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Harsh Parenting, Child Behavior Problems, and the Dynamic Coupling of Parents' and Children's Positive Behaviors

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Abstract

We examined self-reported maternal and paternal harsh parenting (HP) and its effect on the moment-to-moment dynamic coupling of maternal autonomy support and children's positive, autonomous behavior. This positive behavior coupling was measured via hidden Markov models as the likelihood of transitions into specific positive dyadic states in real time. We also examined whether positive behavior coupling, in turn, predicted later HP and child behavior problems. Children (*N*=96; age 3½ years at Time 1) and mothers completed structured clean-up and puzzle tasks in the laboratory. Mothers' and fathers' HP was associated with children being less likely to respond positively to maternal autonomy support; mothers' HP was also associated with mothers being less likely to respond positively to children's autonomous behavior. When mothers responded to children's autonomous behavior with greater autonomy support, children showed fewer externalizing and internalizing problems over time and mothers showed less HP over time. These results were unique to the dynamic coupling of maternal autonomy support and children's autonomous behavior: the overall amount of these positive behaviors did not similarly predict reduced problems. Findings suggest that HP in the family system compromises the coregulation of positive behavior between mother and child and that improving mothers' and children's abilities to respond optimally to one another's autonomy-supportive behaviors may reduce HP and child behavior problems over time.

Keywords

parent-child interaction; harsh parenting; externalizing problems; internalizing problems; dynamic systems

Harsh parenting practices such as hostility, overreactivity, and physical punishment predict a host of negative child outcomes (MacKenzie, Nicklas, Brooks-Gunn, & Waldfogel, 2014; Stormshak, Bierman, McMahon, & Lengua, 2000). These practices are often accompanied by lax discipline, with parents oscillating between hostile commands and the failure to set consistent limits on the child's behavior (Gardner, 1989). Collectively, these practices create

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a context in which children struggle to obtain consistent support for their developing autonomy in early childhood. Outcomes of harsh parenting include children's limited self-regulation skills, behavior problems, and delayed autonomy orientation development (Cicchetti & Lynch, 1993). A major mechanism by which harsh parenting contributes to children's behavior problems is via dynamic patterns of parent-child interaction (Granic & Patterson, 2006). For example, harsh parenting is often accompanied by mutually aversive parent-child interactions, which in turn contribute to children's behavior problems over time (Smith et al., 2014).

On the other hand, parents who engage in harsh parenting also experience positive interactions with their children. Positive and neutral behaviors are observed in the laboratory more often than negative behaviors, even in the highest-risk families (Dishion, Duncan, Eddy, Fagot, & Fetrow, 1994). Abusive parents have been observed to initiate both positive and aversive control exchanges with their children and respond to child behavior with both positive and aversive strategies (Oldershaw, Walters, & Hall, 1986; Skowron, Cipriano-Essel, Benjamin, Pincus, & Van Ryzin, 2013). In family interventions for child behavior problems, practitioners build on existing positive behaviors to develop more positive parenting and parent-child relationships (Dishion et al., 2008). Yet despite the importance of understanding positive interaction dynamics for family intervention, we have little evidence on how dynamic positive interactions operate in the context of harsh parenting, and their role in the transmission of risk.

Positive Interactions in Families at Risk

Research on interaction *content* suggests that there is overall less positive affective and behavioral content in dyadic interactions in families at higher risk for child externalizing problems (Foster, Garber, & Durlak, 2008; Tronick & Reck, 2009). Research on interaction *context* suggests that these higher-risk families show greater negativity than lower-risk families even when primed to focus on happy experiences (Lunkenheimer, Hollenstein, Wang, & Shields, 2012), suggesting they have greater difficulty accessing the positive affect and behavior that typically accompanies these positive contexts. However, when positive interaction dynamics are stronger in higher-risk families, they act as a buffer against children's behavior problems (Deater-Deckard, Atzaba-Poria, & Pike, 2004) and an index of improvement in intervention (Granic, O'Hara, Pepler, & Lewis, 2007).

Knowing there is less positive behavior in families at higher risk is informative, but it does not explain the heterogeneity in outcomes for children exposed to harsh rearing environments. Understanding how parents and children coordinate positive behaviors could shed light on potential resilience factors such as how children make use of parental support when it is offered. Positive behaviors beget more positive behaviors in parent-child interactions (Ramsey & Gentzler, 2015). Parent-child dyads at risk for child maltreatment show decreases in positive synchrony or fail to increase positive synchrony (as compared to controls) during interaction (Giuliano, Skowron, & Berkman, 2015). Research on interpersonal repair, reflecting the transition from miscoordination or conflict to a mutually positive state (Tronick & Reck, 2009), suggests that dyads at lower and higher risk for child maltreatment are equally likely to experience conflict but that higher-risk dyads are less likely to repair it (Skowron, Kozlowski, & Pincus, 2010); the same has been demonstrated for interactions of depressed mothers (Jameson, Gelfand, Kulscar, & Teti, 1997). Thus, parent and child appear less likely to prompt one another's positive behaviors when dyads are at greater risk for parent mental health problems or child behavioral problems. However, research is needed to model these dynamic patterns directly and test whether they contribute to individual differences in problem behavior for children exposed to harsh parenting. The construct of parent-child coregulation provides a useful conceptual and methodological framework for modeling these patterns.

Coregulation of Maternal Autonomy Support and Children's Autonomous Behavior

Parent-child coregulation, or the processes by which parent and child regulate one another during face-to-face interactions, has been operationalized in various ways (Lunkenheimer, Kemp, & Albrecht, 2013; Skowron et al., 2010; Tronick & Reck, 2009). This construct reflects that the parent-child relationship is a dynamic system, one that self-organizes into stable patterns over time but is also open to reorganization by perturbation of the system (Granic & Patterson, 2006). Parent-child interactions may be less stable in early childhood because coregulation during this stage involves the active coordination of behavior around the child's rapidly developing autonomy and corresponding changes in regulatory skills. Accordingly, a better understanding of parent-child coregulation in early childhood, and specifically the coordination of parental autonomy support and children's autonomous behavior, could inform prevention targets.

Early parental autonomy support plays a crucial and positive role in child development (Roth, Assor, Niemiec, Ryan, & Deci, 2009). When parents provide scaffolding within the child's zone of proximal development and support to maintain the child's interest in tasks, children show higher levels of social and cognitive independence in early childhood (Landry, Smith, Swank, & Miller-Loncar, 2000). When parents provide opportunities to respond in teaching tasks, children show better regulatory skills (Supplee, Shaw, Hailstones, & Hartman, 2004). The dynamics of these teaching interactions also matter: when mothers respond contingently to child compliance by offering subsequent opportunities to respond and learn, children show better behavioral regulation in preschool (Lunkenheimer et al., 2013). These findings suggest that when parental guidance is coordinated with the child's needs and behavior, it contributes to the internalization of conduct and corresponding autonomy (Grusec & Goodnow, 1994; Ryan, Deci, Grolnick, & La Guardia, 2006). Similarly, we argue that the ideal outcome of parent-child coregulation, which acts as a training ground for self-regulation in interpersonal contexts, is the child's internalization of self-regulation skills.

On the other hand, parent familial risk factors can compromise parental autonomy support; for example, they are associated with parents' lower energy and resources with which to utilize autonomy-supportive parenting techniques (Cicchetti & Lynch, 1993). Maltreating parents are physiologically taxed by parenting in positive ways (Skowron et al., 2013) and tend to respond to children's positive bids for autonomy with hostile control (Skowron et al., 2011). Parents and children at risk also show weaker contingencies and poorer coordination of behavior, especially in disciplinary situations (Dumas, Lemay, & Dauwalder, 2001; Oldershaw et al., 1986). Children experiencing harsh parenting also show lower levels of internalization of conduct (Koenig, Cicchetti, & Rogosch, 2000). But children's autonomy orientation can be a strong resilience factor in adverse caregiving contexts (Cicchetti & Rogosch, 1997). Therefore, a better understanding of the parent-child coregulation dynamics surrounding children's autonomous behavior in harsh parenting contexts could inform intervention efforts.

Present Study

The present study was driven by the following questions: 1) Does maternal and paternal harsh parenting constrain the positive coupling of autonomy support and autonomous behavior between mother and child in early childhood?; and 2) Does the positive coupling of maternal autonomy support and children's autonomous behavior lead to reductions in behavior problems for children in the context of harsh parenting? Theorists suggest that children from adverse caregiving environments calibrate their regulatory strategies to adapt to the environment in which they are raised (Del Giudice, Ellis, & Shirtcliff, 2011). If so, then it is essential that we study adaptive calibration processes (e.g., positive parent-child coregulation dynamics) (a) within the primary context in which children develop regulatory skills, i.e., the parent-child relationship, (b) in early childhood when children's regulatory skills are becoming internalized and stabilizing, and (c) in adverse caregiving contexts, to inform the etiology and prevention of developmental psychopathology. We argue that by employing dynamic, real-time modeling of parent-child coregulation patterns, we gain more information about risk transmission and potential protective factors in everyday parent-child interactions.

We operationalized maternal autonomy support as two behaviors shown to promote children's developing autonomy and internalization of self-regulation skills: (1) proactive parenting: child-centered guidance that involves scaffolding within the child's zone of proximal development (Landry et al., 2000); and (2) teaching: providing instruction to the child that would enable them to learn and complete tasks independently (Eisenberg et al., 2010). Children's autonomous behavior was operationalized as independent task persistence (i.e., without parental prompting) in parent-guided dyadic tasks. We examined the dynamic coupling of these behaviors as the likelihood of two specific transitions as they played out in real time: (1) Instances in which, while the mother was displaying autonomy-supportive behavior, the child transitioned into positive autonomous behavior, and (2) Instances in which, while the child was displaying positive autonomous behavior, the mother transitioned into autonomy-supportive behavior. In other words, we examined positive, autonomy-supportive behavior coupling related to changes in *children's* behavioral responses and coupling related to changes in *mothers'* behavioral responses. We used hidden Markov modeling to model the likelihood of these dyadic state transitions in real time; this method captured both the temporal coordination and contingency of mother and child behaviors.

Research suggests that the most effective assessment of coregulation processes involves measuring the dyad as a unit of analysis (Stifter & Rovine, 2015), employing a challenge that prompts a regulatory response by the (in this case, dyadic) system (Cole, Martin, & Dennis, 2004), and appreciating that the function of dyadic behavior may change in light of contextual demands (Lunkenheimer et al., 2012). Accordingly, we examined the coregulation of autonomy support and autonomous behavior during interactions in which mother and child were challenged to complete a task, with the dyad as the unit of analysis, and aggregated across two different interaction contexts, specifically a clean-up task and a teaching task. To represent the context of harsh parenting practices in the family system, we examined both mothers' and fathers' self-reported overreactivity, hostility towards the child, physical punishment, and lax discipline (Gershoff, 2002; Trickett & Kuczynski, 1986); this approach allowed us to examine the effects of mothers' and fathers' harsh parenting accounting for the effects of the other parent.

Method

Participants

Ninety-six children (54% female) and their families participated, recruited via flyers in day care centers, preschools, and businesses, in addition to email listservs of agencies serving families with young children. Child race was reported as 85% White, 7% Biracial, 3% Asian, and 1% "other" race, and child ethnicity was reported as 87% Non-Hispanic and 9% Hispanic (4% did not report race or ethnicity). Children were an average of 41 months old ($SD = 2.95$ months) at Time 1 and 45 months old ($SD = 3$ months) at Time 2. Mothers were 30.17 years old on average ($SD = 3.22$) and fathers were 32.78 years old on average ($SD = 3.97$). Median annual family income was $55,000 and parental education was high on average (college graduate). Parents could be married or unmarried; 79% percent of parents were married, 7% cohabiting, 7% single, 5% separated or divorced, and 1% remarried. Exclusion criteria included a diagnosis of a pervasive developmental disorder or a medical condition that interfered with physiological data collection. Four families from the overall sample ($N = 100$) did not have complete data due to equipment malfunction ($n = 2$) and speaking a language other than English during the interaction ($n = 2$), which resulted in an analysis sample of $N = 96$ families for the present study.

Procedure

During a 2 1/2-hour laboratory session at Time 1, mothers and fathers filled out questionnaires, and mothers and children completed four dyadic tasks, including two structured, goal-oriented tasks: a clean-up task and a puzzle task. Mothers were not allowed to physically assist the child to complete the tasks, thus prompting the need for parents' verbal guidance and instruction. The Clean-up task lasted four minutes and the mother was asked to guide the child to clean up toys into a large bin using only her words. Prior to the Clean-up task, a free play task had been conducted for seven minutes with a wide array of toys; thus, for most children the request to clean up so soon was a challenge. Subsequently, mothers and children engaged in a puzzle task, the Parent-Child Challenge Task (PCCT; Lunkenheimer, Kemp, Lucas-Thompson, Cole, & Albrecht, 2016), for six minutes. Mothers were asked to help their children complete three successive puzzle designs in a guidebook using a 3-D wooden puzzle, once again using only their words, in order to win a prize (but all children received the prize regardless). Please see Lunkenheimer et al. (2016) for more detailed information regarding the PCCT.

Families were compensated $70 for laboratory sessions and questionnaires at Time 1. At Time 2, the same questionnaires were administered online and mothers and fathers were each compensated with a $20 gift card. At Time 1, 96 mothers participated and 82 fathers participated; the majority of families in which fathers did not participate at Time 1 were single-mother-headed households. At Time 2, 87 mothers participated and 62 fathers participated, therefore 87 mothers and 62 fathers participated at both time points. Families with mothers who dropped out at Time 2 showed lower education levels, $t(98) = -2.57$, $p < .05$, and lower SES, $t(98) = -2.92$, $p < .01$, but did not differ on primary study variables. Families in which fathers dropped out at Time 2 did not differ on demographic measures or primary study variables. This study entitled the Parent-Child Interaction Study was approved by the Institutional Review Board at Colorado State University, protocol #09-776H.

Measures

Mother and child behavioral coding—Mothers' and children's behaviors during the Clean-up and PCCT tasks were recorded using Noldus Observer XT 8.0 software and coded with the Dyadic Interaction Coding system (Lunkenheimer, 2009). Parents and children were coded for affect and goal-directed behavior on a second-by-second basis and codes were mutually exclusive; only the codes for *goal-directed behavior* were used for the present study. There were nine codes for parents: proactive structure, teaching, directive, positive reinforcement, engagement, emotional support, disengagement, intrusion, and negative discipline. There were seven codes for children: persistence, compliance, social conversation, solitary/parallel play, noncompliance, disengagement, and behavioral dysregulation.

Autonomy-supportive/autonomous behavior—The codes of proactive structure and teaching represented the autonomy support variable for mothers and children's self-directed task persistence represented the child's autonomous behavior. *Proactive structure* was defined as child-centered parenting behaviors designed to maximize children's participation and independent efforts towards the task (e.g., providing the child developmentally appropriate choices, informing the child about the next steps to come, or making a game of a task in order to keep the child engaged). *Teaching* was defined as instances in which the parent explained the task or asked a task-related question and allowed the child to respond. Children's *persistence* reflected children's sustained attention on the task in a self-directed, autonomous manner without an immediately preceding prompt by the parent. Proactive structure and teaching were combined to represent maternal autonomy support. Average interrater agreement was 82.5% for maternal autonomy support (kappa = .74) and 82.0% for children's autonomous behavior (kappa = .73) based on a standard 3-sec window in Noldus Observer 8.0.

Harsh parenting—Subscales from two questionnaires were used to assess the context of harsh parenting. The Parenting Scale (Arnold, O'Leary, Wolff, & Acker, 1993) assessed parental overreactivity (harsh and punitive parenting), hostility toward the child (verbal and physical), and lax discipline (inconsistent and permissive discipline), which typically accompanies harsh parenting (Gardner, 1989). Parents responded on a Likert scale ranging from “never or rarely” (1) to “almost always/most of the time” (7) regarding their parenting behavior in the past two months. These subscales have demonstrated good internal consistency and validity (Rhoades & O’Leary, 2007), though some studies show greater reliability for overreactivity and lax discipline than for hostility (Reitman et al., 2001); we found this pattern as well. Cronbach’s alpha values for overreactivity were .73 at Time 1 and .74 at Time 2 for mothers, and .67 at Time 1 and .74 at Time 2 for fathers. Cronbach’s alpha for lax discipline was .75 at Time 1 and .74 at Time 2 for mothers, and .82 at Time 1 and .81 at Time 2 for fathers. Cronbach’s values for hostility were .44 and .47 for mothers across the two time points, and .54 and .61 for fathers. The lower internal consistency for hostility was likely due to the fact that only three items made up this subscale, and of these three items, parents endorsed the physical hostility item but did not endorse the two verbal hostility items. Thus, it should be noted that this variable predominantly reflected physical hostility in the present sample.

The Conflict Tactics Scales—Parent-Child version (Straus, Hamby, Finkelhor, Moore, & Runyan, 1998) assessed parent physical assault, including items such as, “Spanked bottom with bare hand.” Parents responded on an 8-point weighted scale of frequency of assault in the past year, ranging from “This has never happened” to “More than 20 times.” Cronbach’s alpha for maternal physical assault was .60 at Time 1 and .59 at Time 2, and for paternal physical assault was .47 at Time 1 and .67 at Time 2. The lower internal consistency was likely due to the fact that parents in our sample endorsed spanking and light slapping, but rarely endorsed the other forms of physical assault (e.g., shook the child, pinched the child, or hit the child with an object).

In the present study, our interest was in a constellation of parenting behaviors that put children at higher risk for externalizing behavior problems. Thus, we planned to aggregate the four parenting behaviors of interest to get a broader representation of the context of harsh parenting. Raw scores for maternal overreactivity ($M = 2.69$, $SD = 0.90$, range = 1 – 5.40), lax discipline ($M = 2.38$, $SD = 0.87$, range = 1 – 5.60), hostility ($M = 1.38$, $SD = 0.60$, range = 1 – 3.67), and physical assault ($M = 6.64$, $SD = 10.45$, range = 0 – 76.00) were significantly correlated at Time 1, with correlations from .26 to .46, $p < .05$; the one exception was that lax discipline and physical assault were not significantly related. Similarly, raw scores for paternal overreactivity ($M = 2.77$, $SD = 0.87$, range = 1 – 5.40), lax discipline ($M = 2.42$, $SD = 0.85$, range = 1 – 5.00), hostility ($M = 1.66$, $SD = 0.81$, range = 1 – 4.67), and physical assault ($M = 6.25$, $SD = 7.92$, range = 0 – 33.00) were significantly correlated at Time 1, with correlations ranging from .20 to .50, $p < .05$; again, lax discipline and physical assault were not correlated. Interrelations among maternal and paternal variables at Time 2 were similar, ranging from .22 to .44, $p < .05$ for mothers and .21 to .48, $p < .05$ for fathers. These four subscales were standardized and averaged to form a cumulative index of harsh parenting for mothers and fathers, respectively.

Child behavior problems—Mothers reported on externalizing (EXT) and internalizing (INT) behavior problems via the Child Behavior Checklist (CBCL/1.5–5; Achenbach & Rescorla, 2000). The EXT subscale reflects poor attentional control and physically aggressive behavior. The INT subscale reflects anxiety, depression, and dysregulated fear. The 99 items are rated on a 3-point scale with 0 = "not true (as far as you know)", 1 = "somewhat or sometimes true" and 2 = "very true or often true." Cronbach's alpha reliability for externalizing behaviors was .89 at Time 1 and .93 at Time 2, and for internalizing behaviors was .64 at Time 1 and .77 at Time 2. Eleven out of 96 children had t-scores at or above the clinical cutoff ($T \geq 64$) for externalizing behavior problems at Time 1, $M = 49.85$, $SD = 9.97$, Range = 33.00 – 76.00. One child had a t-score at or above the clinical cutoff ($T \geq 64$) for internalizing behavior problems at Time 1, $M = 48.42$, $SD = 8.31$, Range = 29.00 – 64.00.

Analytic Plan

We used hidden Markov modeling (HMM; Rabiner, 1989; Visser, 2011) to examine whether parent and child positive behaviors co-occurred in expected ways to form dyadic states and to examine the likelihood of transitions between these dyadic states. HMM is considered a generalized mixture model and an extension of the latent class model to individual or dyadic time series data, appropriate for modeling a dynamic time series process for discrete categorical variables. This model is governed by the Markov property that holds that the probability of being in a particular state depends only upon the previous state. Using HMM, one derives a matrix of transition probabilities for the system states under study. Please see Stifter and Rovine (2015) for an example of HMM with observed mother-child interactions. HMM analyses were conducted in a java environment using open source code adapted for our specific invariance constraints (invariant emission matrix, dyad-specific transition matrix). Parameter estimation was embedded in a typical EM algorithm loop, with state sequences estimated using a Vertebi algorithm (Böckenholt, 2005; Visser, 2011).

Data preprocessing—Our first task was to derive measures that captured inter-dyad differences in the dynamic coupling of maternal autonomy support and children's autonomous behavior. To do so, we applied a continuous-time hidden Markov model (Böckenholt, 2005; Rabiner, 1989) to behavioral time series data. In specifying the measurement portion of the model (the emission matrix), we first combined mother and child behaviors into types based on the coding system (Lunkenheimer, 2009) and prior literature on supportive parenting behavior (Landry et al., 2000; Ryan et al., 2006, Roth et al., 2009). Mothers' behaviors were defined as being of three types: the *autonomy supportive* type consisted of proactive structuring and teaching behaviors; the *protecting/guiding* type consisted of directive, positive reinforcement, engagement, and emotional support behaviors, and the *negative* type consisted of disengagement, intrusion, and negative discipline behaviors. Similarly, children's behaviors were also defined as being of three types: *persistence* and *compliance* types were defined by their namesake variables, and an *off-task* type consisted of the five remaining behaviors (social conversation, solitary/parallel play, noncompliance, disengagement, and behavioral dysregulation). The multivariate dynamics of these six behavior types were then described using an HMM; this HMM was also used to model the combinations of the three maternal behavior categories and the three child behavior categories, resulting in nine possible dyadic states.

We constructed the emission matrix, which can be conceived of as a measurement model (e.g., a factor loading matrix), to link the six individual behavior types to nine latent dyadic states determined through the examination of relative model fits (Table 1). On top of this common measurement frame, we estimated task- and dyad-specific transition matrices that described the dynamics of dyadic behavior in the Clean-up and PCCT tasks. When averaged across the sample and across tasks, the (9 × 9) estimated transition probabilities provided a robust description of how mother-child dyads typically moved among the dyadic states (Table 1). In the present study, however, our main interest was in two specific transitions: children responding to mothers' autonomy support with positive, autonomous behavior, and mothers responding to children's positive, autonomous behavior with autonomy support.

To target these transitions, we extracted three of the nine latent states, the emission mappings of which are highlighted in Table 1. We considered maternal autonomy-supportive behavior + child persistence (State 1) as the optimal (target) dyadic state, reflecting that mothers were successfully supporting the child's autonomous behavior in a challenging task. *Child-response coupling* was then defined as the probability of the child's positive response to the mother's supportive behavior, measured as the probability of the dyad's transition from parent autonomy support + child compliance (State 2) to the desired outcome (State 1). Conversely, *mother-response coupling* was defined as the probability of the mother's supportive response to child's positive behavior, measured as the probability of the dyad's transition from parent protecting/guiding behavior + child persistence (State 4) to the desired outcome (State 1). These two transition probabilities were averaged across the Clean-up and PCCT tasks to obtain an index of mother-child positive behavior coupling across contexts. In sum, a continuous time HMM was used to derive two transition probability measures that indexed dyad-level differences in mothers' and children's positive behavior coupling from the multivariate behavioral time-series collected during two challenging tasks. These two transition probability measures were then saved and utilized as observed variables in subsequent structural equation models.

In order to examine positive behavior coupling in relation to our predictors and outcomes of interest, we modeled the relations among maternal and paternal harsh parenting (HP), mother-child positive behavior coupling (POS), and child externalizing (EXT) and internalizing (INT) behavior problems in a structural equation model. Specifically, we modeled HP, POS, EXT, and INT at Time 1 in relation to HP, EXT, and INT at Time 2. Finally, we performed two post-hoc analyses. The first post-hoc analysis examined whether the dynamic coupling of mother and child autonomy-supportive behaviors in real time, and not just the overall amount of these positive behaviors, was uniquely related to harsh parenting and child behavior problems. The second post-hoc analysis examined whether child gender influence the proposed model given prior research suggesting differences in relations between discipline and children's behavior problems for boys versus girls (Deater-Deckard & Dodge, 2009).

Results

Preliminary Analyses

First, variable distributions were examined. Positive behavior coupling probabilities (POS) were normally distributed across the sample (Kolmorgorov-Smirnov test, $D(98) = .089$, *ns*, for child-response coupling and $D(98) = .094$, *ns,* for mother-response coupling). The variables of HP, EXT, and INT, as well as the individual parent and child behaviors that made up the coupling probabilities, maternal autonomy support and child persistence, all showed normal distributions with standardized skewness of an absolute value less than 1.96 for the present sample size, therefore transformation was not warranted (Ghasemi & Zahedaisl, 2012). Next, primary study variables were examined in relation to the sociodemographic variables of child age, child gender, maternal education, and family income. No significant relations were found, thus these variables were not included as covariates in primary analyses.

Descriptive data and bivariate correlations are presented in Table 2. Across both interaction tasks, dyads had a 25% likelihood on average (range = 0 to 95%) of making the transition in question, i.e., responding to autonomous/autonomy-supportive behavior with behavior in kind. Six dyads did not make the mother-response coupling in question, and two dyads did not make the child-response coupling in question. Maternal autonomy support and child autonomous behavior co-occurred 12.35 times on average ($SD = 5.97$) for a total duration of 66.08 seconds on average ($SD = 35.84$) during the 10 minutes of dyadic tasks.

Bivariate correlations illustrated that both mother-response and child-response POS were negatively associated with maternal harsh parenting at Time 2. Mother-response POS was negatively associated with children’s externalizing problems at both time points, but neither mother- nor child-response POS was significantly associated with children’s internalizing problems. Separate bivariate correlations were performed to examine whether the original self-reported maternal harsh parenting components (hostility, overreactivity, physical assault, and lax discipline) were correlated with the two components of observed maternal autonomy support (teaching and proactive structure); none of these variables were significantly intercorrelated.

Primary Analysis

We modeled maternal and paternal HP, POS, EXT, and INT (Time 1) in relation to maternal and paternal HP, EXT, and INT (Time 2) to examine how dynamic coupling of maternal autonomy support and child autonomous behavior was related to harsh parenting and child behavior problems within and across time. Structural equation modeling was performed in Mplus 7 (Muthén & Muthén, 1998–2015) using full information maximum likelihood estimation (FIML). Using FIML, families with complete data on exogenous variables were retained, resulting in $n = 82$ given that 14 of the 96 families were single-mother-headed families with no participating father. All parents in the analysis were married to and/or cohabiting with the other biological parent with the exception of 3 families (1 separated, 2 divorced). The comparative fit index (CFI), root mean square error of approximation

(RMSEA), and standardized root mean square residual (SRMR) were used to assess model fit (Hu & Bentler, 1995).

Model fit was good, χ^2 (10) = 15.31, *ns*, CFI=.98, RMSEA=.06, SRMR=.05 (Figure 1). Higher maternal HP was concurrently related to the reduced likelihood that mothers would respond to children's autonomous behavior with autonomy support, and the reduced likelihood that children would respond to mothers' autonomy support with autonomous behavior. Paternal HP was concurrently associated with the reduced likelihood that children would respond to mothers' positive autonomy support with autonomous behavior, but was not associated with the reverse direction of influence: mothers' likelihood of autonomy-supportive responses to their children. Maternal HP at Time 1 also positively predicted both maternal and paternal HP at Time 2, and paternal HP at Time 1 positively predicted children's higher internalizing problems at Time 2. Maternal and paternal HP were positively interrelated at Time 2.

With regard to the longitudinal effects of POS, mothers' higher likelihood of responding with autonomy support to children's autonomous behavior at Time 1 predicted lower levels of children's externalizing and internalizing behavior problems at Time 2. Thus, over a period of only four months on average in early childhood, mothers' contingent autonomy-supportive responses contributed to children's lower behavior problems. This same process of mothers responding to autonomous behavior with autonomy support at Time 1 also predicted lower levels of maternal HP at Time 2. These effects were found accounting for stability in maternal HP and children's behavior problems over time. Children's externalizing and internalizing problems showed stability over time, and were positively intercorrelated at both Time 1 and Time 2. This model explained 45% ($p < .001$) of the variance in externalizing problems, 57% ($p < .001$) of the variance in internalizing problems, 31% ($p < .01$) of the variance in maternal harsh parenting, and 43% ($p < .001$) of the variance in paternal harsh parenting at Time 2.

Post-hoc Analyses

A post-hoc analysis was performed to verify that it was the dynamic coupling of mothers' autonomy support and children's autonomous behavior, not simply the degree to which mothers and children displayed these behaviors, driving the results. The structural equation model was modified to replace the two positive behavior coupling probabilities with two new variables: the total duration in seconds of mothers' autonomy-supportive behavior and the total duration in seconds of children's autonomous behavior. Model fit was good and comparable to the previous model, χ^2 (10) = 11.16, *ns*, CFI=.97, RMSEA=.06, SRMR=.06. However, the overall amount of mothers' autonomy-supportive and children's autonomous behavior were not related to concurrent maternal or paternal HP, nor related to any outcomes with one exception: maternal autonomy support was positively related to externalizing problems at Time 2, $b = .29$, $p < .05$. Explained variance for internalizing problems at Time 2 dropped by 7%, whereas the explained variance for externalizing problems and maternal and paternal harsh parenting remained comparable to the original model. Thus, the total amount of mothers' autonomy-supportive behavior and children's autonomous behavior was not related to lower concurrent harsh parenting or behavior problems, nor to reductions in later harsh parenting or behavior problems.

Another post-hoc analysis was performed to examine whether the model differed with the inclusion of child gender, given prior research suggesting differences in relations between discipline and children's behavior problems for boys versus girls (Deater-Deckard & Dodge, 2009). Model fit was comparable, χ^2 (11) = 17.98, *ns*, CFI=.96, RMSEA=.07, SRMR=.05. Child gender was not related to any variables in the model, with the exception of maternal HP at Time 2: male gender was related to higher maternal HP at Time 2, $b = .26$, $p < .05$.

Discussion

The role of positive behavior in familial risk processes has been understudied relative to that of negative behavior (Davis & Suveg, 2014). This gap creates significant difficulties in understanding protective factors and resilience processes for children developing in the context of familial risk and may restrict intervention approaches. Even when parents are a source of risk, they can also be a source of protection (Cicchetti & Rogosch, 1997; Lunkenheimer et al., 2012). Bringing awareness to existing positive parent-child interactions and building upon them are key pathways to change in family intervention. Evidence-based intervention programs such as the Family Checkup (Dishion et al., 2008), the Parent Management Training program (Forgatch & Patterson, 2010), and Parent-Child Interaction Therapy (Chaffin et al., 2004) reduce parent-child relationship problems by altering everyday patterns of interaction, encouraging parents' proactive rather than reactive responses to children. The present study sought a better understanding of how mothers and children responded positively to one another's positive behaviors, which maps onto an important goal of family interventions, and how these processes were related to harsh parenting and children's behavior problems in early childhood.

As expected, we found that higher levels of harsh parenting were associated with the lower likelihood of positive behavior coupling between mothers and children. In other words, when mothers and fathers self-reported higher levels of harsh parenting, the child was less likely to make use of the mother's autonomy-supportive parenting practices and transition into autonomous behavior. Similarly, when children displayed positive, autonomous behavior, the mother was less likely to transition into parenting behaviors that supported that autonomy when she also reported higher levels of harsh parenting. Maternal autonomy support and children's autonomous behavior were quite common in our community sample of mothers and children. So although all mother-child dyads displayed these positive individual behaviors, they were less likely to couple to produce more optimal support of children's developing autonomy when maternal and paternal harsh parenting was higher.

These results complement findings showing that parent-child coregulation is impaired in the context of harsh parenting (Giuliano et al., 2015; Skowron et al., 2010), which may occur through multiple mechanisms. Harsh parenting is associated with higher levels of parenting stress and limited resources with which to parent in a proactive manner (Skowron et al., 2013). Harsh parenting may reflect that the parent's own self-regulation is compromised (Cicchetti & Lynch, 1993); if parents lack a reliable baseline of parenting behavior, it could be difficult for them to calibrate their behaviors to those of their child, or for the child to calibrate his or her behaviors to those of the parent. Harsh parenting may also create a climate in which positive interactions are not valued or rewarded, thus receiving less attention from parents and children. It could also contribute to fear or insecure attachment in the child (deWolff & van IJzendoorn, 1997), making children less likely to trust that their parents' support is reliable and perform autonomous behaviors in the context of that uncertain support. Interestingly, fathers' harsh parenting was associated with *children's* lower likelihood of positive behavior coupling but not that of *mothers*. This finding suggests that when both mother and father engage in harsh parenting, the child's autonomous behavior is more likely to be hindered, reflecting the influence of cumulative risk within the family system. It also suggests that harsh parenting may limit a parent's own, but not necessarily his or her partner's, coregulation with the child. Future research on father-child interaction dynamics will be needed to test whether harsh parenting impacts father-child coregulation in the same manner that it impacts mother-child coregulation.

The present findings also suggest that the greater likelihood of coupling around support for children's autonomy may act as a protective factor. Even after accounting for the influence of harsh parenting and stability over time in children's behavior problems, mothers who responded positively to their children's persistent, on-task behavior by offering them more scaffolding and opportunities to respond had children who showed reductions in externalizing and internalizing behavior problems over time. These effects were found over just four months, which raises the question of whether maternal autonomy support has relatively powerful effects on improvements in children's dysregulated behavior between the ages of 3 and 4 years. Autonomy support may provide the child opportunities to practice self-regulation, models of planning and flexible behavioral strategies, and information with which to more competently handle challenges (Landry et al., 2000; Supplee et al., 2004).

Mothers' contingent autonomy support was also associated with reductions in mothers' own self-reported harsh parenting over time. From a transactional perspective, contingent autonomy support may be successful in supporting children and reducing children's behavior problems, which in turn may reduce the likelihood of mothers using harsher parenting practices. It is important to note here that it was not the *overall amount* of autonomy support that was beneficial in reducing maternal harsh parenting and children's behavior problems over time, since the overall amount was in fact positively related to children's later externalizing problems (a finding that may have reflected that mothers were responding to dysregulated children's needs for more guidance). Rather, it was the *dynamic contingency and coordination* of the autonomy support with children's positive, autonomous behavior that predicted children's lower behavior problems and reduced harsh parenting, suggesting that dynamic aspects of parent-child coregulation play an important and unique role in children's developing regulatory skills and developmental psychopathology in the family (Lunkenheimer et al., 2013).

Limitations and Future Directions

Only mother-child coregulation and maternal ratings of child behavior problems were assessed, so in future work it will be important to examine whether these findings extend to father-child coregulation and father and teacher ratings of child behavior. A significant portion of fathers dropped out at Time 2, which may be why we did not find stability in fathers' harsh parenting over time; lower reliability in specific components of harsh parenting, namely the hostility and physical assault variables, could also have contributed to this unexpected finding. Levels of harsh parenting and child behavior problems were typical of a community sample, so future research should test whether findings replicate with families at higher levels of risk and clinical symptoms. These lower levels of risk were likely the reason that our measures of hostility and physical assault showed lower reliability since parents tended to report physical punishment (e.g., spanking) but not other forms of physical or verbal abuse.

We defined coregulation as the coupling of mother and child behaviors, measured as transitions among particular dyadic states. These dyadic states were defined a priori in relation to our specific coding system and hypotheses, as opposed to allowing latent states to emerge organically from the available data. So future work could use HMM to examine which coregulation patterns emerge as being most closely related to the covariates and outcomes of interest. Although we also had an interest in negative behavior coupling, negative parenting behaviors did not couple predictably enough with child behavior to produce stable dyadic states for analysis (see States 7, 8, and 9 in Table 1). This may be a function of parents in our community sample showing fewer negative behaviors in the laboratory, or may reflect that parents' negative behaviors are typically less predictable and contingent (Dumas et al., 2001) than their positive behaviors, which may inform future studies of coregulation.

Conclusion

Parent-child coregulation is a central mechanism by which familial risk factors impact children's developing regulatory skills (Lunkenheimer et al., 2013). Correspondingly, early impairments in parent-child coregulation lay the groundwork for limitations in child self-regulation (Lunkenheimer et al., 2016), which in turn can hinder functioning in multiple other domains of child development. Parent-child coregulation is an essential area of study for developmental psychopathology, particularly given that many family interventions for children's behavior problems operate by targeting change in parenting behaviors and parent-child interactions. Thus, we must continue to examine dynamic, positive interaction processes in families at risk in order to build a more comprehensive empirical foundation for the prevention of child behavior problems through strengths-based family interventions.

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References

Achenbach, TM., Rescorla, LA. Manual for the ASEBA Preschool Forms & Profiles. Burlington, VT: University of Vermont; 2000.

Arnold DS, O'Leary SG, Wolff LS, Acker M. The Parenting Scale: A measure of dysfunctional parenting in discipline situations. Psychological Assessment. 1993; 5:137–144. doi: 0.1037/1040-3590.5.2.137.

Böckenholt U. A latent Markov model for the analysis of longitudinal data collected in continuous time: States, durations, and transitions. Psychological Methods. 2005; 10(1):65–83. DOI: 10.1037/1082-989X.10.1.65 [PubMed: 15810869]

Chaffin M, Silovsky JF, Funderburk B, Valle LA, Brestan EV, Balachova T, Jackson S, Lensgraf J, Bonner BL. Parent-Child Interaction Therapy with physically abusive parents: Efficacy for reducing future abuse reports. Journal of Consulting and Clinical Psychology. 2004; 72:500–10. DOI: 10.1037/0022-006X.72.3.500 [PubMed: 15279533]

Cicchetti D, Lynch M. Toward an ecological/transactional model of community violence and child maltreatment: Consequences for children's development. Psychiatry. 1993; 56:96–117. [PubMed: 8488217]

Cicchetti D, Rogosch FA. The role of self-organization in the promotion of resilience in maltreated children. Development and Psychopathology. 1997; 9(4):797–815. DOI: 10.1017/S0954579497001442 [PubMed: 9449006]

Cole PM, Martin SE, Dennis TA. Emotion regulation as a scientific construct: Methodological challenges and directions for child development research. Child Development. 2004; 75(2):317–333. DOI: 10.1111/j.1467-8624.2004.00673.x [PubMed: 15056186]

Davis M, Suveg C. Focusing on the positive: A review of the role of child positive affect in developmental psychopathology. Clinical Child And Family Psychology Review. 2014; 17(2):97–124. DOI: 10.1007/s10567-013-0162-y [PubMed: 24323039]

Deater-Deckard K, Atzaba-Poria N, Pike A. Mother- and father-child mutuality in Anglo and Indian British families: A link with lower externalizing problems. Journal of Abnormal Child Psychology. 2004; 32(6):609–620. DOI: 10.1023/B:JACP.0000047210.81880.14 [PubMed: 15648528]

Deater-Deckard K, Dodge KA. Externalizing behavior problems and discipline revisited: Nonlinear effects and variation by culture, context, and gender. Psychological Inquiry. 2009; 8:161–175. DOI: 10.1207/s15327965pli0803_1

Del Giudice M, Ellis BJ, Shirtcliff EA. The Adaptive Calibration Model of stress responsivity. Neuroscience & Biobehavioral Reviews. 2011; 35(7):1562–1592. DOI: 10.1016/j.neubiorev.2010.11.007 [PubMed: 21145350]

deWolff MS, van IJzendoorn MH. Sensitivity and attachment: A meta-analysis on parental antecedents of infant attachment. Child Development. 1997; 68(4):571–591. DOI: 10.1111/j.1467-8624.1997.tb04218.x [PubMed: 9306636]

Dishion TJ, Duncan TE, Eddy JM, Fagot BI, Fetrow R. The world of parents and peers: Coercive exchanges and children's social adaptation. Social Development. 1994; 3:255–268. DOI: 10.1111/j.1467-9507.1994.tb00044.x

Dishion T, Shaw D, Connell A, Gardner F, Weaver C, Wilson M. The Family Check-Up with high-risk indigent families: Preventing problem behavior by increasing parents' positive behavior support in early childhood. Child Development. 2008; 79:1395–1414. DOI: 10.1111/j.1467-8624.2008.01195.x [PubMed: 18826532]

Dumas JE, Lemay P, Dauwalder JP. Dynamic analyses of mother–child interactions in functional and dysfunctional dyads: A synergetic approach. Journal of Abnormal Child Psychology. 2001; 29:317–329. DOI: 10.1023/A:1010309929116 [PubMed: 11523837]

Eisenberg N, Vidmar M, Spinrad TL, Eggum ND, Edwards A, Gaertner B, et al. Mothers' teaching strategies and children's effortful control: A longitudinal study. Developmental Psychology. 2010; 46:1294–1308. DOI: 10.1037/a0020236 [PubMed: 20822239]

Forgatch, MS., Patterson, GR. Parent management training—Oregon model: An intervention for antisocial behavior in children and adolescents. In: Weisz, JR., Kazdin, AE., editors. Evidence-based psychotherapies for children and adolescents. 2. New York: Guilford; 2010. p. 159-178.

Foster CJ, Garber J, Durlak JA. Current and past maternal depression, maternal interaction behaviors, and children's externalizing and internalizing symptoms. Journal of Abnormal Child Psychology. 2008; 36(4):527–537. DOI: 10.1007/s10802-007-9197-1 [PubMed: 18071896]

Gershoff ET. Corporal punishment by parents and associated child behaviors and experiences: A meta-analytic and theoretical review. Psychological Bulletin. 2002; 128(4):539–579. DOI: 10.1037//0033-2909.128.4.539 [PubMed: 12081081]

Ghasemi A, Zahediasl S. Normality tests for statistical analysis: A guide for non-statisticians. Endocrinology & Metabolism. 2012; 10:486–489. DOI: 10.5812/ijem.3505

Giuliano RJ, Skowron EA, Berkman ET. Growth models of dyadic synchrony and mother-child vagal tone in the context of parenting at-risk. Biological Psychology. 2015; 105:29–36. DOI: 10.1016/j.biopsycho.2014.12.009 [PubMed: 25542759]

Granic I, Patterson GR. Toward a comprehensive model of antisocial development: A dynamic systems approach. Psychological Review. 2006; 113(1):101–131. DOI: 10.1037/0033-295X.113.1.101 [PubMed: 16478303]

Grusec J, Goodnow J. Impact of parental discipline methods on the child's internalization of values: A reconceptualization of current points of view. Developmental Psychology. 1994; 30(1):4–19. doi: 0.1037/0012-1649.30.1.4.

Hu, L., Bentler, PM. Evaluating model fit. In: Hoyle, RH., editor. Structural equation modeling: Concepts, issues, and applications. Thousand Oaks, CA: Sage Publications, Inc; 1995. p. 76-99.

Jameson P, Gelfand D, Kulcsar E, Teti D. Mother-toddler interaction patterns associated with maternal depression. Development and Psychopathology. 1997; 9:537–550. DOI: 10.1017/S0954579497001296 [PubMed: 9327238]

Koenig AL, Cicchetti D, Rogosch FA. Child compliance/noncompliance and maternal contributors to internalization in maltreating and nonmaltreating dyads. Child Development. 2000; 71(4):1018–1032. DOI: 10.1111/1467-8624.00206 [PubMed: 11016563]

Landry SH, Smith KE, Swank PR, Miller-Loncar CL. Early maternal and child influences on children's later independent cognitive and social functioning. Child Development. 2000; 71(2): 358–375. DOI: 10.1111/1467-8624.00150 [PubMed: 10834470]

Lunkenheimer, ES. The Dyadic Interaction Coding System. Fort Collins, Colorado: Colorado State University; 2009. Unpublished manual

Lunkenheimer ES, Hollenstein T, Wang J, Shields A. Flexibility and attractors in context: Family emotion socialization patterns and children's emotion regulation in late childhood. Nonlinear Dynamics-Psychology and Life Sciences. 2012; 16:269–291. DOI: 10.1017/S095457941200051X

Lunkenheimer ES, Kemp CJ, Albrecht EC. Contingencies in parent-child teaching interactions and behavioral regulation and dysregulation in early childhood. Social Development. 2013; 22:319–339. DOI: 10.1111/sode.12016 [PubMed: 23645973]

Lunkenheimer E, Kemp CJ, Lucas-Thompson RG, Cole PM, Albrecht EC. Assessing biobehavioural self-regulation and coregulation in early childhood: The Parent-Child Challenge Task. Infant and Child Development. 2016; Advance online publication. doi: 10.1002/icd.1965

MacKenzie MJ, Nicklas E, Brooks-Gunn J, Waldfogel J. Spanking and children's externalizing behavior across the first decade of life: Evidence for transactional processes. Journal of Youth and Adolescence. 2014; 44:658–669. DOI: 10.1007/s10964-014-0114-y [PubMed: 24664147]

Muthén, LK., Muthén, BO. Mplus User's Guide. 7. Los Angeles, CA: Muthén & Muthén; 1998–2015.

Oldershaw L, Walters GC, Hall DK. Control strategies and noncompliance in abusive mother-child dyads: An observational study. Child Development. 1986; 57:722–732. doi:0.1007/s10826-014-9981-9. [PubMed: 3720400]

Rabiner LR. A tutorial on hidden Markov models and selected applications in speech recognition. Proceedings of the IEEE. 1989; 77(2):257–286. DOI: 10.1109/5.18626

Ramsey MA, Gentzler AL. An upward spiral: Bidirectional associations between positive affect and positive aspects of close relationships across the life span. Developmental Review. 2015; 36:58–104. DOI: 10.1016/j.dr.2015.01.003

Reitman D, Currier RO, Hupp SD, Rhode PC, Murphy MA, O'Callaghan PM. Psychometric characteristics of the Parenting Scale in a head start population. Journal of Clinical Child Psychology. 2001; 30(4):514–524. doi:0.1207/S15374424JCCP3004_08. [PubMed: 11708239]

Rhoades KA, O'Leary SG. Factor structure and validity of the Parenting Scale. Journal of Clinical Child and Adolescent Psychology. 2007; 36:137–146. DOI: 10.1080/15374410701274157 [PubMed: 17484687]

Roth G, Assor A, Niemiec CP, Ryan RM, Deci EL. The emotional and academic consequences of parental conditional regard: Comparing conditional positive regard, conditional negative regard, and autonomy support as parenting practices. Developmental Psychology. 2009; 45(4):1119–1142. DOI: 10.1037/a0015272 [PubMed: 19586183]

Ryan, RM., Deci, EL., Grolnick, WS., La Guardia, JG. The significance of autonomy and autonomy support in psychological development and psychopathology. In: Cicchetti, D., Cohen, DJ., editors. Developmental psychopathology: Theory and method. Vol. 1. New Jersey: John Wiley & Sons, Inc; 2006. p. 795-849.

Skowron EA, Cipriano-Essel E, Benjamin LS, Pincus AL, Van Ryzin MJ. Cardiac vagal tone and quality of parenting show concurrent and time-ordered associations that diverge in abusive, neglectful, and non-maltreating mothers. Couple and Family Psychology: Research and Practice. 2013; 2(2):95–115. DOI: 10.1037/cfp0000005 [PubMed: 24729945]

Skowron EA, Kozlowski JM, Pincus AL. Differentiation, self–other representations, and rupture–repair processes: Predicting child maltreatment risk. Journal of Counseling Psychology. 2010; 57:304–316. DOI: 10.1037/a0020030 [PubMed: 20729978]

Skowron EA, Loken E, Gatzke-Kopp LM, Cipriano-Essel E, Woehrle PL, … Ammerman RT. Mapping cardiac physiology and parenting processes in maltreating mother-child dyads. Journal of Family Psychology. 2011; 25(5):663–674. DOI: 10.1037/a0024528 [PubMed: 21842991]

Smith JD, Dishion TJ, Shaw DS, Wilson M, Winter C, Patterson G. Coercive family process and early-onset conduct problems from age 2 to school entry. Development and Psychopathology. 2014; 26(4):917–932. DOI: 10.1017/S0954579414000169 [PubMed: 24690305]

Stifter C, Rovine M. Modeling dyadic processes using hidden Markov models: A times series approach to mother-infant interactions during infant immunization. Infant and Child Development. 2015; 24(3):298–321. DOI: 10.1002/icd.1907 [PubMed: 27284272]

Stormshak EA, Bierman KL, McMahon RJ, Lengua L. Parenting practices and child disruptive behavior problems in early elementary school. Journal of Clinical Child Psychology. 2000; 29(1): 17–29. DOI: 10.1207/S15374424jccp2901_3 [PubMed: 10693029]

Straus MA, Hamby SL, Finkelhor D, Moore DW, Runyan D. Identification of child maltreatment with the Parent–Child Conflict Tactics Scales: Development and psychometric data for a national sample of American parents. Child Abuse & Neglect. 1998; 22(4):249–270. DOI: 10.1016/S0145-2134(97)00174-9 [PubMed: 9589178]

Supplee LH, Shaw DS, Hailstones K, Hartman K. Family and child influences on early academic and emotion regulatory behaviors. Journal of School Psychology. 2004; 42(3):221–242. DOI: 10.1016/j.jsp.2004.02.001

Trickett PK, Kuczynski L. Children's misbehaviors and parental discipline in abusive and nonabusive families. Developmental Psychology. 1986; 22:115–123. DOI: 10.1037/0012-1649.22.1.115

Tronick E, Reck C. Infants of depressed mothers. Harvard Review of Psychiatry. 2009; 17:147–156. DOI: 10.1097/00004583-198903000-00016 [PubMed: 19373622]

Visser I. Seven things to remember about hidden Markov models: A tutorial on Markovian models for time series. Journal of Mathematical Psychology. 2011; 55(6):403–415. DOI: 10.1016/j.jmp.2011.08.002

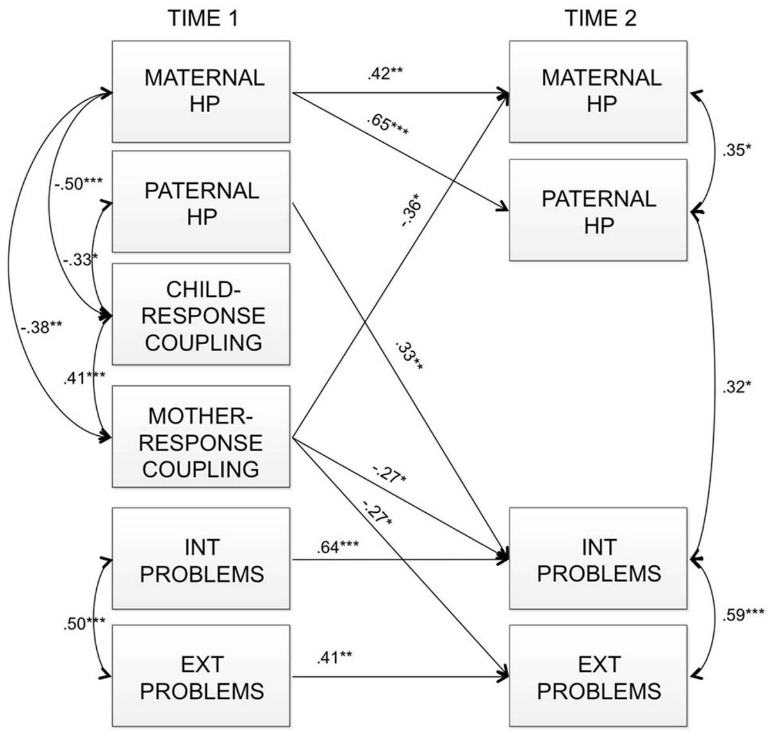

Figure 1. Relations among Maternal and Paternal Harsh Parenting (HP), Mother-Child Positive Behavior Coupling, and Child Internalizing (INT) and Externalizing (EXT) Behavior Problems

Note: Only significant pathways are displayed, with standardized coefficients.

Table 1

Emission Matrix and Transitional Probabilities for Positive Behavior Coupling

	Mother Behavior Types			*Child Behavior Types*			*Transition Probabilities*								
Dyadic State	**AS**	**P/G**	**NEG**	**P**	**C**	**OT**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
1	***0.7487***	0.2458	0.0056	***0.8564***	0.1176	0.0261	---	0.198	0.206	0.340	0.057	0.056	0.111	0.020	0.013
2	***0.7659***	0.2275	0.0067	0.0319	***0.9299***	0.0383	***0.265***	---	0.176	0.068	0.284	0.041	0.023	0.133	0.008
3	***0.7822***	0.2141	0.0037	0.0088	0.0706	***0.9207***	0.121	0.312	---	0.030	0.067	0.334	0.007	0.023	0.109
4	0.0235	***0.9740***	0.0025	***0.8117***	0.1575	0.0309	***0.224***	0.028	0.035	---	0.279	0.293	0.111	0.016	0.014
5	0.0237	***0.9742***	0.0021	0.0355	***0.9197***	0.0449	0.047	0.177	0.029	0.324	---	0.278	0.022	0.107	0.015
6	0.0237	***0.9741***	0.0022	0.0105	0.0848	***0.9048***	0.019	0.064	0.264	0.165	0.318	---	0.014	0.024	0.133
7	0.1127	0.4826	0.4048	***0.8885***	0.0948	0.0168	0.202	0.028	0.058	0.405	0.054	0.102	---	0.077	0.074
8	0.1278	0.5017	0.3706	0.0206	***0.9401***	0.0393	0.035	0.191	0.030	0.088	0.396	0.087	0.087	---	0.086
9	0.1008	0.4522	0.4471	0.0031	0.0381	***0.9589***	0.029	0.051	0.213	0.044	0.074	0.438	0.039	0.115	---

Note: The dyadic states under study are highlighted in gray. Dyadic states were defined by combining each of the individual mother and child behavior types; the defining behaviors for each state are the highest respective loadings, which are noted in bolded and italicized text. For example, State 1 was defined as the combination of maternal autonomy support (AS) and child persistence (P). The transition probabilities matrix reflects the average transitional probabilities of moving among the nine dyadic states. Positive behavior coupling in the present study was measured as the transitional probabilities from State 2 to State 1 (child-response) and from State 4 to State 1 (mother-response); these two average probabilities are noted in bolded and italicized text in the transition probabilities matrix. AS=Autonomy-supportive; P/G = Protecting/Guiding; NEG = Negative; P = Persistence; C = Compliance; OT = Off-Task

Table 2

Descriptive Data

	1	2	3	4	5	6	7	8	9	10	11	12	*M*	*SD*
1. Maternal HP (T1)	---												0.00	3.69
2. Maternal HP (T2)	.62***	---											−0.11	3.30
3. Paternal HP (T1)	.28**	.07	---										0.01	3.83
4. Paternal HP (T2)	.13	−.01	.62***	---									0.06	3.72
5. Maternal AS	−.01	−.10	−.15	−.23†	---								107.58	52.22
6. Child Persistence	−.04	−.12	−.04	−.12	.28**								70.48	63.35
7. Child-response POS (T1)	−.11	−.27*	−.09	−.07	.12	.43***	---						0.27	0.20
8. Mother-response POS (T1)	−.14	−.22*	−.08	−.16	.28**	.37***	.30**	---					0.22	0.16
9. Externalizing (T1)	.18†	.27*	.14	.10	−.19†	−.36***	−.19†	−.20*	---				10.64	6.63
10. Externalizing (T2)	.20*	.31**	.07	−.03	−.16	−.28**	−.10	−.23*	.64***	---			7.91	7.34
11. Internalizing (T1)	.12	.21†	.03	.22†	−.09	−.02	−.10	.03	.47***	.18†	---		7.17	4.34
12. Internalizing (T2)	.07	.05	.11	.08	−.03	−.04	.02	−.06	.32**	.65***	.45***	---	5.07	4.21

Note: Maternal autonomy support and child persistence were measured as duration in seconds. POS is measured as the probability of behavior coupling of maternal autonomy support and child persistence. HP = Harsh parenting; AS = Autonomy support; POS = Positive behavior coupling probability; T1 = Time 1, T2 = Time 2;

† $p < .10$,

* $p < .05$,

** $p < .01$,

*** $p < .001$.