden, Nelson, & May, 1990). In this study, Cronbach alphas of the two 13-item IPRI subscales (satisfaction and conflict) were .91 and .89, respectively.

Ontogenic factors—The mother's age and the child's age and gender were obtained from the FII. Maternal physical health was measured using the Medical Outcomes Study Short Form Health Survey (SF-12), Physical Component Summary (PCS) scale (Gandek et al., 1998); in this sample, Cronbach alpha for the SF-12 was .87.

Maternal depressive symptom severity—Depressive symptom severity was measured by the HRSD, a 17-item measure that combines self-reported symptoms with a trained observer's ratings of selected symptoms (Hamilton, 1960). A score of 17 or greater indicates significant depressive symptom severity. While the self-reported CES-D is an accurate measure of depressive symptom severity, the HRSD gave a better estimate of clinical depression, hence providing greater comparability of the results of this study to other large population-based studies (Kessler et al., 2003). In this study, Cronbach alpha for the HRSD was .81. Data collectors were required to reach >85% agreement with master raters during bi-monthly reliability checks.

Maternal parenting behaviors—Three maternal behavioral dimension scores were constructed using data from two sources. We coded 45-minute unstructured inhome videotapes of the mother with her child using the Maternal-Child Observation (MCO), an observational coding system (Holditch-Davis, Schwartz, Black, & Scher, 2007). This observational approach was chosen over maternal self-reports of negative child behaviors, which are inflated by depressive symptoms (Chilcoat & Breslau, 1997) and contaminated by shared source variance (Burt et al., 2005). For every 10-second segment of videotape, trained coders recorded the presence or absence of target behaviors exhibited by the mother and the child. The observation was divided into five subsets of behaviors, and two or three coders scored each subset. Inter-rater reliability was checked every other month by having each coder score a previously scored tape, and all coders achieved adequate inter-rater reliability (more than 80% exact agreement, and kappas exceeding .65) throughout the project. Mean Cohen's kappas for each behavior ranged from .66 to .96, with a mean of .81.

We also used the HOME (Home Observation for Measurement of the Environment; 0–3 year-old version) to measure the degree to which the mother provided a home environment with social-emotional and stimulation characteristics that promote child development (Caldwell & Bradley, 1980). The HOME consists of six sub-scales, with a total of 45 home and maternal behavior characteristics that are scored as present or absent by a trained observer in the presence of the mother and child.

Using previously published procedures (Holditch-Davis et al., 2007; Lee, Holditch-Davis, & Miles, 2007), maternal behaviors from the videotapes and sub-scales from the HOME were grouped into three theoretically derived dimensions: positive involvement (e.g., playing, interacting, warm touch), negative control of the child (e.g., spanking, restraining, scolding, derogating), and developmental stimulation (e.g., teaching, talking). To calculate dimension scores, each behavior of the HOME sub-scale in the dimension was converted to a *Z*-score, and the *Z*-scores for the variables in each dimension were averaged. Internal consistency (Cronbach alpha) of the dimensions was .86 for positive involvement, .82 for negative control, and .72 for developmental stimulation.

Procedures

Consent and data collection—The project was approved by the Institutional Review Board of the lead author's university and by the parent-headed Policy Council at each EHS program. To remove the impact of literacy levels, all consents were read aloud and explained to the mothers, and each mother received a written copy of the consent. Mothers under 18 years of age gave assent for participation, and a legal guardian signed the consent form.

After being instructed to go about their normal activities, mothers were videotaped for 45 minutes in their homes with their children. Data collectors completed observational assessments (HOME and the SCID-R) and a set of interview questions about personal and family characteristics (Family Information Interview—FII), and read aloud several standardized self-report questionnaires (described in the next section). Mothers were paid \$10 for participating in the screening phase and \$25 for the data collection. The completed questionnaires were reviewed immediately, and mothers were contacted about missing answers and responses that indicated acute distress. The data were entered into SAS Version

9 software. A second verification entry was done and corrections made before analysis began.

Data analysis—The frequency of missing values for each variable is reported in Table 1; these represented less than 10% of the sample size for each variable and therefore were not imputed. With at least 10 observations per regression parameter, the sample size was judged to be adequate to support the regression analyses.

Using an analysis strategy informed by Belsky's model, a series of hierarchical linear regression models was created. First, the key contributors to maternal depressive symptoms were identified. Then, a second series of regression models analyzed the impact of those risks and depressive symptoms on parenting behaviors. In each series of analyses, four sets of variables were entered in the conceptual order dictated by Belsky's model, from macrosystem to ontogenic levels.

Conceptually meaningful pairwise interactions then were tested separately via forward selection. For the model of depressive symptoms, interactions between each effect and maternal chronic stress (ESI) were constructed; for the models of maternal parenting behaviors, pairwise interactions between each effect and depressive symptoms (HRSD) were constructed. For these tests of interaction, a $p < .05$ significance level was used. To describe interactions involving continuous effects, simple slopes of ESI or HRSD (as appropriate) were calculated, plotted, and tested for significance at the sample mean of the interacting effect (e.g., child age, maternal education) as well as 1 standard deviation below and above the mean.

Regression diagnostics were performed on the residuals from the main effects models at the final step for each outcome. Model assumptions were judged to be met, with the exception of maternal negative control and maternal developmental stimulation, which exhibited skew; logarithmic transformations were applied, which improved the distributions. As the transformation maintained a generally similar pattern of significance for each variable and each grouping of variables, results without the transformation are reported. Multicollinearity of the models was assessed via variance inflation factors (VIF) and condition number; neither indicated problems of multicollinearity (i.e., all VIF < 2 ; all condition numbers < 3).

For the regression analyses, we reported all R^2 values as the unadjusted proportion of variation for the dependent variable that is described jointly by the set of independent variables. To describe the effect of adding each set of explanatory factors, we reported the p -values for the test of whether the change in R^2 was significantly different from 0. Interpretation of results was focused on the final model for each analysis, with all variables entered.

Results

Risks Related to Mothers' Depressive Symptom Severity

The first model (see Table 3) tested the macro-, exo-, microsystem, and ontogenic risks hypothesized to contribute to maternal depressive symptom severity. The first hypothesis

was supported. The four-level model of risks was associated with 48% of the variation in depressive symptom severity ($F = 11.3$, $df[16, 194]$, $p < .0001$). White race/ethnicity ($t = 2.32$, $df 194$, $p = .02$), greater economic hardship (i.e., lower income to needs ratio; $t = -2.69$, $df 194$, $p < .01$), less satisfaction with social support ($t = -3.77$, $df 194$, $p < .001$), greater conflict with social support ($t = 3.63$, $df 194$, $p < .001$), more maternal chronic stress ($t = 3.54$, $df 194$, $p < .001$) and poorer physical health ($t = -2.09$, $df 194$, $p = .04$) were associated with higher depressive symptom severity (see Table 3).

Two variables moderated the effect on depressive symptoms of maternal chronic stress: exposure to violence ($p < .05$) and child age ($p = .02$; see Fig. 2a and b). As stress increased, depressive symptoms (HRSD) increased ($t = 3.94$, $df 193$, $p = .0001$) only in mothers who had not been exposed to violence. Under log transformation, the effect of exposure to violence became non-significant ($p > .10$) and should therefore be cautiously interpreted. Greater perceived stress was associated with more severe depressive symptoms for mothers with older children (39 months [$1\ SD$ above the mean]; $t = 4.29$, $df 193$, $p < .0001$).

Relationship of Risks and Depressive Symptom Severity to Maternal Parenting

Our second group of models tested the combined impact of ecological risks and depressive symptom severity on three clusters of parenting behaviors (positive involvement, negative control, developmental stimulation). The second hypothesis was partially supported, with different ecological levels contributing to variance in different behaviors, and depressive symptoms influential in two out of three parenting behaviors.

Maternal positive involvement—Risks and depressive symptoms combined to explain 25% of the variance in mothers' positive involvement during interactions (expressing positive affect, playing) ($F = 3.41$, $df[17, 177]$, $p < .0001$). Older child age ($t = -5.66$, $df 177$, $p < .0001$) and more severe depressive symptoms ($t = -2.08$, $df 177$, $p = .04$) were associated with lower maternal positive involvement. Table 4 shows these results.

Depressive symptom severity moderated the relationship between maternal educational level and maternal involvement ($p = .05$, see Fig. 2c). Higher levels of depressive symptoms were associated with lower positive involvement for mothers with the average level of education (12 years; $t = -2.04$, $df 176$, $p < .05$); this relationship was even more pronounced for mothers with higher education (14 years [$1\ SD$ above the mean]; $t = -2.85$, $df 176$, $p = .005$).

Maternal negative control—Risks and depressive symptoms were associated with 20% of the variation in maternal negative control of the child ($F = 2.83$, $df[17, 192]$, $p < .001$). Residing in the South ($t = -2.51$, $df 192$, $p = .01$), less education ($t = -2.12$, $df 192$, $p = .04$), older child age ($t = 2.83$, $df 192$, $p = .005$), the child being male ($t = 2.32$, $df 192$, $p = .02$), and higher levels of depressive symptoms ($t = 2.73$, $df 192$, $p = .007$) were associated with higher scores on maternal negative control (see Table 5).

Depressive symptom severity was a moderator ($p < .01$) of the relationship between geographic residence and negative control of the child. As depressive symptom severity increased, Southern mothers displayed increasing levels of negative control (spanking,

scolding) in their interactions ($t = 3.60$ $df 191$, $p < .001$), whereas Northern mothers did not. Figure 2d shows these results.

Maternal developmental stimulation of the child—Risks and depressive symptoms were associated with 23% of the variation in maternal developmental stimulation ($F = 3.14$, $df [17, 177]$, $p < .0001$). Factors from each ecological level had significant main effects: self-defining as white versus other race ($t = 2.96$, $df 177$, $p = .004$), exposure to violence ($t = 2.24$, $df 177$, $p = .03$), living with a partner ($t = 2.17$, $df 177$, $p = .03$), and older maternal age ($t = 2.55$, $df 177$, $p = .01$) were associated with more developmental stimulation of the child. Mothers of children with health problems or disabilities provided less developmental stimulation ($t = -2.85$, $df 177$, $p = .005$). Depressive symptom severity was not a significant individual contributor. Table 6 shows these results.

Depressive symptom severity moderated the relationships of race and developmental stimulation ($p = .02$) and of child age and developmental stimulation ($p = .02$) (see Fig. 2e and f). For non-white mothers only, as depressive symptom severity increased, mothers provided less developmental stimulation ($t = -2.43$, $df 176$, $p = .02$). Mothers of children 1 *SD* above the mean age (39 months) provided less developmental stimulation than did mothers of younger children, as depressive symptom severity increased ($t = -2.70$, $df 176$, $p = .008$).

Discussion

This analysis used Belsky's ecological model to help disentangle the interrelated risks in the lives of in low-income mothers in relation to depressive symptoms and parenting interactions. The goal was to identify only the most salient factors at each level in order to create a basis for a thrifty, targeted intervention.

Depressive Symptoms

Factors in each ecological level (larger social fabric, neighborhood, close relationships, individual characteristics) predicted nearly half of the variance in depressive symptoms. This study brought greater precision to the measurement of depressive symptoms by using a standardized clinical instrument (HRSD) that combined maternal self-reported symptoms with ratings done by a trained observer.

Traditional depression intervention approaches that focus on the mother's depressive symptoms (e.g., medication), coping strategies (e.g., cognitive or self-calming measures), or conflicts in her closest relationships may not be adequate to ward off more remote but powerful stressors generated by economic hardship. Our results suggest that interventions might be strengthened if the contextual factors that created problems in mothers' lives (race, income, chronic stress, social support, physical health) were addressed. For example, a recent intervention for symptomatic Black and Latina postpartum women that went beyond the traditional individual approach showed efficacy in lowering depressive symptoms at 6 months postpartum (Howell et al., 2012). The intervention provided problem-solving strategies for depressive symptoms, bolstered social support, and developed individual action plans for making connections to community-wide resources to reduce the frequency, severity and consequences of chronic problems generated by economic hardship.

The interaction of exposure to violence and chronic stress in predicting depressive symptoms illustrated the complex factors that characterize low-income life. In the presence of higher chronic stress, mothers who did not report exposure to violence had higher maternal depressive symptoms than did mothers with violence exposure. Across many studies, violence exposure has been correlated with maternal depressive symptoms and compromised parenting (Westbrook & Harden, 2012). Unlike previous studies, we measured both exposure to violence and chronic stress, and chronic stress competed strongly with exposure to violence as a contributor to depressive symptoms. Our measure of violence exposure did not specify whether the incident was isolated or chronic, or whether it was life-threatening. These qualities can make a difference and need more detailed study (Westbrook & Harden, 2012).

Further, the mothers in this sample had children enrolled in EHS, where exposure to violence would likely trigger a referral for resources that could be a portal to treatment or, for children in EHS daycare, at least some respite from environmental danger. Under such favorable conditions, low-income families exposed to adversity have developed greater problem-solving, communication, and use of support (Orthner & Jones-Sanpei, 2004). However, our finding highlights that stressors such as inadequate basic necessities can erode maternal resources and generate depressive symptoms (Hall, Williams, & Greenberg, 1985) and are worthy of attention in interventions.

At the ecological level close to the mother, relationships that were unsupportive or conflicted contributed to depressive symptom severity. We examined the positive and negative dimensions of social support. Belle's classic work (1982) showed that for low-income women, necessity was often the calculus through which they chose their supporters. Supporters often brought high costs, introducing more problems and conflicts into women's lives in exchange for necessary support. With limited social or geographic mobility and constrained income, women entered into support relationships in which barter exacted a price for returned goods and favors. Our results suggest that it would be helpful to provide mothers with a means of analyzing their support relationships and choosing supporters who provide maximal support with minimal conflict. An intervention such as interpersonal psychotherapy (Weissman, Markowitz, & Klerman, 2007) that reduces conflict in close relationships and improves social support would address mothers without the option to choose supporters. Programs such as EHS, nurse home visiting and antepartum initiatives have helped mothers widen their social support options through community connections (Grote et al., 2009; Olds et al., 1997).

Under conditions of increased stress, mothers of older children had more severe depressive symptoms. The finding suggests that the toddler's need for parenting strategies that promote emotional and behavioral self-regulation is challenging in the context of greater everyday stressors. Nationally, research efforts have been concentrated on the immediate postpartum period. While this period provides contact with health providers who can screen and intervene, these results support extending assessment for maternal depressive symptoms well into the toddler and early preschool era (Eckenrode et al., 2010). Evidence-supported interventions such as Gross and colleagues' Chicago Parent Program (Breitenstein et al., 2012) could be tailored for mothers of toddlers to respond to shifts in mothers' depressive

symptoms. Conversely, reducing parenting hassles with the toddler while simultaneously increasing parenting self-efficacy could be an efficient means to reduce depressive symptoms. Universal preschool to combat the effects of child poverty (Academic Pediatric Association, 2013) would also provide support for low-income mothers of toddlers.

Parenting Interactions

We predicted that risks in the lives of low-income mothers combined with depressive symptoms would compromise mothers' parenting interactions. For maternal positive involvement (engaging the child in play, warm touch), one ontogenic or personal characteristic (older child age) and more severe depressive symptoms were inversely associated with maternal positive involvement. To date, interventions to increase maternal positive involvement have focused on postpartum coaching to increase maternal sensitivity to newborn cues, with a goal of secure attachment (van Doesum et al., 2008). Our results suggest that such interventions need to extend well past infancy through the toddler period. In other studies by this team, symptomatic mothers' low energy and disrupted concentration limited the extent to which they could maintain high levels of positive involvement, especially with energetic toddlers (Beeber et al., 2013). As an energy-conserving measure for mothers, interventions can help the mother learn one strategy at a time (e.g., prevention of tantrums, by positively engaging with the toddler when he cues that he is tired or bored). Such an approach would be more effective than teaching her a complicated repertoire of cue responses that she uses inconsistently.

While only nearing significance ($p = .05$), the interaction of maternal depressive symptoms and high maternal education in reducing maternal positive involvement is important to consider (see Fig. 2c). In this sample, depressive symptoms may have overridden the advantage of greater education, which ordinarily helps mothers offer more positive parenting (Green et al., 2009; Lung, Shu, Chiang, & Lin, 2009). If replicated, this finding will support greater efforts to embed mental health intervention in maternal educational self-development and parenting efficacy programs (Reyno & McGrath, 2006).

For the second parenting practice, negative control (scolding, spanking), geographic locale, and personal characteristics along with depressive symptoms were significant contributors. While it has been established that depressive symptoms are associated with more harsh parenting methods, we were able to test geography as an additional factor in maternal negative control. As the severity of depressive symptoms increased, mothers in the South engaged in more scolding, spanking and other forms of negative control than did Northern mothers. Different regions of the US hold different values about corporal punishment, with greater acceptance in the South (Flynn, 1996; Straus & Stewart, 1999). Our data raise the question: does greater acceptability of corporal punishment in familial and community contexts increase the likelihood that a symptomatic mother will use harsher disciplinary methods?

Optimal parenting practices with toddlers include nimble proactive and anticipatory responses to challenging behaviors in order to prevent injury, de-escalate emotion, and assist the child to build self-regulatory controls. These strategies require levels of energy and attentiveness that are difficult for mothers to maintain amid significant depressive symptoms.

Acknowledging this challenge with symptomatic mothers could be combined with parenting education that addresses the influence of values and disciplinary practices shared by family and community. A mother could be helped to recognize that increasing depressive symptoms, in a context of family or community belief in corporal punishment, make her more vulnerable to using corporal punishment. She could learn to monitor her symptoms and be vigilant when she might be more sensitive to a child's behavioral triggers and more prone to using spanking instead of practices that help the child build self-regulation. Further, at the macrosystem level, community health campaigns could target community parenting norms by presenting the risks of punitive parenting practices and offering alternative responses to toddler behavior.

For developmental stimulation (talking, teaching), distal and proximal ecological risks were significant contributors, while depressive symptom severity was not. However, this relationship was not consistent across different racial/ ethnic groups. Mothers who had greater depressive symptom severity and who identified as Black provided less developmental stimulation than did equally depressed white mothers. This suggests that racial, ethnic and class variations in childrearing norms and parenting practices may interact with depressive symptoms.

Rather than treating race or ethnicity as a characteristic endogenous to the mother, we conceptualized race/ethnicity as a macrosystem factor that connected the mother with particular sets of cultural values. Depression severity varies among racial/ethnic groups, despite shared social challenges. In one recent study, Black single mothers who had one or more children (<18 years old) in the household were at no higher risk for depressive symptoms when unpartnered, whereas white and Hispanic mothers were at higher risk (Schwarz, McVeigh, Hoven, & Kerker, 2012). Parenting guidance offered as part of a depression intervention should be tailored to racial/ethnic differences as well as other relevant factors, such as how racial discrimination, family customs, and depressive symptoms affect a particular mother's functioning.

Furthermore, the presence of a partner positively affected the mother's provision of developmental stimulation, regardless of her depressive symptom severity. Rather than using marital status as a proxy for partner presence, we asked whether mothers were currently living with a partner and their perceived satisfaction with the relationship. While 21% of mothers reported being married, a larger percentage (37%) had live-in partners. Our results indicate that clinical assessment of partner support is important, as is the need for research that separates supportive functions of partners from marital status.

Limitations

This study generated rich data with which to focus interventions to reduce depressive symptoms and improve parenting in at-risk, low-income mothers of infants and toddlers. However, the cross-sectional nature of the data did not permit us to disentangle the influences of changing depressive symptoms and parenting interactions over time. While our low internal consistency for the Family Environment Scale was consistent with other studies, this diminished reliability may have weakened the association of microsystem-level variables with depressive symptom severity and parenting behaviors. The convenience

sample of mothers recruited from multiple EHS programs prevents generalizability to a broader population of low-income mothers; yet, there are strong consistencies between these findings and the national evaluation of EHS programs (Administration for Children and Families Office of Planning Research & Evaluation—OPRE, 2006). Finally, notable strengths were the use of an observer-rated standardized clinical instrument (HRSD), which allows comparison with other studies of maternal depressive symptoms. Further, we used state-of-the-art videotaped, coded maternal behavioral data that differentiated among three distinct types of parenting interactions (positive involvement, negative control, developmental stimulation), allowing us to propose different types of interventions for each of these parenting dimensions.

Conclusions

The purpose of this analysis was to streamline an intervention for low-income mothers by identifying specific risks associated with depressive symptoms and compromised parenting. Developing interventions for low-income mothers is an ambitious goal in light of the profound contextual challenges associated with economic hardship. However, an intervention that reduces depressive symptoms, helps mothers address chronic stress, and improves parenting is likely to have a beneficial effect for both mother and child. The data from this multi-level ecological analysis supported interventions that:

- include strategies that help the mother understand that remote, stress-generating contextual factors such as regional economic factors may affect her mood,
- provide strategies to reduce chronic, daily issues that accompany economic hardship and generate stress, for example, figuring out how to keep enough food on hand or money to pay the most important bills,
- provide a way for mothers to analyze the emotional and social costs associated with social support and engage in a thoughtful process of either choosing good sources of support or reducing conflicts with supporters on whom they must depend,
- help the mother recognize the ways in which depressive symptoms, contextual factors and chronic stress affect her parenting behaviors and include strategies that she can use consistently even when her symptoms are compromising her energy or patience.

We have provided examples of how attention to maternal depressive symptoms can be integrated into existing parenting efficacy programs and child and maternal enrichment programs and emphasized that vigilance should be extended past the postpartum era to include mothers of older infants (6–12 months) and toddlers (13–36 months). Given what we are learning about the importance of early neurodevelopment and the long-term effects of poverty on later life outcomes, there is no greater return on the investment of resources into mental health intervention than an improved future for high-risk mothers and their infants and toddlers.

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FIGURE 1. Belsky's Ecological Framework of distal to proximal levels of influence in which the child and family are embedded was used to organize risk factors for depressive symptoms in hierarchical regression models.

FIGURE 2.

Interactions of Maternal Depressive Symptoms and Mothering Behaviors. Higher scores on ESI and HRSD reflect higher stress levels and depression severity. ESI, Everyday Stressors Indicator; HRSD, Hamilton Rating Scale for Depression.

Table 1. Demographic Characteristics of Study Participants (*n* = 251)

	Missing	Mean	SD	Range	%	(<i>n</i>)
Macrosystem factors						
Northeast region	0				34.7	(87)
Race/ethnicity ^a	0					
White					25.5	(64)
Black					62.2	(156)
Latino					3.2	(8)
Income to needs ratio	21	0.5	0.4	0–1		
Mother's education	7	11.9	2.1	6–19		
Exosystem factors						
Housing instability (# moves, past 12 months)	4	0.7	1.0	0–5		
Exposure to violence	2				14.1	(35)
Microsystem factors						
Partnered status	3				37.5	(93)
Family conflict	0	9.6	3.1	5–19		
Maternal chronic stress	1	44.4	11.6	20–78		
Child health/disabilities	0				55.4	(139)
Social support satisfaction	1	50.3	9.6	17–65		
Social support conflict	1	41.0	11.4	14–65		
Ontogenic factors						
Mother's age (years)	3	25.9	5.8	15–44		
Maternal physical health	2	49.2	9.7	18–67		
Child age (months)	0	25.3	13.6	>1–54		
Child gender (male)					48.6	(122)
Maternal outcomes						
Depressive symptom severity (HRSD)	1	15.1	8.2	0–35		
Other demographics						
Mother currently employed	1				43.6	(109)
Endorses use of spanking (past week)	0				34.3	(86)

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	Missing	Mean	SD	Range	%	(n)
# Spankings (past week) ^b	8	4.6	5.1	1–27		
Married	0				21.1	(53)
Major depressive episode criteria met	0				22.3	(56)
Minor depressive episode criteria met	0				33.5	(84)

Note. SD = standard deviation.

^a Ethnicity: <5 mothers endorsed Latina ethnicity; no other ethnicities were endorsed by participants.

^b Includes only those who endorsed spanking of the child.

Table 2.

Variables and Description of Measures

Construct	Variable	Measure	Type	Psychometrics	Score Range
Macrosystem	Geographic location	Northeast/Southeast	Site		Nominal
	Self-defined race/ethnicity	White vs. Other/Family Information Interview (FII)	Interview		Nominal
Exosystem (neighborhood)	Economic hardship	Income-to-need ratio (FII)	Interview		0–1; lower indicates greater economic hardship
	Educational attainment	Years completed (FII)	Interview		0–20
	Housing instability	# Moves/past year (FII)	Interview		0–∞
	Exposure to violence	Witnessed/victim in past 6 months (FII)	Interview		Nominal (yes/no)
Microsystem	Absence/presence live-in partner	FII	Interview		Nominal (yes/no)
	Family conflict	Family Environment Scale (FES)	Self-report		Ordinal; 5–20 (low to high conflict)
	Maternal stress	Everyday Stressors Index	Self-report		Ordinal; 20–80 (low to high stress)
	Satisfaction with social support	Interpersonal Relationship Inventory (IRR), satisfaction subscale	Self-report		Ordinal; 13–65 (low to high satisfaction)
	Conflict with social support providers	IRR, conflict subscale	Self-report		Ordinal; 13–65 (low to high conflict)
Ontogenic	Child disability/chronic health problems	FII	Interview		0–∞
	Maternal age	FII	Interview		15–∞ years
	Maternal health status	MOS Health Form (SF-12)	Self-report	$\alpha = .87$	Ordinal; 12–56 (poor to good)
	Child age	FII	Interview		6 weeks–60 months
	Child gender	FII	Interview		Female or male
Outcomes	Depressive Symptom Severity	Hamilton Rating Scale for Depression (HRSD)	Observer-rated	$\alpha = .75$	Ordinal; 0–46 (absent to severe)
	Maternal Parenting Behaviors (Positive Involvement, Negative Control, Developmental Stimulation)	Maternal-Child Observation (MCO) (Videotaped)	Coded	Kappas .66–.95; mean = .80	
		HOME Inventory	Observer-rated	$IRR > .90$ $\alpha = .84$	

Note. *IRR*= inter-rater reliability.

Table 3.
Predictors of Depression Severity (HRSD Total Score) in Hierarchical Regression Models

	Step 1 (<i>n</i> = 223), Macrosystem		Step 2 (<i>n</i> = 219), Exosystem		Step 3 (<i>n</i> = 215), Microsystem		Step 4 (<i>n</i> = 211), Ontogenic	
	β	SE	β	SE	β	SE	β	SE
Macrosystem								
Region (Northeast)	1.17	1.21	1.01	1.22	0.51	0.98	0.53	1.00
Race/ethnicity	3.37*	1.33	3.36*	1.35	2.43*	1.11	2.59*	1.12
Income to needs ratio	-1.81**	0.58	-1.99***	0.59	-1.37**	0.50	-1.37**	0.51
Mother's education	0.24	0.61	0.25	0.62	0.33	0.49	0.23	0.52
Exosystem								
Housing instability			0.16	0.55	-0.11	0.46	-0.10	0.48
Exposure to violence			2.61	1.59	-0.21	1.31	0.16	1.34
Microsystem								
Partnered status					1.32	0.99	0.82	1.00
Family conflict					0.62	0.49	0.67	0.49
Maternal chronic stress					2.15***	0.55	1.95***	0.55
Child health/disabilities					1.80*	0.89	1.14	0.93
Social support satisfaction					-1.76***	0.47	-1.77***	0.47
Social support conflict					2.13***	0.53	1.96***	0.54
Ontogenic								
Mother's age (years)							0.39	0.53
Maternal physical health							-1.01*	0.48
Child age (months)							-0.20	0.47
Child gender (male)							-0.34	0.88
<i>R</i> ²		0.07**		0.08**		0.46***		0.48***
<i>R</i> ²		—		<i>p</i> = NS		<i>p</i> < .001		<i>p</i> = NS

Notes. SE, standard error. NS, not significant; HRSD, Hamilton Rating Scale for Depression. Values -0.00 or 0.00 indicate $-0.01 < \beta < .01$. All continuous explanatory variables were standardized to provide an interpretation of the regression parameters that reflects the change in the dependent variable per 1 standard deviation change in the explanatory variable.

* $p < .05$.

** $p < .01$.

.100>*p*
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Table 4.

Predictors of Maternal Positive Involvement in Hierarchical Regression Models

	Step 1 (<i>n</i> = 207), Macrosystem		Step 2 (<i>n</i> = 203), Exosystem		Step 3 (<i>n</i> = 200), Microsystem		Step 4 (<i>n</i> = 196), Ontogenic		Step 5 (<i>n</i> = 195), Depressive Symptoms	
	β	SE	β	SE	β	SE	β	SE	β	SE
Macrosystem										
Region (Northeast)	0.17	0.12	0.18	0.12	0.20	0.12	0.21	0.11	0.22	0.11
Race/ethnicity	0.25	0.13	0.24	0.13	0.19	0.13	0.18	0.13	0.23	0.13
Income to needs ratio	-0.03	0.05	-0.02	0.06	-0.02	0.06	-0.00	0.06	-0.03	0.06
Mother's education	-0.03	0.06	-0.02	0.06	-0.02	0.06	-0.02	0.06	-0.02	0.06
Exosystem										
Housing instability			-0.04	0.05	-0.06	0.06	-0.08	0.06	-0.08	0.06
Exposure to violence			-0.21	0.15	-0.17	0.16	0.02	0.15	0.03	0.15
Microsystem										
Partnered status					0.18	0.12	0.19	0.11	0.21	0.11
Family conflict					-0.03	0.06	-0.02	0.06	-0.00	0.06
Maternal chronic stress					0.02	0.07	-0.00	0.06	0.03	0.06
Child health/disabilities					-0.16	0.11	-0.12	0.11	-0.12	0.11
Social support satisfaction					0.06	0.06	0.07	0.05	0.04	0.06
Social support conflict					0.07	0.07	0.05	0.06	0.09	0.06
Ontogenic										
Mother's age (years)							0.07	0.06	0.08	0.06
Maternal physical health							0.03	0.06	0.01	0.06
Child age (months)							-0.30***	0.05	-0.30***	0.05
Child gender (male)							0.15	0.10	0.15	0.10
Depression severity (HRSD)									-0.14*	0.07
R^2	0.05*		0.05					0.23***		0.25***
R^2	—		$p = NS$		$p = NS$		$p < 0.0011$		$p = 0.039$	

Notes. SE, standard error; HRSD, Hamilton Rating Scale for Depression. Values -0.00 or 0.00 indicate -0.01 < β < 0.01. All continuous explanatory variables were standardized to provide an interpretation of the regression parameters that reflects the change in the dependent variable per 1 standard deviation change in the explanatory variable.

* $p < .05$.

.100 > *d*
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Table 5.

Predictors of Maternal Negative Control of the Child in Hierarchical Regression Models

	Step 1 (<i>n</i> = 223), Macrosystem		Step 2 (<i>n</i> = 219), Exosystem		Step 3 (<i>n</i> = 215), Microsystem		Step 4 (<i>n</i> = 211), Ontogenic		Step 5 (<i>n</i> = 210), Depressive Symptoms	
	β	SE	β	SE	β	SE	β	SE	β	SE
Macrosystem										
Region (Northeast)	−0.60*	0.28	−0.53	0.28	−0.63*	0.28	−0.69*	0.28	−0.70*	0.28
Race/ethnicity	−0.34	0.31	−0.27	0.30	−0.25	0.32	−0.30	0.32	−0.42	0.32
Income to needs ratio	−0.19	0.13	−0.19	0.13	−0.12	0.14	−0.09	0.14	−0.03	0.15
Mother's education	−0.19	0.14	−0.26	0.14	−0.27	0.14	−0.32*	0.15	−0.31*	0.15
Exosystem										
Housing instability			−0.16	0.13	−0.14	0.13	−0.14	0.14	−0.14	0.13
Exposure to violence			−0.13	0.36	−0.31	0.38	−0.45	0.38	−0.47	0.38
Microsystem										
Partnered status					−0.04	0.28	−0.11	0.29	−0.15	0.28
Family conflict					0.06	0.14	0.04	0.14	0.00	0.14
Maternal chronic stress					0.38*	0.16	0.40*	0.16	0.30	0.16
Child health/disabilities					0.12	0.26	0.00	0.27	−0.08	0.26
Social support satisfaction					−0.05	0.14	−0.03	0.13	0.08	0.14
Social support conflict					−0.14	0.15	−0.03	0.15	−0.14	0.16
Ontogenic										
Mother's age (years)							0.08	0.15	0.06	0.15
Maternal physical health							0.08	0.14	0.14	0.14
Child age (months)							0.36**	0.13	0.37**	0.13
Child gender (male)							0.55*	0.25	0.58*	0.25
Depression severity (HRSD)									0.46**	0.17
R^2	0.06*		0.07*		0.01*			0.17**	0.20***	
R^2	—		$p = NS$		$p = NS$		$p = 0.008$		$p = 0.007$	

Notes. SE, standard error; NS, not significant; HRSD, Hamilton Rating Scale for Depression. Values −0.00 or 0.00 indicate $-0.01 < \beta < 0.01$. All continuous explanatory variables were standardized to provide an interpretation of the regression parameters that reflects the change in the dependent variable per 1 standard deviation change in the explanatory variable.

* $p < .05$.

$p < .001$
***
 $p < .01$
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Table 6.
Predictors of Maternal Developmental Stimulation in Hierarchical Regression Models

	Step 1 (<i>n</i> = 207), Macrosystem		Step 2 (<i>n</i> = 203), Exosystem		Step 3 (<i>n</i> = 200), Microsystem		Step 4 (<i>n</i> = 196), Ontogenic		Step 5 (<i>n</i> = 195), Depressive Symptoms	
	β	SE	β	SE	β	SE	β	SE	β	SE
Macrosystem										
Region (Northeast)	0.29*	0.13	0.28*	0.13	0.28*	0.13	0.22	0.13	0.24	0.13
Race/ethnicity	0.50***	0.14	0.49***	0.14	0.39***	0.15	0.38*	0.15	0.44**	0.15
Income to needs ratio	0.00	0.06	0.01	0.06	-0.01	0.07	-0.01	0.07	-0.04	0.07
Mother's education	-0.01	0.06	-0.02	0.07	-0.02	0.06	-0.08	0.07	-0.06	0.07
Exosystem										
Housing instability			-0.05	0.06	-0.05	0.06	-0.03	0.06	-0.02	0.06
Exposure to violence			0.28	0.17	0.38*	0.17	0.38*	0.17	0.39*	0.17
Microsystem										
Partnered status					0.32*	0.13	0.27*	0.13	0.29*	0.13
Family conflict					-0.03	0.07	-0.04	0.07	-0.02	0.07
Maternal chronic stress					0.04	0.07	0.02	0.07	0.05	0.07
Child health/disabilities					-0.26*	0.12	-0.36**	0.12	-0.35**	0.12
Social support satisfaction					-0.03	0.06	-0.02	0.06	-0.04	0.06
Social support conflict					-0.01	0.07	0.01	0.07	0.04	0.07
Ontogenic										
Mother's age (years)							0.17*	0.07	0.18*	0.07
Maternal physical health							0.02	0.07	0.00	0.07
Child age (months)							0.06	0.06	0.06	0.06
Child gender (male)							0.20	0.12	0.21	0.12
Depression severity (HRSD)									-0.13	0.08
R^2	0.11***		0.13***		0.17***		0.21***		0.23***	
R^2	—		$p = NS$		$p = NS$		$p = 0.025$		$p = NS$	

Notes. *SE*, standard error; *NS*, not significant; HRSD, Hamilton Rating Scale for Depression. Values -0.00 or 0.00 indicate -0.01 < β < 0.01. All continuous explanatory variables were standardized to provide an interpretation of the regression parameters that reflects the change in the dependent variable per 1 standard deviation change in the explanatory variable.

* $p < .05$.

.100`>*p*
***
.10`>*p*
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