Journal of Youth and Adolescence (2019) 48:1580–1591
https://doi.org/10.1007/s10964-019-01033-y

EMPIRICAL RESEARCH

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# Coping and Stress Reactivity as Moderators of Maternal Depressive Symptoms and Youth's Internalizing and Externalizing Symptoms

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Received: 5 March 2019 / Accepted: 30 April 2019 / Published online: 27 May 2019


## Abstract

Youth's responses to stress are a central feature of risk and resilience across development. The current study examined whether youth coping and stress reactivity moderate the association of current maternal depressive symptoms with youth's internalizing and externalizing symptoms. Mothers ($M_{age} = 41.58$, $SD = 6.18$) with a wide range of depressive symptoms and their children ages 9–15 ($M_{age} = 12.25$, $SD = 1.89$, 45.3% girls) completed measures of youth symptoms and coping and automatic responses to stress. Mothers also completed a self-report measure of depressive symptoms. Youth's primary and secondary control coping, stress reactivity, and involuntary disengagement moderated the association between current maternal depressive symptoms and youth symptoms. Maternal depressive symptoms were associated with youth's internalizing and externalizing symptoms when youth used low as opposed to high levels of primary and secondary control coping. Conversely, maternal depressive symptoms were associated with youth symptoms for youth with high levels of stress reactivity and involuntary disengagement. The findings suggest interventions focused on improving the use of primary and secondary control coping skills and reducing reactivity and involuntary disengagement to stress may benefit youth with mothers who are experiencing high levels of depressive symptoms.

**Keywords** Coping · Stress reactivity · Maternal depression

## Introduction

The association between maternal depressive symptoms and major depressive disorder with child and adolescent emotional and behavioral problems is well established (Goodman et al. 2011; National Research Council and Institute of Medicine 2009). Youth of depressed mothers have significantly higher rates of internalizing and externalizing problems as well as other social, emotional, and behavioral difficulties relative to children of non-depressed mothers (Goodman et al. 2011). Offspring of depressed mothers are approximately 4 times more likely to develop a depressive disorder than children of non-depressed mothers (Weissman et al. 2006), and adolescence is a particularly salient period of risk for many forms of psychopathology, as rates increase for depression, anxiety, substance use, and behavioral difficulties (Kessler et al. 2003). Thus, identifying protective factors for youth that guard against the harmful effects of maternal depression is an important focus for research, and how youth cope with and respond to family stress may be one potential protective factor.

There are a number of pathways through which risk associated with maternal depression is conferred from mothers to their children (Goodman and Gotlib 1999). Mothers with current depressive symptoms and diagnoses of major depressive disorder display higher levels of negative parenting behaviors, including increased parental hostility, inconsistent discipline, maternal negative affect, and decreased responsiveness to their children (Lovejoy et al. 2000). These impairments in parenting contribute to highly stressful environments for children in families of depressed mothers (e.g., Jaser et al. 2005), and maternal depression and associated levels of family stress subsequently increase children's risk for both internalizing and externalizing psychopathology (Jaser et al. 2008).

Importantly, two frequently used criteria for defining depression are interview-based clinical diagnosis of major

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depressive disorder and elevated scores on self-report measures. Both higher levels of depressive symptoms and a history of major depressive disorder are associated with children's internalizing and externalizing problems (Goodman et al. 2011). *Current maternal depressive symptoms* are an important proximal risk mechanism that has been shown to contribute to vulnerability in children of depressed mothers (Goodman et al. 2011). Thus, better understanding the association of maternal history of major depressive disorder and current levels of depressive symptoms with children's internalizing and externalizing problems by examining both self-report of current depressive symptoms and history of major depressive disorder will better elucidate the association between maternal depression and child functioning. In addition, it will support a better understanding of why some children of depressed mothers are resilient to the stressors in their environment and the mechanisms of such resilience.

The ways that youth respond to stress may reflect mechanisms that are sources of resilience against and vulnerability to the deleterious effects of maternal depression on youth's internalizing and externalizing problems. Two important ways that children and adolescents respond to stress are by employing controlled, conscious, volitional coping strategies and through involuntary, automatic processes of stress reactivity (Compas et al. 2017). Control-based models of stress and coping define coping as a set of "conscious and volitional efforts to regulate emotion, cognition, behavior, physiology, and the environment in response to stressful events or circumstances" (Compas et al. 2001, p. 89). This conceptual model separates coping into three factors of primary control coping (e.g., problem solving), secondary control coping (e.g., acceptance, cognitive reappraisal), and disengagement coping (e.g., avoidance, denial), and automatic responses to stress into two factors, involuntary engagement (e.g., emotional and physiological reactivity) and involuntary disengagement (e.g., escape, emotional numbing) (e.g., Wadsworth et al. 2016). This control-based model of coping and stress responses has been validated in children exposed to a variety of stressors (e.g., war-related trauma, chronic pain, family stress, economic hardship) and from diverse cultural backgrounds (e.g., Benson et al. 2011; Compas et al. 2006; Wadsworth and Compas 2002). The present study focuses on primary control coping and secondary control coping as possible sources of resilience, and disengagement coping, involuntary engagement (i.e., stress reactivity), and involuntary disengagement as possible sources of increased vulnerability to maternal depressive symptoms.

Substantial evidence indicates that controlled, volitional coping responses are linked to psychopathology in children and adolescents (Compas et al. 2017). Specifically, controlled processes reflect both cognitive and behavioral strategies that youth purposefully use to regulate their emotions and cope with stress. These responses occur in both stressful and emotionally arousing situations and are often more accessible to conscious awareness than non-conscious processes (Rabiner et al. 1990). In a recent meta-analytic review of 212 studies, Compas et al. (2017) reported that greater use of primary control coping and secondary control coping was related to lower levels of child and adolescent internalizing and externalizing psychopathology. In contrast greater use of disengagement coping was associated with higher levels of symptoms.

Conversely, heightened stress reactivity (e.g., physiological and emotional arousal in response to stress) is associated with increased risk for internalizing and externalizing problems. Automatic responses to stress (i.e., reactivity) may predispose youth to be more sensitive to stressful environments, including the stress associated with maternal depression (e.g., Wolff et al. 2009). Children and adolescents with heightened stress reactivity are hypervigilant to stressors in the environment, thereby increasing the risk of internalizing and externalizing problems (Obradovic 2012). Youth with elevated affective reactivity to stress are more likely to experience elevated levels of internalizing and externalizing symptoms in response to interpersonal stress and therefore may be more sensitive to the impact of maternal depression (Owens et al. 2018). Further, Foland-Ross et al. (2014) found that daughters of depressed mothers who reported more automatic stress responses exhibited higher elevations in diurnal cortisol, suggesting maternal depression increases risk for these stress reactivity responses.

Previous studies have explored the association of maternal depressive symptoms with child and adolescent emotional and behavioral problems as well as the association between youth's coping skills and emotional and behavioral problems. For example, Langrock et al. (2002) found that adolescents' use of primary control, secondary control and disengagement coping accounted for the association of parental withdrawal and intrusiveness with adolescents' internalizing and externalizing symptoms. Compas et al. (2010) found that improvements in parenting and children's use of secondary control coping mediated the effects of a family group cognitive behavioral preventive intervention for families of parents with a history of depression on child internalizing and externalizing symptoms. While these findings suggest that coping can function as a mechanism through which stress affects psychopathology, children's coping skills can also be conceptualized as a moderator (i.e., a risk or protective factor) that increases or decreases the likelihood that stress will be associated with psychopathology. This approach theorizes maternal depressive symptoms and adolescent internalizing and externalizing symptoms are associated for individuals who fail to use adaptive coping techniques or who rely on maladaptive or ineffective coping techniques; conversely, the association between maternal depressive symptoms and

adolescents' symptoms is attenuated for youth who use more adaptive forms of coping. For example, research has shown that coping moderates the association between sociotropy and distress in young adults (Connor-Smith and Compas 2002) and between economic strain and depression in adults (Wadsworth et al. 2005). However, no studies have examined coping and automatic responses to stress as moderators of the association between maternal depressive symptoms and youth's internalizing and externalizing symptoms. Examining the associations among maternal depression, youth coping and stress reactivity, and youth internalizing and externalizing symptoms may provide a better understanding of the central features of risk and resilience. Specifically, understanding the ways in which adolescents respond to sources of stress may help explain individual differences in the effects of stress on youth psychopathology (Compas et al. 2017).

## Hypotheses

The current study first aimed to replicate previous studies by examining group differences on child internalizing and externalizing symptoms based on maternal depression history. It was hypothesized that youth of mothers with a history of depression would have more internalizing and externalizing symptoms compared to youth of never depressed mothers (Goodman et al. 2011). Second, it was expected that youth of mothers with a history of depression would report lower levels of primary control and secondary control coping and greater disengagement coping, stress reactivity, and involuntary disengagement (Foland-Ross et al. 2014). Third, because current maternal depressive symptoms are a part of adolescents' immediate, proximal environment, the association of maternal depression history with youth's internalizing and externalizing symptoms were hypothesized to be accounted for by current levels of maternal depressive symptoms. Finally, the primary aim of the current study was to examine the role of youth's coping and stress reactivity in the association between current maternal depressive symptoms and youth's internalizing and externalizing problems in a heterogenous sample of mothers with regard to current depressive symptoms. Primary control coping, secondary control coping, disengagement coping, and stress reactivity (i.e., involuntary engagement), and involuntary disengagement were expected to moderate relations between maternal depression and child psychopathology symptoms. Specifically, increased use of primary control coping and secondary control coping skills were hypothesized to diminish the association between maternal depressive symptoms and youth's internalizing and externalizing problems. In contrast, greater disengagement coping, stress reactivity, and involuntary engagement were expected to amplify relations between maternal depression and youth's internalizing and externalizing symptoms.

## Method

### Participants

The sample included 120 mothers and their children ages 9–15 years old ($M = 12.27$, $SD = 1.90$; 45% female) recruited from a metropolitan community in the Southeast United States. Families that did not have complete data for both the mother and child were excluded from the present analyses ($n = 3$). There were no differences between those with missing data and those with complete data on mother and child age, household income, maternal depressive symptoms, youth psychopathology symptoms, or youth coping. The final sample included 117 children (64 boys, 53 girls) between the ages of 9 and 15 ($M = 12.25$ years, $SD = 1.89$) and their mothers ($M$ age $= 41.58$ years, $SD = 6.18$). At the time of the study visit, 57 mothers had a history of major depressive disorder and 60 mothers had no current or past history of major depressive disorder. The sample was predominantly non-Hispanic or Latino (92% of mothers and 87.2% of children), and 67.5% of mothers and adolescents were White, 26.5% of mothers and 25.6% of adolescents were Black or African American, 2.6% of mothers and adolescents were Asian; the remainder reported "Other" or mixed racial/ethnic background. Mothers' level of education included 75% reporting earning at least a college degree. Annual family income ranged from less than $10,000 to more than $300,000, with a median income of $70,000.

### Procedure

Participants were invited to take part in a study designed to better understand how mothers and adolescents communicate about stress and emotions. Participants were recruited through a variety of sources, including emails to a university employee list serve, fliers placed in waiting rooms at private and public mental health clinics, and other university web-based methods of advertising research studies. Interested participants were screened via phone prior to enrolling for exclusion based on (a) maternal history of bipolar I, bipolar II disorder, or schizophrenia; (b) youth's history of schizophrenia; and (c) child currently meeting criteria for pervasive developmental disorder or an intellectual disability. The eldest eligible child and the mother were invited to the laboratory to participate in the clinical study assessment and asked to complete a battery of questionnaires through RedCap about stress, coping, and internalizing and externalizing symptoms (REDCap; Harris et al.

2009). During the lab visit, a diagnostic interview was administered to the mother to determine depression history.

The university's Institutional Review Board approved all procedures. Clinical psychology graduate students conducted all semi-structured interviews. Families were compensated for their participation.

## Measures

### Maternal depression diagnoses

Mothers' current and history of major depressive disorder was assessed with the Structured Clinical Interview for DSM (SCID; First et al. 2001) a semi-structured diagnostic interview based on DSM-IV criteria (American Psychiatric Association 1994). The SCID is widely used in clinical research and has been shown to capture reliable diagnoses of current and past major depressive disorder in adults (First et al. 2001).

### Current maternal depressive symptoms

Mothers completed the Beck Depression Inventory-II (BDI-II; Beck et al. 1996) to assess their current depressive symptoms in the past two weeks. The BDI-II is a widely used self-report checklist of current depressive symptoms and has been shown to yield adequate internal consistency and validity in distinguishing severity of major depressive disorder (Beck et al. 1996; Steer et al. 2001). Internal consistency in the current sample was $\alpha = 0.93$.

### Adolescent emotional and behavioral problems

Mothers completed the Child Behavioral Checklist (CBCL; Achenbach and Rescorla 2001) and children completed the Youth Self-Report (YSR; Achenbach and Rescorla 2001) to assess internalizing and externalizing problems in children and adolescents. The CBCL is a 118-item checklist of problem behaviors that mothers rate (0 = not true; 1 = somewhat or sometimes true; 2 = very true or often true) of their child in the past six months. Similarly, the YSR uses this same scale for children to report on their own symptoms. Reliability and validity of the CBCL and YSR are well established (Achenbach and Rescorla 2001). The internal consistencies for the current sample ranged from 0.85 to 0.94 for the scales used in this study. Children aged 9 and 10 years also completed the YSR to allow for complete data. The internal consistency for the YSR scales was high with this younger age group as well (all $\alpha = 0.80$–$0.96$).

### Adolescent coping and stress reactivity

Mothers and youth completed the Responses to Stress Questionnaire—Family Stress version (RSQ-FS; Wadsworth and Compas 2002) to assess adolescents' responses to stress, including both coping strategies and stress reactivity. The RSQ includes 12 items assessing stress associated with family stress and then includes 57 items measuring voluntary (coping) and involuntary (automatic) stress responses. This study focused on three coping scales: primary control coping, secondary control coping, and disengagement coping; and two automatic reactivity scales: involuntary engagement (i.e., stress reactivity) and involuntary disengagement. *Primary control coping* includes strategies that act to directly change the stressor or one's emotional response to the stressor (problem-solving, emotional expression, emotional modulation). *Secondary control coping* includes efforts intended to reduce stress and adapt to a stressor, rather than to directly act upon or change the stressor (acceptance, cognitive reappraisal, positive thinking, and distraction). *Disengagement coping* includes efforts to orient away from the source of stress or one's emotions (avoidance, denial, wishful thinking). *Stress reactivity* involves involuntary emotional, physiological, cognitive, and behavioral responses to stress (emotional arousal, physiological arousal, impulsive action, intrusive thoughts, and rumination). Previous studies have shown self-report stress reactivity, as measured on the RSQ, to positively correlate with heart rate reactivity (Dufton et al. 2011). *Involuntary disengagement* includes automatic responses to orient away from a stressor or one's reactions to a stressor (cognitive interference, escape, emotional numbing, and inaction). Internal consistencies were adequate for mother reports of all youth coping scales (all $\alpha = 0.83$–$0.89$) and youth self-reports (all $\alpha = 0.75$–$0.85$).

## Data Analytic Approach

To reduce the number of analyses and account for possible shared method variance, composite variables were created from mother and youth reports of internalizing and externalizing symptoms. Composites were created by converting mother and youth reports to standardized $z$ scores and calculating the mean of the $z$ scores for each variable. The CBCL and YSR internalizing ($r = 0.50$, $p < 0.01$) and externalizing ($r = 0.68$, $p < 0.01$) were significantly correlated at a level comparable to those reported in the standardization of the measure (Achenbach and Rescorla 2001). Similarly, composite variables were created from mother and youth reports on the RSQ family stress measure using the same method stated above. Mother and youth reports on the RSQ of primary control coping ($r = 0.19$ $p < 0.05$), secondary control coping ($r = 0.43$, $p < 0.01$), disengagement coping ($r = 0.23$, $p < 0.05$), involuntary engagement ($r = 0.25$, $p < 0.01$) and involuntary disengagement ($r = 0.24$, $p < 0.01$) were all positively correlated with each other. Due to the low to moderate levels of correspondence between mother and youth reports, all analyses were also run with mother and youth reports of coping separately. In order

to reduce the number of analyses, analyses using the composite variables are reported in the manuscript and tables, and supplementary analyses using separate mother and youth reports are included in footnotes.

Independent samples $t$ tests were conducted to test the hypotheses that maternal depression history would be associated with greater youth internalizing and externalizing symptoms, disengagement coping, stress reactivity, and involuntary disengagement and less youth primary control coping and secondary control coping using SPSS (25th edition). To evaluate whether youth's coping moderated the link between maternal depression and youth's internalizing and externalizing symptoms linear multiple regression analyses were conducted. To account for multiple analyses, Bonferroni corrections were applied to each of the 10 regression models ($\alpha = 0.05/10 = 0.005$) and to the four predictors within each model ($\alpha = 0.05/4 = 0.0125$). Maternal depression history (i.e., no history of depression vs. history of depression), current maternal depressive symptoms, the relevant coping term, and the interaction term were simultaneously entered. Child age and gender were not significantly associated with any variables of interest and thus were not included in the regression models ($r's = -0.10$ to 0.10, all $p's > 0.25$; $t(115) = -0.18$ to 1.7, all $p's > 0.08$). In order to probe the interaction terms, Model 1 of PROCESS macro for SPSS was used (Hayes 2013), which did not include maternal depression history. The current analyses were conducted with a 95% confidence interval and the number of bootstrap resamples was set to 5000. The macro estimates an Ordinary Least Squares regression, with each term yielding its own significance value and an $F$ value is provided to indicate whether the interaction significantly changes the amount of variance accounted for by the model (i.e., moderation occurred).

## Results

### Descriptive Statistics

Mean levels of maternal and youth's symptoms are presented in Table 1. The mean level of maternal symptoms of depression was in the minimal range ($M = 10.46$, $SD = 10.41$); 18 mothers (15.4%) reported symptoms in the moderate to severe range (scores ≥ 20; Beck et al., 1996). $T$ scores on the YSR/CBCL scale composites are provided as a normative reference point for this sample. Youth's mean levels of internalizing ($M = 52.12$, $SD = 8.97$) and externalizing ($M = 49.83$, $SD = 9.31$) symptoms were in the normative range; 4.3% percent of children were in the clinical range ($T > 70$, 98th percentile) on the YSR internalizing scale and on the YSR externalizing scale, 1% on the CBCL internalizing scale, and 3.4% on the CBCL externalizing scale.

Never depressed mothers and mothers with a history of major depressive disorder during the lifetime of their youth, as determined by the SCID, were compared on their current depressive symptoms, and youth coping, stress reactivity, and symptom scales (Table 1). Independent samples $t$-tests yielded significant effects for all comparisons and indicated that mothers with a history of depression had significantly higher rates of current depressive symptoms, as reported on the BDI-II than never depressed mothers $t(115) = 4.46$, $p < 0.01$. Offspring of mothers with a history of depression had more internalizing problems $t(115) = 2.69$, $p < 0.01$ and externalizing problems $t(115) = 2.61$, $p = 0.01$ than youth of never depressed mothers. Youth of mothers with a history of depression reported that they used less primary control coping $t(115) = -2.52$, $p < 0.05$ and secondary control coping $t(115) = -4.15$, $p < 0.01$ than adolescents of

**Table 1** Means, standard deviations, and between-group comparisons among key study variables

| Measure | Total sample ($N = 117$) | Mother never depressed ($N = 60$) | Mother history of depression ($N = 57$) |
|---|---|---|---|
| 1. Mother BDI-II | 10.46 (10.41) | 6.58 (7.60) | 14.54 (11.43)** |
| 2. Child internalizing problems | 52.12 (8.97) | 50.00 (8.01) | 54.34 (9.45)** |
| 3. Child externalizing problems | 49.83 (9.31) | 47.70 (7.79) | 52.08 (10.29)* |
| 4. Primary control coping | 0.19 (0.03) | 0.19 (0.03) | 0.18 (0.03)* |
| 5. Secondary control coping | 0.26 (0.04) | 0.27 (0.04) | 0.24 (0.05)*** |
| 6. Disengagement coping | 0.15 (0.03) | 0.14 (0.02) | 0.15 (0.03)* |
| 7. Stress reactivity | 0.23 (0.04) | 0.22 (0.03) | 0.24 (0.04)*** |
| 8. Involuntary disengagement | 0.17 (0.03) | 0.16 (0.02) | 0.18 (0.03)*** |

Means and standard deviations for children's internalizing and externalizing symptoms are reported as $T$ scores on the CBCL and YSR and raw composites of children's primary control coping, secondary control, coping, disengagement coping, and stress reactivity are reported (all analyses used $z$ scores of the composites)

*BDI-II* Beck Depression Inventory-II

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

never depressed mothers. However, after Bonferonni correction, the effect for youth primary control coping was no longer significant. In contrast, youth of mothers with a history of depression reported that they used more disengagement coping $t(115) = 2.15$, $p < 0.05$, more involuntary engagement $t(115) = 3.59$, $p < 0.01$, and more involuntary disengagement $t(115) = 3.78$, $p < 0.01$ than adolescents of never depressed mothers

## Moderation Analyses

To test the hypothesis that stress responses (i.e., coping and stress reactivity) would moderate the association between current maternal depressive symptoms and youth's internalizing and externalizing symptoms, 10 moderation models were tested in linear multiple regression analyses. In all of the models, maternal depression history and current depressive symptoms were included as predictors. Consistent with the third hypothesis, although maternal depression history was related to more internalizing and externalizing symptoms (see above), when current maternal depressive symptoms were included in the regression models, maternal depression history was no longer related to adolescent internalizing or externalizing symptoms.

In the models predicting youth's internalizing symptoms (Table 2), the association between mothers' current depressive symptoms and youth's internalizing problems was moderated by youth's use of primary control coping ($\beta = -0.27$, $p < 0.001$) and secondary control coping ($\beta = -0.18$, $p < 0.01$). Specifically, for youth with high levels of either primary control or secondary control coping, there was no association between maternal depressive symptoms and youth's internalizing symptoms ($\beta = 0.11$ and 0.07 respectively, $p > 0.30$). However, for youth low in either primary control or secondary control coping, there was a significant association between maternal depressive symptoms and internalizing symptoms ($\beta = 0.65$ and 0.43 respectively, $p < 0.001$) (Fig. 1). Youth stress reactivity ($\beta = 0.12$, $p < 0.05$) and involuntary disengagement ($\beta = 0.23$, $p < 0.001$) also moderated the link between mothers' current depressive symptoms and youth's internalizing symptoms. Specifically, for youth with higher levels of either stress reactivity or involuntary disengagement, there was a significant link between mothers' depressive symptoms and internalizing symptoms ($\beta = 0.41$ and 0.55, respectively, $p < 0.001$), whereas there was no significant association between mothers' depressive symptoms and internalizing symptoms for youth with low levels of stress reactivity or involuntary disengagement ($\beta = 0.17$ and 0.10, $p > 0.05$). Of note, the effect for stress reactivity was no longer significant after Bonferroni correction. Disengagement coping did not significantly moderate the association between maternal depressive symptoms and youth's internalizing problems ($\beta = 0.07$, $p = 0.66$) (Fig. 1).[1]

**Table 2** Regression analyses of maternal depressive symptoms and adolescent coping and stress reactivity predicting adolescent internalizing symptoms

| | $\beta$ | SE $b$ | $R^2$ | $sr^2$ |
|---|---|---|---|---|
| *Model 1F* (4, 112) = 25.31, $p < 0.001$ | | | 0.48*** | |
| Mother depression history | −0.02 | 0.15 | | 0.00 |
| Mother current BDI-II score | 0.38*** | 0.08 | | 0.18 |
| Primary control coping | −0.38*** | 0.07 | | 0.20 |
| Primary control x BDI-II | −0.27*** | 0.07 | | 0.11 |
| *Model 2F* (4, 112) = 35.49, $p < 0.001$ | | | 0.56*** | |
| Mother depression history | −0.07 | 0.14 | | 0.01 |
| Mother current BDI-II score | 0.27*** | 0.07 | | 0.11 |
| Secondary control coping | −0.53*** | 0.07 | | 0.33 |
| Secondary control x BDI-II | −0.20** | 0.07 | | 0.08 |
| *Model 3F* (4, 112) = 15.53, $p < 0.001$ | | | 0.36*** | |
| Mother depression history | 0.01 | 0.17 | | 0.00 |
| Mother current BDI-II score | 0.49*** | 0.08 | | 0.24 |
| Disengagement coping | 0.29*** | 0.08 | | 0.11 |
| Disengagement x BDI-II | 0.07 | 0.08 | | 0.01 |
| *Model 4F* (4, 112) = 33.37, $p < 0.001$ | | | 0.54*** | |
| Mother depression history | −0.06 | 0.14 | | 0.01 |
| Mother current BDI-II score | 0.31*** | 0.07 | | 0.14 |
| Stress reactivity | 0.51*** | 0.07 | | 0.29 |
| Stress reactivity x BDI-II | 0.15* | 0.07 | | 0.04 |
| *Model 5F* (4, 112) = 25.09, $p < 0.001$ | | | 0.47*** | |
| Mother depression history | −0.04 | 0.15 | | 0.00 |
| Mother current BDI-II score | 0.34*** | 0.08 | | 0.14 |
| Involuntary disengagement | 0.38*** | 0.08 | | 0.19 |
| Involuntary disengagement x BDI-II | 0.26** | 0.24 | | 0.10 |

$\beta$ standardized beta, *SE b* standard error of beta, *BDI-II* Beck Depression Inventory-II

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

A similar pattern was found for youth's externalizing symptoms (Table 3), with youth's use of secondary control coping skills moderating the link between mothers' current depressive symptoms and youth's externalizing symptoms ($\beta = -0.22$, $p < 0.01$). Specifically, mothers' depressive symptoms were significantly related to youth's externalizing symptoms for youth using low levels of secondary

[1] Mother-reports of youth primary control coping ($\beta = -0.15$, $p < 0.05$), secondary control coping ($\beta = -0.16$, $p < 0.05$), and stress reactivity ($\beta = 0.15$, $p < 0.05$) all significantly moderated the relationship between maternal depressive symptoms and youth's internalizing symptoms ($\beta = -0.30$ to 0.15, $ps < 0.01$). Youth-report of child primary control coping ($\beta = -0.31$, $p < 0.01$), secondary control coping ($\beta = -0.23$, $p < 0.01$), stress reactivity ($\beta = 0.15$, $p < 0.01$), and involuntary disengagement ($\beta = 0.28$, $p < 0.05$) all significantly moderated the relationship between maternal depressive symptoms and youth's internalizing symptoms. Neither mother reports of disengagement coping ($\beta = 0.08$, $p = 0.65$), involuntary disengagement coping ($\beta = 0.16$, $p = 0.13$) nor youth reports of disengagement coping ($\beta = 0.01$, $p = 0.96$) were significant moderators of the relationship between maternal depressive symptoms and youth's internalizing symptoms.

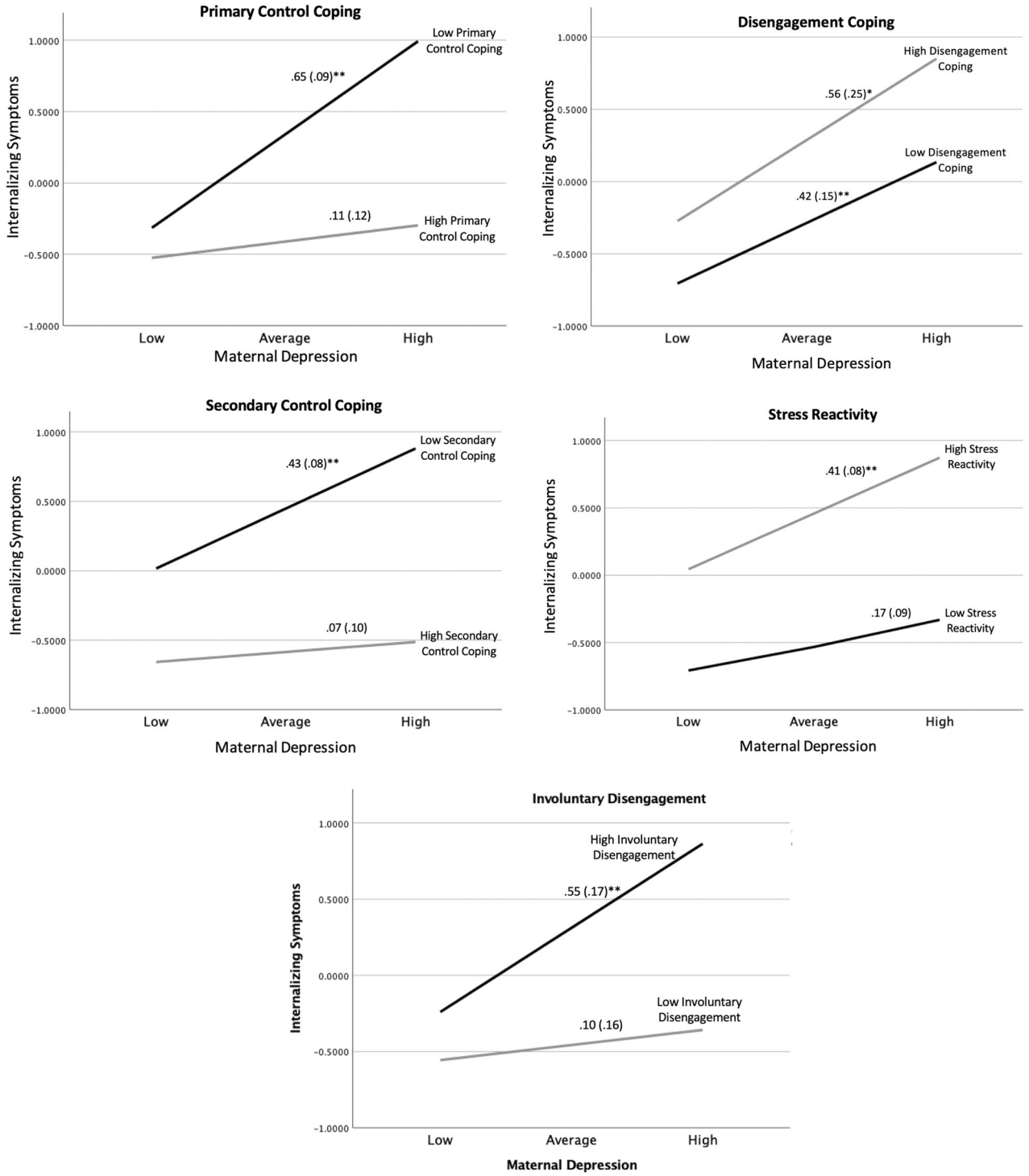


**Fig. 1** Moderation model interactions of maternal depressive symptoms and coping in predicting internalizing symptoms. Simple slopes at values 1 *SD* above the mean (high), and 1 *SD* below the mean (low) presented separately for all five types of coping. Values depicted are standardized regression coefficients (i.e., *β;* standard errors are in parentheses) (**$p < 0.001$)

control coping ($\beta = 0.41$, $p < 0.001$), but not for youth with high levels of secondary control coping skills ($\beta = -0.03$ $p = 0.76$) (Fig. 2). Youth stress reactivity moderated also moderated the link between mothers' current depressive symptoms and youth's externalizing symptoms ($\beta = 0.13$, $p < 0.05$). Specifically, mothers' depressive symptoms were significantly related to youth's externalizing symptoms for youth with high levels of stress reactivity ($\beta = 0.37$ $p < 0.01$), but not for youth with low levels ($\beta = 0.12$, $p = 0.27$). Youth disengagement coping significantly moderated the link

**Table 3** Regression analyses of maternal depressive symptoms and adolescent coping and stress reactivity predicting adolescent externalizing symptoms

| | $\beta$ | SE $b$ | $R^2$ | $sr^2$ |
|---|---|---|---|---|
| *Model 1F* (4, 112) = 11.86, $p < 0.001$ | | | 0.30** | |
| Mother depression history | 0.03 | 0.17 | | 0.00 |
| Mother BDI-II score | 0.34*** | 0.09 | | 0.15 |
| Primary control coping | −0.27** | 0.08 | | 0.09 |
| Primary control x BDI-II | −0.15 | 0.08 | | 0.03 |
| *Model 2F* (4, 112) = 23.06, $p < 0.001$ | | | 0.45** | |
| Mother depression history | −0.02 | 0.16 | | 0.00 |
| Mother BDI-II score | 0.20* | 0.08 | | 0.05 |
| Secondary control coping | −0.45*** | 0.08 | | 0.22 |
| Secondary control x BDI-II | −0.26** | 0.07 | | 0.10 |
| *Model 3F* (4, 112) = 9.45, $p < 0.001$ | | | 0.25** | |
| Mother depression history | 0.07 | 0.18 | | 0.01 |
| Mother BDI-II score | 0.39*** | 0.09 | | 0.15 |
| Disengagement coping | 0.16 | 0.08 | | 0.03 |
| Disengagement x BDI-II | 0.17* | 0.18 | | 0.03 |
| *Model 4F* (4, 112) = 19.13, $p < 0.001$ | | | 0.41** | |
| Mother depression history | −0.01 | 0.16 | | 0.00 |
| Mother BDI-II score | 0.25** | 0.08 | | 0.07 |
| Stress reactivity | 0.42*** | 0.08 | | 0.18 |
| Stress reactivity x BDI-II | 0.16* | 0.08 | | 0.04 |
| *Model 5F* (4, 112) = 15.22, $p < 0.001$ | | | 0.35** | |
| Mother depression history | −0.01 | 0.16 | | 0.00 |
| Mother BDI-II score | 0.29** | 0.08 | | 0.09 |
| Involuntary disengagement | 0.38*** | 0.08 | | 0.16 |
| Involuntary disengagement x BDI-II | 0.15 | 0.08 | | 0.03 |

$\beta$ standardized beta, *SE b* standard error of beta, *BDI-II* Beck Depression Inventory-II

$^{\dagger}p < 0.1$, $*p < 0.05$, $**p < 0.01$

between mothers' current depressive symptoms and youth's externalizing symptoms in the linear regression analyses ($\beta = 0.17$, $p = 0.05$), however this association was not significant upon further probing using PROCESS ($\beta = 0.17$, $p = 0.36$). Both youth stress reactivity and disengagement coping were no longer significant after Bonferroni correction. Similarly, primary control coping ($\beta = -0.15$, $p = 0.07$) and involuntary disengagement coping ($\beta = 0.15$, $p = 0.08$) were not a significant moderators of mothers' depressive symptoms and youth's externalizing symptoms (Fig. 2).[2]

[2] Mother-report of youth primary control coping ($\beta = -0.02$, $p = 0.78$) and stress reactivity ($\beta = 0.08$, $p = 0.28$) did not significantly predict the relationship between maternal depression and youth's externalizing problems. Mother-report of youth secondary control coping ($\beta = -0.19$, $p < 0.05$) did significantly moderate the relationship between maternal depression and youth's externalizing symptoms. Youth-report of child primary control coping ($\beta = -0.25$, $p < 0.01$), secondary control coping ($\beta = -0.28$, $p < 0.01$), and stress reactivity ($\beta = 0.19$, $p < 0.01$) all significantly moderated the relationship between maternal depression and youth's externalizing symptoms. Neither mother report of disengagement coping ($\beta = 0.18$, $p = 0.33$), involuntary disengagement coping ($\beta = 0.08$, $p = 0.62$) nor youth report of disengagement coping ($\beta = 0.08$, $p = 0.67$) or involuntary disengagement coping ($\beta = 0.19$, $p = 0.28$) were significant moderators of the relationship between maternal depressive symptoms and children's externalizing symptoms.

## Discussion

As the study of maternal depression and child behavioral and emotional problems has progressed, it has become increasingly important to examine specific mechanisms that may either increase risk or protect youth from the adverse effects of maternal depressive symptoms. Previous studies have focused on coping as a mediator of the association between stress related to maternal depressive symptoms and children's internalizing and externalizing symptoms, since it is a malleable target for interventions (e.g., Jaser et al. 2005). The goal of this study was to broaden the focus of this work and investigate youth coping and stress reactivity as possible moderators of the association between maternal depression and youth's internalizing and externalizing symptoms.

Linear regression models were used to explore the role of coping in the association between maternal depressive symptoms and youth's internalizing and externalizing symptoms. Although, there were significant group differences between mothers with a history of depression and never depressed mothers on all variables of interest, in each of the 10 linear regression analyses, maternal depression history was not a significant predictor of adolescent internalizing or externalizing symptoms when taking current maternal depressive symptoms into account. Thus, current maternal depressive symptoms accounted for variance above and beyond the effects of maternal depression history. This suggests that while depression history is related to child psychopathology symptoms, the association is better accounted for by *current* depressive symptoms. Further it suggests that at least for some outcomes, models may benefit from measuring depression as a continuous variable, including milder (i.e., subclinical) and more severe (i.e., clinical) forms of depression that might be associated with depression relative to clinically diagnosed depression. This is in line with recent research that suggests that at a given point in time, current maternal depressive symptoms contribute more to a child's current functioning than maternal depression severity and chronicity (O'Connor et al. 2017).

Analyses also investigated the hypothesis that coping strategies would either amplify or dampen the connection between maternal depression and youth's internalizing and externalizing symptoms. Primary and secondary control coping both served as protective factors, indicating a non-significant association between maternal depressive symptoms and youth's internalizing and externalizing symptoms for youth with high levels of either type of coping. The opposite was true for stress reactivity and involuntary disengagement, which served to amplify the association between maternal depression and child symptomatology. The moderation analyses were consistent with hypotheses, and suggest that the coping strategies implemented by youth as well as their levels of stress reactivity play a significant

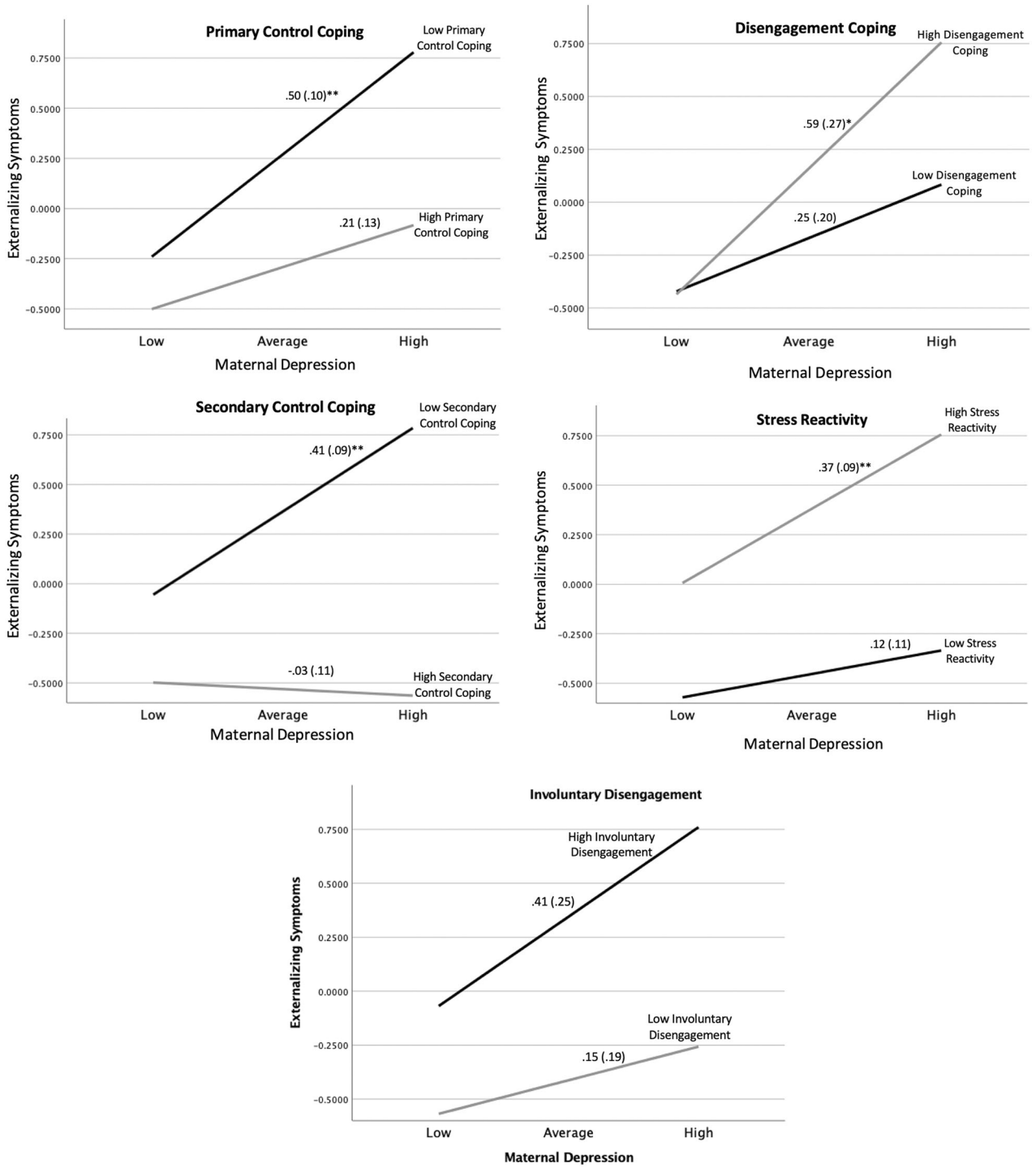


**Fig. 2** Moderation model interactions of maternal depressive symptoms and coping in predicting externalizing symptoms. Simple slopes at values 1 *SD* above the mean (high), and 1 *SD* below the mean (low) presented separately for all five types of coping. Values depicted are standardized regression coefficients (i.e., *β;* standard errors are in parentheses) (**$p < 0.001$)

role in determining levels of internalizing and externalizing symptoms. However, the findings for stress reactivity should be considered with caution, as these were on longer significant after Bonferroni correction. Disengagement coping did not significantly moderate the association between maternal depressive symptoms and youth psychopathology. It may be that coping with the stress of having a mother with depression by evading the stressor or engaging in wishful thinking is beneficial in the moment, but becomes maladaptive over time.

Interventions have been developed to reduce internalizing and externalizing symptoms and disorders in children who are exposed to high levels of parental depressive symptoms, and skills used to cope with and regulate emotions are one mechanism through which interventions effectively treat and prevent childhood disorders (Compas et al. 2010). However, additional mechanisms of risk and resilience in children of depressed parents warrant attention. Previous depression prevention studies have also examined parental depression diagnostic status as a moderator of intervention effects and have reported mixed findings. Garber et al. (2009) and Weersing et al. (2016) found parent depression status at baseline to moderate the positive effects of a cognitive behavioral prevention program such that the intervention was efficacious only for adolescents of parents not depressed at baseline. Conversely, Compas. et al. (2015), found no significant moderator effects for parental depression status in a family group cognitive behavioral preventive intervention. It is possible that this discrepancy may be the result of incorporating the teaching of secondary control coping skills to children by Compas. et al. (2015), whereas the Garber et al. (2009) intervention did not emphasize these skills to the same extent. Thus, the ability of children to cope in the face of a stressful family environment, and ongoing parental depressive symptoms may be a key factor in preventing the cascading effects of familial depression (see Compas et al. 2010).

Attention to stress reactivity also provides greater insight into risk factors and internalizing and externalizing symptoms in children of depressed parents. Specifically, youth with heightened stress reactivity have an increased risk for internalizing and externalizing problems. Thus, elevated stress reactivity may have the potential to amplify risk of psychopathology, while more modulated automatic responses to stress may buffer against negative outcomes (Obradovic 2012). Further examination of these physiological responses to stress may provide greater insight into the interactions between maternal depression and child symptoms. The current findings on the role of stress reactivity as a moderator of the association between maternal depressive symptoms and youth's internalizing and externalizing problems provide support for this as a direction for future research. However, as noted above, these findings should be considered with caution, as they were no longer significant after correcting for multiple analyses.

This study supports further investigation of the role coping and stress reactivity play in the association between maternal depression and child internalizing and externalizing symptoms, and presents with several strengths including the use of multi-informants and recruiting a heterogeneous sample in reference to current maternal depressive symptoms. However, it is important to address the limitations of this study. First, the study utilized a cross-sectional design in which direction of effects cannot be determined. Although unidirectional associations between maternal depressive symptoms and psychopathology symptoms in children were tested, current research has stressed the importance of examining child effects on maternal behavior and symptoms (Sun et al. 2016). Influence of proximal, child characteristics (e.g., internalizing and externalizing problems) on maternal depressive symptoms were not analyzed in this study but could provide a more accurate picture of the relationship between maternal depression and child adjustment. Future longitudinal studies should be conducted to better understand the associations between maternal depressive symptoms and child problems simultaneously in a path-analytic model. Second, although the sample had adequate representation of racial and ethnic minorities, it was limited in regard to the range of maternal education and income (i.e., the sample was primarily middle and upper socioeconomic statues). Third, information regarding the severity and chronicity of maternal history of depression was not collected. Recent research has reported that prior severity/chronicity of maternal depression predicted levels of youth internalizing and externalizing symptoms when controlling for current maternal depressive symptoms (O'Connor et al. 2017). Future studies should aim to screen and assess the nature of past maternal depressive episodes. Lastly, although detailed information was collected about maternal depression history, other types of maternal psychopathology (i.e., anxiety disorders) were not assessed and may have an effect on these processes.

## Conclusion

How children cope with and respond to stress have been identified as potential sources of risk and resilience in the development of internalizing and externalizing problems. While coping and stress reactivity have been examined as moderators in previous studies, this is the first study to directly examine coping and stress reactivity as moderators of the relationship between maternal depressive symptoms and youth's internalizing and externalizing symptoms in a heterogeneous sample of youth of mothers with and without a history of depression. The findings suggest that youth's use of primary and secondary control coping strategies may serve as protective factors against the effects of maternal depression, whereas stress reactivity may be a marker of risk. Thus, the findings provide potentially important implications for treatment and preventive interventions for youth and adolescents. Specifically, interventions may be most effective when they teach child coping skills (e.g., primary control coping, secondary control coping), indirectly affect reductions in stress reactivity, and target the impact of maternal depressive symptoms (e.g., parenting skills, depression treatment).

**Authors' Contributions** A.V. conducted all data analyses and was the lead author in writing the paper; A.H.B. collaborated with the writing of the manuscript; MR helped design and execute the study; J.P.D. helped design and execute the study; K.H.W. helped design and execute the study; M.A.G. helped design and execute the study; B.E.C. designed and executed the study, assisted with the data analyses and in the writing and editing of the study. All authors read and approved the final manuscript.

**Funding** This research was supported by a gift from Patricia and Rodes Hart and from an anonymous donor.

**Data Sharing and Declaration** This manuscript's data will not be deposited.

## Compliance with Ethical Standards

**Conflict of Interest** The authors declare that they have no conflict of interest.

**Ethical Approval** All procedures performed in studies involving human participants were in accordance with the ethical standards of the Vanderbilt University institutional review board and the national research committee and with the 1964 Helsinki declaration and its later amendments of comparable ethical standards.

**Informed Consent** Informed consent was obtained from all individual participants included in the study.



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