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Abstract

The role of effective parenting in promoting child executive functioning and school success was examined among 138 children (age 4 to 6 years) staying in family emergency shelters the summer before kindergarten or first grade. Parent-child co-regulation, which refers to relationship processes wherein parents guide and respond to the behavior of their children, was observed during structured interaction tasks and quantified as a dyadic construct using state space grid methodology. Positive co-regulation was related to children's executive functioning and IQ, which in turn were related to teacher-reported outcomes once school began. Separate models considering parenting behavior demonstrated that EF carried indirect effects of parents' directive control to school outcomes. Meanwhile, responsive parenting behaviors directly predicted children's peer acceptance at school beyond effects of EF and IQ. Findings support theory and past research in developmental science indicating the importance of effective parenting in shaping positive adaptive skills among children who overcome adversity, in part through processes of co-regulation.

Parenting and Co-Regulation: Adaptive Systems for Competence in Children Experiencing Homelessness

Parenting has been widely implicated in the positive development of children, particularly those in contexts of poverty and high psychosocial risk (Luthar, 2006; McLoyd, Aikens, & Burton, 2006). However, there is surprisingly limited research on the processes through which parents support and protect their children's development, particularly during periods of acute adversity. The present study examined the potential role of positive co-regulation (PCR) by parents as a protective system for children experiencing homelessness, a stressful situation that can disrupt child functioning and challenge the capabilities of parents in their everyday interactions with children (David, Gelberg, & Suchman, 2012). PCR, a dyadic concept referring to the effectiveness with which parents guide and respond to the behavior of their children, was related to child functioning on cognitive tasks assessed in the shelter context and subsequently to adjustment in school. The goal was to advance knowledge on the processes through which parents contribute to resilience, with particular attention to factors that can be targeted for change to promote positive child development in contexts of acute adversity (Jouriles et al., 2009; Patterson, Forgatch, & DeGarmo, 2010).

Risks and Resilience in Children Who Experience Homelessness

Homelessness and residential instability are prevalent markers of considerable risk for child development generally, and for school success in particular (National Research Council and Institute of Medicine, 2010; Samuels, Shinn, & Buckner, 2010). In 2010, 336,429 children stayed in homeless shelters with their families, and about half of these children were under the age of 6 (U.S. Department of Housing and Urban Development, 2012). Children from homeless families have higher rates of various negative outcomes, including academic failure as well as behavioral and emotional problems (Samuels et al., 2010). Homeless and residentially unstable children often begin school without adequate preparation, leading to poor achievement in the early years that contributes to lasting academic disparities even relative to residentially stable, low-income peers (Cutuli et al., 2013; Herbers et al., 2012; Masten et al., 1997; Rafferty, Shinn, & Weitzman, 2004). Homelessness and residential instability can disrupt learning and routines that support school engagement as well as relationships with teachers and peers (Rafferty et al., 2004; Rog & Buckner, 2007).

Homelessness represents a complex context of varied risk factors. As a group, families who experience homelessness also tend to experience risks associated with poverty, such as fewer educational, capital, and social resources (Buckner, 2008; Luthar, 2006; McLoyd et al., 2006). They also experience higher rates of other stressful life circumstances that threaten positive development, such as witnessing community and domestic violence, parental substance use and mental illness (Gewirtz, Forgatch, & Wieling, 2008; Masten, Miliotis, Graham-Bermann, Ramirez, & Neemann, 1993; Rog & Buckner, 2007). Moving to shelter often involves additional adversities, like becoming disconnected from some family members and social supports, disruptions in child care and school, loss of possessions, and the challenges of adapting to contexts often marked by crowding, lack of privacy, and feelings of stigma (Samuels et al., 2010). All of these risk factors can impact the child at both the individual and the family level, as the stressors associated with poverty and homelessness also put strain on the well-being and caregiving capacity of parents (David et al., 2012; Perlman, Cowan, Gewirtz, Haskett, & Stokes, 2012). Given the concatenation of risks, homeless children have been conceptualized as falling at the high end of a continuum of poverty-related risk (Buckner, 2008; Masten et al., 1993; Samuels et al., 2010).

Despite high levels of risk exposure, many children who experience family homelessness demonstrate competence across developmental domains, suggesting resilience (Buckner, Mezzacappa, & Beardslee, 2003; Cutuli et al., 2013; Obradović, 2010). Research to date, although limited, suggests that competence among children from homeless families, including school success, is associated with better self-regulation skills and parenting (Buckner et al., 2003; Herbers et al., 2011; Miliotis, Sesma, & Masten, 1999; Obradović, 2010). Buckner and colleagues (2003) found that positive adjustment of homeless and very low-income students was related to self-regulation skills and parental monitoring. Similarly, Obradović (2010) linked young homeless children's resilience at school to higher levels of effortful control, a component of self-regulation. With the same sample, Herbers and colleagues (2011) demonstrated that ratings of overall parenting quality predicted children's academic functioning in kindergarten or first grade, and that the effect was mediated by child executive functioning and IQ.

Nonetheless, the processes through which parenting and child self-regulation and cognitive skills in concert lead to positive development in high risk contexts have yet to be adequately explained. Understanding individual differences in the processes through which parenting supports the development of children's functioning during a period of acute adversity in a context of chronic risk can inform both the broader understanding of resilience processes as they unfold and also inform efforts to intervene in the lives of vulnerable children.

Parenting, Cognitive Functioning, and Self-regulation

Parents have a particularly important role with respect to emerging child self-regulation in all families, and especially in contexts of adversity. A child's capacity for cognitive functioning and self-regulation is the product of complex coordination of developing cognitive, social, emotional, and physiological systems for the purpose of accomplishing goals and adapting to contexts and situations (Berger, Kofman, Livneh, & Henik, 2007). The better children can solve problems while monitoring and managing their own behavior, the more likely they are to benefit from future experiences and show later positive developmental outcomes across academic, cognitive, social, and emotional domains (Blair & Diamond, 2008).

The current study focused on children's cognitive general functioning (IQ) as well as executive functioning (EF), a central component of the broader construct of self-regulation. IQ and EF abilities are related but distinct (Authors, 2012; Garon, Bryson, & Smith, 2008), and both have been identified as protective factors for competent development in contexts of adversity (Sapienza & Masten, 2011). Executive functioning refers to a diverse set of cognitive control processes that enable individuals to control their attention, thoughts, and behaviors to accomplish goals (Best & Miller, 2010; Diamond & Lee, 2011). For young children, executive function skills are particularly important for starting school, where they face new demands without their caregivers nearby (Blair, 2002). A child with strong intellectual and executive functioning is more likely to succeed in the classroom environment and reap the most from school curricula (Blair, 2002; Thompson & Raikes, 2007).

EF and self-regulation more broadly develop rapidly between the ages of 3 to 6 years with the physical maturation of the prefrontal cortex and associated neural systems (Garon et al., 2008). However, the experiences that support this development begin much earlier and continue throughout and beyond this period. From infancy onward, warm, sensitive, and responsive caregiving provides a source of external regulation for the child, serving as the basis for a secure attachment relationship while setting a foundation for the child's developing self-regulation (Ainsworth, Blehar, Waters, & Wall, 1978; Berger et al., 2007; Calkins & Hill, 2007; Cole, Teti, & Zahn-Waxler, 2003; Sroufe, Egeland, Carlson, & Collins, 2005). As part of this process, most caregivers respond to signals from children to meet their physical, emotional, and behavioral needs. These interactions are referred to as dyadic co-regulation, relationship processes by which a parent and child alter their behaviors in response to and anticipation of each other's behavior (Fogel, 1993). Over time, positive co-regulation supports and structures children's developing ability for autonomy and self-regulation through which they increasingly meet their own needs and manage their own behavioral and emotional responses (Calkins & Hill, 2007; Fogel, 1993; Shipman & Zeman, 2001). The nature and quality of thousands of accumulating interactions form an external context that complements or challenges the child's developing self-regulation capacities.

Through these processes, the co-regulation experiences are internalized and carried forward to new contexts, relationships, and experiences throughout the child's life. Studies have shown that preschool-aged children of mothers who provided more cognitive stimulation and less restrictiveness showed better behavioral control and attention focus at age eight (Olson, Bates, Sandy, & Schilling, 2002), and that harsh parenting predicted poor self-regulation later in development, even when concurrent child self-regulation abilities were statistically controlled (Colman, Hardy, Albert, Raffaelli, & Crockett, 2006). In situations of overwhelming stress for children, caregivers also can provide co-regulation by comforting the child with physical affection and conversations that encourage processing of experiences and other healthy coping skills (Eisenberg et al., 2005; Lengua, Honorado, & Bush, 2007; Raver, 2004).

Parenting behaviors and positive dyadic co-regulation have been linked to better child self-regulation if marked by positive control. In a meta-analysis of 41 studies of preschool-aged children, positive control by parents was related to better self-regulation and negative control was related to worse self-regulation, but the dyadic construct of parenting responsiveness was not significantly related to self-regulation (Karreman, van Tuijl, van Aken, & Deković, 2006). These studies defined positive control as teaching, encouraging, guiding, limit-setting, and directing the child through low-to-moderate power assertion. Meanwhile, negative control included acts of anger, harshness, criticism, excessive or intrusive control, physical intervention, coercive behaviors, hostility, and over-involvement. Finally, behaviors considered responsive included positive affect, accepting behavior, sensitivity, coordination, warmth, contingent behavior, approval, and affection (Karreman et al., 2006).

Among the studies represented in the meta-analysis, the majority were conducted with relatively homogeneous samples of white families of mid-to-high socioeconomic status (Karreman et al., 2006). The authors posited that the lack of socio-economic diversity could have accounted for the lack of association between dyadic responsiveness and child self-regulation. Results of the few studies conducted with higher risk samples of white and minority families living in poverty suggest that the importance of the parent-child relationship for developing self-regulation may be especially crucial in conditions of adversity (Eisenberg et al., 2005; Lengua et al., 2007; Raver, 2004). Parent responsiveness may vary more among parents facing considerable stress that can compromise the capacity for optimal parenting (David et al., 2012).

The Present Study

This study examined the role of effective parenting for school success in a high-risk sample of children living in emergency shelters for homeless families, with the goal of elucidating how positive co-regulation was related to concurrent child cognitive functioning, including executive functioning and IQ, and subsequent school adjustment in contexts of adversity. Co-regulation was operationalized as dyadic interactions using independently coded parent and child behavior with state space grids (SSG), a methodology designed to capture behavior of dynamic systems (Hollenstein, 2007; Lewis, Lamey, & Douglas, 1999). We also examined the independently coded parent behavior as a non-dyadic measure of parenting. Executive functioning was assessed with a battery of tasks administered during the shelter stay. Outcome data pertaining to school success were collected from the children's teachers during the subsequent school year.

We expected children from dyads with more positive co-regulation to demonstrate better concurrent executive and intellectual functioning and to show better adjustment to the school context in terms of academic competence, appropriate conduct, and positive relationships with peers. Analyses also were conducted focused on parent behavior only (not considering the context of concurrent child behavior) to compare the predictive significance of parent positive control behaviors and parent responsiveness for child adjustment in this high-risk, high adversity sample.

Method

Participants and Procedures

Caregivers and their 4-6 year old children (N = 138) participated while residing in one of three emergency shelters during the summers of 2008 and 2009. All children were entering kindergarten or first grade the subsequent fall, were fluent in English, and had no known developmental delays that would interfere with their participation in cognitive tasks. Families were not recruited until they had spent at least three nights in shelter, allowing them time to acclimate. At the time of participation in the study, families had been in shelter an average of 32.9 days (range = 3-335 days; 94% of families had been in shelter 90 days or less). The overall participation rate was 72% of all eligible families residing in the shelters at the time of the study. These were the only three general emergency shelters for families in this city.

The sample was roughly half female (56.5%) with an average age of 5 years, 9 months (SD = 7 months). Ninety-two (66.6%) of the children were African American, twenty-two (15.9%) Multiracial, nine (6.5%) American Indian, six (4.3%) Caucasian, and nine (6.3%) were some other race. Almost all primary caregivers were biological mothers (92.7%), while the remaining were biological fathers, step-parents, and grandmothers. Primary caregivers ranged in age from 20 to 57 (mean = 30, SD = 6 years, 3 months). While the majority of families were headed by single parents, 37 families had two caregivers present in shelter. The most frequently endorsed reasons for coming to shelter included being unable to afford rent, a voluntary move to another city or state, being evicted, relationship problems or domestic violence, and violence in the neighborhood.

Children and caregivers completed separate hour-long assessments before reuniting for eight structured interaction tasks lasting about another 50 minutes. In the fall, children were located in schools and teachers completed a measure of school outcomes. Overall, 114 of the 138 students (82.6%) were located in schools, yielding 110 (96.5%) teacher questionnaires for located students and providing teacher outcome data for 80% of the total sample. Analyses of missing data revealed no significant differences in study variables for children with teacher data compared to those without teacher data.

Parent-Child Interaction Tasks

The parent-child interaction session consisted of a standardized series of eight tasks that have been adapted for use with low-income families (DeGarmo, Patterson, & Forgatch, 2004; Gewirtz et al., 2008). For the first task, *Free Play*, parents and children were instructed to talk or play with toys while the parent was expected to enforce a rule about which toys the child could touch. In the second task, *Clean Up*, the researcher gave the parent a magazine to read while asking her child to clean up the toys. For *Problem Solving*, the third and fourth activities, parents and children discussed one issue selected by the parent and one selected by the child. Common problems included arguing with siblings, following family rules, and cleaning up. *Labyrinth* was the fifth task in which the parent and child used a modified Labyrinth tilt-table game board and worked cooperatively and competitively to move marbles into holes. Next in the *Safety Plan* activity, parents and children discussed a safety issue that the parent had selected such as strangers, house fires, or crossing the street. The *Guessing Game* task was seventh. Parents and children took turns giving each other clues to guess what was pictured on a standard set of cards. In the final game task, *Tangoes*, parents were instructed to help their children make specific designs using puzzle pieces from the commercial game.

Parent behavior and child behavior were coded separately using comprehensive micro-coding schemes by independent teams of coders trained to reliability. Parent codes reflected positive control behaviors, negative control behaviors, and responsiveness. Child codes differentiated on-task behavior from behaviors that indicate dysregulation, ineffective coping, or need for assistance. The codes represented durations of behavior, such that a code was applied at behavior onset and maintained until offset (which was also the onset of behavior from a different category). Coders used the software program ProcoderDV (Tapp, 2003).

All observed parent behavior was coded into one of the following four categories: positive control, non-directive responsiveness, disengaged/distracted, or negative control. Positive control described positive, constructive strategies to regulate the child that were accompanied by a positive or neutral affective tone. Examples of positive control include giving instructions, teaching, setting limits, and explaining rules. Non-directive responsiveness described parent behaviors that were involved and responsive but not directive. These behaviors were not specifically aimed at controlling or modifying child behavior or affect and occurred in the context of positive or neutral parent affect, such as active listening, watching the child work on a task, or reflecting something the child said. The parent code of disengaged/distracted occurred when the parent was ignoring the child, distracted, withdrawn, or otherwise not participating in the interaction. Parent negative control applied to behaviors that were harsh, punitive, insensitive, or intrusive such as criticisms, shaming, hostility, yelling, or physically intervening to redirect the child. Any behaviors accompanied by negative affective tone were coded as negative control.

All child behavior during the parent-child interaction tasks was coded into four categories: on-task, signals/bids, withdrawn, and defiant/disobedient. Child on-task behavior was characterized by child engagement and constructive behavior that was consistent with task demands and parent directives. When on-task, the child might be engaging in a puzzle or discussion, listening to the parent, or working fairly independently and confidently while remaining attentive to signals from the parent; child affect had to be positive or neutral. Child signals/bids were defined as verbal or nonverbal behaviors intended to get the parent’s attention or indicating opportunities for the parent to help, in the absence of defiance and disobedience. A variety of different behaviors fell under this category, including verbal requests for attention, assistance, or comfort; emotional distress and over-arousal; and social-referencing or touching the parent in a non-aggressive way. Child withdrawn behavior was coded when the child was distracted, not engaged with the parent or the task at hand, or otherwise uninvolved but not refusing or oppositional. Child defiant/disobedient behavior included refusing to comply, acting in opposition to instructions, breaking rules, or attempting to engage or direct the parent using negative behaviors such as hostility or aggression.

Parent and child coding teams consisted of a primary coder and a reliability coder who completed 30% of the videos. Observer accuracy was calculated based on the kappa statistic and the observed base rates of behavior in the sample (Bruckner, Yoder, & MacLean, 2006). Observer accuracy for all four parent codes was above 90%, with accuracy of parent disengaged/distracted above 95%. Observer accuracies were above 90% for child codes on-task and withdrawn, and above 85% for signals/bids and defiant/disobedient codes. Additional information regarding the coding scheme and reliability is available from the first author.

Positive Co-regulation: The State Space Grid

The state space was defined as a 4x4 grid with parent behavior on the *x*-axis and child behavior on the *y*-axis (Figure 1). Seven cells of the SSG were designated *a priori* as the region of positive co-regulation (PCR). The cells were chosen as ideal or preferred parent behavior in the context of the child behavior, based on the following assumptions drawn from developmental theory and past research. When the child is on-task, the parent should be giving positive direction or following the child's lead with non-directive responsiveness. When the child is signaling to the parent or struggling with a task, the parent also should be giving positive direction or responsively engaged. When the child is either withdrawn from interaction or defiant and disobedient, however, the parent should make efforts to re-engage or redirect the child with positive control behaviors and should not use negative control or disengage. Thus the portions of the grid representing the intersections of parent positive control with child on-task and with child signals, non-directive responsiveness with child on-task and child signals, and positive control with withdrawn and defiant/disobedient were considered PCR. Child on-task coupled with parent disengaged/distracted was also considered PCR because when children are independently and successfully engaged in appropriate behaviors, parents can use the opportunity to attend to other important matters. Parent disengagement/distraction was not considered PCR when it intersected with child signals, withdrawal, or defiance/disobedience. Regardless of child behavior, parent negative control was not considered PCR.

To measure individual differences in PCR, a variable measuring PCR influence was created using output from Gridware 1.1 (Lamey, Hollenstein, Lewis, & Granic, 2004). PCR influence represents the likelihood that each event, or instance of paired parent-child behavior, would occur within the PCR region. Influence is calculated as the number of events within the PCR region divided by the total number of events in the entire state space grid.

Cognitive Skills and School Outcomes

Executive Function. Children completed six validated, standardized executive function tasks that together emphasized inhibitory control, working memory, cognitive flexibility, and delay of gratification. These were the *Simon Says* task (Kochanska, Murray, & Coy, 1997; Strommen, 1973), the *Dimensional Change Card Sort* (DCCS: Zelazo, 2006), the *Peg-Tapping* task (Diamond & Taylor, 1996), the *Computerized Pointing Stroop* task (Berger, Jones, Rothbart, & Posner, 2000), the *Dinky Toys* task (Bruce, Tarullo, & Gunnar, 2009), and the *Gift Delay* task (Kochanska et al., 1997). Three tasks were coded by teams of raters with good reliability: Simon Says ($\kappa = .94$), Dinky Toys ($\kappa = .76$ for worst transgression, 93% agreement for frequency of transgressions, and 95% agreement for latency to first transgression), and Gift Delay ($\kappa = 1.0$ for worst transgression, 95% agreement for frequency of transgressions, and 96% agreement for latency to first transgression). Details on these tasks and their use in this study can be found elsewhere (Authors, 2012). Overall EF scores were computed based on averaging z-scores from each task (Cronbach's alpha = .71). This produced valid and reliable assessments of executive functioning that were distinguishable from IQ (Authors, 2012).

Child IQ. Estimates of child intellectual functioning were based on scores from the Peabody Picture Vocabulary Test, Fourth Edition (PPVT-IV: (Dunn & Dunn, 2007) and two subscales (Block Design and Matrix Reasoning) of the Wechsler Preschool and Primary Scales of Intelligence, Third Edition (WPPSI-III: Wechsler, 2002). The PPVT-IV is a standardized assessment of receptive vocabulary, a component of verbal intelligence. Block Design and Matrix Reasoning are two subscales from the WPPSI-III that measure nonverbal or performance intelligence (Wechsler, 2002). Scaled scores from the two subscales (r = .29) were averaged as an indicator of performance intelligence. Z-scores of the PPVT-IV score and the WPPSI-III composite (r = .35) were averaged to create an estimate of general intellectual function (IQ).

School Outcomes. Measures of school adaptation across developmental domains were based on the following three subscales from the teacher version of the MacArthur Health and Behavior Questionnaire (Essex et al., 2002): academic competence, externalizing/ADHD symptoms, and peer acceptance/rejection. The academic competence subscale comprises 5 items (α = .96) related to the child's academic achievement. The externalizing symptoms composite combines six subscales (α = .91) measuring oppositional defiant behavior (9 items, α = .91), conduct problems (11 items, α = .86), overt hostility (4 items, α = .84), relational aggression (6 items, α = .85), inattention (6 items, α = .90), and impulsivity (9 items, α = .92). The peer acceptance/rejection subscale includes eight items related to how well the child gets along with peers at school (α = .91).

Missing Data

Missing data were assumed to be missing at random and estimated using MCMC with fully conditional specification (Schafer & Graham, 2002) in IBM SPSS Statistics 20. Data were imputed 20 times with results of analyses combined according to Rubin's Rules (Rubin, 1987).

Complete data were available for the following variables: child age, gender, and IQ. Rates of missing data for other variables were as follows: 1.4% for executive function, 5.8% for all parenting and co-regulation variables, and 20.0% for all school outcomes. Results from analyses using imputed data are presented in all tables and figures.

Results

Means and standard deviations of all study variables are included in Table 1, along with rates of observed behavior (percent duration of coded time) for the parent and child codes. Zero-order correlations are presented in Table 2. Rates of coordinated parent and child behavior on the state space grid are depicted graphically using Gridware output in Figure 1. EF and IQ were moderately correlated (r = .48), as is common in other samples (Blair, 2006). IQ was included as a mediator in addition to EF to differentiate the role of self-regulation skills from general intellectual ability, which is a well-established protective factor for children at risk. Child age and gender were included as control variables in path analyses.

Co-regulation Models

Hypotheses linking PCR to child cognitive functioning and school adjustment were tested through a series of path models including PCR, EF, IQ, child age and child gender to predict teacher-reported school outcomes of academic competence, peer acceptance, and externalizing behavior. We used LISREL (Jöreskog & Sörbom, 1996) for path analyses with maximum likelihood estimation. The models estimated error variances for all terms. All three school outcomes were tested in the same model so that errors could be correlated to capture shared method variance. The first model included direct pathways from PCR to each of the school outcomes as well as pathways from EF, IQ, age, and gender to each of the school outcomes. EF and IQ were allowed to correlate, as were EF and age based on *a priori* expectations. Three additional models were tested to examine whether model fit was improved when PCR was allowed to predict outcomes indirectly through the mediator of EF only, when PCR was allowed to predict outcomes through the mediator of IQ only, and when PCR was allowed to predict outcomes through both EF and IQ simultaneously. By comparing Akaike Information Criterion (*AIC*) values of model fit (where lower values denote better fit), we determined whether these indirect paths from PCR made significant contributions to model fit based on a change in *AIC* greater than 3 (Burnham & Anderson, 2004).

The first model, with only direct pathways to outcomes, had an *AIC* of 84.5. The second model, which included an indirect pathway of PCR through EF had a significantly lower *AIC* of 70.8. For the model with IQ as the only mediator of PCR, the *AIC* value of 86.3 did not differ significantly from that of the first model. In the model including both EF and IQ as mediators of PCR, the *AIC* was lowest at 66.5. Additional model fit statistics as well as standardized estimates and standard errors for each of the pathways in this final model are presented in Table 3.

Considering individual parameter estimates for the final model, pathways from PCR to both EF and IQ were significant ($\beta = .38$, $p < .01$ and $\beta = .21$, $p < .01$, respectively), as expected. The model revealed significant pathways from EF to school outcomes of academic competence ($\beta = .34$, $p < .01$) and externalizing behavior ($\beta = -.25$, $p < .05$). From IQ, a significant pathway emerged only for academic competence ($\beta = .38$, $p < .01$). Though none of the direct paths from PCR to school outcomes were statistically significant in this model, there were significant indirect paths from PCR to academic competence ($\beta = .17$, $p < .05$) and externalizing behavior ($\beta = -.12$, $p < .05$). Taken together, the direct and indirect effects of PCR accounted for significant total effects for academic competence ($\beta = .17$, $p < .05$) and peer acceptance ($\beta = .17$, $p < .05$).

Parenting Behavior Models

Parent behavior models were designed to compare predictive effects of parental positive control versus responsiveness regardless of child behavior during the interaction tasks. Parent positive control and non-directive responsiveness were moderately related to each other (r = -.27) and thus were allowed to correlate in the path models.

All direct paths to school outcomes from the two parenting variables (positive control and non-directive responsiveness), EF, IQ, age, and gender to the three school outcomes were included in the first model. Subsequent models included indirect paths through EF, IQ, and both together for each of the parent behavior variables. Model fit was evaluated by comparing change in *AIC*. The first model with only direct paths specified had an *AIC* value of 97.8. The indirect pathways from parent responsiveness through IQ and parent positive control through EF both contributed to model fit with changes in *AIC*s greater than 3. Pathways from responsiveness through EF and positive control through IQ did not significantly change model fit for better or for worse. We retained these paths in the final model for purposes of comparison to the PCR model. This final model with EF and IQ as mediators of both responsiveness and control had an *AIC* value of 85.1.

In the final model, there were no significant direct pathways from the positive control composite to the three school outcomes, but the path from positive control to EF was significant (β = .24, p < .01). Positive control had significant indirect effects on outcomes of academic competence (β = .14, p < .01) and externalizing behaviors (β = -.08, p < .05), though the total effects of positive control were not statistically significant. In contrast, parent non-directive responsiveness had a significant direct effect on peer acceptance (β = .29, p < .01). Non-directive responsiveness also had significant indirect effects on academic competence (β = .16, p < .01) and externalizing behavior (β = -.07, p < .05), as well as accumulated total effects for all three school outcomes: academic competence ($\beta = .21$, $p < .05$), externalizing behaviors ($\beta = -.21$, $p < .05$), and peer acceptance ($\beta = .29$, $p < .01$). All coefficients and additional fit statistics are presented in Table 4, and the final models are depicted in Figures 2 and 3.

Additional Analyses

To address potential confounds and support validity of our findings, we ran several additional analyses. To support theoretical claims that co-regulation represents an important relationship construct beyond its obvious overlap with child functioning, we ran regression analyses with percent duration of child on-task behavior during parent-child interaction tasks statistically controlled. This analysis revealed positive co-regulation as a significant predictor of child EF beyond child on-task behavior. Similarly, in separate linear regression models, parent responsiveness predicted peer acceptance with child on-task behavior controlled.

Because 92.7% of the parents in the sample were biological mothers, it was not possible to examine differences in caregiving behaviors based on caregiving role. We did run all the study analyses using the subsample of children with mothers only. Results for these analyses did not differ from results with the full sample including fathers and other parent figures, thus we present findings from the entire sample.

Discussion

Results of this study suggest that positive co-regulation with parents supports competence and resilience in young children experiencing high levels of adversity. More positive co-regulation observed in dyadic interactions predicted better executive functions and IQ, which in turn predicted better academic competence, conduct, and peer relationships. Positive co-regulation appears to be important for healthy cognitive development and school functioning in kindergarten and first grade for children in homeless families. Results are consistent with developmental resilience theory positing that parent-child relationships serve as a central adaptive system for children experiencing ongoing adversity. Findings are congruent with theory and previous research suggesting that positive co-regulation experiences within the context of the parent-child relationship support the development of child self-regulation and cognitive functioning, which the child carries forward into the school context (Blair, 2002; Herbers et al., 2011; Thompson & Raikes, 2007).

The current study extends the literature by identifying expected relationships between parent co-regulation, child cognitive functioning (EF and IQ), and later functioning during kindergarten and first grade for children staying in emergency shelter with their families. Results indicated that the PCR construct captured co-regulation processes that were related to EF and IQ, even when child on-task behavior during interaction was statistically controlled. While children with good cognitive abilities also may have performed better during interaction tasks, the quality of external regulation provided by their parents predicted differences beyond this association. It was not only a matter of what the child could do, but also a matter of how the parent directed and responded to the child in moments of success and struggle. Positive behaviors tended to co-occur and, correspondingly, negative behaviors tended to co-occur. Overall, these individual patterns of interaction at the level of the relationship were related to children's concurrent individual performance on EF and IQ tasks, which then predicted school outcomes across domains.

Interestingly, parent's non-directive responsiveness was unrelated to child behavior during the interaction tasks. Unlike parent positive control, parent responsiveness did not occur more for children who spent more time on-task. In the models with parent behavior as predictors, without considering dyadic PCR, parent responsive, non-directive behavior was related to concurrent child EF and IQ and also directly predicted peer relationships beyond the effects of child EF and parent positive control. This differed considerably from the PCR models in which no direct effects emerged for any school outcomes. Thus, regardless of child behavior, parents who demonstrated more active listening, reflecting of child statements and feelings, and following the child's lead in activities had children who were more accepted by peers.

Non-directive responsiveness may be a unique aspect of parenting behavior that is particularly beneficial for young children in high risk contexts (Eisenberg et al., 2005; Lengua et al., 2007; Raver, 2004). Children who experience more non-directive responsiveness from their parents may have unique opportunities to explore their own perspectives, skills, and regulatory capacities compared to children whose parents predominantly take charge of interaction. Such opportunities could support the developing sense of autonomy and self-efficacy that supports prosocial behavior and adaptation to new contexts. Too much control, even when positive or neutral in tone, may be detrimental if not balanced with autonomy support and responsiveness. Future studies could test this hypothesis by measuring non-directive responsiveness and co-regulation in dyads across a broad range of exposure to risk and adversity to determine whether non-directive responsiveness moderates the impact of risk on outcomes, acting as a protective factor and contributing beyond the impact of co-regulation.

Families in Crisis

The observed parent-child behaviors in the current study represent aspects of ongoing adaptation to a situation of crisis. For most families, a stay in emergency shelter is a significant departure from their typical lives, accompanied by acute disruptions and a period of particularly high stress. Thus this study, with a representative sample of families in shelter, provides a unique window into processes of adaptation to acute adversity as they unfold. From a dynamic systems point of view, how parents and children interact during their stay in emergency shelter or in acute stages of other adversities may differ from how they interact during more stable periods of their lives. The observed behaviors may represent systems in flux, or temporary periods of reorganization following a significant perturbation to the system's typical pattern of behavior and functioning (Hollenstein, 2007). Parent-child interactions during acute stages of system re-organization could appear quite disorganized and even maladaptive, but this would not necessarily represent the level of stability of the system prior to and following the adjustment to such a change. Future studies could incorporate multiple observations of parent-child interaction during the course of a shelter stay and beyond, into subsequent housing situations. Some families would likely achieve more stable housing with less chaotic living conditions while others might continue to experience high levels of chaos and instability in other settings. The longitudinal changes in dyadic behavior for such families could differ in informative ways and extend findings from this study by exploring the relationship between behavior patterns during acute and long-term responses to stress and adversity.

Limitations

Children who experienced more positive co-regulation with their parents also showed higher levels of EF when assessed independently on the same day. We attempted to address the concern that the children who perform best on behavioral tasks of EF are also more likely to be on-task in the parent-child interaction tasks, making it easier for these parents to demonstrate positive co-regulation. This did not seem to be the case in the current study. We conducted several analyses seeking to parse concurrent child-driven and parent-driven effects. Positive co-regulation was related to child EF even when child on-task behavior during interaction tasks was controlled. This is consonant with findings from other longitudinal studies wherein positive co-regulation predicts better child self-regulation (Bernier, Carlson, & Whipple, 2010; Cole et al., 2003; Colman et al., 2006).

Because measures of child EF and parent-child interaction were collected on the same day, it is difficult to conclude with certainty the nature of the indirect effects of parenting through EF and IQ over time. We assume that parenting contributes to cognitive development over time because of theory and findings from previous longitudinal investigations (Bernier et al., 2010; Cole et al., 2003; Colman et al., 2006). Future studies with longitudinal data are warranted to address whether previous findings demonstrating effects of parenting on changes in child self-regulation (Colman et al., 2006) hold up in the population of homeless dyads. Also informative would be studies that involve longer-term school outcomes to determine whether parent-child co-regulation and child EF and IQ measured in shelter predict child school adjustment beyond the subsequent year. Such investigations will require careful planning to retain mobile families.

Conclusion and Implications

Parent-child relationships predicted concurrent child self-regulation and subsequent child adaptation to school among a high-risk group of parents and children experiencing homelessness. Positive co-regulation in parent-child interactions predicted child IQ and executive function, both of which carried indirect effects of co-regulation to school outcomes. Furthermore, parent non-directive responsiveness independently predicted positive social adjustment beyond the indirect pathways through child IQ and EF. These findings support the central role of parents in shaping development of child self-regulation and other skills in contexts of significant risk and adversity.

Findings from this study underscore the importance of the parent-child relationship for young children developing in contexts of risk and adversity. The links among parenting, executive function, and school adjustment suggest that interventions aiming to improve child functioning at school would benefit from parent involvement. More specifically, interventions can be targeted to improve child self-regulation and school adjustment by helping support parents in ways that promote a balance of positive control techniques, such as instructing and correcting, and non-directive responsiveness, such as active listening, while also reducing harsh or insensitive behaviors. Efforts to promote parenting in homeless families could also focus on addressing and reducing the stress and trauma experienced by homeless parents, which can interfere with their parenting. Children develop self-regulation in the context of their social relationships, with parents as their most proximal and influential social partners. Contexts of risk and adversity affect children directly and through their impact on parent-child relationships. Thus, interventions designed to support positive development are likely to be most effective when they target both direct and indirect processes.

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Table 1. Means, standard deviations, and range for study variables.

	M (SD)	Min	Max
Positive Co-regulation (PCR)	0.76 (0.11)	0.40	0.92
Parent – Positive Control	0.42 (0.12)	0.15	0.74
Parent – Responsiveness	0.34 (0.08)	0.17	0.55
Parent – Disengagement	0.13 (0.08)	0.00	0.46
Parent – Negative Control	0.10 (0.08)	0.00	0.40
Child – On-task	0.60 (0.15)	0.19	0.91
Child – Signals/Bids	0.25 (0.09)	0.05	0.49
Child – Withdrawn	0.10 (0.06)	0.00	0.37
Child – Defiant	0.06 (0.10)	0.00	0.63
Child IQ	-0.01 (0.83)	-2.22	3.06
Executive Function (EF)	0.00 (1.00)	-2.44	1.47
Academic Competence	2.48 (0.92)	1.00	5.00
Peer Acceptance	3.29 (0.61)	1.38	4.00
Externalizing Behavior	0.34 (0.38)	0.00	2.00

Table 2. Zero-order correlations.

		1	2	3	4	5	6	7	8	9	10
1.	Positive Co-Regulation	-									
2.	Positive Control	.64**	-								
3.	Responsiveness	.30**	-.27**	-							
4.	Child EF	.40**	.18	.17*	-						
5.	Child IQ	.21*	.08	.22*	.48**	-					
6.	Child Age	.09	-.06	.18	.40**	.17*	-				
7.	Child Gender	.06	.05	.12	-.10	-.02	.01	-			
8.	Academic Competence	.15	.01	.16	.38**	.48**	-.11	-.05	-		
9.	Peer Acceptance	.18	.02	.27**	.21*	.08	.06	.04	.29**	-	
10.	Externalizing Behavior	-.05	.05	-.16	-.24**	-.22*	.07	.23**	-.37**	-.49**	-

Table 3. Estimates and standard errors from best-fitting path analysis model of Positive Co-regulation.

	Executive Function	Child IQ	Academic Competence	Peer Acceptance	Externalizing Behavior
Positive Co-Regulation (PCR)	.38(.07)**	.21(.08)**	-.04(.08)	.10(.09)	.05(.09)
Executive Function			.34(.09)**	.20(.11)	-.25(.10)*
Child IQ			.38(.08)**	-.03(.09)	-.14(.09)
Child Age			-.30(.08)**	-.03(.09)	.19(.08)*
Child Gender			-.01(.07)	.05(.08)	.20(.08)*
PCR indirect			.20(.06)**	.07(.04)	-.12(.04)**
PCR total	.38(.07)**	.21(.08)*	.17(.09)*	.17(.08)*	-.07(.08)

* $p < .05$, ** $p < .01$

AIC = 66.5; $\chi^2(7, N = 138) = 8.6$, $p = 0.28$; RMSEA = 0.04; NNFI = 0.97.

Table 4. Estimates and standard errors from best-fitting path analysis model of Parenting Behavior.

	Executive Function	Child IQ	Academic Competence	Peer Acceptance	Externalizing Behavior
Positive Control (POS)	.24(.08)**	.15(.08)	-.08(.07)	.06(.08)	.07(.08)
Responsiveness (RES)	.18(.08)*	.26(.08)**	.05(.07)	.28(.08)**	-.13(.08)
Executive Function			.34(.09)**	.21(.10)*	-.24(.10)**
Child IQ			.36(.08)**	-.07(.09)	-.11(.09)
Child Age			-.32(.07)**	-.06(.09)	.21(.08)*
Child Gender			-.01(.07)	.02(.08)	.22(.08)**
POS indirect			.14(.03)**	.04(.02)	-.08(.03)*
POS total	.24(.08)**	.15(.08)	.06(.08)	.10(.08)	-.01(.08)
RES indirect			.16(.05)**	.02(.02)	-.07(.03)*
RES total	.18(.08)*	.26(.08)**	.21(.08)*	.29(.08)**	-.21(.08)*

* $p < .05$, ** $p < .01$

AIC = 85.1; $\chi^2(9, N = 138) = 13.5$, $p = 0.14$; RMSEA = 0.06; NNFI = 0.92.

Figure 1. The State Space Grid with all observed data. Nodes represent each visit (single instance of behavior for a single dyad within a cell), and the size of the nodes represent the relative duration of time for that visit. The Positive Co-regulation region is outlined in bold.

Figure 2. This figure shows only selected variables and pathways from the overall Positive Co-Regulation model, for clarity. In the overall model, control variables of Child Age and Gender were included and all outcomes were allowed to correlate.

Figure 3. This figure shows only selected variables and pathways from the overall model Parenting Behavior model, for clarity. In the overall model, control variables of Child Age and Gender were included and all outcomes were allowed to correlate.

Figure 1.

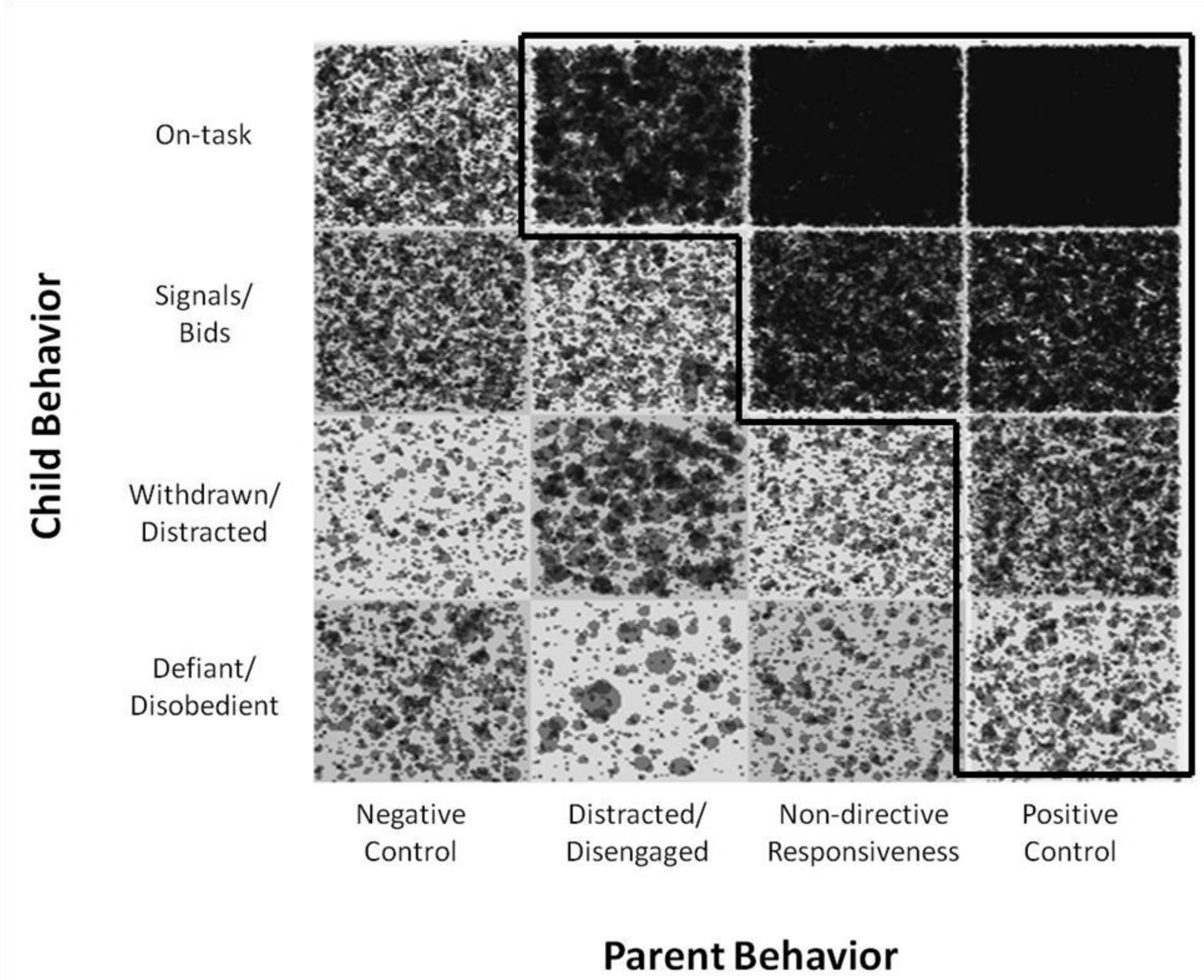
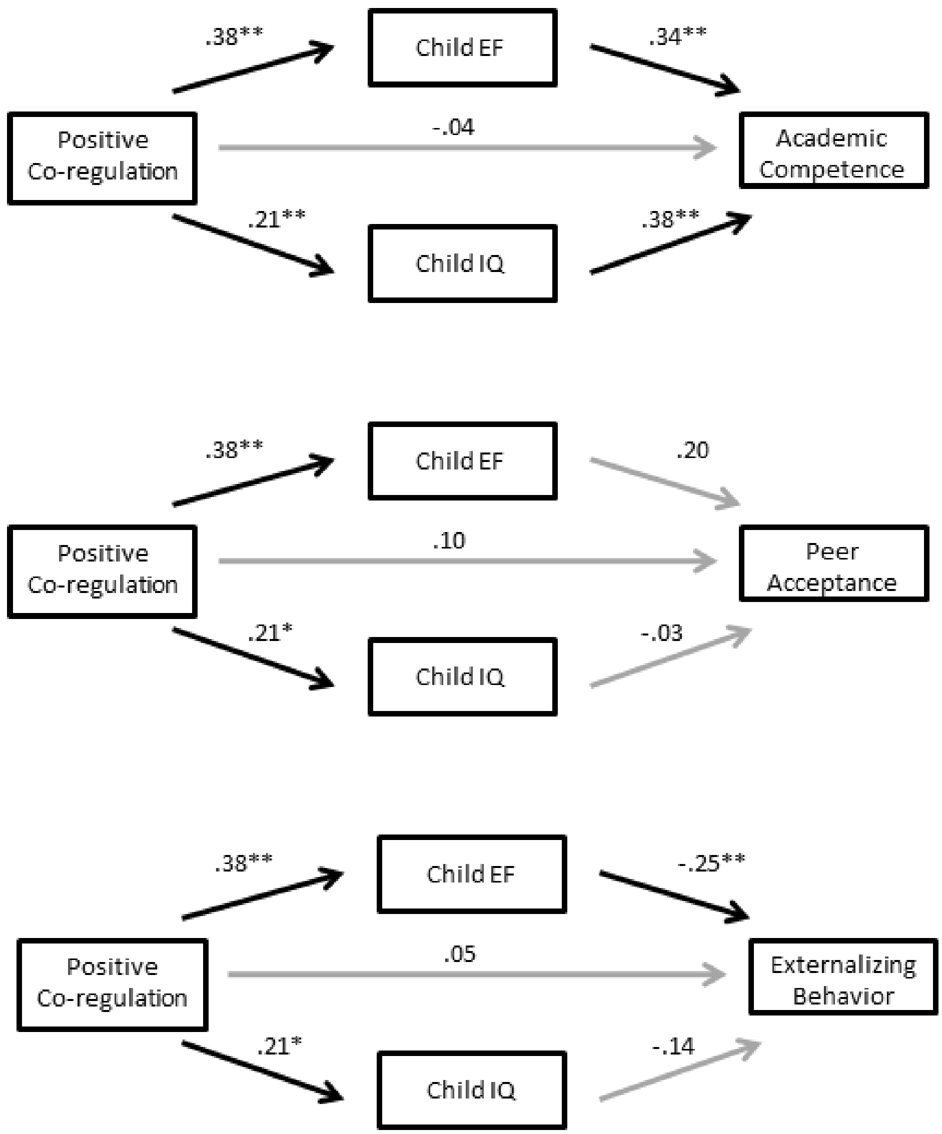

Child Behavior
On-task
Signals/ Bids
Withdrawn/ Distracted
Defiant/ Disobedient
Negative Control
Distracted/ Disengaged
Non-directive Responsiveness
Positive Control
Parent Behavior

Figure 2.


Positive
Co-regulation
Child EF
Child IQ
Academic
Competence
.38**
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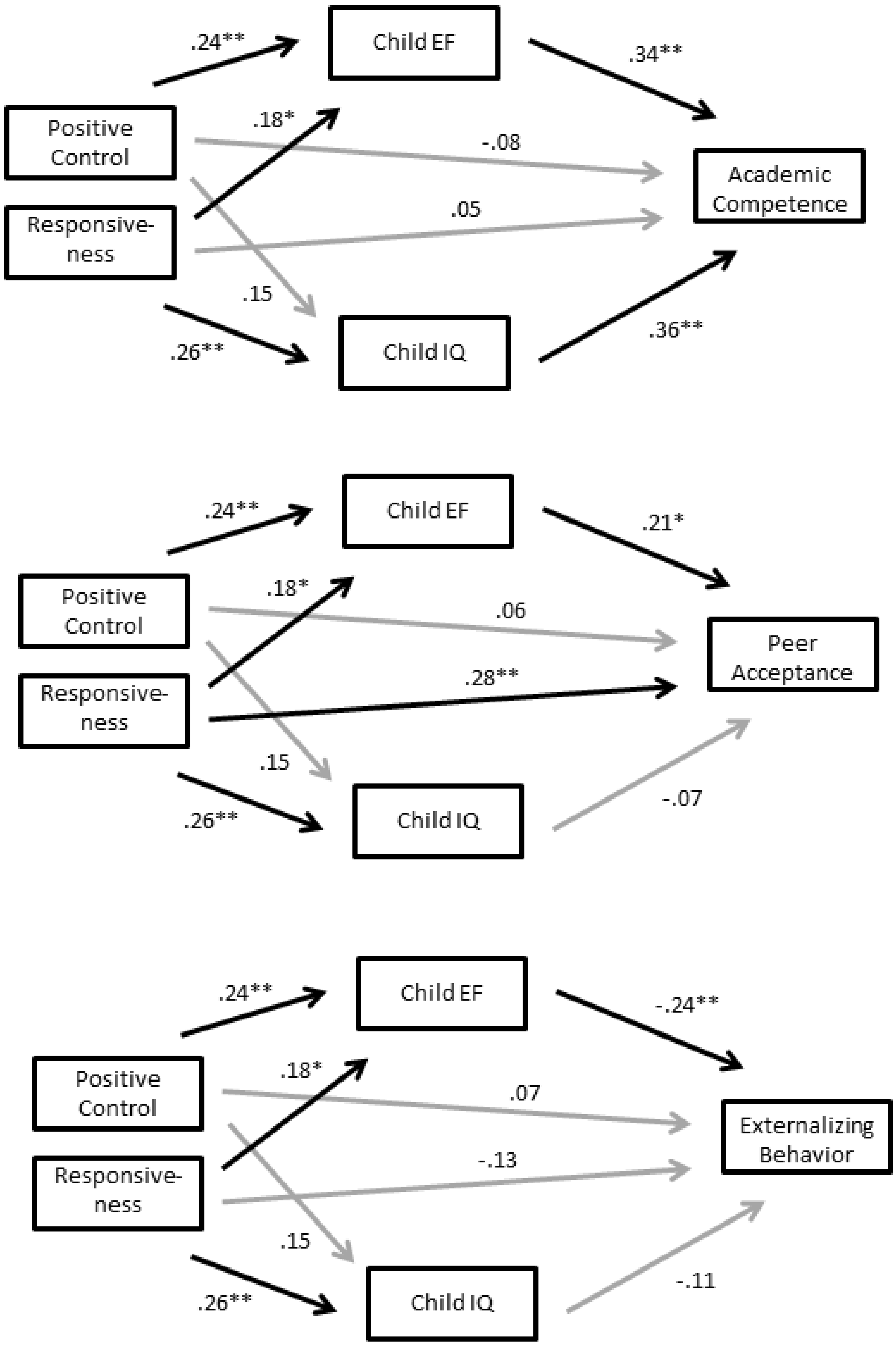
Positive
Co-regulation
Child EF
Child IQ
Peer
Acceptance
.38**
.20
.10
.21*
-.03
Positive
Co-regulation
Child EF
Child IQ
Externalizing
Behavior
.38**
-.25**
.05
.21*
-.14

Figure 3.


.24**
Child EF
.34**
Positive Control
.18*
-.08
Academic Competence
Responsive-ness
.05
.15
.26**
Child IQ
.36**
.24**
Child EF
.21*
Positive Control
.18*
.06
Peer Acceptance
Responsive-ness
.28**
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.26**
Child IQ
-.07
.24**
Child EF
-.24**
Positive Control
.18*
.07
Externalizing Behavior
Responsive-ness
-.13
.15
.26**
Child IQ
-.11