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Parental Anxiety and Child Symptomatology: An Examination of Additive and Interactive Effects of Parent Psychopathology

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Abstract

The current study examined relations between parent anxiety and child anxiety, depression, and externalizing symptoms. In addition, the study tested the additive and interactive effects of parent anxiety with parent depression and externalizing symptoms in relation to child symptoms. Forty-eight parents with anxiety disorders and 49 parents without any psychiatric disorder participated with one of their children (ages 6 to 14 years; 46.4% male; 75.8% Caucasian). Parent anxiety was related to both child anxiety and depression, but not child externalizing symptoms. Hierarchical regression analyses showed that only parent externalizing symptoms had additive effects, beyond parent anxiety symptoms, in relation to child anxiety symptoms. Further, parent anxiety symptoms moderated the relationship between parent and child externalizing symptoms, such that the strength of this relationship was reduced in the presence of high levels of parent anxiety symptoms. Results of this study illuminate the role of parent comorbidity in understanding relations between parent and child symptoms.

Keywords

Parent psychopathology symptoms; Child anxiety; Child depression; Child externalizing

Introduction

A large body of work has demonstrated that parent anxiety disorders increase the risk for similar problems in children (e.g., Beidel and Turner 1997; Biederman et al. 2006; Merikangas et al. 1999; Merikangas et al. 1998). Although relations between parent and child anxiety have been well-established, relations between parent anxiety and other child problems, such as depression and externalizing symptoms, are less clear. According to the theoretical principle of multifinality (Cicchetti and Rogosch 1996), a single risk factor, such as parental anxiety, may predict a wide range of negative outcomes among children. In view

of this theory, it is of theoretical and empirical interest to examine relations between parent anxiety and a number of child problems.

Parent Anxiety and Child Anxiety, Depression, and Externalizing Problems

To date, several high-risk studies have examined whether children of parents with anxiety disorders are at greater risk for problems other than anxiety, such as depression and externalizing symptoms or disorders (e.g., Beidel and Turner 1997; Biederman et al. 1991; Merikangas et al. 1998, 1999; Silverman et al. 1988; Turner et al. 1987; Warner et al. 1995). Results from these studies have been mixed; some find that children are at increased risk for both internalizing and externalizing child problems (Biederman et al. 1991; Silverman et al. 1988; Turner et al. 1987), and others find that children are only at increased risk for anxiety (or at greater risk for anxiety relative to depression and/or externalizing problems) (Beidel and Turner 1997; Biederman et al. 2006; Merikangas et al. 1998, 1999).

Prior work has indicated that both biological/genetic (Gregory and Eley 2007) and environmental mechanisms (e.g., maternal anxious attachment perceptions; Costa and Weems 2005; maladaptive parenting practices; Wood et al. 2003; parental modeling of anxiety and avoidance; Fisak and Grills-Tauchel 2007), may account for the observed association between parent and child anxiety. Given that anxiety and depression problems are highly comorbid among adults (Kessler et al. 2005a) and research has increasingly found anxiety and externalizing disorders, such as antisocial personality disorder (ASPD), to covary (Goodwin and Hamilton 2003; Sareen et al. 2004), similar mechanisms may also be invoked to explain associations between parental anxiety and other child problems. For example, children of parents with both anxiety and depression (or externalizing) symptoms may be at increased risk for these symptoms due to a genetic predisposition for their expression (Hicks et al. 2004; Rice et al. 2002) as well as concomitant environmental factors that confer risk for these symptoms (Goodman and Gotlib 1999; Patterson and Capaldi 1991). Consideration of a variety of parent symptom types, then, may enable a better understanding of the relations between parent anxiety and child emotional and behavioral problems. Such a consideration may further provide evidence for the notion of multifinality.

Additive and Interactive Effects of Parent Comorbid Psychopathology

Over and above equivocal findings on the relations between parent anxiety and child depression or externalizing problems, high-risk studies often fail to account for the additive or interactive effect of other forms of parent psychopathology in relation to child problems. As indicated by the cumulative risk hypothesis, the greater the amount of adversity or risk to which a child is exposed, the greater the likelihood for poor outcomes. The cumulative risk hypothesis further posits that the effects of risk on child outcomes may operate in an additive (i.e., Sameroff 2000) or interactive fashion (i.e., Rutter 1979). Within the context of family aggregation studies, this hypothesis suggests that children exposed to greater (as opposed to fewer) types of parent psychopathology symptoms will be at increased risk for poor outcomes. In terms of additive effects, the biological/genetic and environmental risks of parent depression or externalizing symptoms that present *in addition to* parent anxiety symptoms may impact child symptoms in a cumulative linear manner (Sameroff 2000). With regard to interactive effects, the biological/genetic or environmental risks of parent comorbid symptoms *in combination with* parent anxiety symptoms may exceed the simple summative effect of each individual risk, thereby working in an interactive manner (Rutter 1979).

Though some high-risk studies have tested differences in rates of child internalizing and externalizing problems across parent groups characterized by anxiety versus another single psychiatric diagnosis (e.g., Merikangas et al. 1998; Sylvester et al. 1988; Turner et al. 1987),

far fewer studies have examined the additive effect of parent anxiety with other types of parent psychopathology on child problems. Of note, Beidel and Turner (1997) found that children of parents with comorbid anxiety and depressive disorders were at no greater risk for any psychological disorder relative to children of parents with either disorder in isolation. Likewise, Warner et al. (1995) found no differences in child psychological disorders when children of parents with panic disorder were compared to children of parents with both panic disorder and major depressive disorder. In contrast, Biederman et al. (2006) found that children of parents with both panic disorder and major depressive disorder were at greater risk for externalizing disorders, but not anxiety or depressive disorders, relative to children of parents with only panic disorder. Such inconsistency in results across studies may be a function of differences in the clinical characteristics of samples. In particular, whereas Beidel and Turner (1997) and Warner et al. (1995) obtained parents with psychiatric disorders from both clinical and community sources, Biederman and colleagues (2006) recruited parents exclusively from an outpatient clinic. Because adults who seek treatment tend to demonstrate more serious pathology than their non-treatment seeking counterparts (Kessler et al. 2005b), the related dysfunction among these parents may contribute to more severe problems among children, thereby augmenting the observation of significant additive effects of parent comorbid psychopathology.

Beyond yielding inconsistent results, current high-risk studies that have investigated the additive effects of different types of parent psychopathology on child outcomes demonstrate a number of limitations. First, no research to date has examined the additive effect of parent externalizing symptoms, above and beyond parent anxiety, in the prediction of child problems. Because prior work provides evidence for the association between parent externalizing and child internalizing problems, even after controlling for the independent effects of parent internalizing problems (Burststein et al. 2006; Marmorstein et al. 2004), and clinical research has found parent externalizing problems (i.e., hostility and paranoid ideation) to negatively influence child anxiety treatment outcomes (Berman et al. 2000), it may be important to also consider this symptom type when identifying potential pathways of risk to children.

Second, much of this research has employed a group comparison method in which differences between children are tested based on the diagnostic membership of their parents. However, comparisons based on parental diagnostic status may be confounded by demographic factors. In particular, studies that have employed a group comparison method have found parent diagnostic groups to differ in demographic and psychosocial characteristics other than parent clinical status (e.g. Beidel and Turner 1997; Biederman et al. 2006; Warner et al. 1995), and few studies have controlled for such differences. This lack of homogeneity across clinical groups may override the observation of differences that are due only to parent psychopathology. In addition, because most previous high-risk research has examined the impact of parent clinical *diagnoses* rather than *symptoms* on child problems,¹ differences in child problems that are due to variations in parent symptom levels may be obscured. Specifically, comparison of groups defined by clinical diagnosis may generate groups that are clinically different, but symptomatically and functionally similar, particularly when parent symptoms are high, but fail to reach a clinical threshold (see also MacCallum et al. 2002).

¹Notably, a number of studies involving community or clinically-referred youth have tested relations between parent psychopathology and child problems at the symptom rather than diagnostic level (e.g., Costa and Weems 2005; Costa et al. 2006). However, no studies of which we are aware have examined these relations in a high-risk design sample and none to our knowledge have examined the incremental contribution of different types of parent symptoms to relations between parent anxiety and child symptoms.

Finally, few high-risk studies (e.g., Beidel and Turner 1997; Biederman et al. 2006; Warner et al. 1995) have used a regression approach to test the additive effect of multiple types of parent psychopathology in the prediction of child problems, above and beyond that which is attributable to parent anxiety. Among the minority of studies that have examined relations using regression, often independent rather than additive effects are tested. That is, studies test the effects of parent comorbid psychopathology by employing binary variables in which parents with comorbid clinical problems are statistically compared to a normal reference group, rather than to parents with only one clinical problem. While this clarifies whether children of parents with more than one type of psychopathology are at significantly greater risk relative to children of parents without *any* psychopathology, this approach fails to directly test the independent and additive contribution of various types of parent clinical symptoms to child symptomatology.

Goals and Hypotheses of Present Study

Because both general population and clinically-referred samples tend to yield very low and high levels of problems, respectively, a limited range in the severity of problems observed may curtail the detection of viable risk factors. In contrast, high-risk design samples (i.e., samples including individuals who exhibit the presence and absence of a single risk factor) are generally heterogeneous with respect to psychological functioning; therefore, such samples often enhance the ability to identify risk factors that occasion poor outcomes (Chassin et al. 2002; Merikangas et al. 1999). Toward this end, the present study attempted to contribute to current understanding of relations between parent anxiety and several different child symptoms among children who exhibit varying degrees of risk for psychopathology. The study also aimed to expand present knowledge of the additive and interactive effects of parent psychopathology symptoms in relation to child symptoms in this group. To address these aims, three primary research questions were examined: (1) are parent anxiety symptoms significantly related to child anxiety, depression, and/or externalizing symptoms?; (2) above and beyond parent anxiety symptoms, do parent depression or externalizing symptoms contribute to child anxiety, depression, or externalizing symptoms?; and (3) do parent anxiety symptoms moderate the relationship between other parent symptoms and child symptoms?

Consistent with the theoretical principle of multifinality (Cicchetti and Rogosch 1996), we hypothesized that, in addition to child anxiety symptoms, parent anxiety symptoms would be related to child depression and externalizing symptoms. Although some prior work has failed to detect greater risk among children of parents with both anxiety and depressive disorders relative to children of parents with only anxiety disorders (Beidel and Turner 1997; Warner et al. 1995), the use of dichotomous rather than continuous variables may have limited the observation of significant additive effects. Further, no studies have tested the additive contribution of parent externalizing symptoms to relations between parent anxiety and child symptoms. Therefore, consistent with the notion of cumulative risk (Rutter 1979; Sameroff 2000), we also hypothesized that both parent depression and externalizing symptoms would show significant additive effects, above and beyond those attributable to parent anxiety symptoms, in relation to child anxiety, depression, and externalizing symptoms. Also consistent with this theory, we hypothesized that parent anxiety symptoms would moderate relations between other parent symptoms and child symptoms, such that the relationship between parent depression or externalizing symptoms and child symptoms would be magnified in the presence of high compared to low levels of parent anxiety symptoms.

Method

Participants

Participants included 97 parents and their children who took part in a high-risk study of outcomes among children of parents with an anxiety disorder (high-risk sample; $n=48$) vs. children of parents without any anxiety diagnosis (control sample; $n=49$) in Baltimore, Maryland. Among the 48 families with parents who had an anxiety disorder, 40 (83.3%) also took part in a subsequent intervention study aimed at preventing anxiety disorders in their children (Ginsburg 2009).² All 48 parents with an anxiety disorder had diagnoses that were primary and current: generalized anxiety disorder ($n=25$; 51%), social phobia ($n=10$; 20.4%), panic disorder with agoraphobia ($n=6$; 12.2%), panic disorder without agoraphobia ($n=4$; 8.1%), specific phobia ($n=2$; 4.1%), and obsessive-compulsive disorder ($n=1$; 2%). Of these 48 parents, approximately half (53.2%) were currently receiving outpatient psychiatric treatment for their anxiety disorder.

Inclusion and exclusion criteria for the initial high-risk/prevention study are described in more detail elsewhere (Ginsburg 2009). Briefly, families were included in the high-risk/prevention group if they fulfilled the following criteria: (a) parents had a child between the ages of 7 and 12 (however, the study included two children who were 6 and two children who were 13 to 14 years old); (b) the parent or child had no medical or psychiatric condition that might contraindicate the study intervention (e.g., suicidality, current substance use disorder); and (c) the child had no current anxiety disorder diagnosis and was not receiving psychological or pharmacological treatment for anxiety reduction. Families were included in the control group if: (a) parents had no current or lifetime diagnosis of an anxiety disorder or any current psychiatric condition (e.g., suicidality, current substance use disorder, mood disorder); and (b) children had no current or lifetime psychiatric diagnosis. Although children with lifetime or current psychiatric diagnoses were excluded from the high-risk/intervention study, for the current study, all children who completed an in-person evaluation were included, regardless of the presence of any psychiatric disorder.

A total of 51 high-risk families completed an in-person evaluation. One family was excluded because the parent met criteria for major depression and not anxiety as the primary disorder, and two families were excluded because neither parent met criteria for any anxiety disorder. Among the 48 parents who met criteria for a primary anxiety disorder, there were eight families in which the child met criteria for one or more psychiatric disorders³: generalized anxiety disorder ($n=5$; 10.2%), social phobia ($n=4$; 8.1%), separation anxiety disorder ($n=3$; 6.1%), specific phobia ($n=2$; 4.1%), and attention-deficit/hyperactivity disorder ($n=1$; 2.1%). Among these eight children, only one child (12.5%) was currently receiving treatment for their psychiatric disorder.

The 50 families recruited to serve as a control group also completed the same in-person evaluation. One family who was unable to complete a full assessment was excluded, yielding a control sample of 49 families. Among these 49 families, one child (2.0%) met criteria for enuresis. For both the high-risk/intervention study sample and the control sample, one child per family was randomly selected to participate when multiple children in the same family met inclusion criteria.

In the total sample, the 97 parent participants included 91 female parents (93.8%) and six male parents (6.2%)⁴ who ranged in age from 26 to 58 years ($M=40.43$; $SD=5.95$). The majority of parents were currently married ($n=78$; 80.4%) and had an annual household

²All analyses involved participant data from the baseline assessment before involvement in the preventive intervention study.

³Many children with a psychiatric disorder had more than one diagnosis. As such, frequency counts are not mutually exclusive.

income of \$80,000 or higher ($n=57$; 58.8%). The 97 child participants were 46.4% male ($n=45$) and ranged in age between 6 and 14 years ($M=9.11$; $SD=1.69$). Children were primarily of Caucasian ethnicity ($n=74$; 76.3%), followed by African American ($n=15$; 15.5%), Asian ($n=5$; 5.2%), and other ($n=3$; 3.1%).

Procedure

Parents with anxiety disorders were recruited from the city of Baltimore and surrounding areas through advertisements in local papers, mailings to local physicians and psychiatrists, and community flyers to participate in a study examining the impact of an anxiety prevention program on their offspring (Ginsburg 2009). Parents without any psychiatric diagnosis were recruited as healthy controls and responded to flyers describing a study of stress and coping in families. All families who contacted the project responded to a series of questions designed to identify eligible families prior to the full assessment battery. Families identified as eligible were scheduled for an in-person evaluation, during which all measures for the present study were collected. All participants gave informed written consent to the study procedures prior to completing the evaluation.

Diagnoses among parents and children were determined using the Anxiety Disorders Interview Schedule: Lifetime Version (ADIS; Brown et al. 1994) and the Anxiety Disorders Interview Schedule: Child Version (ADIS-C; Silverman and Albano 1996), respectively. Trained masters and doctoral level clinicians conducted ADIS interviews with the primary caretaker and ADIS-C interviews with the primary caretaker and child. The primary caretaker was the only parent assessed via a structured interview (in both the high-risk and control sample) in order to simultaneously reduce assessment burden and obtain data on the parent that interacted most with the child.

Measures

Parent Psychopathology Symptoms—Parents completed the Brief Symptom Inventory (BSI; Derogatis 1993), a 53-item self-report measure of parent symptomatology. Items are measured on a 5-point Likert scale, with responses ranging from 0 (*not at all*) to 4 (*extremely*), and scale scores are calculated by taking the mean item rating. In the present study, six BSI scales were used: Anxiety, Phobic Anxiety, Obsessive Compulsive, Depression, Hostility, and Paranoid Ideation. The Anxiety scale concerns cognitive and somatic aspects of anxiety, including feelings of terror, panic attacks, nervousness, and tension. For the present sample, the mean Anxiety scale score was 0.57 ($SD=0.66$). The Phobic Anxiety scale ($M=0.19$; $SD=0.43$) involves avoidance and escape behavior typical of agoraphobia. The Obsessive Compulsive scale ($M=0.84$; $SD=0.68$) includes symptoms characteristic of obsessive-compulsive disorder, including thoughts, impulses, and actions that are perceived as intrusive. The Depression scale ($M=0.39$; $SD=0.62$) includes the affective problems of clinical depression, such as dysphoria and suicidal ideation. The Hostility scale ($M=0.47$; $SD=0.54$) includes thoughts, feelings, or actions that reflect anger and negative affectivity. The Paranoid Ideation scale ($M=0.38$; $SD=0.60$) indicates paranoid behavior, including hostility, suspiciousness, grandiosity, centrality, and content-congruent delusions. The BSI has shown adequate reliability (Derogatis 1993) and moderate to high convergent validity with similar constructs (Derogatis and Melisaratos 1983).

For the purposes of the present study, we created two composite variables by standardizing then averaging the scores obtained on the BSI subscales. The *Parent Anxiety* variable consisted of BSI Anxiety, Phobic Anxiety, and Obsessive Compulsive scores, and the *Parent*

⁴Hierarchical linear regressions were also conducted without male parents. Because results were similar, they are presented for the entire sample.

Externalizing variable consisted of BSI Hostility and Paranoid Ideation scores. The items of the composite parent anxiety and parent externalizing variables were each internally consistent ($\alpha = 0.92$ and $\alpha = 0.89$, respectively). The Paranoid Ideation scale was included as a measure of parent externalizing symptoms because of its relations with externalizing problems such as aggressive behavior (Berman et al. 1998). Further, the BSI Hostility and Paranoid Ideation scales have been found to correlate highly with other measures of externalizing psychopathology in adults (Achenbach and Rescorla 2001). The *Parent Depression* variable consisted of scores on the BSI Depression scale ($\alpha = 0.89$).

Child Anxiety Symptoms—Parents and children completed the Screen for Child Anxiety-Related Emotional Disorders—Parent and Child Versions (SCARED; Birmaher et al. 1997). The SCARED is a 41-item measure of child anxiety in which items are assessed on a 3-point scale, with responses ranging from 0 (*not true or hardly ever true*) to 2 (*very true or often true*). The SCARED Total score is calculated by taking the sum of all 41 items and was used as a measure of child anxiety symptoms in the present study. For the current sample, parent and child mean SCARED scores were 13.59 ($SD = 11.54$) and 22.61 ($SD = 13.19$), respectively. These measures showed high internal consistency (parent: $\alpha = 0.93$; child: $\alpha = 0.92$). The SCARED has shown excellent reliability and discriminant validity, differentiating well between clinically anxious and non-anxious psychiatrically-ill youth (Birmaher et al. 1997).

Because both parent and child reports of symptoms can provide important information on child functioning (Achenbach 1998) and employing data from each source reduces the likelihood of a shared method effect, a composite *Child Anxiety* variable was created by standardizing then averaging parent and child reports on the SCARED Total subscale. Parent and child items comprising the variable were internally consistent ($\alpha = 0.93$).

Child Depression Symptoms—Parents completed the Child Behavior Checklist for Ages 6–18 (CBCL/6–18; Achenbach and Rescorla 2001) which obtains ratings of 20 competence items, 118 specific behavioral/emotional items, and 2 open-ended items. The CBCL can be scored for a number of *DSM*-oriented scales derived from the CBCL syndrome items. The Affective Problems scale ($\alpha = 0.82$) was used as a measure of child depression symptoms in the present study. The scale consists of 13 items which are consistent with *DSM-IV* diagnoses of dysthymia and major depressive disorder (e.g., “there is very little he/she enjoys”, “unhappy, sad, or depressed”, and “feels worthless or inferior”). The response items for the problem scales range from 0 (*not true*) to 2 (*very true or often true*) and scores are generated by taking the sum of all 13 items. In the current sample, the mean Affective Problems score was 1.55 ($SD = 1.72$). The Affective Problems scale has shown excellent reliability and correlates highly with other measures of child depression (Achenbach and Rescorla 2001).

Children also completed the Children’s Depression Inventory—Short Form (CDI-S; Kovacs 1992), a 10-item self-report questionnaire that assesses symptoms of depression in children. For each item on the CDI ($\alpha = 0.70$), children select one of three responses that best describes how they have been feeling during the past two weeks (e.g., “I am sad once in a while/I am sad many times/I am sad all the time”), which are scored on a 3-point scale from 0 (*symptom is absent*) to 2 (*definite symptom*). Scores are calculated by taking the sum of all 10 items. In the current sample, the mean CDI score was 1.67 ($SD = 2.17$). The CDI-S has displayed good reliability and concurrent validity with the full scale version, which differentiates well between depressed and non-depressed children (Kovacs 1992).

A composite *Child Depression* variable was created by standardizing then averaging parent and child reports on the CBCL Affective Problems scale and the CDI, respectively. Parent and child items comprising the variable showed adequate internal consistency ($\alpha=0.64$).

Child Externalizing Symptoms—For the current analyses, we used the CBCL broad-band Externalizing ($\alpha=0.82$) syndrome scale scores as a *Child Externalizing* variable. The Externalizing syndrome scale consists of 35 items (e.g., “breaks rules at home, school, or elsewhere”, “argues a lot”, and “lying or cheating”) that assess child behavior problems. The scale is derived from the sum of the Aggressive Behavior and Rule Breaking Behavior syndrome scores. In the present sample, the mean Externalizing scale score was 4.14 ($SD=4.41$). All CBCL syndrome scales have displayed excellent psychometric properties (Achenbach and Rescorla 2001).

Results

Preliminary Analyses

Missing Data—Participants who completed at least 80% of an instrument were retained in all analyses and missing items were mean-substituted within each subsample. At the variable level, a minority of the data were missing (i.e., $n=3$; 3.1%) on one or more variables because measures were not completed by participants during the initial assessment. Cases missing data for any variable in an analysis were excluded from that analysis.

Outliers—Regression diagnostic indices of center leverage value (Neter et al. 1989), Mahalanobis' distance (Stevens 1984), and DFFITS and Cook's distance (Cook 1977) were used as indications of outlier or influential data. One case from the high-risk sample was identified as an outlier and was excluded from all analyses ($n=96$).

Parent and Child Symptom Variables Across Groups—Ranges, skewness, means, and standard deviations for all parent and child symptom variables are presented for the total sample and by sample group (i.e., high-risk sample vs. control sample) in Table 1. Levene's test for equality of variances was used to examine the equality of symptom variable variances across groups. As was expected due to the nature of these samples, results indicated that the parent symptom variables were heterogeneous across groups (all $ps < 0.001$), with greater variability in the high-risk vs. control sample, whereas all child symptom variables with the exception of *Child Anxiety* displayed more homogeneity across groups. Mean scores were compared using the one-way analysis of variance Welch procedure to address the heterogeneity of variance observed in variables (Kohr and Games 1974). As is shown, parents in the high-risk sample obtained higher mean scores than did parents in the control sample on *Parent Anxiety*, *Parent Depression*, and *Parent Externalizing* (all $ps < 0.001$). Likewise, children in the high-risk sample obtained higher mean scores than did children in the control sample on *Child Anxiety*, *Child Depression*, and *Child Externalizing* ($p < 0.05$ to $p < 0.001$).

Statistical Assumptions—The skewness and kurtosis statistics for all variables were within appropriate limits (<2 for skewness, <7 for kurtosis; West et al. 1995), with the exception of *Parent Depression* (skewness: 2.24) and *Parent Externalizing* (skewness: 2.10). Log transformations were used to induce normality. However, because results were consistent with and without data transformations, final results are presented using the untransformed data to enhance interpretation. Appropriate tolerance statistics were observed within each regression, indicating that multi-collinearity among independent variables was low.

Examining Confounding Variables—There were no significant differences between children in the high-risk vs. control sample in the following demographic factors: parent income, parent age, child age, or child gender. However, there were significantly fewer African American relative to Caucasian children who had parents with an anxiety disorder (i.e., 2.1% African American children vs. 42.6% Caucasian children; $\chi^2[3]=12.41$, $p<0.05$). Given this observed difference, we tested whether child ethnicity or the interaction of parent anxiety with child ethnicity significantly predicted child symptoms. Because no main or interaction effects were significant for any child variable (all $ps>0.05$), child ethnicity was not included in the present analyses.

We also tested whether sample group (high-risk vs. control) moderated relations between parent and child symptom variables in all regression models we tested. No interactions were significant (all $ps>0.05$), indicating that sample group did not moderate observed relations between parent and child symptoms, nor did it moderate interactions of parent symptom variables in relation to child symptoms.

Correlations Among Parent and Child Symptoms

In order to determine whether parent anxiety symptoms were significantly related to child anxiety, depression, and externalizing symptoms, we examined correlations between *Parent Anxiety* and the three child variables (*Child Anxiety*, *Child Depression*, and *Child Externalizing*).

The correlations among all parent and child symptom variables are presented in Table 2. As is shown, all parent symptom variables were highly and significantly correlated with one another ($rs=0.67$ to 0.72 , $ps<0.01$) and all child symptom variables were significantly correlated with one another ($rs=0.29$ to 0.50 , $ps<0.01$), however to a lesser degree. Consistent with our hypotheses, *Parent Anxiety* was significantly related to both *Child Anxiety* and *Child Depression* ($r=0.40$ and $r=0.28$, $ps<0.01$, respectively). However, *Parent Anxiety* was not significantly related to *Child Externalizing* ($r=0.10$, $p>0.05$). For this reason, only *Child Anxiety* and *Child Depression* were retained as outcome variables in our examination of the additive effects of parent symptoms on relations between parent anxiety and child symptoms. In consideration of the possibility that parent anxiety interacted with other parent symptoms in relation to child externalizing symptoms, *Child Externalizing* was re-introduced as an outcome variable when we tested interactive effects.

Multivariate Analyses

A series of 4 Hierarchical Linear Regression (HLR) models were tested in order to determine whether parent depression or externalizing symptoms significantly predicted child symptoms, above and beyond parent anxiety symptoms. *Parent Anxiety* was entered in Step 1, followed by either *Parent Depression* or *Parent Externalizing* in Step 2. In addition to examination of the standardized regression coefficient, the significance of the change in R^2 served as an index of the significant additive effects of each parent symptom domain on relations between parent anxiety and child symptoms (Howell 2002).

To examine the possible interactive effects of parent psychopathology symptoms in relation to child symptoms, a second series of 6 linear regression models were tested. All parent symptom variables were centered prior to calculation of interaction terms and only centered variables were included in regression models. Due to limited power and the likelihood of unstable estimates (Aiken and West 1991), we did not examine the 3-way interaction (*Parent Anxiety*×*Parent Depression*×*Parent Externalizing*) as a predictor of child symptoms. Further, 2-way interactions were examined one at a time to reduce the likelihood of multicollinearity among variables. In these models, the lower-order main effects of the

parent psychopathology variables (*Parent Anxiety* and *Parent Depression* or *Parent Anxiety* and *Parent Externalizing*) and one of the corresponding 2-way interactions (*Parent Anxiety*×*Parent Depression* or *Parent Anxiety* × *Parent Externalizing*) was entered into the regression. As suggested by Aiken and West (1991), significant interactions were probed post-hoc by plotting and testing the simple slope of the child symptom variable regressed on the parent symptom variable at 1.0 *SD* above and 1.0 *SD* below the mean of *Parent Anxiety*.

Additive Effects for Child Anxiety and Child Depression—Results of the HLR models testing additive effects are displayed in Table 3. As is shown, when the additive effects of *Parent Depression* were tested for *Child Anxiety*, *Parent Depression* did not significantly improve the prediction of *Child Anxiety* ($\Delta R^2=0.008$, $p>0.05$), beyond the effects of *Parent Anxiety*. However, when the additive effects of *Parent Externalizing* were tested, *Parent Externalizing* significantly improved the prediction of *Child Anxiety* ($\Delta R^2=0.036$, $p<0.05$), beyond the effects of *Parent Anxiety*.

When the additive effects of *Parent Depression* were tested for *Child Depression*, *Parent Depression* did not significantly improve the prediction of *Child Depression* ($\Delta R^2=0.021$, $p>0.05$), after controlling for the effects of *Parent Anxiety*. Likewise, when the additive effects of *Parent Externalizing* were tested for *Child Depression*, *Parent Externalizing* did not significantly improve the prediction of *Child Depression* ($\Delta R^2=0.018$, $p>0.05$), after controlling for the effects of *Parent Anxiety*.

Therefore, only *Parent Externalizing*, not *Parent Depression*, had significant additive effects on *Child Anxiety*, above and beyond the effects of *Parent Anxiety*. However, neither *Parent Depression* nor *Parent Externalizing* had significant additive effects in the prediction of *Child Depression*, above and beyond the effects of *Parent Anxiety*.

Interactive Effects for Child Anxiety, Depression, and Externalizing—Results of the linear regression models testing interactive effects are displayed in Table 4. As is shown, the *Parent Anxiety*×*Parent Depression* interaction did not significantly predict *Child Anxiety*, *Child Depression*, or *Child Externalizing*. Similarly, the *Parent Anxiety* × *Parent Externalizing* interaction did not significantly predict *Child Anxiety* or *Child Depression*. However, the *Parent Anxiety* × *Parent Externalizing* interaction significantly predicted *Child Externalizing*, demonstrating that the magnitude of the relation between parent and child externalizing symptoms depends on the level of parent anxiety symptoms. Figure 1 illustrates the simple effect (regression line) at +1.0 *SD*, the mean, and −1.0 *SD* of *Parent Anxiety*. At low and moderate levels of *Parent Anxiety* (1.0 *SD* below the mean and at the mean), *Parent Externalizing* was strongly and positively related to *Child Externalizing* ($\beta=0.89$ and $\beta=0.64$, respectively; both $ps<0.001$); at high levels of *Parent Anxiety* (1.0 *SD* above the mean), *Parent Externalizing* was also significantly related to *Child Externalizing* ($\beta=0.38$; $p<0.01$), but to a lesser degree. Therefore, although the relationship between parent and child externalizing symptoms remained significant across all levels of *Parent Anxiety*, this relationship was weakest at high levels of *Parent Anxiety*.

Discussion

The current study sought to advance previous work by examining relations between parent anxiety and several different child symptoms in a sample including children at risk for psychopathology due to parent anxiety disorders. The study further tested the possible additive effects of parent depression or externalizing symptoms on extant relations between parent anxiety and child symptoms. Finally, the study considered whether relations between parent and child symptoms were moderated by levels of parent anxiety symptoms.

Consistent with our expectations, results provided partial support for the notion of multifinality (Cicchetti and Rogosch 1996). As hypothesized, we found that parent anxiety symptoms were significantly related to both child anxiety and depression symptoms, indicating that one risk factor may predict more than one problem. These results are consistent with several previous studies that have found parent anxiety to predict both child anxiety and depression problems (e.g., Biederman et al. 1991; Turner et al. 1987), however they counter some prior work that has found parent anxiety to only (or more strongly) predict child anxiety (Beidel and Turner 1997; Biederman et al. 2006; Merikangas et al. 1998, 1999). Such inconsistency in results across studies may be a function of differences in their statistical methodology. In particular, studies that have found parent anxiety to predict only child anxiety (e.g., Merikangas et al. 1998, 1999) have controlled for other forms of comorbid parent psychopathology (i.e., parent depression and/or ASPD) in analyses, whereas studies that have found parent anxiety to predict both child anxiety and depression have not. Therefore, our observation of significant relations between parent anxiety and child depression symptoms may be due in part to the additional risk of concomitant depression or externalizing symptoms among parents. Providing support for this idea, although bivariate correlations indicated that parent anxiety symptoms were significantly related to child depression symptoms, regression models indicated that parent anxiety symptoms were no longer associated with child depression symptoms when either parent depression or externalizing symptoms were included in the models we tested. As such, it is possible that the observed relation between parent anxiety symptoms and child depression symptoms would be absent if other parent symptoms were controlled. Therefore, our findings may be representative of the genuine co-occurrence of these symptom types among both parents and children. Alternatively, our use of continuous rather than dichotomous measures of parent and child psychopathology may have optimized the detection of significant relations between parent and child symptom variables. Future work investigating this research question that utilizes symptom measures of parent and child psychopathology will be helpful in providing further support for this finding.

Although we found that parent anxiety symptoms were significantly related to both child anxiety and depression symptoms, counter to our predictions, parent anxiety symptoms were not significantly related to child externalizing symptoms. Whereas these results differ from previous work that has found parent anxiety problems to place children at greater risk for both internalizing and externalizing problems (e.g., Biederman et al. 1991; Silverman et al. 1988; Turner et al. 1987), it is important to note that such studies have compared children of parents with anxiety disorders to children of parents without any psychopathology, rather than examining relations among variables. Therefore, when compared to children of healthy parents, greater dysfunction of any kind among children of parents with anxiety disorders may be expected. Indeed, our examination of differences in child symptoms by parent clinical status indicated that children of parents with anxiety disorders had higher mean levels of all types of symptomatology relative to children of parents with no psychiatric diagnosis.

In addition, in accordance with the notion of cumulative risk, we hypothesized that both parent depression and externalizing symptoms would significantly contribute to the prediction of child symptoms, beyond the contribution of parent anxiety symptoms. In support of this hypothesis, we found that parent externalizing symptoms had significant additive effects on child anxiety symptoms, even after accounting for the effects of parent anxiety symptoms. Although no previous research has directly tested this hypothesis, our results are consistent with other high-risk studies that have found parent externalizing problems to independently predict child internalizing problems (Burststein et al. 2006; Marmorstein et al. 2004), after controlling for the effects of other parent psychopathology.

Contrary to our expectations, parent depression symptoms had no significant additive effects on relations between parent anxiety and child anxiety or depression symptoms, after already accounting for parent anxiety symptoms. These results are in agreement with prior work that has found no significant differences in rates of anxiety and depression between children of parents with only anxiety disorders relative to children of parents with comorbid anxiety and depressive disorders (Beidel and Turner 1997; Warner et al. 1995). From a statistical standpoint, parent anxiety and depression symptoms may both significantly predict child symptoms, yet due to their high degree of covariation, parent depression symptoms may fail to predict unique variance in child symptoms when they are considered with parent anxiety symptoms. From a phenomenological perspective, it is possible that the psychosocial and environmental context that occasions parent depression symptoms poses no greater risk to children if they are already exposed to parent anxiety symptoms. For instance, separate lines of research have identified many of the same negative parenting behaviors (i.e., rejection, low warmth, control/intrusive behavior) as correlates of both parent depression (Goodman et al. 1994; Hammen 1991) and parent anxiety (Ginsburg and Schlossberg 2002; Wood et al. 2003). In contrast, parenting behaviors and interactional styles that may be more typical of parents with externalizing problems, such as hostile behavior and harsh discipline (Loney et al. 2007; Patterson et al. 1989) have previously been shown to predict child anxiety (Katz and Low 2004; Rodriguez 2003) and may confer additional distinct risks for child anxiety symptoms, even after accounting for the effects of parent anxiety symptoms. Therefore, children of parents who present with both anxiety and externalizing problems may be at greater risk for anxiety relative to children of parents who present only with anxiety problems. Future research that identifies the environmental processes that may be common and specific to each form of parent psychopathology will enable examination of this possibility.

Finally, though we hypothesized that relations between parent depression or externalizing symptoms and child symptoms would be stronger in the presence of high vs. low parent anxiety symptoms, only one interactive effect emerged. When the pattern of this interaction effect was examined, its direction was contrary to our expectations. Specifically, results indicated that at low and moderate levels of parent anxiety symptoms, the relationship between parent and child externalizing symptoms was strongly positive and significant, however at high levels of parent anxiety symptoms, the strength of this relationship was reduced. Thus, high levels of parent anxiety symptoms appear to attenuate the magnitude of the relationship between parent and child externalizing symptoms. In view of these findings, it is possible that parent anxiety symptoms increase parental conscientiousness and concern. In turn, these parental characteristics may offset negative parenting practices, such as poor monitoring and inconsistent discipline, which have been found to mediate the relationship between parent and child externalizing problems (Dogan et al. 2007). Additional studies that examine the associated mechanisms of this interaction pattern may provide evidence for this explanation.

The results of this study are not without several limitations. First, because these data are concurrent the direction of effects and causation cannot be definitively established. Although findings of this study are suggestive of possible risk pathways, it is equally plausible that child symptoms influence parent symptoms, or more likely, that these problems operate in a bi-directional fashion. It may also be that the relations between parent and child symptoms are due in part to their association with another psychosocial risk factor (e.g., parenting, family environment). Albeit preliminary, results of the current study are an important first step to advancing our knowledge of the relations between parent and child symptoms among children at greater risk for psychopathology. Future longitudinal studies that examine these and other risk factors will be helpful in refining our understanding of

how parent symptoms might influence environmental processes, and how these risks may operate over time.

Second, given that parents were the only informants of their psychological symptoms, the measurement of these variables is subject to the biases inherent to all self-report instruments. Similarly, because parents provided the only report of child externalizing symptoms, our findings for this variable remain vulnerable to the confound of informant. For example, it may be that, relative to parents who present only with externalizing symptoms, parents who present with both anxiety and externalizing symptoms understate externalizing symptoms in their children or are less aware of their presence. However, our use of child self-reports of their own symptoms of anxiety and depression both reduced the possibility of a shared method effect and decreased the likelihood that parents' own psychopathology influenced our estimation of child internalizing problems. In the future, it will be useful to supplement self-report data with observational and multi-informant data in order to enhance our measurement of parent and child symptomatology.

Third, a moderate sample size and limited power prohibited our examination of the 3-way interaction of parent psychopathology symptoms in relation to child symptoms. However, our sample size was appropriate to detect the main effects that were observed in the regression models we tested (Cohen 1992) and power analyses indicated that the current sample size had a power of 0.70 to detect the observed interaction effect. Studies that employ larger samples will be useful in examining higher-order interactions and providing further support for the current results. Finally, the results of this study may not generalize to clinical samples or to the general population. Future high-risk family studies will be useful in further exploring the additive and interactive effects of parent comorbid symptoms in relation to child symptoms.

Even with these limitations, the current study exhibits a number of strengths and has important implications for future clinical and theoretical models. The results of this study add to an increasing body of literature documenting the relationship between parent anxiety and several different child problems. It is also one of the few studies to directly examine the additive and interactive effects of multiple types of parent symptoms on relations between parent and child symptoms. Findings of this study suggest that parent anxiety problems may broadly confer risk for child emotional and behavioral symptoms. Further, results demonstrate that, beyond parent anxiety symptoms, parent externalizing symptoms significantly contribute to child anxiety symptoms. Although many high-risk and clinical studies focus on examining the relationship between parent anxiety and child anxiety (e.g., Biederman et al. 1991; Cobham et al. 1998; Kendall et al. 2008), results of this study suggest that it may also be important to consider parent externalizing symptoms (i.e., hostility and paranoid behavior) as they relate to child anxiety in research and treatment. Moreover, future studies that examine the additive risk and psychosocial sequelae of a variety of parent symptoms may be helpful in determining how to enhance the efficacy and cost-effectiveness of interventions with at risk youth.

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Fig. 1. Relationship between parent externalizing symptoms and child externalizing symptoms moderated by level of parent anxiety symptoms; High Parent Anx (+1.0 SD)=*Parent Anxiety* at +1.0 SD; Mean Parent Anx=*Parent Anxiety* at mean; Low Parent Anx (-1.0 SD)=*Parent Anxiety* at -1.0 SD; at -2 SD=two standard deviations below the mean for *Parent Externalizing*; at mean=at the mean of *Parent Externalizing*; at +2 SD=two standard deviations above the mean for *Parent Externalizing*

Table 1

Descriptive statistics of parent and child symptom variables across parent groups and for the total sample

Variable	High-Risk Sample (n=47)				Control Sample (n=49)				Total (n=96)			
	Range	Skew	M	SD	Range	Skew	M	SD	Range	Skew	M	SD
Parent Symptoms												
Parent Anxiety	-0.65-2.29	0.77	0.46**	0.77**	-0.81-0.49	1.80	-0.52	0.28	-0.81-2.29	1.40	-0.05	0.75
Parent Depression	0-3.33	1.50	0.71**	0.74**	0-1.33	3.40 ^a	0.11	0.26	0-3.33	2.24	0.40	0.62
Parent Externalizing	-0.72-3.25	1.33	0.34**	1.00**	-0.72-0.71	1.18	-0.40	0.33	-0.72-3.25	2.10	-0.04	0.82
Child Symptoms												
Child Anxiety	-1.64-2.56	0.33	0.39**	0.89*	-1.41-1.36	0.86	-0.36	0.63	-1.64-2.56	0.71	0.01	0.85
Child Depression	-0.83-2.34	0.81	0.19*	0.78	-0.90-1.77	1.24	-0.22	0.68	-0.90-2.34	0.98	-0.02	0.76
Child Externalizing	0-16.00	0.92	5.17*	4.49	0-21.00	2.28	3.13	4.14	0-21.00	1.44	4.14	4.41

* the difference in mean scores or variances (expressed as standard deviations) between the high-risk and control sample is significantly greater at $p < 0.05$;

** the difference in mean scores or variances (expressed as standard deviations) between the high-risk and control sample is significantly greater at $p < 0.001$;

^a high positive skewness was present for the *Parent Depression* variable due to a preponderance of zeros in the control sample (69.4%)

Table 2

Zero-Order Correlation Matrix of Parent and Child Symptoms

Variable	(2)	(3)	(4)	(5)	(6)
(1) Parent Anxiety	0.71 ** (94)	0.67 ** (94)	0.40 ** (94)	0.28 ** (94)	0.10 (92)
(2) Parent Depression	—	0.72 ** (94)	0.35 ** (94)	0.30 ** (94)	0.08 (92)
(3) Parent Externalizing		—	0.41 ** (94)	0.29 ** (94)	0.27 * (92)
(4) Child Anxiety			—	0.50 ** (96)	0.30 ** (93)
(5) Child Depression				—	0.29 ** (93)
(6) Child Externalizing					—

Pairwise ns are displayed below correlations;

* $p < 0.05$,** $p < 0.01$

Table 3

Hierarchical Linear Regression Analyses of the Additive Effects of Parent Symptoms as Predictors of Child Symptoms

Step and Predictor	Dependent Variable			
	Child Anxiety		Child Depression	
	β	ΔR^2	β	ΔR^2
Step 1		0.160 **		0.077 **
Parent Anxiety	0.401 **		0.278 **	
Step 2		0.008		0.021
Parent Anxiety	0.313 *		0.133	
Parent Depression	0.124		0.204	
Cumulative R^2		0.168 **		0.098 **
Step 1		0.160 **		0.077 **
Parent Anxiety	0.401 **		0.278 **	
Step 2		0.036 *		0.018
Parent Anxiety	0.227		0.154	
Parent Externalizing	0.258 *		0.184	
Cumulative R^2		0.197 **		0.096 *

β Standardized regression coefficient, ΔR^2 R-square change;

* $p < 0.05$;

** $p < 0.01$

Table 4
Linear Regression Analyses of the Interactive Effects of Parent Symptoms as Predictors of Child Symptoms

Predictor	Dependent Variable					
	Child Anxiety		Child Depression		Child Externalizing	
	β	ΔR^2	β	ΔR^2	β	ΔR^2
Parent Anxiety	0.312 *	0.168 **	0.136	0.100 *	0.082	0.029
Parent Depression	0.112		0.263		0.188	
PA $\times$ PD	0.016		-0.080		-0.214	
Parent Anxiety	0.247	0.205 **	0.161	0.097 *	-0.085	0.175 **
Parent Externalizing	0.339 *		0.211		0.636 **	
PA $\times$ PE	-0.133		-0.045		-0.438 **	

PA Parent Anxiety, PD Parent Depression, PE Parent Externalizing; β Standardized regression coefficient; ΔR^2 R-square change;

* $p < 0.05$;

** $p < 0.01$