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Sex Differences in Associations between Early Adversity, Child Temperament, and Behavior Problems

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Abstract

Early adversity is associated with both internalizing and externalizing problems among children, and effects of adversity on dimensions of child temperament may underlie these links. However, very little is known about the role of child sex in these processes. The current study examined if there are indirect effects of early adversity on behavior problems through dimensions of child temperament and if these indirect effects vary across child sex. Participants in this multimethod (parent-report survey, semi-structured interview, child protection records) study included 274 preschool-aged children (M_{age} = 50.86 months; 52% with documented case of moderate-severe maltreatment) and their primary caregivers assessed at two time-points spaced 6 months apart. Results of multi-group path analyses revealed that while anger mediated associations between lifetime stress and behavior problems for the full sample, inhibitory control and appropriate attentional allocation were significant intermediary mechanisms of lifetime stress for boys, but not for girls. Inhibitory control mediated associations between maltreatment and behavior problems for the full sample, but appropriate attentional allocation mediated these associations for boys only. Results suggest that early adversity influences child behavior problems through child temperament, particularly for boys. This work supports the perspective that temperament is influenced by characteristics of the early rearing environment, and the indirect effects of adversity on behavior problems through temperament vary across sex.

Keywords

stress; maltreatment; temperament; behavior problems; preschool children

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Children who experience early life adversity are at increased risk for a myriad of psychological and emotional difficulties (see Jaffee, 2017 for a review). In particular, chronic stress (e.g., housing or income instability, separation or loss of caregiver, neighborhood violence, parental incarceration) and child maltreatment (i.e., abuse and neglect) are potent risk factors for internalizing and externalizing symptoms in early childhood (Cicchetti & Toth, 2016; Coe, Davies, Hentges, & Sturge-Apple, 2019). These findings are particularly troubling given the high prevalence of chronic stress and maltreatment experienced by young children. Nearly 700,000 children in the U.S. are reported victims of maltreatment each year, and this is likely an underestimate because as few as 5% of abuse cases are reported (Gilbert et al., 2009; U.S. Department of Health and Human Services, 2019). Additionally, approximately 54% of U.S. children do not live with both parents by age 17, more than 400,000 children spend time in foster care on any given day, and 44% of young children live in low-income or impoverished families (Anderson, 2014; U.S. Department of Health and Human Services, 2018). In light of the prevalence of early adversity and its potency as a risk factor for psychopathology, it is critical that research efforts shift toward understanding the mechanisms underlying this risk and identifying the conditions under which risk is highest.

There is mounting theoretical (Compas, Connor-Smith, & Jaser, 2004) and empirical (Lansford et al., 2006) support that individual difference factors play a critical role in the risk conferred by early adversity. Child temperament, reflecting stable individual differences in behavior (Shiner et al., 2012), may exacerbate adverse outcomes or support resilience in the face of adversity (Masten, Best, & Garmezy, 1990). For example, research guided by differential susceptibility theory has shown that children high in negative emotionality or temperamental irritability tend to be more sensitive to both positive and negative characteristics of their environment (e.g., Ellis, Boyce, Belsky, Bakermans-Kranenburg, & van IJzendoorn, 2011). Such effects may persist or cascade over time, particularly among those who experience adversity before age 5 (Shi, Bureau, Easterbrooks, Zhao, & Lyons-Ruth, 2012). Consequently, there is a need to better understand links between childhood adversity, temperament, and child adjustment early in development.

Child Temperament as a Mechanism of Risk

Temperament is conceptualized as the child's basic disposition related to attention, activity, affectivity, and self-regulation that is early emerging and the product of complex interactions among genetic, biological, and environmental factors over time (Shiner et al., 2012). In other words, there is now a general consensus amongst scholars that temperament is not only biologically driven, but in fact the result of biological and environmental factors working together. In particular, characteristics of the early caregiving environment have been shown to be salient predictors of changes in child temperament over time (Parade, Armstrong, Dickstein, & Seifer, 2018). Furthermore, although temperament is often examined as a moderator of associations between early adversity and psychopathology (Rende & Plomin, 1992; Schermerhorn et al., 2013), growing evidence suggests that aspects of temperament may be independently affected by environmental insult (Lemery-Chalfant, Kao, Swann, & Goldsmith, 2013). Indeed, a recent study by Pitzer and colleagues (2017) found that dimensions of temperament mediated, rather than moderated, links between parenting in

early childhood and behavior problems in preadolescence. This suggests that there is value in not only examining how temperament modifies children's vulnerability to early adversity but also how temperament may in fact be influenced by adversity.

Three primary dimensions of temperament that may be particularly malleable to early adversity include: (a) inhibitory control, (b) temperamental anger, and (c) appropriate attentional allocation. First, research has shown that children who experience adversity have greater inhibitory control problems (i.e., challenges withholding prepotent responses) and exhibit differences in brain activation in response to inhibitory control tasks (Fisher, Bruce, Abdullaev, Mannering, & Pears, 2011). Second, although few studies have explored the association between adversity and temperamental anger (i.e., the propensity toward negative affective responding in challenging situations) in young children, there is evidence for increased levels of trait anger in adolescents and adults with a history of childhood adversity (Kim et al., 2018; Springer, Sheridan, Kuo, & Carnes, 2007). Third, studies of the relationship between early adversity and attention (i.e., appropriate allocation [shifting, focusing] of attention) have largely focused on the effects of poverty and find that there are socioeconomic disparities in appropriate attentional allocation and other indices of attentional functioning (see Pietto, Kamienkowski, & Lipia, 2017 for a review).

Although alterations in these regulatory aspects of temperament may be adaptive in the short term (e.g., children raised in poverty may show less inhibitory control as a strategy to gain scarce or uncertain resources; Sturge-Apple et al., 2016), there may also be developmental tradeoffs in the form of increased risk for the development of psychopathology. Specifically, individual differences in these dimensions of temperament are consistently implicated in the etiology and trajectories of internalizing and externalizing behavior problems across childhood (see Sanson, Hemphill, & Smart, 2004 for a review). As a few examples: (a) poorer attentional control is linked to externalizing behavior problems (Eisenberg et al., 2000), (b) greater and more stable anger and frustration are associated with both internalizing and externalizing problems (Liu et al., 2018), and (c) poorer inhibitory control is associated with increased externalizing (Kahle, Utendale, Widaman, & Hastings, 2018) and internalizing behavior problems (Liu, Calkins, & Bell, 2018).

In spite of piecemeal support for each link in a mediational model involving early adversity, child temperament, and psychopathology, very few studies have explicitly examined temperament as a mediator. As one exception, Otten and colleagues (2019) found evidence for a developmental cascade that included stressful life events in early childhood, inhibitory control problems in middle childhood, and problem behavior in late childhood (Otten et al., 2019). Therefore, temperament may mediate associations between early life adversity and psychopathology, but this has not yet been tested in young children. Gaining a better understanding of associations between temperament and early adversity may help clarify the origins and trajectories of problem behavior. Thus, a primary aim of this study was to test if individual differences in dimensions of temperament (inhibitory control, anger, appropriate attentional allocation) mediate the association between early life adversity (lifetime stress, maltreatment) and child behavior problems (internalizing and externalizing problems).

Sex Differences in Indirect Pathways

Multiple theories propose sex differences in how individuals are influenced by characteristics of the early rearing environment (Del Giudice, Ellis, & Shirtcliff, 2011; Hankin & Abramson, 2001), but empirical findings are mixed. While some studies find links between adversity and psychological adjustment problems to be stronger for girls than boys (Alto, Handley, Rogosch, Cicchetti, & Toth, 2018; Fletcher, 2009), others find these associations are stronger for boys than girls (Garnefski & Diekstra, 1997; Martin, Bergen, Richardson, Roeger, & Allison, 2004), and still others find no significant sex differences (Pimlott-Kubiak & Cortina, 2003). One solution to provide clarity to inconsistencies in *direct* associations between early adversity and psychopathology is to gain a better understanding of how early adversity may differentially affect *intermediary processes*, such as temperament, in boys and girls. Alternatively, another approach is to explore if different types of adversity are detrimental to one, but not both of the sexes. There is some empirical evidence for this notion. For example, mother-child relationship quality uniquely explained the association between maltreatment and depressive symptoms in adolescent females only (Alto et al., 2018). In another study, exposure to violence was associated with a dysregulated stress response in boys, but not girls (Aiyer, Heinze, Miller, Stoddard, & Zimmerman, 2014). Taken together, it is possible that the risk associated with early adversity may operate through different mechanisms for girls (e.g., relational) versus boys (e.g., regulation). However, to our knowledge, no studies have tested whether child sex plays a role in understanding indirect effects of adversity on behavior problems through temperament.

Present Study

To our knowledge, the present study is the first to evaluate if child sex moderates the indirect effect of early adversity on behavior problems through temperament in early childhood. We utilized data from a sample of preschool-aged children (i.e., 3–5 years old) because: a) there is rapid growth in children's regulatory abilities (e.g., inhibitory control, anger regulation, attentional control) during the preschool and early childhood years (McClelland & Cameron, 2012; Utendale & Hastings, 2011), and (b) early childhood is a particularly sensitive period for detrimental and lasting effects of adversity (Fraley, Roisman, & Haltigan, 2013; Haltigan, Roisman, & Fraley, 2013). We hypothesized that child maltreatment and lifetime stress would be associated with lower inhibitory control, higher anger, and lower appropriate attentional allocation. In turn, these temperamental difficulties would predict increased internalizing and externalizing symptoms 6 months later.

Although there is a dearth of research examining sex differences in these indirect associations involving temperament, we propose some speculative hypotheses based on related literature. First, because young boys may be particularly sensitive to the detrimental influence of early adversity, especially in relation to the development of regulatory abilities (Hodes & Epperson, 2019; Rudolph & Flynn, 2007), we hypothesized that links between adversity and these dimensions of temperament may be stronger for boys than girls. However, given that prior studies have established temperament as a potent predictor of later behavior problems across sexes (Schmitz et al., 1999), we did not expect sex differences in links between temperament and internalizing or externalizing symptoms. Because chronic

stress and child maltreatment are overrepresented in impoverished families (Drake & Jonson-Reid, 2014), we conducted this research with a predominantly high-risk, low-SES sample of children and their primary caregivers. Approximately half of the families had at least one substantiated instance of moderate to severe maltreatment in the 6 months prior to study enrollment. As a result, it was possible to test if the moderated indirect effects were unique to specific types of early adversity (maltreatment or lifetime stress) or generalizable across forms of adversity.

Methods

Participants

Data for this study were drawn from a larger project examining the biopsychosocial consequences of child maltreatment. Participants included 274 children and their primary caregivers. Families were recruited from a pediatric medical clinic during a well-child visit, childcare centers, and the state's child protection agency. All families consented to examination of child welfare records to determine child maltreatment status. For the purposes of the primary aims of the larger study, the sample was recruited such that half of children had a history of maltreatment, and the other half did not. To maximize the difference between these groups, children who were maltreated were only eligible for the study if they experienced maltreatment that was in the moderate to severe range (see details below), whereas children without a history of maltreatment were only eligible for participation if there had been no lifetime history of maltreatment. Children ranged in age from 3 to 5 years (M = 50.86 months; SD = 9 months), 143 were female, and 131 were male. The sample was racially and ethnically diverse as 110 children were White, 43 Black, 60 Biracial, and 52 Other Races; 125 children were Hispanic. Five children were in family foster care situations. Of caregivers, 256 (93%) were biological mothers; 58 had less than a high school degree, 110 completed high school, 81 had some post-secondary education, 24 had a bachelor's degree, and one did not provide education information; 145 were single parents, and 62 were under 20 at the time of the child's birth; 150 were unemployed. Of families, 247 qualified for public assistance, and 20 experienced homelessness within the past year. Of children, 143 (52%) had substantiated cases of moderate to severe maltreatment within the past 6 months, as described below.

Procedure

Families completed baseline assessments at study enrollment and follow-up assessments 6 months later (retention = 89%). At each time-point, families completed two home visits and questionnaires between visits. Parents provided written consent for themselves and their child to participate. Ethical permission for the study was granted by the Institutional Review Board.

Measures

Demographics.—At baseline, caregivers reported child age in months and child sex.

Life stressors.—At baseline, caregivers completed a semi-structured interview developed in our laboratory (Tyrka et al., 2015) to assess contextual stressors experienced in the child's

lifetime. Consistent with previous conceptualizations and assessments of life stressors in childhood (e.g., Felitti et al., 1998; Forman & Davies, 2003), categories included: death of a caregiver, separation from a caregiver, housing instability, inadequate food or clothing, and other stressful events, including witnessing neighborhood violence or parental arrest. Interviews were conducted by trained clinical social workers and PhD-level psychologists and scored by a single rater who was trained to reliability by one of the principal investigators of the larger project (kappa for overlap on 10% of interviews = .89). The project coordinator reviewed each interview to ensure compliance with the scoring protocol. Each domain was scored as positive if at least one episode occurred, and domains were summed to determine the number of contextual stressor categories the child experienced in their lifetime. Possible scores ranged from 0 (no stressors) to 5 (stressors in all 5 domains). Validity for this interview is supported by its expected associations with theoretically relevant constructs, including other forms of adversity (child maltreatment, traumatic life events), biological indices of stress in children (methylation of stress-sensitive genetic polymorphisms, accelerated cellular aging), and behavior problems in children (internalizing and externalizing symptoms) (see Parade et al., 2016; Ridout et al., 2019 for more information).

Child maltreatment.—At baseline, child protection records were coded using the System for Coding Subtype and Severity of Maltreatment in Child Protective Records (MCS; Barnett, Manly, & Cicchetti, 1993). A single MCS reliable coder who was granted access to child records by the child protection agency coded all maltreatment records. Cases that were complex or difficult to code were rated via group consensus between the coder and the principal investigators of the larger project. Five maltreatment subtypes and severity scores ranging from 1 (*least severe*) to 5 (*most severe*) were derived. Consistent with the eligibility criteria for the larger study, children with an episode that met criteria for moderate to severe maltreatment (score of 3–5) within the last 6 months were included in the maltreatment group (n = 143). Of children, 27 had substantiated cases of physical abuse, 34 sexual abuse, 17 physical neglect/failure to provide, 38 physical neglect/lack of supervision, and 90 emotional maltreatment (including witnessing domestic violence). Given the nature of how children were recruited and scored on the maltreatment variable in the larger project, maltreatment was rated as 0 (*no maltreatment present*) or 1 (*maltreatment present*) for the current report. Children rated as 0 (n = 131) never had a substantiated case of maltreatment, regardless of severity.

Temperament.—At baseline, caregivers completed a subset of scales from the Toddler Behavior Assessment Questionnaire (TBAQ; Goldsmith, 1996). Subscales used in the current study included Inhibitory Control (mean of 13 items; “when asked to wait for something [like a toy or snack], how often did your child wait patiently?”; α = .84), Anger (mean of 10 items; “when you turned off the television set [because it was bedtime, dinnertime, or time to leave], how often did your child throw a tantrum or get really mad?”; α = .86), and Appropriate Attentional Allocation (mean of 16 items; “when asked to complete tasks, such as cleaning up toys or blocks, how often did your child do this without becoming distracted?”; α = .75). Items were rated on seven-point scales ranging from 1 (*never*) to 7 (*always*). The TBAQ is reliable and valid for use with young children (e.g., good

internal consistency, interrater reliability, and convergence with other temperament assessments; Goldsmith, 1996).

Internalizing and externalizing behavior problems.—At the baseline and 6-month follow-up assessments, caregivers completed the Child Behavior Checklist for Ages 1.5 to 5 (CBCL; Achenbach & Rescorla, 2000) to assess children's internalizing (36 items; "unhappy, sad, or depressed"; $\alpha = .87$ at baseline and .88 at follow-up) and externalizing (24 items; "hits others"; $\alpha = .93$ at baseline and follow-up) problems. For each behavior, parents assessed their children on three-point scales from 0 (*not true*) to 2 (*very true*). T scores were used for data analysis. Prior research has demonstrated that the CBCL is a reliable and valid measure with strong test-retest reliability and discriminant validity between children who were and were not referred for behavioral health services (Achenbach & Rescorla, 2000).

Data Analytic Plan

Primary analyses were tested using multi-group path analysis in a structural equation modeling framework, specified with Mplus Version 7.4 statistical software (Muthen & Muthen, 1998–2012). Full-information maximum likelihood estimation (FIML) was used to accommodate missing data (7.5% of values). We evaluated if missingness was associated with any of the primary study variables, covariates, and demographic characteristics of families, and only one analysis was significant: higher rates of missingness were associated with lower child internalizing symptoms on the CBCL at baseline ($r = -.17$, $p = .008$). Six sets of multi-group path models (one for each temperament dimension per type of adversity) were conducted to examine if links between adversity (lifetime stress, child maltreatment), temperament (inhibitory control, appropriate attentional allocation, anger), and behavior problems (externalizing and internalizing problems) depended on child sex. We conducted analyses separately by type of adversity and dimension of temperament to limit the number of parameters estimated in analytic models and to reduce the risk of problems caused by multicollinearity among measures. In each model, adversity was specified as a predictor of temperament at baseline and internalizing and externalizing problems at baseline and the 6-month follow-up. To test if there were indirect effects, additional paths were specified between baseline temperament and follow-up internalizing and externalizing problems. Autoregressive paths were specified between baseline assessments of child behavior problems and their 6-month follow-up counterparts (e.g., follow-up externalizing problems were regressed on baseline externalizing problems). Child age was included as a covariate and specified as a predictor of child temperament at baseline and behavior problems at both time-points. Correlations were specified among exogenous predictors, among residual errors on temperament and baseline internalizing and externalizing problems, and among residual errors on internalizing and externalizing problems at the 6-month follow-up.

First, models in which all structural paths were constrained to equality across boys and girls were tested. Model fit was assessed using standard criteria, including chi-square (χ^2) tests, root-mean-square error of approximation (RMSEA), the comparative fit index (CFI), and the standardized root mean squared residual (SRMR). Acceptable fit values include a non-significant χ^2, RMSEA and SRMR of .08 or lower, and CFI of .90 or higher, with .95 and higher preferred (Browne & Cudeck, 1993; Hu & Bentler, 1999). Then, a series of partially

unconstrained models were tested to see if model fit significantly differed when paths were allowed to vary freely between girls and boys. Significant improvement in model fit indicates that the estimated parameters differ significantly between boys and girls (i.e., sex moderates that pathway), whereas no significant improvement in fit indicates no difference in the estimated parameters across boys and girls (i.e., sex does not moderate that pathway). To test for hypothesized moderated indirect effects, we assessed models using 1,000 bootstrap replicates to obtain bias-corrected bootstrap confidence intervals for the indirect effects (Mackinnon, Lockwood, & Williams, 2004).

Results

Descriptive Analyses

Descriptive statistics and correlations among study variables were examined using SPSS software, Version 25.0. To adjust for statistical outliers, values of three variables (five values overall) that were higher than 3.29 standard deviations above the mean were winsorized (Tabachnick & Fidell, 2012). Subsequently, all variables in analyses met appropriate standards for skewness and kurtosis. Tables 1 and 2 provide means, standard deviations, and intercorrelations for the variables used in the primary analyses, separated by boys and girls. Note that values presented in the tables were calculated using winsorized data.

Preliminary Analyses

Results of *t*-tests and χ^2-tests revealed that boys and girls did not significantly differ on any of the primary study variables or demographic characteristics (see Table 3). Girls were more likely than boys to experience sexual abuse, $\chi^2(1) = 7.09$, $p = .008$, but there were no other differences in maltreatment type across sexes. Families with children who were maltreated were more likely to receive services to support their child's development or behavior or services to support family wellbeing (i.e., outpatient mental health treatment, home based services, and/or services provided by the local school department), $\chi^2(1) = 3.88$, $p = .049$. However, when examining whether services were meaningfully related to child outcomes, we found that children in families receiving services were actually *higher* in internalizing and externalizing problem at baseline and follow-up than those who did not receive services (all ps $\leq .09$). Therefore, it would seem that whether or not families received services actually served as an indicator of the severity of the problems they were experiencing (e.g., family stress, child behavior problems). Children who were maltreated did not differ from those who were not maltreated on a composite of socioeconomic risk (i.e., parent did not complete high school, single parent household, child ethnic minority status, parent unemployed, more than three children in the household), $t(272) = -.68$, $p = .50$, and socioeconomic risk was also not associated with internalizing or externalizing symptoms at either time-point. Therefore, socioeconomic risk was not included as a covariate in primary analyses.

Primary Analyses

Table 4 provides a summary of the main findings from multi-group path models that are discussed in detail below.

Models involving lifetime stress.—We examined three sets of multi-group path models in which lifetime stress was specified as the predictor to test our hypotheses that greater lifetime stress would be associated with lower inhibitory control, higher anger, and lower appropriate attentional allocation, which would in turn predict increases in children's internalizing and externalizing symptoms 6 months later.

Inhibitory control.: We tested a model including inhibitory control as the mediator of the effect of lifetime stress on child behavior problems in which all structural paths were constrained to equality across boys and girls (see Figure 1). The model fit the data adequately, $\chi^2(18) = 32.36$, $p = .02$, RMSEA = .076, CFI = .97, SRMR = .078. In the fully constrained model, greater lifetime stress was not associated with inhibitory control (B = −.08, SE = .05, $p = .13$), but lower inhibitory control predicted increases in internalizing (B = −1.37, SE = .44, $p = .002$) and externalizing (B = −1.59, SE = .69, $p = .02$) problems from the baseline to 6-month follow-up assessment. There were no significant indirect effects of lifetime stress on internalizing or externalizing problems through inhibitory control.

Sex differences.: Next, a series of partially unconstrained models were conducted to test whether child sex moderated any of the indirect pathways involving lifetime stress, inhibitory control, and internalizing and externalizing problems. Findings revealed significant sex differences in links between lifetime stress and inhibitory control. Specifically, a model that allowed the path from lifetime stress to inhibitory control to freely vary across boys and girls fit the data well, $\chi^2(17) = 27.38$, $p = .05$, RMSEA = .067, CFI = .98, SRMR = .07, and was a significantly better fit than the fully constrained model, $\Delta\chi^2(1) = 4.98$, $p = .03$. This indicates that the strength of this association differed by sex such that greater stress was associated with lower inhibitory control for boys (B = −.21, SE = .09, $p = .01$) but not for girls (B = −.01, SE = .06, $p = .94$). However, sex did not moderate links between inhibitory control and behavior problems. Results of bias-corrected bootstrapping tests indicated that the indirect effects of lifetime stress on child internalizing (95% CI [.061, .680]) and externalizing (95% CI [.054, .969]) problems through lower inhibitory control were significant for boys but not for girls.

Appropriate attentional allocation.: Next, we tested a model including appropriate attentional allocation as a mediator in which all structural paths were constrained to equality across boys and girls (see Figure 2). The model fit the data adequately, $\chi^2(18) = 29.088$, $p = .047$, RMSEA = .067, CFI = .98, SRMR = .078. In the fully constrained model, greater lifetime stress was associated with appropriate attentional allocation at trend-level (B = −.07, SE = .04, $p = .097$), and lower appropriate attentional allocation predicted increases in internalizing (B = −1.50, SE = .55, $p = .006$) and externalizing (B = −1.93, SE = .84, $p = .02$) problems from the baseline to 6-month follow-up assessment. There were no significant indirect effects of lifetime stress on internalizing or externalizing problems through appropriate attentional allocation.

Sex differences.: Results of a series of partially unconstrained models revealed significant sex differences in links between lifetime stress and appropriate attentional allocation. Specifically, a model that allowed the path from lifetime stress to appropriate attentional

allocation to freely vary across boys and girls fit the data well, $\chi^2(17) = 24.05$, $p = .12$, RMSEA = .055, CFI = .99, SRMR = .07, and was a significantly better fit than the fully constrained model, $\Delta\ \chi^2(1) = 5.04$, $p = .02$. This indicates that the strength of this association differed by sex such that greater stress was associated with lower appropriate attentional allocation for boys (B = −.16, SE = .05, $p = .004$) but not for girls (B = .01, SE = .06, $p = .85$). However, sex did not moderate links between appropriate attentional allocation and behavior problems. Results of bias-corrected bootstrapping tests indicated that the indirect effects of lifetime stress on child internalizing (95% CI [.062, .527]) and externalizing (95% CI [.078, .778]) problems through lower appropriate attentional allocation were significant for boys but not for girls.

Anger.: We then tested a model including anger as a mediator in which all structural paths were constrained to equality across boys and girls (see Figure 3). The model fit the data well, $\chi^2(18) = 22.47$, $p = .21$, RMSEA = .04, CFI = .99, SRMR = .07. In the fully constrained model, greater lifetime stress was associated with higher anger (B = .14, SE = .07, $p = .05$), and higher anger in turn predicted increases in internalizing (B = .998, SE = .35, $p = .004$) and externalizing (B = 1.70, SE = .48, $p < .001$) problems from the baseline to 6-month follow-up assessment. Results of bias-corrected bootstrapping tests indicated that the indirect effects of lifetime stress on child internalizing (95% CI [.014, .378]) and externalizing (95% CI [.032, .600]) problems through higher anger were significant for all children.

Sex differences.: No significant sex differences emerged in any of the indirect pathways involving lifetime stress, anger, and behavior problems in partially unconstrained models.

Models involving child maltreatment.—We then examined the three sets of multi-group path models described above with child maltreatment, instead of lifetime stress, as the predictor to test our hypotheses that greater child maltreatment would be associated with lower inhibitory control, higher anger, and lower appropriate attentional allocation, which would in turn predict increases in children's internalizing and externalizing symptoms 6 months later.

Inhibitory control.: The fully constrained model including inhibitory control as a mediator (see Figure 4) provided fair fit to the data, $\chi^2(18) = 30.73$, $p = .03$, RMSEA = .07, CFI = .98, SRMR = .085. Child maltreatment was associated with lower inhibitory control at a trend-level (B = −.22, SE = .13, $p = .08$), and lower inhibitory control in turn predicted increases in internalizing (B = −1.30, SE = .44, $p = .003$) and externalizing (B = −1.63, SE = .68, $p = .02$) problems from the baseline to 6-month follow-up assessment. Results of bias-corrected bootstrapping tests indicated that the indirect effects of child maltreatment on child internalizing (95% CI [.001, .788]) and externalizing (95% CI [.006, 1.139]) problems through lower inhibitory control were significant for all children. However, because the association between maltreatment and inhibitory control did not reach significance, this indirect effect should be interpreted with caution. Additionally, child maltreatment uniquely predicted increases in internalizing problems over time (B = 2.00, SE = .74, $p = .007$).

Sex differences.: When analyzing partially unconstrained models, no significant sex differences emerged in indirect pathways involving maltreatment, inhibitory control, and behavior problems.

Appropriate attentional allocation.: The fully constrained model including appropriate attentional allocation as a mediator (see Figure 5) provided fair fit to the data, $\chi^2(18) = 28.47$, $p = .06$, RMSEA = .065, CFI = .98, SRMR = .086. Child maltreatment was not associated with appropriate attentional allocation (B = −.10, SE = .10, $p = .31$), but lower appropriate attentional allocation predicted increases in internalizing (B = −1.46, SE = .54, $p = .007$) and externalizing (B = −1.93, SE = .83, $p = .02$) problems from the baseline to 6-month follow-up assessment. There were no significant indirect effects of maltreatment on internalizing or externalizing problems through appropriate attentional allocation. However, consistent with the model including inhibitory control, child maltreatment uniquely predicted increases in internalizing problems over time (B = 2.20, SE = .76, $p = .004$).

Sex differences.: Partially unconstrained models revealed significant sex differences in links between child maltreatment and appropriate attentional allocation. Specifically, a model that allowed the path from child maltreatment to appropriate attentional allocation to freely vary across boys and girls fit the data well, $\chi^2(17) = 24.42$, $p = .11$, RMSEA = .056, CFI = .99, SRMR = .087, and was a significantly better fit than the fully constrained model, $\Delta\chi^2(1) = 4.05$, $p = .04$.

This indicates that the strength of this association differed by sex such that maltreatment was associated with lower appropriate attentional allocation for boys (B = −.28, SE = .13, $p = .04$) but not for girls (B = .08, SE = .13, $p = .56$). However, sex did not moderate links between appropriate attentional allocation and behavior problems. Results of bias-corrected bootstrapping tests indicated that the indirect effects of lifetime stress on child internalizing (95% CI [.058, .994]) and externalizing (95% CI [.058, 1.448]) problems through lower appropriate attentional allocation were significant for boys but not for girls.

Anger.: The fully constrained model including anger as a mediator (see Figure 6) fit the data well, $\chi^2(18) = 20.96$, $p = .28$, RMSEA = .04, CFI = .995, SRMR = .08. Although higher anger predicted increases in internalizing (B = .996, SE = .35, $p = .004$) and externalizing (B = 1.71, SE = .48, $p < .001$) problems from the baseline to 6-month follow-up assessment, child maltreatment was not associated with anger (B = .24, SE = .16, $p = .14$). There were no significant indirect effects of maltreatment on internalizing or externalizing problems through anger. However, child maltreatment uniquely predicted increases in internalizing problems over time (B = 2.17, SE = .73, $p = .003$).

Sex differences.: Partially unconstrained models revealed no significant sex differences in indirect pathways involving maltreatment, anger, and behavior problems.

Discussion

The primary aims of this study were to: (a) test if dimensions of child temperament mediated links between early adversity and behavior problems in early childhood, and (b) examine if

child sex moderated these indirect effects. In general, temperament served as an intermediary mechanism between early adversity and child internalizing and externalizing problems. Furthermore, several of the indirect effects were specific to boys, including: (a) lifetime stress on behavior problems through deficits in inhibitory control and appropriate attentional allocation and (b) maltreatment on behavior problems through appropriate attentional allocation. Indirect effects of lifetime stress on behavior problems through anger and indirect effects of maltreatment on behavior problems through inhibitory control difficulties were observed in the full sample and not moderated by child sex. Results were also relatively consistent across both types of adversity (lifetime stress and child maltreatment), suggesting generalizability in the impact of forms of adversity in the early rearing environment on temperament. Although associations between adversity and temperament were evident only in boys in several cases, sex differences did not emerge in links between temperament and behavior problems in any of our analyses. This suggests that while temperamental difficulties are consistently associated with adjustment problems in boys and girls, boys may be particularly susceptible to adversity in shaping dimensions of their temperament.

Our results build on prior findings that adversity is associated with temperament dimensions (Lemery-Chalfant et al., 2013; Kim et al., 2018; Pietto et al., 2017) and that temperament predicts later internalizing and externalizing behavior problems (Eisenberg et al., 2000; Kahle et al., 2018; Liu et al., 2018). Although the literature documents that temperament is moderately stable, there is evidence that individual differences in aspects of temperament in early childhood are both genetically and environmentally influenced (Gagne & Saudino, 2010) and are subject to multiple forms of gene-environment interplay (Lemery-Chalfant et al., 2013). For example, aspects of temperament are more heritable in children living in chaotic homes (Wang et al, 2012). Results from the current study suggest that sex differences also likely play a role in this complex relationship.

Another consideration is the role of transactional relations between caregivers and children in shaping both child temperament and parental behavior. According to the developmental-ecological model, temperament may interact with parental characteristics to increase the likelihood of later neglect and parental maltreatment (Belsky, 1993). For example, parents who are predisposed toward abusive behavior may lack appropriate coping and parenting skills that are required to manage young children with difficult temperaments (Maltby, Callahan, Friedlander, & Shetgiri, 2018). Furthermore, difficult temperament in early childhood and negative parenting have been found to mutually exacerbate one another over time in bidirectional ways (Micalizzi, Wang, & Saudino, 2017; Wittig & Rodriguez, 2019). Therefore, it is possible that our results actually reflect transactions among adversity, temperament, and child behavior problems. It will be critical for future research with repeated measures of indices of adversity, temperament, and behavior problems to further disentangle and more definitively understand the nature of the interplay between these variables over time.

We found that boys tended to be more sensitive to adversity than girls in shaping aspects of their temperament, and it is notable that these sex differences were evident for inhibitory control and appropriate attentional allocation, but not anger. Difficulties with inhibitory

control and attention have consistently been identified as correlates of attention-deficit/hyperactivity disorder (ADHD; Barkley, 1997). Several studies demonstrate that males are more commonly diagnosed and treated for ADHD than females (Mowlem et al., 2019), which may be a function of sex differences in how symptoms of ADHD manifest. For example, meta-analytic findings reveal that males with ADHD show more difficulties with inattention, hyperactivity, and impulsivity than females with ADHD (Gershon, 2002). Additionally, studies have shown associations between adverse childhood experiences and greater symptoms, diagnoses, and severity of ADHD (Brown et al., 2017). Therefore, it is possible that boys' vulnerability to ADHD may partially explain why we found adversity to be linked with dimensions of temperament that cohere with aspects of cognition, attention, and executive function in boys but not girls. Similar to our findings, Arnett, Pennington, Willcutt, DeFries, and Olson (2015) found that sex differences in ADHD were partially explained by deficits in boys' cognitive endophenotypes (processing speed, inhibition, working memory).

Findings from the current study did not reveal any significant links between adversity and temperament for girls. It is possible that effects of adversity on behavior problems may operate through different mechanisms for girls. A growing body of research shows that girls tend to be more sensitive to relational consequences of adversity. For example, Davies and Lindsay (2004) found that girls' elevated sense of communion (e.g., merging of an individual within social relationships) explained why they were more sensitive to the negative effects of interparental conflict. This is consistent with findings from another study that the influence of maltreatment on the mother-child relationship partially explained girls' heightened vulnerability (Alto et al., 2018). Therefore, it may be that whereas adversity operates through temperamental regulatory processes for boys, its impact on family relationships may be more harmful for girls. It will be critical for future studies to directly test this hypothesis by examining whether there are unique sex differences in types of intermediary processes linking adversity to psychopathology in young children (e.g., directly pitting regulatory versus relational processes against each other as mediators to test if one cascade of processes is evident for boys and the other for girls).

It is also possible that developmental factors may play a role in explaining our results. Although the majority of studies examining sex differences in the effects of early adversity on psychopathology have been conducted using samples of children in middle childhood or adolescence (Alto et al., 2018; Fletcher, 2009), few studies have examined if there are age-related differences in the pattern of results. As one of the few studies to examine if age directly plays a role, Rudolph and Flynn (2007) found *pubescent* girls to be more sensitive to effects of early stress than boys, but *prepubescent* boys were more sensitive than girls. These results are consistent with meta-analytic findings indicating that older females are more sensitive to victimization as a predictor of psychiatric outcomes, but the opposite is true for young children, with boys being more sensitive than girls (Gershon, Minor, & Hayward, 2008). Our findings build on these results by offering preliminary support for the possibility that young boys may be more sensitive than young girls to adversity's effects on *temperament* in early childhood. However, given that participants in our study were exclusively preschoolers, it will be critical for future studies to more definitively test this

possibility through the use of longitudinal designs spanning multiple developmental periods (e.g., early childhood, middle childhood, adolescence, adulthood).

These findings must also be interpreted in the context of the study's limitations which pose important directions for future research. First, although the use of repeated measures of internalizing and externalizing problems is a strength of the study, examination of concurrent associations between adversity and temperament preclude definitive conclusions regarding directionality of these associations. Future work with repeated measures of temperament over time is needed to replicate findings. Similarly, we decided to follow up with families over the course of 6 months to maximize feasibility due to the extensive protocol for the larger study, the high-risk and often transient nature of the sample, and to allow for examination of changes in behavior problems over the short term in early childhood. However, it will be important for future studies to test whether our findings are similar or different over longer periods of time (e.g., years). Additionally, many measures relied on caregiver report, which could introduce informant bias in the nature and strength of the associations. As one example, all three dimensions of temperament were highly correlated with one another. Utilization of observational assessments (e.g., Lab-TAB; Goldsmith & Rothbart, 1996) may be valuable in replication. Use of multiple methods may also reduce the risk of multicollinearity among temperament constructs and allow for examination of *unique* contributions of each temperament dimension to the development of child behavior problems. Relatedly, our analysis of lifetime stress and child maltreatment in separate analytic models does not allow for definitive interpretations about the nature of the potential interplay between these two forms of stress in predicting child outcomes (e.g., whether they are additive contributors to internalizing and externalizing problems or whether lifetime stress may mediate or moderate relations between maltreatment and behavior problems). Future studies with repeated measures of key constructs over time will be important to further explore these additional research questions. Additionally, our use of a single informant across constructs (e.g., temperament and behavior problems) with measures that may have some conceptual overlap (e.g., TBAQ Anger and CBCL Externalizing Problems) is an important limitation of the findings. It will be critical for future efforts include other informants (e.g., teachers, observers) for assessments of temperament and behavior problems.

We also did not have assessments of parental temperament available for use in this study. Due to the heritable nature of temperament and personality, future studies should include these as covariates or in sensitivity analyses. Similarly, it is possible that some of our findings related to the mediating role of temperament (e.g., appropriate attentional allocation) may actually be a function of a broader influence of adversity on cognitive functioning. Future research is needed to see if the pattern of findings is still evident when accounting for child intelligence or verbal ability. Furthermore, modest effect sizes of predictive pathways point to considerable variability in these associations, so it will be important for future studies to examine if other child and family factors moderate these indirect pathways. Similarly, because families with children who were maltreated were more likely to receive services to support their child and/or family functioning, this research may underestimate the impact of maltreatment on children's adjustment. Additionally, although the high risk nature of our sample is a strength of the current study, results may not

necessarily generalize to children in families with less risk or high affluence. Finally, our examination of multiple dimensions of adversity and temperament is not exhaustive, and it will therefore be critical for future studies to test if other types of adversity (e.g., interparental conflict, parental psychopathology) and aspects of temperament (e.g., effortful control, negative emotionality, positive affect, behavioral inhibition) function differently in these developmental processes. As preliminary support for the potential value in examining other dimensions of temperament, supplemental analyses in our sample revealed that social fear measured with the TBAQ did not mediate links between maltreatment or stress and behavior problems for either boys or girls (see Supplemental Document for social fear analyses), but activity level did mediate effects of lifetime stress on behavior problems in a similar pattern to our findings with anger (i.e., evident for all children and not moderated by child sex).

In summary, our study examined child sex as a moderator of indirect effects of early adversity on behavior problems through dimensions of child temperament in a sample of high-risk preschoolers. Findings suggest that early adversity exerts influence on child behavior problems through temperament, and boys are at particularly high risk. This study supports the perspective that temperament is influenced by characteristics of the early rearing environment. Our findings may have important implications for the prevention and treatment of psychopathology in young children who experience early adversity. For example, existing interventions aimed at improving developmental outcomes for young children (e.g., Parent-Child Interaction Therapy, Incredible Years, Teacher-Child Interaction Training) have components that target building children's regulatory abilities (e.g., inhibitory control, attention, emotion regulation) to promote positive behavioral outcomes (Kanine, Jackson, Huffhines, Barnett, & Stone, 2018; Timmer, Urquiza, Zebell, & McGrath, 2005; Webster-Stratton, Reid, & Stoolmiller, 2008). Our results suggest that targeting these skills may buffer young children, especially boys, from the harmful effects of maltreatment, stress, and other significant adversities. It is essential to continue to identify individual difference factors that predict maladaptive outcomes to aid in the early identification of children at highest risk.

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Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Additional Analyses Testing Child Social Fear as a Mediator

Models Involving Social Fear

Consistent with the analytic approach used for the other dimensions of temperament, we conducted two sets of multi-group path models (i.e., one with lifetime stress as the predictor and the other with child maltreatment as the predictor) with social fear included as the mediator.

Lifetime stress.

We tested a model including social fear as the mediator of the effect of lifetime stress on child behavior problems in which all structural paths were constrained to equality across boys and girls (see Figure 1). The model provided fair fit to the data, $\chi^2(18) = 29.15$, $p = .046$, RMSEA = .07, CFI = .98, SRMR = .083. In the fully constrained model, greater lifetime stress was not associated with social fear (B = −.05, SE = .05, $p = .39$), and social fear did not predict changes in externalizing (B = .19, SE = .64, $p = .77$) or internalizing (B = −.19, SE = .43, $p = .65$) problems from the baseline to 6-month follow-up assessment. There were no significant indirect effects of lifetime stress on internalizing or externalizing problems through social fear.

Sex differences.: No significant sex differences emerged in any of the indirect pathways involving lifetime stress, social fear, and behavior problems in partially unconstrained models.

Child maltreatment.

The fully constrained model including child maltreatment as the predictor (see Figure 2) also provided fair fit to the data, $\chi^2(18) = 28.33$, $p = .06$, RMSEA = .07, CFI = .98, SRMR = .096. Child maltreatment was associated with lower social fear (B = −.24, SE = .12, $p = .046$), but social fear did not predict changes in externalizing (B = .15, SE = .65, $p = .82$) or internalizing (B = −.06, SE = .43, $p = .88$) problems from the baseline to 6-month follow-up assessment. Thus, there were no significant indirect effects of maltreatment on internalizing or externalizing problems through social fear.

Sex differences.: When analyzing partially unconstrained models, no significant sex differences emerged in indirect pathways involving child maltreatment, social fear, and behavior problems.

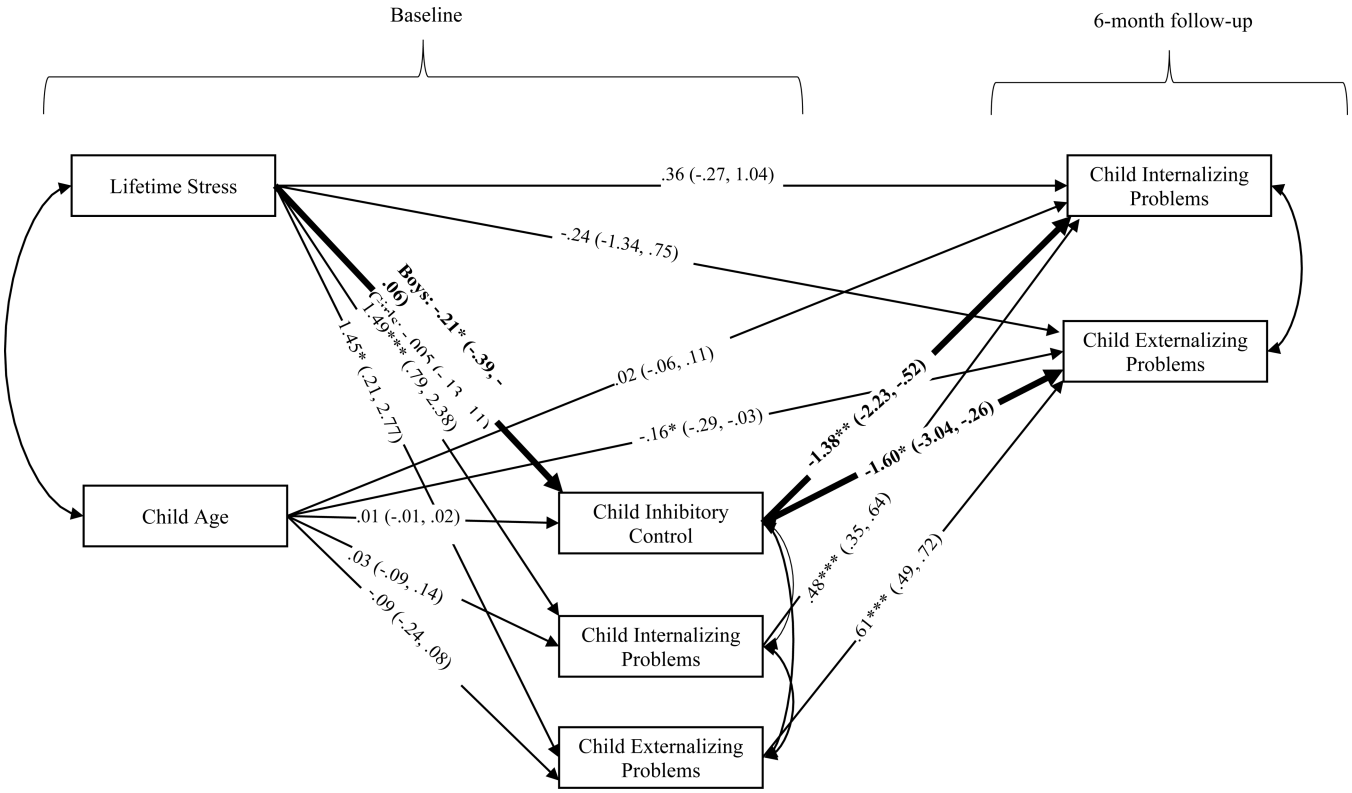

Figure 1.

Multi-group path model testing indirect pathways involving lifetime stress, inhibitory control, and changes in child behavior problems over 6-month period. Total N = 274 (131 boys and 143 girls). Parameter estimates for structural paths are unstandardized path coefficients; 95% confidence intervals are in parentheses. For path significantly moderated by child sex, coefficients listed separately for boys and girls. For clarity, correlation coefficients not depicted. * $p < .05$. ** $p < .01$. *** $p < .001$.

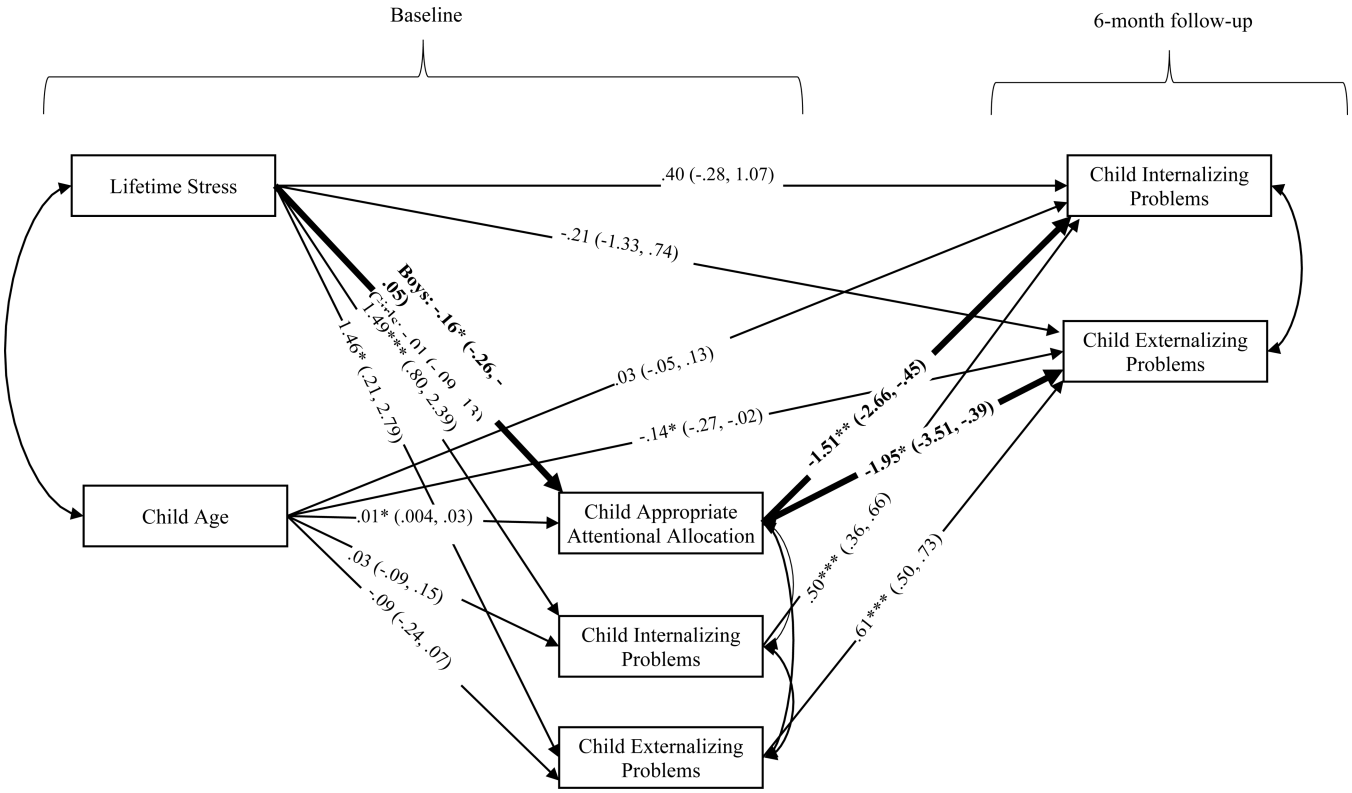

Figure 2.

Multi-group path model testing indirect pathways involving lifetime stress, appropriate attentional allocation, and changes in child behavior problems over 6-month period. Total N = 274 (131 boys and 143 girls). Parameter estimates for structural paths are unstandardized path coefficients; 95% confidence intervals are in parentheses. For path significantly moderated by child sex, coefficients listed separately for boys and girls. For clarity, correlation coefficients not depicted. * $p < .05$. ** $p < .01$. *** $p < .001$.

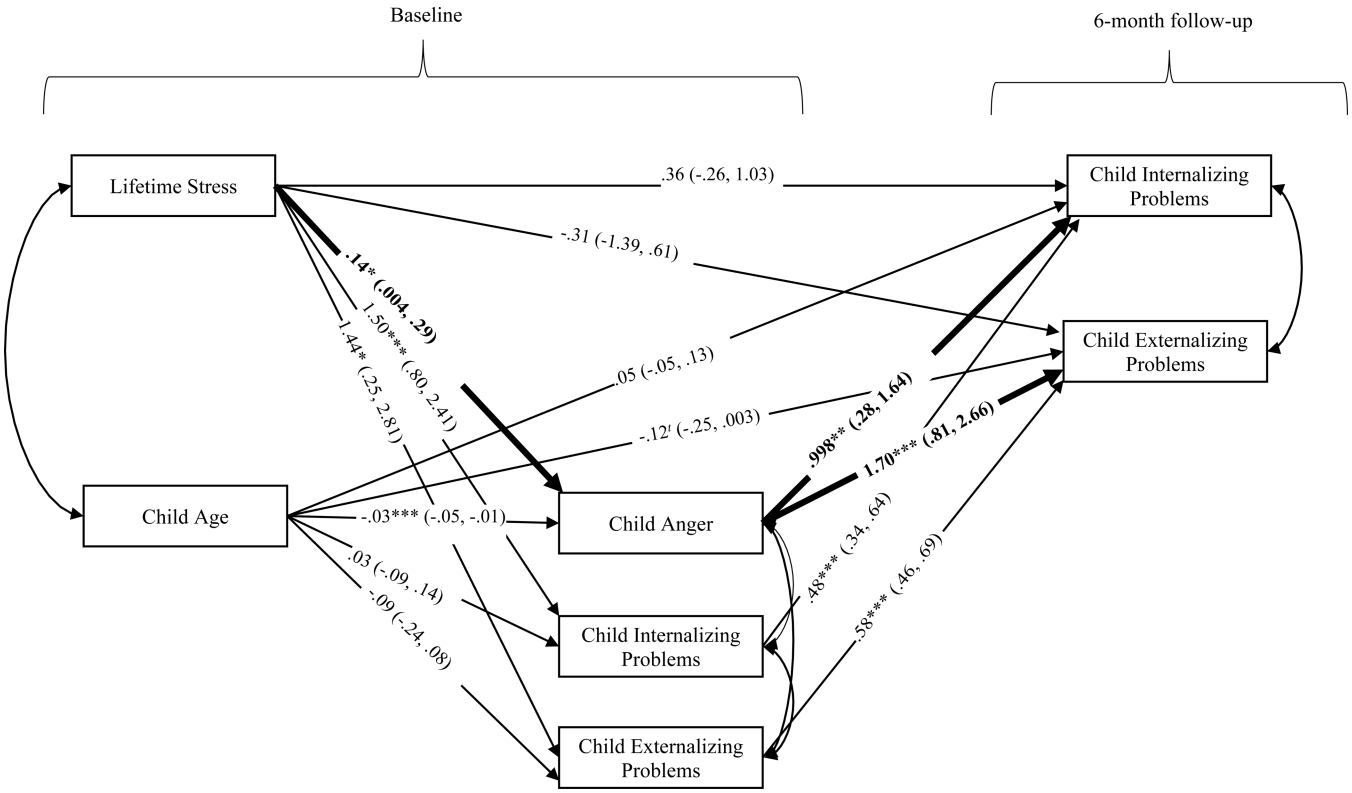

Figure 3.

Multi-group path model testing indirect pathways involving lifetime stress, anger, and changes in child behavior problems over 6-month period. Total N = 274 (131 boys and 143 girls). Parameter estimates for structural paths are unstandardized path coefficients; 95% confidence intervals are in parentheses. For clarity, correlation coefficients not depicted. * $p \leq .05$. ** $p < .01$. *** $p < .001$.

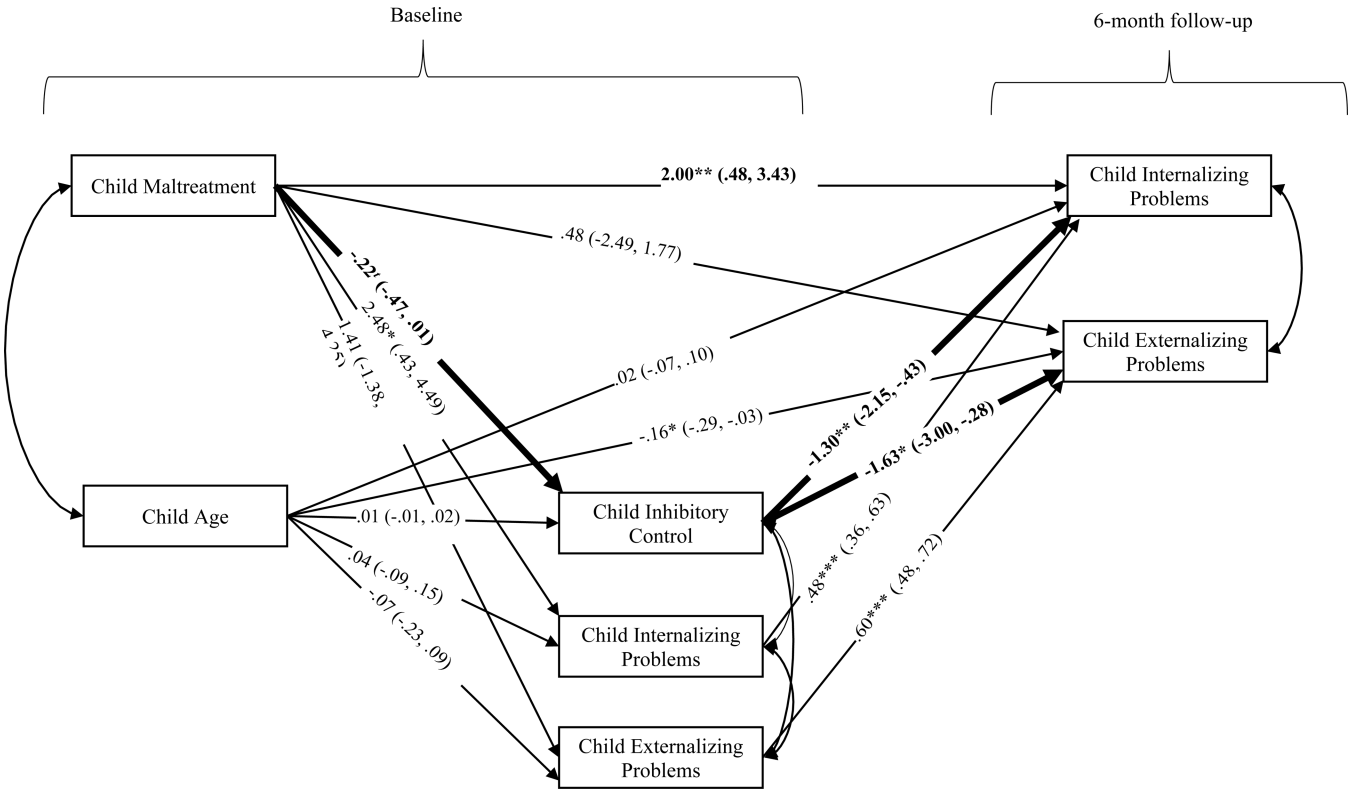

Figure 4.

Multi-group path model testing indirect pathways involving child maltreatment, inhibitory control, and changes in child behavior problems over 6-month period. Total N = 274 (131 boys and 143 girls). Parameter estimates for structural paths are unstandardized path coefficients; 95% confidence intervals are in parentheses. For clarity, correlation coefficients not depicted. $^{t}p < .10$. $*p < .05$. $**p < .01$. $***p < .001$.

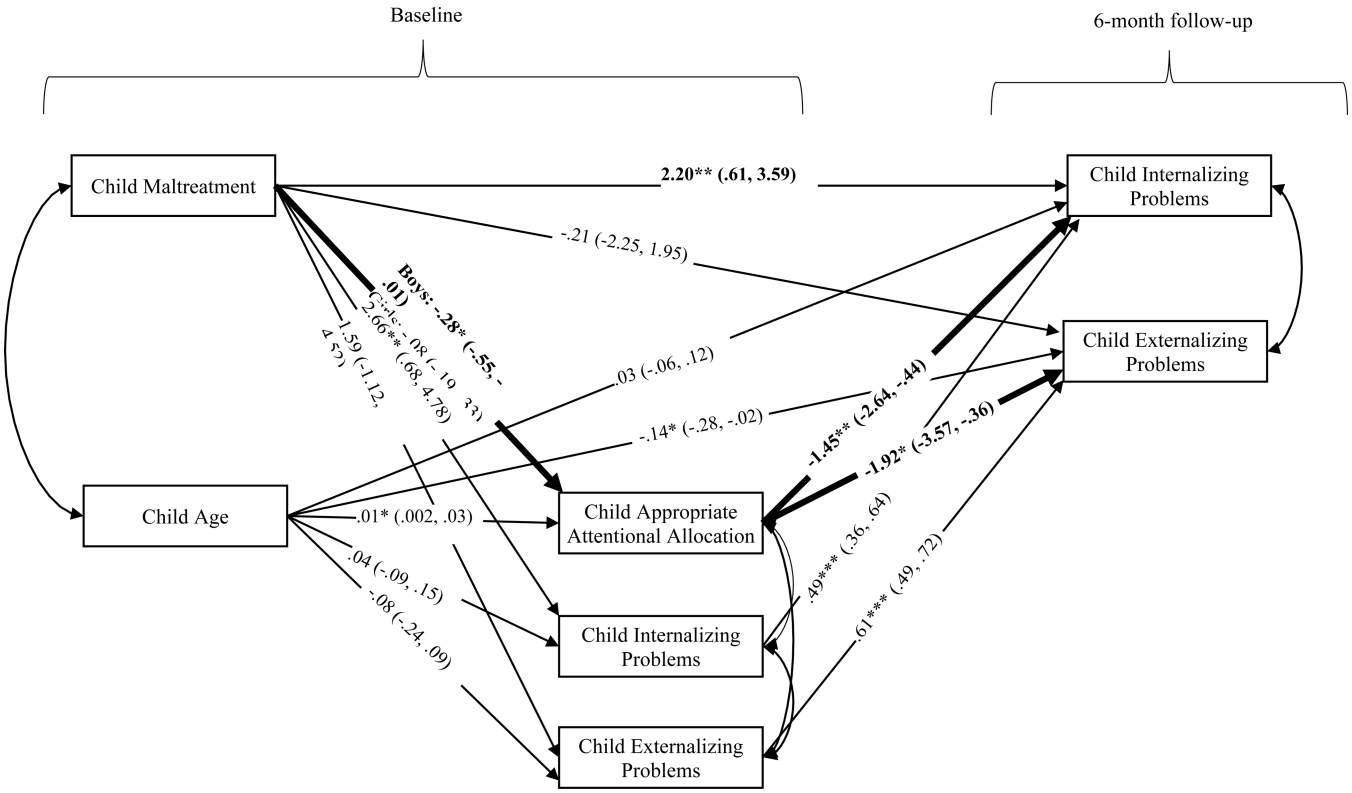

Figure 5.

Multi-group path model testing indirect pathways involving child maltreatment, appropriate attentional allocation, and changes in child behavior problems over 6-month period. Total N = 274 (131 boys and 143 girls). Parameter estimates for structural paths are unstandardized path coefficients; 95% confidence intervals are in parentheses. For path significantly moderated by child sex, coefficients listed separately for boys and girls. For clarity, correlation coefficients not depicted. *$p < .05$. **$p < .01$. ***$p < .001$.

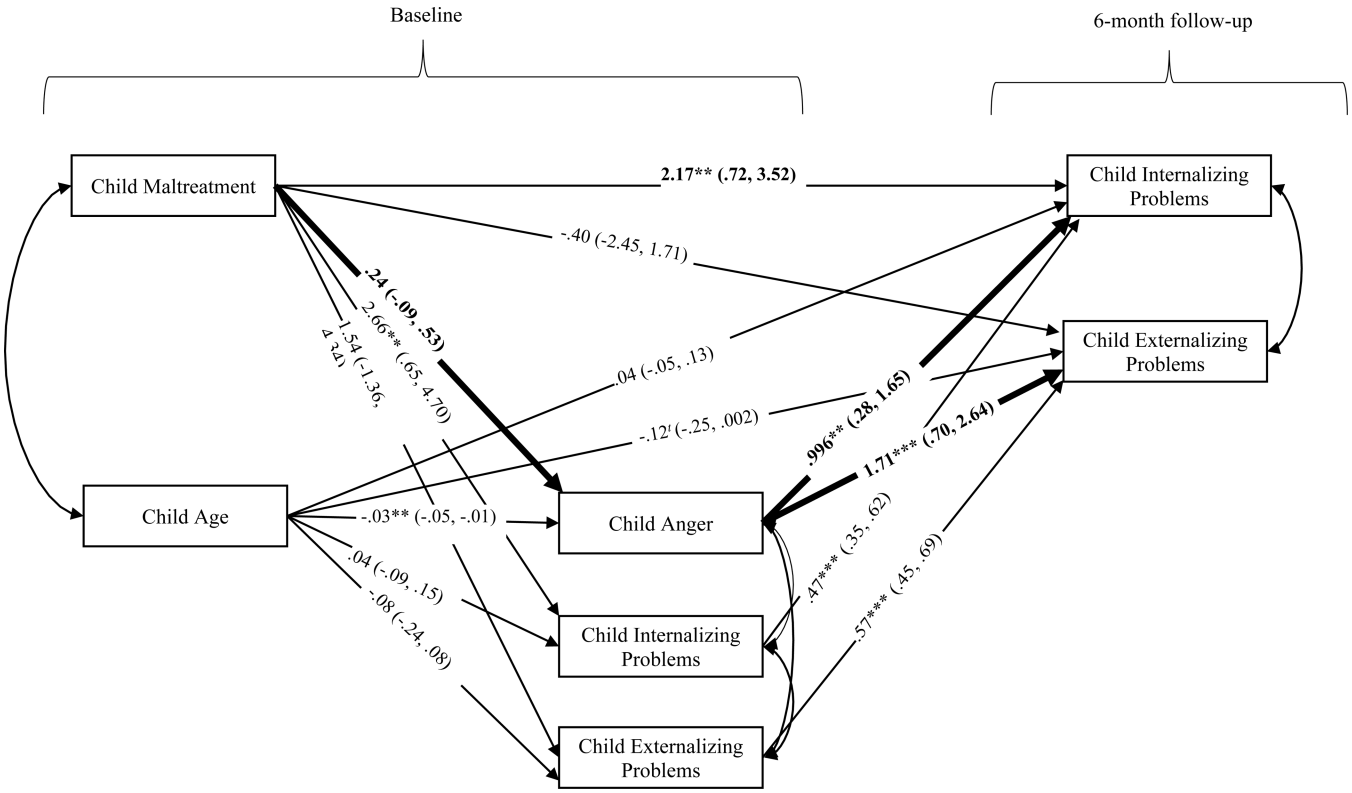

Figure 6.

Multi-group path model testing indirect pathways involving child maltreatment, anger, and changes in child behavior problems over 6-month period. Total N = 274 (131 boys and 143 girls). Parameter estimates for structural paths are unstandardized path coefficients; 95% confidence intervals are in parentheses. For clarity, correlation coefficients not depicted. $^{t}p < .10$. $^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

Table 1.

Means, standard deviations, and intercorrelations of main variables for boys.

	1	2	3	4	5	6	7	8	9	10
Time 1 (baseline)										
1. Child age (months)	−−									
2. Lifetime stress	.05	−−								
3. Maltreatment (% present)	.03	.33***	−−							
4. Inhibitory control	.08	−.24**	−.16^{t}	−−						
5. Attention	.20*	−.24**	−.16^{t}	.73***	−−					
6. Anger	−.21*	.21*	.10	−.76***	−.58***	−−				
7. Internalizing problems	−.08	.20*	.10	−.42***	−.36***	.44***	−−			
8. Externalizing problems	−.07	.18^{t}	.01	−.50***	−.35***	.53***	.66***	−−		
Time 2 (6-month follow-up)										
9. Internalizing problems	.01	.27**	.18^{t}	−.52***	−.41***	.47***	.59***	.43***	−−	
10. Externalizing problems	−.11	.21*	−.03	−.46***	−.35***	.51***	.51***	.67***	.61***	−−
Mean/n	49.73	1.45	66	4.13	4.49	3.66	52.44	47.57	51.84	45.31
SD/%	8.34	1.16	50%	1.08	.76	1.32	8.58	11.65	7.13	12.43
Minimum	36	0	0	1.15	2.06	1.14	29	28	29	28
Maximum	71	4	1	7.00	6.43	6.89	78	77	74	76

Note. Attention = appropriate attentional allocation. N = 131 boys.

$^{t}p < .10$.

$^{*}p < .05$.

$^{**}p < .01$.

$^{***}p < .001$.

Table 2.

Means, standard deviations, and intercorrelations of main variables for girls.

	1	2	3	4	5	6	7	8	9	10
Time 1 (baseline)										
1. Child age (months)	−−									
2. Lifetime stress	.15^{t}	−−								
3. Maltreatment (% present)	.16^{t}	.45***	−−							
4. Inhibitory control	.07	.03	−.05	−−						
5. Attention	.14	.06	.07	.73***	−−					
6. Anger	−.21*	.02	.02	−.72***	−.52***	−−				
7. Internalizing problems	.16^{t}	.22*	.21*	−.24**	−.25**	.36***	−−			
8. Externalizing problems	−.04	.09	.10	−.44***	−.42***	.44***	.63***	−−		
Time 2 (6-month follow-up)										
9. Internalizing problems	.10	.14	.32***	−.15	−.19*	.28**	.66***	.51***	−−	
10. Externalizing problems	−.17^{t}	−.04	.10	−.29**	−.34***	.40***	.45***	.68***	.61***	−−
Mean/n	51.90	1.48	77	4.35	4.57	3.40	52.48	47.11	51.55	45.49
SD/%	9.15	1.23	54%	.87	.76	1.26	8.03	11.21	8.07	11.11
Minimum	35	0	0	2.15	2.63	1.00	29	28	29	28
Maximum	71	5	1	6.54	6.56	6.89	78	75	74	77

Note. Attention = appropriate attentional allocation. N = 143 girls.

$^{t}p < .10$.

$^{*}p < .05$.

$^{**}p < .01$.

$^{***}p < .001$.

Table 3.

Comparisons of boys and girls along primary study variables and demographic characteristics.

	Statistical Comparison of Boys and Girls	Effect Size
Lifetime Stress	$t(272) = -.22$, $p = .82$	$d = .03$
Maltreatment Status	$\chi^2(1) = .33$, $p = .57$	$\varphi = .04$
Inhibitory Control	$t(272) = -1.78$, $p = .08$	$d = .23$
Appropriate Attentional Allocation	$t(243) = -.79$, $p = .43$	$d = .10$
Anger	$t(242) = 1.57$, $p = .12$	$d = .20$
Baseline Internalizing Problems	$t(246) = -.04$, $p = .97$	$d = .00$
6-Month Follow-Up Internalizing Problems	$t(229) = .28$, $p = .78$	$d = .04$
Baseline Externalizing Problems	$t(246) = .32$, $p = .75$	$d = .04$
6-Month Follow-Up Externalizing Problems	$t(229) = -.12$, $p = .91$	$d = .02$
Parental Education Level	$t(271) = -.38$, $p = .70$	$d = .04$
Parental Age at Child Birth	$\chi^2(1) = 2.77$, $p = .10$	$\varphi = .10$
Parental Employment Status	$\chi^2(1) = .15$, $p = .70$	$\varphi = .02$
Parental Marital Status	$\chi^2(1) = .55$, $p = .46$	$\varphi = .05$
Adult-to-Child Ratio in the Home	$t(268) = 1.25$, $p = .21$	$d = .15$
Child Race	$\chi^2(1) = .1.74$, $p = .19$	$\varphi = .08$
Child Ethnicity	$\chi^2(1) = .002$, $p = .96$	$\varphi = .00$

Note. Parental age at child birth was assessed as whether parent was less than 20 years old when child was born. Total N = 274 children (131 boys and 143 girls).

Table 4.

Summary of main findings from multi-group path models testing moderated indirect effects.

Adversity Type in Model	Temperament Dimension in Model	Test of Moderation of Links between Adversity and Temperament	Test of Indirect Effects of Adversity on Externalizing Problems	Test of Indirect Effects of Adversity on Internalizing Problems	Indirect Effects for Full Sample or Boys Only?
Lifetime Stress	Inhibitory Control	$\Delta\ \chi^2(1) = 4.98$, $p = .03$	95% CI [.054, .969]	95% CI [.061, .680]	Boys Only
Lifetime Stress	Attention	$\Delta\ \chi^2(1) = 5.04$, $p = .02$	95% CI [.078, .778]	95% CI [.062, .527]	Boys Only
Lifetime Stress	Anger	$\Delta\ \chi^2(1) = 2.42$, $p = .12$	95% CI [.032, .600]	95% CI [.014, .378]	Full Sample
Maltreatment	Inhibitory Control	$\Delta\ \chi^2(1) = 2.12$, $p = .15$	95% CI [.006, 1.139]	95% CI [.001, .788]	Full Sample*
Maltreatment	Attention	$\Delta\ \chi^2(1) = 4.05$, $p = .04$	95% CI [.058, 1.448]	95% CI [.058, .994]	Boys Only
Maltreatment	Anger	$\Delta\ \chi^2(1) = .79$, $p = .37$	95% CI [−.099, 1.146]	95% CI [−.044, .755]	Non-significant

Note. Bias-corrected bootstrap 95% confidence intervals that do not include zero indicate significant indirect effect. Total N = 274 children (131 boys and 143 girls). Attention = appropriate attentional allocation.

*Because the association between maltreatment and inhibitory control was a trend and did not reach significance, this indirect effect should be interpreted with caution.