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Multi-domain Models of Risk Factors for Depression and Anxiety Symptoms in Preschoolers: Evidence for Common and Specific Factors

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Abstract Relatively few studies have examined multiple pathways by which risk factors from different domains are related to symptoms of anxiety and depression in young children; even fewer have assessed risks for these symptoms specifically, rather than for internalizing symptoms in general. We examined a theoretically- and empirically-based model of variables associated with these symptom types in a diverse community sample of 796 4-year-olds (391 boys, 405 girls) that included factors from the following domains: contextual (SES, stress and family conflict); parent characteristics (parental depression); parenting (support/engagement, hostility and scaffolding); and child characteristics including negative affect (NA) effortful control (EC) sensory regulation (SR), inhibitory control (IC) and attachment. We also compared the models to determine which variables contribute to a common correlates of symptoms of anxiety or depression, and which correlates differentiate between those symptom types. In the best-fitting model for these symptom types (a) SES, stress and conflict had indirect effects on both symptom types via long-chain paths; (b) caregiver depression had direct effects and indirect ones (mediated through parenting and child effortful control) on both symptom types; (c) parenting had direct and indirect effects (via temperament and SR); and temperament had direct effects on both symptom types. These data provide evidence of common risk factors, as well as indicate some specific pathways/mediators for the different symptom types. EC was related to anxiety, but not depression symptoms, suggesting that strategies to improve child EC may be particularly effective for treatment of anxiety symptoms in young children.

Keywords Multi-domain risk factors · Depression and anxiety symptoms · Common factors · Specificity

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Developmental psychopathology research has begun to focus on risk factors for internalizing disorders in preschool children due to the recent recognition that these disorders do occur even in very young children (Egger and Angold 2006; Lavigne et al. 2009). Also, there is evidence that these early-appearing symptoms are associated with impairment in several domains of psychosocial functioning and are relatively stable in later childhood (Luby et al. 2009). While symptoms of anxiety and depression often co-occur (Lavigne et al. 2001), recent studies suggest that anxiety and depression should be considered separate but related constructs (Snyder et al. 2009), even in preschoolers (Strickland et al. 2011). Nevertheless, most of the extant literature in this age group has focused on risk factors for internalizing symptoms in general, without distinguishing between anxiety and depression (Tandon, Cardeli and Luby 2009). Furthermore, to date, even among those studies that

have examined risks for depression or anxiety symptoms specifically, none have examined the risks for symptoms of both disorders in the same study. Examining risk factors for symptoms of each of these disorders in the same sample of young children, therefore, is important to increase our understanding of risk factors that either contribute to a common diathesis for the development of symptoms of anxiety or depression, or differentiate between those symptom types (Moffitt et al. 2007).

A core tenet of a developmental psychopathology approach to studying risk factors for psychopathology is that disorder develops from complex interactions between individuals and multiple domains, involving many risk factors (Rutter 1999). Moreover, there has been a recent call from developmental psychopathology researchers (Cicchetti and Blender 2006; Cicchetti and Curtis 2007) for a multi-domain, or "multiple-levels-of-analysis," approach to studying factors affecting child outcomes. Cicchetti and Curtis (2007) have argued that progress towards understanding the pathways and processes leading to psychopathology requires "the simultaneous assessment of multiple domains of variables both within and outside the developing person (p. 627)."

Such designs also reduce the omitted variables problem occurring when relevant variables are left out of causal models, biasing estimates of causal parameters and inflating estimates of risk factor/outcome relationships (Cicchetti and Curtis 2007; Tomarken and Waller 2003). Researchers have called for greater efforts to address the effects of omitted variables. Goodman and Gotlib (1999), for example, have argued for the importance of studies on the effects of parental depression on child behavior in the context of other correlates of parental depression. For example, they suggest that heritability, stress and direct exposure to the parent's negative affect and behavior may serve as mechanisms that affect the functioning of their children.

To date, few studies have undertaken such a multi-domain approach to studying risk factors or variables associated with symptoms of anxiety or depression in young children, and, to our knowledge, there are none that have used such an approach to examine factors associated with symptoms of both disorders simultaneously. In this study we examined factors from different domains associated with symptoms of anxiety and depression in 4-year-old children. Although longitudinal models are preferable to cross-sectional models in making inferences about mediational processes among risk factors (Maxwell and Cole 2007; Shanahan et al. 2008), it is important to understand what the correlates of a disorder are at any point in time. In addition, cross-sectional models can play an important role in designing interventions for the age group studied, and can be a useful first step toward developing longitudinal causal models (Rutter 2005). Because the identified risk factors in the cross-sectional model may actually be correlates of disorder and should be considered "putative risk factors" (Shanahan et al. 2008), when references are made to "risk factors" herein, we do so for the sake of brevity. Finally, while bias in studying mediation using cross-sectional studies is recognized (Maxwell and Cole 2007; Maxwell, Cole and Mitchell 2011), it is also important to recognize that longitudinal studies of mediational processes are typically not bias-free. To be bias-free, longitudinal mediation studies must include all relevant correlates of the risk factor or mediator, i.e., have no omitted variables, and the causal sequence of risk factor and mediator must be clearly determined, i.e., that the putative mediator occurs after, and not contemporaneous with, the initial risk factor (e.g., if hostile parenting were being modeled as a possible mediator of the relationship between maternal depression and child depression, it would be necessary to demonstrate that the hostile parenting only began after the maternal depression (Shrout 2011). Statistical controls for initial level of hostility will allow for detecting the increase in the mediational process, but will underestimate any mediation that occurred previously. These conditions are rarely met. Thus, while the cross-sectional design may introduce certain bias, the inclusion of multiple relevant variables and mediational processes reduces other biases found in longitudinal reports of small sets of variables.

The aim of the present study was: (1) to examine theoretically-driven, empirically-based models of depression and anxiety symptoms in preschool children; and (2) to compare multi-domain models for symptoms of each of these disorders. The factors that we examined were the same for symptoms of both disorders since, to date, most studies have examined risks for internalizing symptoms without differentiating between depression and anxiety symptoms. Examining and comparing models for symptoms of both of these internalizing disorders in the same sample of children will shed light on factors that are common to both disorders, increase our understanding of the mechanisms and pathways associated with these different types of symptoms (Cicchetti and Curtis 2007), and also enable us to determine if there are pathways from particular factors to symptoms specific to either disorder. (Pickles and Hill 2006).

The present model was derived from Bronfenbrenner's (1979) bioecological model and Cicchetti and Toth's (1998) transactional model of child depression, which posit that multiple factors occurring at different levels affect the emergence of a particular disorder. The specific factors (domains) identified include contextual (e.g., stress), parental (e.g., parental depression), parenting (e.g., hostility), and child characteristics (e.g., temperament). These bioecological models posit that factors more distal to the child (e.g., stress) exert their effects indirectly, through their effects on more

proximal factors (e.g. parenting). These theoretical models, however, do not specify which variables or pathways to examine; thus, we selected variables in each domain that have been shown to be related to anxiety or depression symptoms in children, and also to each other in the empirical literature. Several studies have shown that socioeconomic status, life event stress, and family conflict (contextual factors), parental depressive symptoms (parental characteristics), parental support/engagement, hostility and scaffolding (parenting factors) and child temperament and attachment security (child characteristics) are related to internalizing symptoms or, more specifically, to either (or both) anxiety and depression symptoms in either preschool or older children or adolescents.

Contextual Variables

Contextual variables related to child psychopathology include socioeconomic status (SES; Evans 2004), stress (Grant et al. 2004), and family conflict (Zimet and Jacob 2001). Much of the research on SES and child psychopathology has focused on externalizing problems (Campbell, Shaw and Gilliom 2000), but there are recent data that indicate that low SES is related to anxiety in toddlers and preschoolers (Mian et al. 2011), and depression in 5-year-old children (Najman et al. 2005). Mian et al. found that the effects of low SES on child anxiety were mediated by child temperament, but did not examine other possible mediational pathways. In older children, data indicate that the effects of low SES are mediated by stress, family conflict, parental depression and parenting (Grant et al. 2006). Each of these pathways (mediators) will be examined in the present study.

Higher levels of stress and family conflict (Hammen, Brennan and Shih 2004) are related to higher rates of internalizing symptoms in older children and adolescents, but it is not clear what role these variables play in the early onset of these symptoms. Recently, Luby, Belden and Spitznagel (2006) found an association between stressful life events and preschool depression, and another group of investigators (Edwards, Rapee and Kennedy 2010) reported that stress in the first year of life predicted anxiety symptoms in 12-month olds. There is evidence that family conflict is related to rising levels of depression and anxiety symptoms in children between the ages of 1 ½ and 5 years (Côté et al. 2009), but this study did not differentiate between symptoms of each of these disorders.

Since stress and family conflict are distal risk factors, it is likely that their effects are mediated through more proximal factors (Lau et al. 2007), specifically, parental depression and parenting behaviors (Grant et al. 2006). Multiple mediators and mediational chains linking SES, stress, and conflict are possible (Zimet and Jacob 2001), and were examined in the present report.

Parental Depression Symptoms

There is extensive evidence that parental depression is associated with child internalizing disorders (Cummings, Keller and Davies 2005). A recent meta-analysis (Goodman et al. 2011) indicates that the effect of parental depression is moderated by child age, with parental depression having a stronger association with internalizing symptoms in younger children. Nevertheless, since few of these studies examined the effects of parental depression on anxiety and depression symptoms separately, it is not known whether its effects are specific to child anxiety or depression symptoms.

There is a question as to whether parental depression has a direct effect on child disorders, or if its effects are mediated by parenting. Parental depression has been associated with less supportive parenting (Lovejoy et al. 2000), more negative parenting (Riley et al. 2009), and poorer scaffolding skills (Gelfand and Teti 1990), which, in turn, have been related to internalizing disorders (Cummings et al. 2005).

Effects of parental depression also may be mediated by child variables, specifically temperament and attachment security. Results from a recent study (Mian et al. 2011) indicate that maternal depression symptoms did not have a direct effect on anxiety symptoms in young children, but did have indirect (i.e., mediated) effects via child temperament (i.e., negative affect). Parental depression also has been related to insecure attachment in both infants and preschoolers (Teti et al. 1995), and insecure attachment, in turn, has been associated with internalizing disorders (Shamir-Essakow, Ungerer and Rapee 2005).

Although a few studies have examined parenting as a mediator of the relationship between parental depression and child symptom relationship, to date, there are no studies that have simultaneously examined other mediators of this relationship. In the present study we will examine if parental depression has direct and indirect (mediated) effects on depression and anxiety symptoms via both parenting and child characteristics (including temperament and attachment security).

Parenting

Converging data indicate that parental support and hostility are related to internalizing disorders during the preschool period (Feng, Shaw and Silk 2008; Lovejoy et al. 1999). Scaffolding (i.e., the ability to provide support on difficult tasks to help the child achieve a level of competence, and

then to withdraw support when no longer needed) is another aspect of parenting that has been related to children's behavioral and emotional difficulties (Hoffman, Crnic and Baker 2006). However, less is known about the mechanisms (mediators) whereby parenting exerts its effects. Parenting may have direct effects on anxiety and depression symptoms, or its effects could be mediated by child variables, such as attachment security. Maternal support is associated with secure attachment (Rosen and Rothbaum 1993), but it is not clear if attachment security mediates the relationship between parenting and internalizing problems. Child temperament, particularly effortful control (EC), which, although partly constitutional, develops over time in response to psychosocial influences, such as parenting (Rothbart and Ahadi 1994), also may mediate the relationship between parenting and internalizing symptoms. Examining the significance of these indirect pathways (i.e., attachment and temperament) on symptoms of depression and anxiety will shed light on the processes whereby parenting may lead to one disorder or the other.

Child Factors

Converging data indicate that high levels of negative affect (NA) are related to internalizing symptoms (Eisenberg et al. 2009). Effortful control (EC), the regulatory aspect of temperament that includes the regulation of attention, behavior and emotion (Rothbart and Ahadi 1994), also has been associated with internalizing disorders (Muris and Ollendick 2005), and, in particular, with anxiety (Muris, de Jong and Engelen 2004). Recent data indicate that a specific component of EC, inhibitory control (IC), is related to internalizing symptoms in preschoolers (Rhoades, Greenberg and Domitrovich 2009). Nigg (2000) has argued that EC includes several distinct, but related components, and that these should be examined separately in relation to child outcome. Thus, in the present study, we examined both the general construct of EC (with parent-report), and also IC (with a behavioral task).

Sensory regulation (SR), which refers to the ability to modulate responses to sensory stimuli, has recently received increased attention in the developmental psychopathology literature. SR has been linked to both depression and anxiety symptoms in preschool children (Gouze et al. 2009).

Insecure attachment has been associated with anxiety (Shamir-Essakow et al. 2005) and depression symptoms in pre-school and school-age children (Moss et al. 2006). Attachment theory posits that secure attachment enhances optimal self-regulation (Sroufe 1996), and this is supported by prior work (Sroufe et al. 2005). Thus, insecure attachment may also have indirect effects on symptoms through its effects on EC, IC and SR.

The Present Study Following from the general models and specific studies of risk factors described above, we developed a cross-sectional model of *variables associated with* symptoms of anxiety and depression in young children that included factors from the four domains identified by Cicchetti and Toth (1998); contextual (SES, life stress, family conflict), parent (parental depression symptoms), parenting (support/engagement, hostility/coercion, scaffolding), and child characteristics (temperament and attachment).

The models for anxiety and depression symptoms posit that: (a) contextual factors (stress and family conflict) will have direct effects on symptoms of anxiety and depression, and, along with SES, will have indirect effects on child symptoms via parental depression symptoms and parenting (support/engagement, hostility/coercion and scaffolding); (b) parental depression symptoms will have a direct effect on both symptom types and indirect effects via parenting, child temperament (NA, EC, IC, and SR) and attachment; (c) parenting (support/engagement, hostility/coercion and scaffolding) will have a direct effect on both symptom types, as well as indirect effects via child characteristics of attachment and temperament (NA, EC, IC, and SR); (d) attachment and temperament will have direct effects on symptoms, and attachment will have indirect effects via EC, IC and SR.

In addition to this model, we examined two alternative models that also seemed plausible based on the extant literature. The second model we examined deleted the paths between attachment and temperament because some researchers have argued that these constructs are not related (see Vaughn and Bost 1999 for a review). Also, because it has long been recognized there is a reciprocal relationship between child characteristics and parenting (Bell 1979), we examined a third model positing that temperament has an effect on parenting, and a supplemental model testing the effects of child depression and anxiety symptoms on parenting, with parenting as the outcome measure.

Strengths of the study include: (a) the focus on the relationship between early risk factors and symptoms of both anxiety and depression, disorders that have been understudied in preschool children; (b) the examination of an a priori, theoretically- and empirically-derived model that includes multiple domains and a wide range of risk factors; (c) the examination of multiple mediators and mediational chains; (d) the use of multiple measures and multiple informants (observers as well as parents); and (e) the ability to compare the model across symptoms of two internalizing disorders using common methodology. The model was examined in a large, diverse, community sample, to increase the generalizability of the results and to reduce the possibility that risk factor/disorder relationships would be exaggerated, as can occur in clinical samples.

Method

Participants

Participants were recruited through 13 public schools and 23 pediatric practices in a large urban area. At initial contact, the project was described as a longitudinal study of psychosocial factors associated with developing symptoms of anxiety, depression, and oppositional behavior (Lavigne et al. 2012). There were Lavigne et al. 2012 families who expressed an interest in learning more about the study. When contacted subsequently by telephone, 827 (47.5%) agreed to participate. At the home visit, 31 children did not meet inclusion criteria. Eligibility required being age 4, living with parents for the prior 6 months, not having a diagnosis of an autism spectrum disorder, being Spanish- or English-speaking, and scoring >70 on the Peabody Picture Vocabulary Test (to ensure children could participate in study tasks).

The final sample included 796 children (391 boys, 49.1%), with a mean age of 4.44 years (range=47–61 months). Parent-identified racial/ethnic distribution was 433 White (54.4%); 162 Hispanic (20.4%); 133 African American (16.7%); 19 Asian (2.4%); 35 multi-racial or "other (4.4%);" and 14 not reporting (1.8%). Hollingshead (1975) social class distribution was 303 Class I (highest) (38.1%); 290 Class II (36.4%); 79 Class III (9.9%); 63 Class IV (7.9%); and 61 Class V (7.7%). There were 78.1% (n=622) of parents who were married. Mothers completed 765 evaluations and primary caretaker fathers completed 31.

Measures

A multi-informant approach was used when feasible. Parent questionnaires were used to assess many risk factors, while observer ratings were used to assess scaffolding, attachment security, and inhibitory control. Structured interviews and questionnaires were used to assess outcomes (anxiety and depression symptoms). Children were too young to complete measures, and it was not possible to collect teacher-reported outcome measures because the children came from more than 350 preschools. Multiple indicators of a construct were used to estimate latent factors and reduce measurement error whenever possible. A composite measure or a single measure was used to assess a particular construct when multiple indicators could not be used (see data analysis section for details).

Contextual Measures

SES The Hollingshead Four-Factor Index of Social Status (Hollingshead 1975) was used to assess SES. Demographic information on the child's age, sex, race, parent's education and employment was obtained by parent report.

Life Event Stress Three questionnaires were used to assess *parental* life event stress (hereafter referred to as stress): the Perceived Stress Scale (Cohen, Kamarck and Mermelstein 1983); (b) the McCubbin Family Changes & Strains Scale (H. I. McCubbin and Patterson 1996); and (c) the Parenting Stress Index, Short Form (Abidin 1995).

The Perceived Stress Scale is a 14-item self-report measure of the respondent's perceived degree of stress in response to stressful life events. Both internal (coefficient alphas 84-0.86) and test-retest reliabilities (r =0.85 for a 6-day interval and 0.55 for a 6-week interval) are excellent.

The McCubbin Family Changes & Strains Scale is a self-report measure in which respondents indicate how much stressful life events have impacted their families' lives. (McCubbin, McCubbin and Thompson 1996). Internal consistency is 0.79 (McCubbin, McCubbin and Thompson 1996).

The PSI- SF is a 36-item measure of perceived stress related to parenting. It has high internal consistency (i.e., alphas >0.9) and test–retest reliability coefficients of 0.65–0.96 (Abidin 1995). Internal consistency of the composite stress measure derived from these 3 scales was 0.83.

Family Conflict The three questionnaires used to assess family conflict included: (a) the conflict scale of the Family Environment Scale (FES) (Moos and Moos 1986), alpha=0.78; (b) the McCubbin Family Distress Index (H. I. McCubbin, Thompson and Elver 1996), alpha=0.87; (c) the McCubbin Family Problem Solving/Communication Scales (M. A. McCubbin, McCubbin and Thompson 1996), alpha=0.89. Internal consistency of the composite conflict measure derived from these 3 scales was 0.71.

Parental Depression Two measures of parental depression symptoms were used, the Beck Depression Inventory, (Beck, Steer and Garbin 1988) and the Center for Epidemiologic Studies Depression Scale (CES-D; Radloff 1977). The BDI is a 21-item self-report inventory, with well-established psychometric properties (alpha=0.86 in the present study). The CES-D, a 20-item, self-report measure, was designed specifically to assess depression symptoms in a community sample. The scale has high internal consistency (>0.85). Test-retest reliability (0.45–0.70) is moderate and it correlates well with other depression scales (Radloff 1977).

Parenting

Parent Support and Hostility The Parent Behavior Inventory (PBI) (Lovejoy et al. 1999), a 20-item parent-report measure

of parenting behavior yields two factor-analytically-derived subscales, Support/Engagement (alpha=0.90) and Hostility/Coercion (alpha=0.87). It specifically assesses parenting behaviors (rather than attitudes). Alphas in this study for support and hostility were 0.85 and 0.73 respectively. Items from each scale were divided into 3 parcels to provide 3 indicators of the latent factors of support/engagement and hostility, with an alpha of 0.81 and 0.87.

Scaffolding The NICHD Three Boxes Task (NICHD Early Child Care Research Network 2003), a 15-minute, semi-structured videotaped parent–child interaction paradigm was used to assess scaffolding. Graduate research assistants (blind to other measures of family functioning) rated the quality of parenting on 7-point Likert scales for supportive presence, respect for autonomy, quality of assistance, cognitive stimulation, confidence and hostility. Inter-rater reliability for these scales has been demonstrated to be good to excellent (NICHD Early Child Care Research Network 2003). Reliabilities (intraclass correlation coefficients) in the present study ranged from 0.80 for quality of assistance to 0.69 (likely deflated by a low base rate) for maternal hostility, with a mean reliability of 0.74. A factor analysis yielded a one-factor solution, with a composite measure we labeled scaffolding. Items were divided into parcels to create three indicators of the latent scaffolding factor.

Child Characteristics

Negative Affect (NA) The Children's Behavior Questionnaire(CBQ) (Rothbart et al. 2001), a widely-used, parent-report measure of temperament, yields a measure of NA. Following Lengua, West and Sandler (1998) procedures were used to reduce item contamination with measures of child psychopathology (see data analysis section). A single measure of NA (alpha=0.62) was used, with items from the CBQ scales for discomfort, sadness, fear, anger/-frustration, and soothability (negatively loaded).

Effortful Control (EC) The CBQ, described above, measures EC. After reducing item contamination (see data analysis section), the two CBQ indicators of EC were attentional focusing and inhibitory control.

Inhibitory Control (IC) The Statue subtest from the Developmental Neuropsychological Assessment (NEPSY), alpha=0.85 (Korkman, Kirk and Kemp 1997), assesses the child's ability to inhibit prepotent responses to a stimuli.. Statue provides a single indicator of IC.

Sensory Regulation The Short Sensory Profile (SSP), alphas= 0.70–0.90 (McIntosh et al. 1999), is a 38-item parent-report questionnaire yielding a single total score of sensory regulation. As with the CBQ, some SSP items are similar to those on measures of child psychopathology, and procedures described in the data analysis section were used to reduce item contamination. This yielded three SR indicators measuring the tactile, movement and low energy components of SR.

Attachment The Attachment Q-Sort (AQS; Waters 1987), which provides a continuous measure of attachment security, was used to assess attachment. The AQS was selected over alternative methods (i.e., the Strange Situation Paradigm; SSP) because it provides an ecologically valid measure of secure base behavior in the period beyond infancy, and it yields a continuous measure of attachment security. A meta-analysis (van IJzendoorn et al. 2004) indicates that the observer-rated AQS has strong reliability and convergent validity with the Strange Situation Paradigm. It was completed by graduate student research assistants after the 2-hour home visit. Average inter-rater reliability (based on a 20% random sample of home visits) was 0.77.

IQ Estimate The Peabody Picture Vocabulary Test (PPVT) alpha=0.94 (Dunn and Dunn 1997), a measure of receptive language, was used as a screening measure to ensure that child participants could participate in the parent–child interaction tasks.

Child Psychopathology

Depression and Anxiety Diagnostic Interview Schedule for Children-Parent Scale -Young child version (DISC-YC) (Fisher and Lucas 2006), a developmentally-appropriate interview was used to assess symptoms of anxiety (GAD) and depression. The DISC-YC is a fully structured or respondent-based interview in which the role of clinical judgment is essentially eliminated. Research assistants who administered the DISC-YC were taught how to use the computer program by DISC-trained staff, and practiced conducting interviews until they were able to reproduce the skip patterns used by other trained interviewers, a procedure recommended by Shaffer et al. (2000), which has resulted in high levels of agreement. The symptom count measure from the depression scale of this instrument (test-retest reliability=0.57–0.81), and the symptom count measure from the generalized anxiety scale (test-retest =0.88) were used to assess symptoms of depression and anxiety.

The Child Symptom Inventory (CSI) (Gadow and Sprafkin 2000) is a parent-report measure that consists of symptom items derived from DSM-IV diagnostic criteria in which parents rate the extent to which a symptom is present from "never" to "very often"; thus, each scale yields a continuous score. Depression symptoms were assessed with the major depression scale (alphas=0.70–0.80) and the dysthymia scale (alpha=0.74). Alpha for the depression

composite in this study was 0.70. Anxiety symptoms were assessed with the generalized anxiety and separation anxiety scales (alphas=0.70–0.83). The alpha for the composite measure of anxiety was 0.78.

Procedure

Participants were recruited through pediatric offices and public schools in a large metropolitan area. Parents agreeing to participate were mailed a packet with approximately half of the questionnaire-based items, including the demographic questionnaire, risk factor measures, the CBQ, and the SSP. At the time of the home visit a formal consent was completed, and the remaining questionnaires, parent interviews, and all observational measures were completed. All procedures were approved by the authors' Institutional Review Boards and parents were compensated for their time.

Data Analysis Before analyzing the data, missing data and item frequencies were examined. Less than 3% of the data were missing. Little's Missing Completely at Random test was conducted and data were determined to be missing at random (Little 1988). Subsequently, missing data were imputed using maximum likelihood multiple imputation procedures (using SPSS V15.0 Expectation Maximization program).

Researchers (Eisenberg et al. 2009; Lengua et al. 1998) have raised concerns about possible item contamination occurring between temperament scales and behavior problem scales, as well as between SR and behavior problem scales (Ben-Sasson et al. 2007). If present, item contamination could inflate the relationships between EC, NA, SR and behavior problems. Following procedures developed by Lengua et al. (1998) we refined the temperament and SR measures using a combination of expert opinion and CFA. Two panels with either 7 or 8 advanced clinical child psychology graduate students or doctoral-level psychologists each rated half of the items of the SSP, CBQ EC, CBQ NA, and behavioral symptom scales. Each rater was asked to provide a rating (5-point Likert scale) of the quality of each item as a temperament, sensory, or behavior problem indicator. An SSP sensory item was retained if it was rated as a significantly better indicator of a sensory problem than a temperamental characteristic or a behavior problem symptom; thus, each CBQ EC and NA item was retained if it was rated as being a significantly better indicator of temperament than a sensory characteristic or behavior problem. This resulted in the elimination of 22 sensory items, 66 NA items and 38 EC items. To examine the validity of the reduced scales they were examined in a confirmatory factor analysis, with 3 indicators of EC (attentional focusing, soothability, inhibitory control) 3 parcels as indicators of NA, and 5 sensory scales (taste/smell, low energy, tactile, visual-auditory, and movement) The overall fit was good in the test sample (SB $\chi^2(42)=31.66$, $p=0.85$; RMSEA=0.00, NFI=0.967, NNFI=1.01, SRMR=0.0462, GFI=0.966) and in a holdout sample (SB $\chi^2(42)=46.65$, $p=0.251$; RMSEA=0.0188, NFI=0.942, NNFI=0.99, SRMR=0.0507, GFI=0.958).

For the structural equation modeling (SEM) analysis, LISREL 8.8 was used. A two-step analytic approach was adopted (Anderson and Gerbing 1988). Initially, a confirmatory factor analysis (CFA) was conducted to test the goodness of fit of the measurement model. Because the use of multiple measurement indicators reduces measurement error of the latent factors, we included multiple measures to estimate the latent factors for each construct whenever possible. In some instances, the only developmentally-suitable measured indicator that we could identify involved a single questionnaire with multiple items. When this occurred, individual items from that measure were combined into groups ("parcels") of items to create multiple measured indicators of the latent factor. This process allows for estimating latent factors while avoiding problems associated with non-normality of a single measured indicator (Brown 2006). Combining individual items into parcels is a common procedure in SEM (Hau and Marsh 2004). When compared to the use of individual items, parcels can lead to less biased parameter estimates and better model fit (Coffman and MacCallum 2005).

When the single measured indicator did not involve multiple items allowing for the creation of parcels, the single measured indicator was used. In addition, if a good fit could not be achieved with multiple measured indicators for a latent construct, a composite indicator was used, created by summing the standardized scores from multiple scales.

Subsequently, multiple fit indices were used to examine the overall goodness of fit of the structural models. We followed Brown's method (Brown 2006) of reporting the χ^2 but not interpreting its value because it is inflated by large sample sizes. Fit indices, and criteria used to assess goodness of fit included an index adjusting for model parsimony (RMSEA approximately 0.06 or lower), comparative fit indices (NNFI and CFI both >0.9), and an index of absolute fit (SRMR <0.08). Completely standardized path coefficients are included in the figures and text.

Procedures for modeling causal chains involving two or more mediators are relatively new and less commonly described in the literature. Taylor, MacKinnon and Tein (2008) advocate using the joint significance test for chains of mediators. In this procedure, mediation is present if each component path in the mediated pathway is statistically significant. Because each constituent path must be significant for the mediated effect to be significant, the rejection rate of the null hypothesis is the product of the probabilities of rejecting the individual coefficient's null hypothesis. This process controls well for Type I error (Taylor et al. 2008).

To examine differences in risk factors/correlates across the two disorders, two models were created, (one for symptoms of each disorder), with identical paths between risk factors and to both symptom types. For each model, an SEM analysis was conducted in which a direct effect for a specific risk factor on one type of symptom was set to be equal to that path for the other symptom type (e.g., the path from NA to anxiety symptoms was set to be equal to that for NA to MDD). That analysis was repeated, but with the paths from that risk factor to each symptom type allowed to vary (e.g., the paths from NA to anxiety symptoms and NA to MDD could vary). Since the models are nested, a χ^2 difference test could be used to determine if the models were significantly different from one another and, thus, whether there was a significant difference between the path coefficients for the models of depression and anxiety symptoms.

Results

Measurement Models

The measurement model showed a good fit to the data for symptoms of depression, χ^2 (203, N=796)=699.23, RMSEA=0.047, NNFI=0.96, CFI=0.97, SRMR=0.049, and anxiety (χ^2 (203, N=796)=669.72, RMSEA=0.046, NNFI=0.96, CFI=0.97, SRMR=0.048. The final measurement model consisted of 7 latent factors with multiple indicators: (a) parental depression symptoms (alpha=0.89), with the original 2 parental depression scales as manifest indicators; (b) EC, with two indicators from the CBQ (alpha=0.59); (c) parent hostility with three parcels of items from the PBI hostility scale as indicators (alpha=0.87); (d) parent support/engagement, with 3 parcels of items from the PBI support/engagement scale (alpha=0.81); (e) scaffolding, with 3 parcels of items from the NICHD three boxes task as indicators (alpha =0.81); (f) SR, with three parcels of expert items from the SSP as indicators (alpha=0.63); (g), the outcome measures, symptoms of depression, r's=0.57, 0.60, and 0.94, p<0.01 (alpha=0.75), and symptoms of anxiety, r's=0.36, 0.44, and 0.55, p<0.01 (alpha=0.75). It also included 3 factors, with a single composite indicator, stress (alpha=0.83), conflict (alpha=0.71), and NA (alpha= 0.42), as well as 3 factors with a single indicator derived from the original measure, attachment, SES, and IC.

Table 1 includes the correlations between the manifest indicators included in the model, showing that there are only moderate correlations between the measured indicators of anxiety and depression symptoms. We also obtained a correlation between the latent factors of depression and anxiety symptoms that was moderate in size (0.40). These moderate correlations provide evidence that anxiety and depression symptoms can be considered separate constructs. Factor loadings and internal consistencies of the factors are available online (due to space constraints).

Models for Depression Symptoms

Model 1 Depression Model 1 posited that: (a) conflict and life stress have direct effects on depression symptoms and, along with SES, indirect effects through parental depression symptoms and parenting (hostility, support/engagement and scaffolding skills); (b) parental depressive symptoms have a direct effect on child depression symptoms and indirect effects via attachment, and temperament (NA, EC, IC and SR); (c) parenting has a direct effect on depression symptoms, and indirect effects via child attachment and child temperament (NA, EC, IC, and SR); (d) attachment and child temperament have direct effects on symptoms of depression, and attachment has indirect effects via EC, IC and SR (see Fig. 1). Model 1 (χ^2 (228, N=796)=945.05,) showed a good fit on RMSEA (0.055), NNFI (0.95), and CFI (0.96), and SRMR (0.068).

Alternative Models Model 2 posited no relationship between attachment and temperament (NA, EC, IC and SR), while retaining all other paths as in Model 1. Model 2 showed a good fit overall, χ^2 (231, N=796)=1009.58, RMSEA=0.058, NNFI=0.94, CFI=0.96, SRMR=0.070. Model 2 is a nested version of Model 1. In a χ^2 difference test, Model 1 showed a better fit than model 2, χ^2 (3, N= 796)=64.53, p<0.001).

While Model 1 includes paths suggesting a putative causal influence of parenting on child behavior, Model 3 reflects the concept that child temperament may influence parenting behavior. For child depression symptoms, Model 3(χ^2 (225, N=796)=1015.80) showed a good fit on RMSEA (0.061), NNFI (0.94), and CFI (0.95), but did not meet an acceptable level on SRMR (0.093). Thus, model 3 was not considered a good fit for child depression symptoms.

Direct, Total Indirect and Total Effects on Depression Symptoms (Model 1) Depression Model 1 showed the best fit overall; thus we report only standardized path coefficients for this model (see Fig. 2a). For path coefficients, the magnitude of the coefficient indicates the amount of standard deviation in the "predicted" measure that results from a change in one standard deviation on the measure of the "predictor" factor. Per Kline (1998), path coefficients are considered small (< 0.10), medium (around 0.30), and large (0.50). Direct effects refer to pathways from the risk factor to the outcome without any mediation; total indirect effects include the sum of the indirect (mediated) pathways; total effects include the sum of the direct and total indirect effects. Examining total and total indirect effects is useful

Table 1 Correlations between manifest indicators

	1	2	3	4a	4b	5a	5b	5c	6a	6b	6c	7a	7b	7c	8	9a	9b	10a	10b	10c	11	12	13a	13b	13c	14a	14b	14c
1. Stress																												
2. Conflict	.36[b]																											
3. SES	−.26[b]	−.09[b]																										
4a. Parental depression (BDI)	.61[b]	.31[b]	−.18[b]																									
4b. Parental depression (CES−D)	.60[b]	.31[b]	−.34[b]	.79[b]																								
5a. Parental hostility parcel 1	.28[b]	.28[b]	−.05	.28[b]	.29[b]																							
5b. Parental hostility parcel 2	.25[b]	.23[b]	−.20[b]	.22[b]	.27[b]	.50[b]																						
5c. Parental hostility parcel 3	.07	.25[b]	.02	.08[b]	.06	.50[b]	.36[b]																					
6a. Parental Support parcel 1	−.18[b]	.03	.22[b]	−.13[b]	−.22[b]	−.03	−.17[b]	.19[b]																				
6b. Parental Support parcel 2	−.26[b]	.00	.26[b]	−.21[b]	−.31[b]	.02	−.20[b]	.20[b]	.70[b]																			
6c. Parental Support parcel 3	−.25[b]	−.05	.17[b]	−.17[b]	−.24[b]	−.04	−.20[b]	.17[b]	.65[b]	.69[b]																		
7a. Parental Scaffolding parcel 1	−.19[b]	−.08[a]	.39[b]	−.18[b]	−.32[b]	−.08[a]	−.16[b]	.04	.24[b]	.30[b]	.21[b]																	
7b. Parental Scaffolding parcel 2	−.20[b]	−.09[b]	.33[b]	−.16[b]	−.24[b]	−.16[b]	−.20[b]	−.01	.21[b]	.27[b]	.16[b]	.57[b]																
7c. Parental Scaffolding parcel 3	−.22[b]	−.08[b]	.32[b]	−.17[b]	−.29[b]	−.08[a]	−.17[b]	.02	.22[b]	.30[b]	.22[b]	.79[b]	.65[b]															
8. Negative affect	.21[b]	.22[b]	−.08[a]	.11[b]	.19[b]	.10[b]	.03	.04	−.09[a]	−.12[b]	−.12[b]	−.07	−.07[a]	−.07[a]														
9a. Effortful control −attentional focusing	−.22[b]	−.22[b]	.08[b]	−.18[b]	−.21[b]	−.14[b]	−.14[b]	−.00	.16[b]	.20[b]	.22[b]	.09[b]	.12[b]	.13[b]	−.29[b]													
9b. Effortful control −inhibitory control	−.18[b]	−.15[b]	.12[b]	−.11[b]	−.17[b]	−.12[b]	−.18[b]	−.04	.18[b]	.27[b]	.22[b]	.20[b]	.22[b]	.20[b]	−.12[b]	.34[b]												
10a. Sensory regulation −tactile	−.21[b]	−.26[b]	.03	−.18[b]	−.20[b]	−.08[b]	−.08[a]	−.08[b]	.08[a]	.04	.07	.05	−.01	.08[a]	−.18[b]	.22[b]	.06											
10b. Sensory regulation −movement	−.22[b]	−.14[b]	.22[b]	−.24[b]	−.29[b]	−.11[b]	−.14[b]	−.06	.14[b]	.16[b]	.17[b]	.14[b]	.08[b]	.14[b]	−.12[b]	.17[b]	.10[b]	.35[b]										
10c. Sensory regulation−low energy	−.26[b]	−.18[b]	.15[b]	−.29[b]	−.30[b]	−.18[b]	−.17[b]	−.02[b]	.14[b]	.18[b]	.15[b]	.12[b]	.14[b]	.15[b]	−.09	.19[b]	.18[b]	.30[b]	.42[b]									
11. Attachment (AQS)	−.20[b]	−.19[b]	.19[b]	−.15[b]	−.22[b]	−.15[b]	−.16[b]	−.09[a]	.15[b]	.16[b]	.14[b]	.23[b]	.23[b]	.25[b]	−.16[b]	.23[b]	.25[b]	.12[b]	.10[b]	.18[b]								
12. Inhibitory control (statue)	−.06	−.06	.04	−.10[b]	−.12[b]	−.11[b]	−.07[b]	−.04	.00	.04	.02	.16[b]	.14[b]	.16[b]	−.04	.18[b]	.21[b]	.08[a]	.07	.12[b]	.25[b]							
13a. Depression−DISC−YC	.38[b]	.30[b]	−.09[b]	.39[b]	.38[b]	.30[b]	.20[b]	.14[b]	−.09[a]	−.14[b]	−.11[b]	−.12[b]	−.08[a]	−.12[b]	.20[b]	−.28[b]	−.18[b]	−.23[b]	−.16[b]	.30[b]	−.26[b]	−.12[b]						
13b. Depression−CSI Dysthymia	.41[b]	.35[b]	−.14[b]	.41[b]	.42[b]	.30[b]	.20[b]	.14[b]	−.19[b]	−.19[b]	−.14[b]	−.13[b]	−.16[b]	−.14[b]	.28[b]	−.28[b]	−.15[b]	−.27[b]	−.23[b]	−.34[b]	−.23[b]	−.07[a]	.57[b]					
13c Depression−CSI MDD	.41[b]	.32[b]	−.17[b]	.41[b]	.44[b]	.30[b]	.20[b]	.12[b]	−.22[b]	−.20[b]	−.14[b]	−.17[b]	−.19[b]	−.18[b]	.27[b]	−.29[b]	−.16[b]	−.29[b]	−.23[b]	−.34[b]	−.24[b]	−.08[a]	.60[b]	.94[b]				
14a Anxiety−DISC−YC	.30[b]	.23[b]	−.13[b]	.34[b]	.33[b]	.25[b]	.14[b]	.10[b]	−.02	−.05	−.03	−.11[b]	−.11[b]	−.08[a]	.23[b]	−.22[b]	−.09[b]	−.15[b]	−.14[b]	−.20[b]	−.15[b]	.00	.59[b]	.43[b]	.46			
14b Anxiety−CSI−GAD	.37[b]	.33[b]	−.10[b]	.41[b]	.41[b]	.32[b]	.19[b]	.13[b]	−.11[b]	−.13[b]	−.11[b]	−.12[b]	−.12[b]	−.12[b]	.28[b]	−.38[b]	−.22	−.32[b]	−.20[b]	−.29[b]	−.24[b]	−.14[b]	.56[b]	.63[b]	.63[b]	.44[b]		
14c−Anxiety−CSI−SAD	.30[b]	.30[b]	−.07	.39[b]	.43[b]	.21[b]	.13[b]	.04	−.09[a]	−.09[a]	−.06	−.18[b]	−.12[b]	−.16[b]	.23[b]	−.24[b]	−.10[b]	−.30[b]	−.25[b]	−.23[b]	−.14[b]	−.07	.38[b]	.50[b]	.50[b]	.36[b]	.55[b]	

[a] $p<.05$ [b] $p<.01$

because they are likely to be similar to effects identified in studies that include only a few risk factors.

Contrary to expectation, family conflict did not have a significant direct effect (0.09) on child depression symptoms, but it did have small, but significant indirect (0.05, $p<0.001$) and total (0.10, $p<0.001$) effects, with conflict increasing child depression symptoms. Stress also had a nonsignificant direct (0.08) effect, and small but significant total indirect (0.11, $p<0.001$) and total effects (0.15, $p<0.001$), with stress increasing depression symptoms. The indirect effects (−0.17, $p<0.001$) of SES were significant, but small, with lower SES associated with higher levels of child depression symptoms.

The direct effect of parental depression symptoms on child depression symptoms (0.19, $p<0.05$) was significant. The total indirect effect also was significant and small-to-medium in size (0.21, $p<0.001$), for a medium-size total effect (0.43, $p<0.001$).

The direct effect of hostility was significant, but small (0.12, $p<0.05$), as were the indirect (0.07, $p<0.001$) and total effects (0.18, $p<0.001$), with hostility increasing child depression symptoms. Support/engagement had a nonsignificant direct effect (−0.02), but the indirect (−0.10, $p<0.05$) and total (−0.12, $p<0.05$) effects were significant, decreasing child depression symptoms. Direct (0.01) and indirect (−0.03) effects for scaffolding were not significant.

Attachment did not have either significant direct (−0.05), or indirect effects (−0.04), but the total effect was significant (albeit small) (−0.08, $p<0.05$).

NA (0.13, $p<0.001$) had a significant, but small direct effect and SR had a significant, small-to-medium-size one (−0.25, $p<0.001$), with higher levels of NA and poorer SR associated with increased child depression symptoms. Paths from IC (0.04) and EC (−0.09) to child depression symptoms were not significant.

Specific Indirect Effects on Child Depression Symptoms As noted above, the cumulative indirect effects of the contextual (SES, stress, family conflict) and parent (parental depression) factors were significant, and were significant for two (support/engagement and hostility) of the parenting variables. In addition to the cumulative indirect effect, the significance of each specific indirect path also can be examined. Significant long-chain paths are those for which each constituent path in the causal chain is significant. There are multiple significant indirect paths from SES to child depression symptoms, including paths mediated *sequentially* (i.e. *in turn*) by conflict, parental depression, parenting (hostility and support), child attachment, and child temperament (NA and SR). SES effects were also mediated by stress via parenting (support) and child temperament (NA and SR). SES, stress, and conflict all had direct effects on parental depression. Stress effects on child depression were mediated by caretaker depression and caretaker support, but not by caretaker hostility or scaffolding skills. The effects of conflict were mediated by caretaker depression, hostility and support, but not scaffolding skills.

Parental depression had a significant direct effect on symptoms of child depression. It also had significant indirect effects via parenting (parental depression → hostility → child depression; parental depression → support → NA → child depression) and child characteristics (SR) (parental depression→ SR→ child depression).

Although the cumulative indirect effect of hostility was significant, as noted above, none of the specific indirect paths from hostility to child symptoms of depression via temperament or attachment were statistically significant. Support had a significant indirect effect on child depression symptoms via NA and SR.

The full path coefficient for each extended chain is the product of the path coefficient for each constituent path. Magnitudes of the significant path coefficients for longer causal chains are all very small ($M=-0.0002$), but the cumulative effects, as reflected in the total indirect and total effect sizes, are small-to-medium in size. Space precludes reporting all long-chain effect sizes (available on-line).

Supplemental Model: Child Depression Symptoms Affecting Parenting To examine the possibility that child depression symptoms have an effect on parenting, another model was tested in which paths from child depression symptoms to parental depression, support, hostility and scaffolding were examined. Initial attempts to test this as a nonrecursive model yielded an inadmissible solution. Thus, a recursive model was examined, in which paths from child depression symptoms to parental depression, and to hostility, support, and scaffolding were included, but the reciprocal paths from parental depression and the three parenting variables to child depression symptoms were not. Because of the change in the direction of the paths from child depression symptoms to parenting, the parenting variables were the end points of this model, which, therefore, should be considered a supplemental model (i.e., a model to examine the effects of child depression symptoms on parenting, rather than as an alternative model for the effects of risk factors on child depression symptoms). The supplemental model showed a good fit, $\chi^2(228, N=796)=786.09$, RMSEA=0.055, NNFI=0.95, CFI=0.96, and SRMR=0.069. In Model 1 (parenting predicting child depression symptoms), the path from parental hostility to child depression symptoms was significant. In the supplemental model, none of the paths from child depression symptoms to parenting (hostility, support/engagement, and scaffolding) were significant.

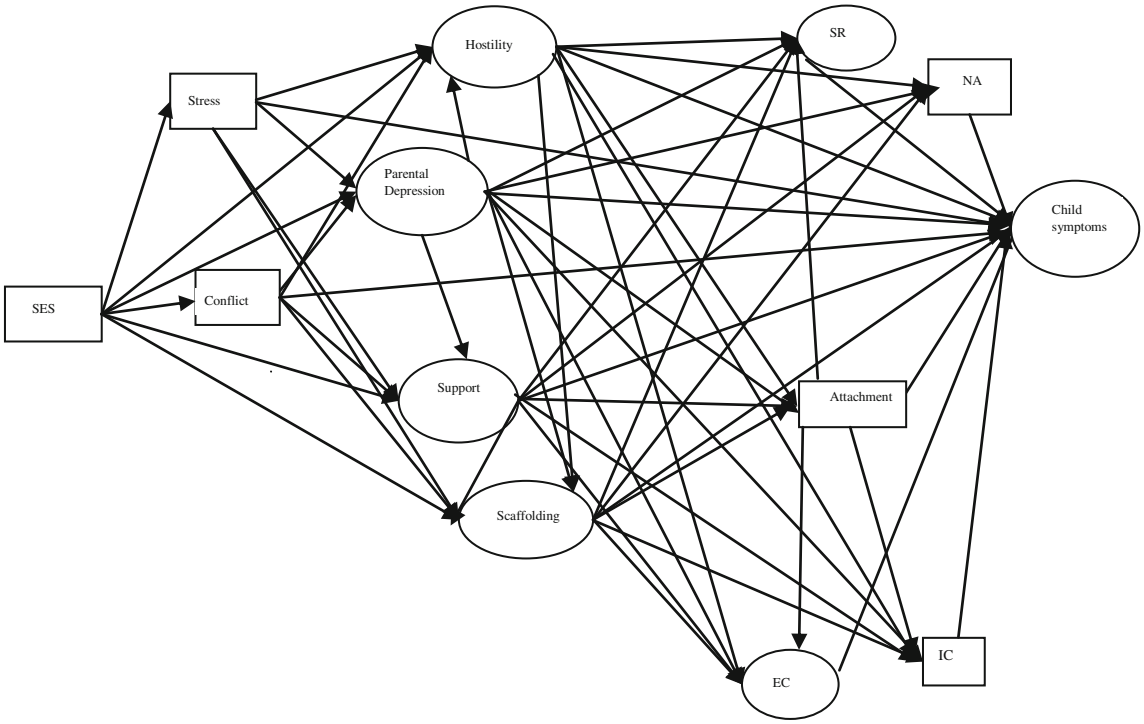


Fig. 1 Schematic representation for all paths for which there is empirical support and which were examined in Model1

Models for Anxiety Symptoms

The pattern of overall model fit for anxiety symptoms was the same as that for depression ones. As in the model of depression symptoms, anxiety Model 1, $\chi^2(228, N=796)=924.23$, RMSEA=0.055, NNFI=0.94, CFI=0.96, SRMR=0.065 showed a good fit overall. Model 2 for anxiety symptoms also showed a good fit, χ^2 (231, N=796)=988.46, RMSEA=0.058, NNFI=0.93, CFI=0.95, SRMR=0.068, but χ^2 difference tests indicated that Model 1 was a better fit than Model 2, χ^2 (3, N=796)=64.23, $p<0.001$). Model fit was poor for Model 3, χ^2 (225, N=796)=1027.90, RMSEA=0.060, NNFI=0.93, CFI=0.95, SRMR=0.090.

Direct, Total Indirect and Total Effects on Anxiety Symptoms (Model 1) These effects are discussed in detail for Model 1 since it showed the best fit overall (see Fig. 2b). For the contextual factors, the pattern of significance for direct, total indirect, and total effects was substantially the same for symptoms of child anxiety as for those of depression. Family conflict did not have a significant direct effect (0.09) on anxiety symptoms, but the total indirect (0.04, $p<0.001$ and total effects (0.07, $p<0.001$) were significant and small, with increased conflict associated with higher levels of child anxiety symptoms. Similarly, the direct effect of stress (−0.01) was not significant, but the indirect (0.09, p<0.001) and total effects (0.09, $p<0.001$) were significant but small, with higher stress associated with higher levels of anxiety symptoms. The indirect effect of SES on child anxiety symptoms was significant, but small (−0.10, <0.001), with lower SES associated with higher levels of anxiety symptoms.

The direct effect (0.38, $p<0.001$) of parental depression symptoms on child anxiety symptoms was significant and medium-size (for child depression symptoms, it was significant, but small), with greater parental depression symptoms associated with greater child anxiety symptoms. Indirect effects for parental depression symptoms were also small to medium (0.13, $p<0.001$), for a total, medium effect size (0.37, $p<0.001$).

For parenting, the direct effect of hostility on child anxiety symptoms (0.09) was not significant, while the total indirect (0.07, $p<0.001$) and total effects (0.13, $p<0.001$) were significant and small. Both the direct (0.19, $p<0.05$) and indirect effects (−0.12, $p<0.001$) of support were significant, and small to medium. The total effect (0.01) was not significant because of the opposite direction of the direct and indirect effects. Scaffolding did not have significant direct (0.04), indirect (−0.03), or total (0.01) effects.

Attachment (−0.01) did not have a significant direct effect on child anxiety symptoms (which also was the case for child depression), but the total indirect (−0.06, $p<0.01$) and total effects (−0.05, $p<0.05$) were significant. IC (−0.01) did not have a direct effect on child anxiety symptoms. NA (0.19, $p<0.001$) and SR (0.24, p<0.001) had significant direct effects on child anxiety symptoms, as they did on depression ones. EC had a direct, significant (medium-

size) effect on child anxiety symptoms (−0.35, $p<0.001$) (unlike its effect on child depression symptoms, which was non-significant).

Specific Indirect Effects for Anxiety Symptoms Most long-chain paths significant for symptoms of child depression symptoms were also significant for child anxiety symptoms with the following exceptions: (a) long-chains, including the path from parental hostility to child depression symptoms were significant. Long chains including the path from parental hostility to child anxiety symptoms were not; (b) long chains including the path from parental depression symptoms to NA were significant for child anxiety, but not child depression symptoms; (c) long chains including the path from EC to child anxiety symptoms were significant, but those including the path from EC to child depression symptoms were not.

Supplemental Model: Anxiety Symptoms Affecting Parenting A supplemental model to examine the effects of child anxiety symptoms on parenting was examined in which the end point of the model was parenting. The supplemental model, ($\chi^2(228, N=796)=799.55$) showed a good fit on RMSEA=0.056, NNFI=0.94, CFI=0.95, and SRMR=0.066. In Model 1, the path from caretaker support to anxiety symptoms was significant, but the paths from hostility and scaffolding were not. In the supplemental model, the path from anxiety symptoms to caretaker support also was significant (0.32, $p<0.05$) and the paths from anxiety symptoms to hostility and scaffolding were not.

Aim 2: Model Differences Between Depression and Anxiety Symptoms

Evidence for specificity of risk factors on symptom types was examined using the χ^2 difference test as described in the data analysis section. The magnitude of the path coefficient from stress to child depression symptoms was higher than the one to child anxiety symptoms, $\chi^2(1)=4.82$, $p<0.028$. Also, the path coefficient from SR to child depression symptoms was higher than the one to anxiety symptoms, $\chi^2(1)=6.42$, $p<0.011$.

Discussion

The present study was designed to address the need to examine risk factor/correlates for more differentiated symptoms of internalizing disorders in young children (i.e., depression and anxiety symptoms), rather than examining risks for internalizing disorders in general (Tandon et al. 2009). In addition to this lack of differentiation, few of the studies conducted to date have used multi-domain models examining complex mediational processes. This study contributes to the literature on internalizing disorders in young children by examining: (a) a multi-domain model of factors *associated with* depression and anxiety symptoms in the same sample of ethnically diverse children; (b) multiple risk factors and mediators; and (c) extended chains of mediators from distal factors to more proximal ones. We also examined two alternative models for symptoms of each disorder. Finally, we compared the best-fitting model for symptoms of each of these disorders to increase our understanding of common, as well as specific pathways, to each of them.

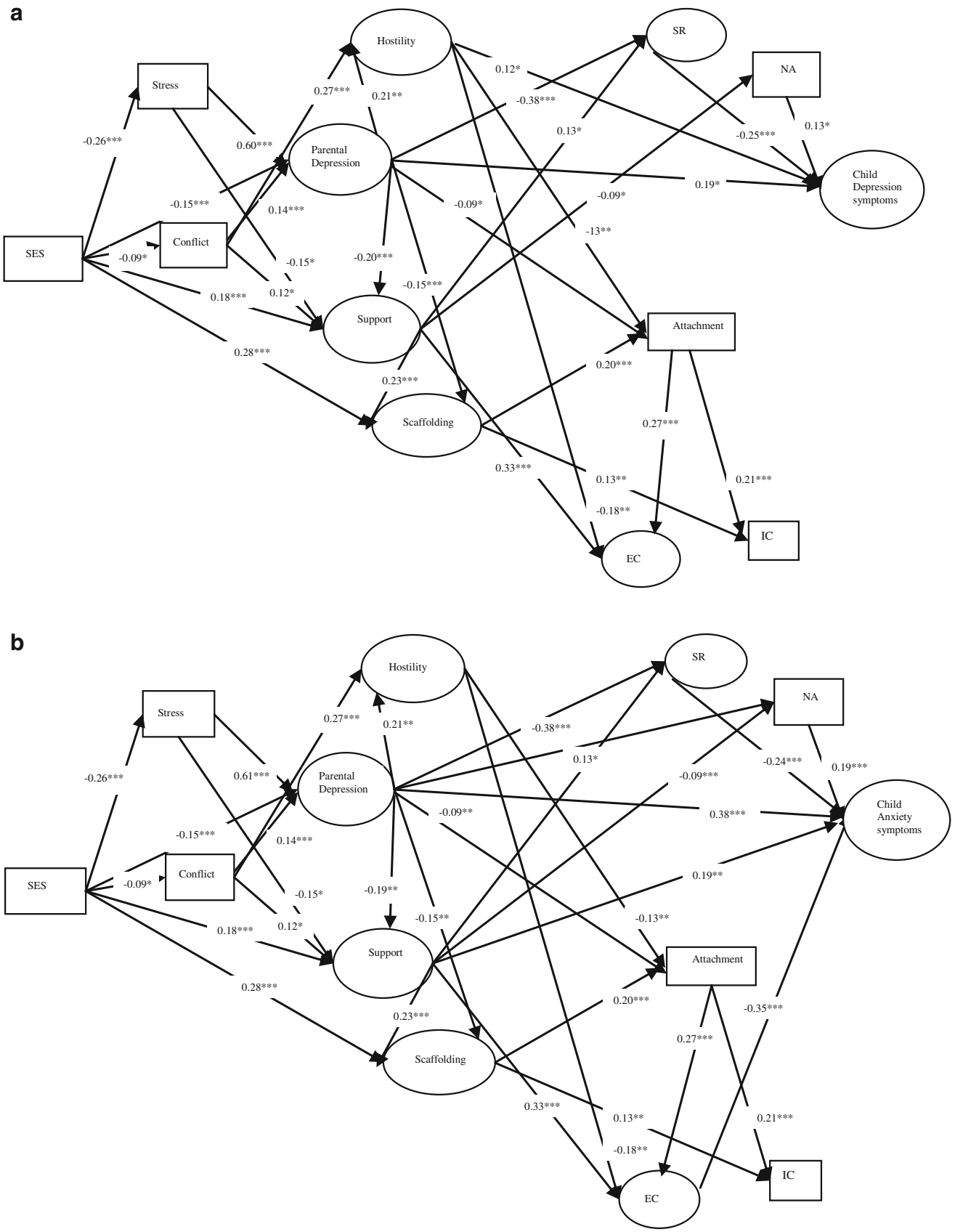
Fig. 2 **a**. Model 1 risk factors for child depression symptoms with ▶ significant, completely standardized path coefficients. **b**. Model 1 risk factors for child anxiety symptoms with significant, completely standardized path coefficients. Legend: SES: Socioeconomic status; NA: Negative affect; EC: Effortful control; IC: inhibitory control; SR: Sensory regulation problems. Ovals represent latent factors with multiple indicators; rectangles indicate measured variables with a single manifest indicator. Path coefficients are completely standardized.

The best-fitting model was the same for symptoms of both disorders. This model specifies that: (a) contextual factors (stress and family conflict) have direct effects on child symptoms of anxiety and depression, and, along with SES, have indirect effects via parental depression symptoms and parenting; (b) parental depression symptoms have a direct effect on child symptoms and indirect ones via parenting and child factors; (c) parenting has direct effects, as well as indirect ones via attachment and temperament (d) attachment and temperament have direct effects, and attachment also has indirect ones via temperament (EC, IC and SR).

Contextual Factors and Long Mediational Chains

The more distal, contextual factors were associated with symptoms of both depression and anxiety via mediation by variables at each level that were more proximal to the child. The most distal variable, SES was related to both types of symptoms via long mediational chains, first through its association with conflict and stress, which, in turn were related to both parental depression symptoms and parenting (hostility and support) and then, to child temperament. For each symptom type, SES effects were pervasive, involving multiple long-chains of associations across different domains. Overall, long-chain path coefficients were small, but their cumulative effect, as indicated in the significant total indirect effects for most risk factors, was significant.

Contrary to expectation, stress and conflict did not have direct effects on either type of symptom; instead their effects on both symptom types were mediated by parental depression symptoms and parenting. This finding suggests that conflict plays a different role in these internalizing disorders than it does in externalizing ones, because recent data (Lavigne et al. 2012) indicate that conflict does have a direct effect on symptoms of Oppositional


a
Hostility
SR
Stress
NA
Parental Depression
Child Depression symptoms
SES
Conflict
Support
Attachment
Scaffolding
IC
EC
0.27***
0.21**
0.12*
-0.38***
-0.26***
0.60***
0.13*
-0.25***
0.13*
0.19*
-0.15***
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-0.09*
-0.09*
-13**
-0.09*
-0.15*
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SES
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-0.18**

Defiant Disorder. It makes sense that conflict would have direct effects only on externalizing symptoms, whereas its effects on internalizing ones are only indirect, because parents who engage in higher levels of conflict are modeling "acting-out" behavior.

Parental Depression

Parental depression symptoms had significant indirect effects on child depression and anxiety symptoms. The indirect effects were mediated both by parenting and child temperament. These findings increase our understanding of the different mechanisms whereby parental depression symptoms exert their effect on child internalizing symptoms, because, to date, most of the studies on mediators of parental depression have only examined parenting as a mediator (Goodman et al. 2011). The present findings show that, in addition to parenting, the effects of parental depression symptoms are also mediated by their effect on child temperament. Moreover, they are consistent with recent data (Mian et al. 2011) indicating that the effect of maternal depression on anxiety symptoms in young children is mediated by temperament (NA), while also extending this finding to symptoms of child depression.

In addition to these indirect effects, parental depression symptoms also had direct effects on symptoms of child anxiety and depression. This direct effect, particularly for symptoms of depression, may be *at least partially* a genetic one, although this speculation awaits conformation by further research. It is equally possible that there are other mediators, specifically other aspects of parenting, that my account for these effects independently, or in conjunction with a genetic predisposition.

There is an issue in the literature about whether the association between parental depression and child psychopathology is due to a depression distortion (or negativity bias), which was found in several studies conducted in the 80's. However, a critical review of this literature (Richters(1992) indicated that many of these studies were methodologically flawed and, thus, there was no clear evidence of a "depression distortion." Data from another study (Fergusson, Lynskey and Horwood 1993) indicate that, although that there were reporting errors associated with maternal depression, there still was an association between maternal depression and child problems that could not be explained by the rating distortion associated with depression. A more recent study (Baumann et al. 2004) indicated that, when child behaviors were standardized, depressed and non-depressed mothers did not differ in the accuracy of their ratings of child behavior. These authors also noted that other studies failed to find biased reporting by depressed mothers. Thus, taken together, the evidence suggests that bias in ratings is not sufficient to cast doubt on the relationships found in this study between parental depression and symptoms of depression and anxiety in preschoolers.

Parenting Factors

Parental hostility had significant direct effects on child depression, but not on anxiety symptoms. It makes theoretical sense that parental hostility and the associated child perception of rejection and potential withdrawal of affection would be related to depression symptoms. Hostility had significant, negative indirect effects on both depression and anxiety symptoms that were mediated by EC, suggesting that decreased hostility was related to better EC, which, in turn, was related to fewer symptoms of both disorders. It is likely that parental hostility would lead to child distress, which would interfere with the child's regulatory abilities.

The relationship between parental support/engagement and child symptoms is complex. The seemingly contradictory positive association between support and anxiety symptoms may be explained by the supposition that sensitive parents are likely to provide more support in response to symptoms of anxiety in their children. This speculation is supported by the finding in the supplemental model that the path from anxiety symptoms to caretaker support was significant. That is, the supplemental model suggests that parents may increase their level of support in response to their children's anxiety, rather than increased support leading to increased anxiety symptoms. Increased support also was related to higher levels of child EC, which, in turn, is associated with decreased symptom levels. Overall, there are significant indirect effects of support on lower levels of child anxiety and depression symptoms. For both child anxiety and depression symptoms, these indirect effects occur through NA and SR. For anxiety symptoms, the effects of support were also mediated by EC, suggesting that supportive parenting strategies aimed at improving the child's self-regulation may be effective in decreasing anxiety.

Child Factors

Attachment security did not have direct effects on either type of symptom. It did, however, have small, but significant indirect effects on lower symptom levels of anxiety via child EC. Attachment has been widely shown to be related to child psychopathology. Thus, these nonsignificant direct effects, but significant indirect ones are noteworthy because they highlight the importance of studying variables in the context of other factors associated with the outcomes to improve the assessment of their specific contributions to symptom levels. It is also interesting that, by preschool, the protective effect of children's attachment security seems to be mediated by better self-regulation.

SR and NA were significantly associated with both types of child symptoms. The association with NA with these symptoms is well known; however, SR has received relatively little attention in the psychological literature. The

present data indicate that its relationship to child symptoms warrants further investigation, particularly for anxiety and depression symptoms where the effects are relatively large.

It is particularly noteworthy that the effect size of EC on anxiety symptoms was moderate, but it was not significantly associated with child depression symptoms. EC has been shown to play a significant role in the development of anxiety in older children (Lonigan and Vasey 2009), and the present data suggest that EC is also associated with anxiety symptoms in preschoolers.

Implications for Developmental Psychopathology

Multifinality is a fundamental principle in developmental psychopathology, and the current findings show that there are common correlates of depression and anxiety symptoms in young children, providing indirect support for this principle because the same model provides the best fit to the data for symptoms of both anxiety and depression as they disorders are emerging, and there are many common pathways to the two types of symptoms. On the other hand, there were also some *correlates* and pathways that have associations with one type of symptom, but not the other, also providing evidence for specificity of particular risk factors and pathways.

The role of parental depression symptoms shows that there are common correlates of both depression and anxiety symptoms because it has both direct and indirect effects (mediated by parenting and child temperament) on child anxiety and depression symptoms. Nevertheless, there are also some differences in the specific mechanisms (mediators) whereby depression exerts its effects on each of these symptom types. The specificity of effects is shown by the different aspects of temperament that serve as mediators in the parental depression-child symptom relationship: that is, for depression symptoms, only child NA mediates the effects of parental depression symptoms on child symptoms, whereas both NA and EC serve as mediators for symptoms of anxiety.

Parenting had indirect effects on symptoms of both disorders, again demonstrating common correlates, but there also was specificity in that hostility had a direct effect only on depression symptoms. Also the indirect effects of parental support were mediated by different aspects of child temperament. That is, higher levels of parental support were related to higher levels of EC for both type of symptoms, but this increase in EC was only related to a decrease in anxiety symptoms, not depression ones.

Finally, some of the same aspects of child temperament were related to both types of symptoms, specifically, NA and SR, another example of common correlates. Specificity also was evident in that only child EC was related to anxiety symptoms, once again, highlighting the importance of EC in early-appearing anxiety symptoms.

Implications for Prevention and Treatment

The commonality of risk factors for both types of symptoms, as well as the specificity of some risk variables and pathways, also leads to suggestions for early intervention. First, these models suggest that strategies that focus on reducing parental depression symptoms and improving parenting are likely to be effective for reducing symptoms of both types of disorders. Moreover, developing parenting strategies designed to improve child EC are likely to be particularly effective in treating anxiety symptoms.

Second, the strength of the direct path from child EC to anxiety symptoms suggests that, in addition to parenting interventions, strategies targeted directly at increasing child EC may be effective in preventing or reducing symptoms of anxiety in young children. The preschool period is one in which there is rapid development of self-regulatory abilities; thus, this period may provide a window of opportunity for the treatment of anxiety by focusing on strategies to improve EC. Interventions for anxiety symptoms have largely focused on parenting strategies, so the present findings suggest a novel, potentially effective approach to early intervention for this disorder. Third, the finding that SR is related to both child depression and anxiety symptoms suggests that strategies designed to improve SR might be effective new avenues for intervention programs for children at risk for internalizing disorders.

Limitations

Longitudinal studies will be needed to explicate the putative causal links identified in this cross-sectional study. While we strove to include multiple-informants, common method variance (CMV) may have played a role in the results. Although some risk factors were assessed by independent observers, eliminating the effects of CMV is difficult in large-scale studies of preschoolers who are not developmentally capable of self-report and when practical considerations make obtaining teacher report difficult. Finally, while the present study attempted to reduce omitted variable effects, undoubtedly additional variables could be identified that would be included in the ideal model. Specifically, there is increasing evidence that caregiver anxiety is associated with anxiety symptoms in young children (Hudson, Dodd and Bovopoulos 2011); thus, including caregiver anxiety symptoms in the model in future research may shed light on a factor that is specific to child anxiety symptoms.

Conclusions

Despite these limitations, this multi-domain model demonstrates the complexities of risk factors/disorder relationships and informs the development of future longitudinal studies

of early risk factors. It also addresses issues of common pathways in the development of two internalizing child disorders, and helps to identify which risk factors and pathways may need to be addressed to treat these disorders.

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