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Breaking Down the Coercive Cycle: How Parent and Child Risk Factors Influence Real-Time Variability in Parental Responses to Child Misbehavior

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Abstract

Objective—Parent-child coercive cycles have been associated with both rigidity and inconsistency in parenting behavior. To explain these mixed findings, we examined real-time variability in maternal responses to children's off-task behavior to determine whether this common trigger of the coercive cycle (responding to child misbehavior) is associated with rigidity or inconsistency in parenting. We also examined the effects of risk factors for coercion (maternal hostility, maternal depressive symptoms, child externalizing problems, and dyadic negativity) on patterns of parenting.

Design—Mother-child dyads ($N = 96$; M child age = 41 months) completed a difficult puzzle task, and observations were coded continuously for parent (e.g., directive, teaching) and child behavior (e.g., on-task, off-task).

Results—Multilevel continuous-time survival analyses revealed that parenting behavior is less variable when children are off-task. However, when risk factors are higher, a different profile emerges. Combined maternal and child risk is associated with markedly lower variability in parenting behavior overall (i.e., rigidity) paired with shifts towards higher variability specifically when children are off-task (i.e., inconsistency). Dyadic negativity (i.e., episodes when children are off-task and parents engage in negative behavior) are also associated with higher parenting variability.

Conclusions—Risk factors confer rigidity in parenting overall, but in moments when higher-risk parents must respond to child misbehavior, their parenting becomes more variable, suggesting inconsistency and ineffectiveness. This context-dependent shift in parenting behavior may help explain prior mixed findings and offer new directions for family interventions designed to reduce coercive processes.

INTRODUCTION

Transactional and dynamic systems theories suggest that stable patterns of health and dysfunction emerge over time from recurring, microlevel dyadic interactions (Sameroff & Chandler, 1975; Granic & Patterson, 2006). Coercion theory (Patterson, 2002) originated in studies of reciprocally aversive behaviors between mother and child and was based on a social learning perspective (Bandura, 1973). Early analyses of family interactions revealed that parents and children were being mutually shaped to engage in aversive behavior through a combination of operant and classical conditioning. For example, a coercive cycle typically begins by a child misbehaving, followed by the parent scolding the child, which results in the child's exacerbation of the misbehavior. If the parent disengages to stop the child's aversive behavior, both participants are shaped by this response. The parent has been shaped to give up when the child's behavior becomes aversive, and the child has been shaped to become aversive again the next time the child's parent disciplined. The negative reinforcement of the child's misbehavior creates a positive feedback cycle whereby parent–child interactions become more difficult to manage, leading to the escalation of aggressive behaviors over time (Patterson, 2002). Dynamic systems theory would suggest that the dyadic system has self-organized into this particular stable pattern, which then constrains the behavioral repertoire for future interactions (Granic & Patterson, 2006).

Accordingly, coercive processes have been characterized as rigid, with parent and child becoming “stuck” in predictable, negative interaction patterns (Patterson, 2002). This rigidity is problematic. Empirical studies have shown that stable, mutually aversive interactions lead to higher child behavior problems over time (Cole, Teti, & Zahn-Waxler, 2003; Dumas, Lemay, & Dauwalder, 2001). Hollenstein, Granic, Stoolmiller, and Snyder (2004) and colleagues have found that rigid parent-child interactions (a restricted affective and behavioral repertoire) predicted the child's inclusion in the “consistently high” and “increasing” externalizing problem groups in kindergarten. Even in the preschool years, dyadic rigidity in parent-child interaction patterns has been shown to predict higher teacher-rated externalizing problems 2 years later in kindergarten (Lunkenheimer, Olson, Hollenstein, Sameroff, & Winter, 2011).

Rigidity vs. Inconsistency in Parenting

Although theory and empirical research agree on the rigid, recurring nature of coercion, parent-child coercion has also been associated with the opposite pattern of maladaptive *increases* in parents' behavioral variability, often termed inconsistent or indiscriminate parenting. Parent-child coercion and its correlates of hostility, familial conflict, and externalizing problems have been associated with inconsistent discipline and indiscriminate parental affect (Dishion, Patterson, Stoolmiller, & Skinner, 1991; Dumas & Wahler, 1985;

Gardner, 1989). For example, hostile and abusive parents tend to respond to their children in indiscriminate ways: they are equally likely to initiate positive and aversive control exchanges and to respond to child behavior with positive and aversive strategies (Dumas, LaFreniere, & Serketich, 1995; Oldershaw, Walters, & Hall, 1986). Oldershaw et al. (1986) found that abusive parents were inconsistent in responding to child noncompliance, but once they did choose to respond they were more likely to make repetitive commands with power assertion, implying behavioral rigidity.

Another set of risk factors associated with parent-child coercion is the combination of parental depression and children's externalizing problems, which has also been linked to greater inconsistency in parental behavior. Parents with depression or higher levels of depressive symptoms display greater affective miscoordination with their infants (Weinberg, Olson, Beeghly, & Tronick, 2006) and are less likely to repair this miscoordination (Jameson, Gelfand, Kulcsar, & Teti, 1997). Over time, these unrepaired interactions set up long-term insecurity, negative expectations, and regulatory difficulties in the parent-child dyad (Tronick & Reck, 2009). Parents with more depressive symptoms show greater inconsistency in discipline and limit-setting with older children (Stoneman, Brody, & Burke, 1989). Parental depression has also been associated with unavailable caregiving (Bugental, Martorell, & Barraza, 2003), which is related to both inconsistent parenting (Shea & Coyne, 2011) and children's externalizing behavior problems (Zahn-Waxler, Iannotti, Cummings, & Denham, 1990).

Implications for Theory and Practice

Overall, these findings appear contradictory in that parent-child coercion and related risks have been associated with both rigidity (low variability) and inconsistency (high variability) in parental and dyadic behavior. These contradictions may create difficulties in understanding and applying coercion theory for researchers and practitioners. Evidence-based interventions, such as the Family Checkup (Dishion et al., 2008) and the Parent Management Training program (Forgatch & Patterson, 2010), reduce parent-child coercion by altering everyday patterns of parent-child interaction, including promoting consistency in parenting and encouraging parents' proactive rather than reactive responses to children (Dishion, Stormshak, & Kavanagh, 2011; Kaminski, Valle, Filene, & Boyle, 2008). Accordingly, understanding how coercive cycles play out in real time, and whether or not they are associated with low or high variability in moment-to-moment parenting behavior, could be important in appropriately tailoring intervention efforts.

One way to examine these mixed findings is through a microlevel analysis of shifts in parental behavior that correspond with the most common trigger of the coercive cycle, the child's misbehavior. In the example in the first paragraph, the child's behavior appears rigid in that negative behavior is maintained and escalates over time, while the parent's behavior undergoes a shift from overt hostility to disengagement. Thus, there is at least one significant change in parental behavior in this cycle. If this cycle has occurred previously, the dyadic system may take less time to settle into its eventual state (Granic & Patterson, 2006), thus appearing more rigid. But if the child is younger or relationship patterns are less entrenched, the parent might oscillate between different strategies before acquiescing and

negatively reinforcing the misbehavior (Dumas et al., 1995), thus appearing more variable in his/her response. Through a microlevel analysis of parental response patterns to child behavior in real time, we may obtain a better understanding of the early stages of the parent-child coercive cycle, which could inform prevention efforts with families at risk for parent-child coercion.

Present Study

The goal of the present study was to understand whether mothers were more likely to increase or decrease variability in their behavior when responding to children's off-task behavior during structured interactions and whether these real-time response patterns differed by certain risk factors known to be associated with parent-child coercion. We also examined whether maternal response patterns differed by dyadic negative episodes because dyadic negativity is a hallmark of coercive processes and may influence parental responses (Cole et al., 2003). The parental risk factors most commonly correlated with parent-child coercion are hostility and depressive symptoms. Each has been associated with parenting inconsistency and/or rigidity in prior research (Dumas et al., 1995; Lunkenheimer, Albrecht, & Kemp, 2013), and each is known to co-occur with children's externalizing problems (Low & Stocker, 2005). Parenting rigidity and inconsistency have also been directly associated with children's externalizing problems (Gardner, 1989; Hollenstein et al., 2004). Thus, we examined these risk factors independently and in combination, considering that a dyadic profile with higher parent and child risk may be more likely to contribute to coercive behavioral patterns in the dyad.

We studied typical parents and preschoolers so that we could examine normative variability in parental responses to child behavior in real time, followed by an examination of the impacts of risk factors on that variability. We studied 3- to 4-year-olds because we expected to observe children's autonomous behavior and misbehavior with parents at this age and because this period may be a ripe time for the formation of coercive patterns (Lunkenheimer et al., 2011). We utilized a structured laboratory task that strongly incentivized parents to engage with and guide their preschoolers to complete the task, which served the purpose of invoking enough variability in parental behavior to examine individual differences. Given the paucity of research on patterns of parenting behavior in real time, in addition to previously mixed findings on the behavioral rigidity and inconsistency associated with parent-child coercion, we did not make specific hypotheses regarding our research questions below. The questions were the following:

- (1) Does variability in mothers' real-time parenting behavior increase or decrease when responding to children's off-task (as compared to on-task) behavior?
- (2) Does variability in mothers' real-time parenting behavior increase or decrease during dyadic negative episodes? I.e., when the child is off-task and the mother is expressing negative behavior, how does this dyadic state influence variability in parenting (as compared to all other dyadic states)?
- (3) How do individual risk factors associated with parent-child coercion (maternal hostility, maternal depressive symptoms, and child externalizing problems) moderate variability in mothers' real-time parenting behavior, both during

parent-child interaction overall and specifically during children's off-task episodes?

- (4) How do interactions between the aforementioned risk factors moderate variability in mothers' real-time parenting behavior, both during parent-child interaction overall and specifically during children's off-task episodes? We examined the interactions of maternal hostility and child externalizing problems, controlling for the influence of dyadic negative episodes, and maternal depressive symptoms and child externalizing problems, controlling for the influence of dyadic negative episodes.

METHOD

Participants

Participants were 96 children and their families (54% female) who were recruited through flyers in child care centers and preschools and via email listservs of agencies serving families with young children. Ethnicity was self-reported as 83% European American, 9% Latin American, 3% Asian American and 1% "other" (4% did not report); 7% of participants reported biracial or multi-ethnic status. Children were 41 months old on average ($SD = 2.95$ months). Median annual family income was \$55,000, and parental education was high on average (college graduate). Family structure was reported as 79% married, 7% cohabiting, 7% single, 5% separated or divorced, and 1% remarried. Families were excluded if children had a pervasive developmental disorder or if parents or children had a medical condition that interfered with physiological data collection. Four families from the study ($N = 100$) were excluded due to equipment malfunction ($n = 2$) and speaking a language other than English during the interaction ($n = 2$), which resulted in a valid N of 96 families for whom we had dyadic observation data.

Procedure

During a 2 1/2-hour laboratory visit, mothers filled out questionnaires, including measures of maternal hostility, maternal depressive symptoms, and child behavior problems. Mothers and children completed four dyadic observation tasks, including a structured problem-solving task (PCCT) that is described in more detail below. Families were compensated \$50 for laboratory sessions and mother questionnaires.

Measures

Parent-Child Challenge Task (PCCT)—The PCCT was designed to study parent-child interaction patterns during a challenging task (Lunkenheimer, Kemp, Lucas-Thompson, Cole, & Albrecht, in press). Mothers were asked to help their children complete three successive puzzle designs using a 3-D wooden puzzle. Mothers were asked to use only their words and were given no time limit. They were told that if they completed all three designs, the child would win a prize, but all children received the prize regardless. This incentive was designed to encourage task persistence, which allowed us to categorize child behavior into on- and off-task categories. After 4 min (the baseline condition), the experimenter interrupted to tell parents they had only 2 min left (the stressor condition). Only the 4 min of

baseline condition data was used in the present study to understand the effects of risk factors on parent behavior change in typical problem-solving situations, as opposed to conditions when parents are under increased contextual stress.

Coding of mother and child behaviors—Observations were recorded using Noldus Observer XT 8.0 software and coded with the Dyadic Interaction Coding system (Lunkenheimer, 2009). Parents and children were each coded along two dimensions, “affect” and “behavior,” on a s-by-s basis, and codes were mutually exclusive. Only behavior codes were examined for the current study and were defined as goal-directed behaviors expressed toward the partner through verbal or nonverbal interaction (e.g., parental directives and child compliance). A list of behavior codes is provided in Appendix A.

Child on-task vs. off-task behavior episodes—We defined children's off-task behavior to compare variability in parenting behavior in off-task vs. on-task episodes. Child behavior codes were aggregated into two mutually exclusive and exhaustive states: the codes of compliance and persistence were combined into an “on-task” state, and the codes of social conversation, solitary/parallel play, noncompliance, disengagement, and emotional dysregulation were combined into an “off-task” state. Thus, off-task behavior reflected episodes in which children were not attending to their mothers’ guidance nor working on the task. Average interrater agreement was 83.5% for on-task and 82.2% for off-task behavior. Interrater agreement was based on a 3-s window, which is standard practice in Noldus Observer; coders were in agreement if they initiated the same behavior within 3 s of one another.

Dyadic negative episodes vs. other dyadic episodes—We also examined the effects of dyadic negative episodes on variability in parenting behavior. Child behavior was already divided into two mutually exclusive and exhaustive states: on-task and off-task (see above). Parent behavior was similarly aggregated into two exhaustive states: the codes of directive, teaching, proactive structure, positive reinforcement, engagement, and emotional support were combined into a “positive parent behavior” state, and the codes of disengagement, intrusion, and negative discipline were aggregated into a “negative parent behavior” state. Average interrater agreement was 85.3% for positive parent behavior and 86.3% for negative parent behavior. Dyadic negative episodes reflected episodes in which children were off-task and parents were engaged in negative behavior (in contrast to the other three possible state combinations of child off-task/parent positive, child on-task/parent positive, and child on-task/parent negative). Thus, there was overlap between dyadic negative episodes and off-task behavior, because the former was defined in part by the latter. Negative affect was coded separately, so the term “negative” reflects that the dyad was not working together effectively on the task, as opposed to signifying an expression of negative affect by parent or child.

Variability in parenting behavior—Variability in real-time parenting behavior was the dependent variable of interest. It reflected the likelihood that the parent would change from any one behavior to any other among the nine behaviors coded, measured using multilevel survival analysis (see Analytic Plan). Thus, this measure reflected the likelihood of any

behavior change at all and did not distinguish between parent behaviors that could be considered positive versus negative. A greater likelihood of change represented greater variability in parenting behavior, whereas a lesser likelihood of change represented lesser variability in parenting behavior.

Maternal hostility—The Parenting Scale (Arnold, O'Leary, Wolff, & Acker, 1993) was used to assess maternal hostility toward the child. This subscale includes three items that reflect verbal or physical hostility in parenting. Items include, “When my child does something I don't like, I insult my child, say mean things, or call my child names.”, “When my child misbehaves, I use bad language.”, and “When my child misbehaves, I spank, slap, grab, or hit my child.” Parents respond on a Likert scale from 1 to 7, ranging from *never or rarely* to *almost always/most of the time*. Hostility was non-normally distributed with a Kolmogorov-Smirnov statistic of $D(96) = 2.81$, $p < .001$, with 53% of the sample reporting a 1 (*never or rarely*) on all three items. Although this subscale has demonstrated good internal consistency and validity (Rhoades & O'Leary, 2007), mothers in our sample who reported hostility endorsed physical hostility but not the two verbal hostility items. Accordingly, maternal hostility was converted to a dichotomous variable: those reporting little to no hostility toward the child (53%) and those reporting some hostility toward the child (47%).

Maternal depressive symptoms—The Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977) is a 20-item self-report questionnaire designed to assess depressive symptomology in the general population. Participants responded about how many times they had felt a certain way during the past week (e.g., “I felt that people disliked me”). The scale ranged from 0-3: 0 = *rarely or none of the time (0 hours)*, 1 = *some or a little of the time (1-2 days)*, 2 = *occasionally or a moderate amount of the time (3-4 days)*, and 3 = *most or all of the time (5-7 days)*. The CES-D has high internal consistency and adequate test-retest reliability (Radloff, 1977). The sum score represented the level of depressive symptoms (possible range = 0 to 60; Cronbach's alpha = 0.73). Using the standard CES-D cutoff (score of 16 or higher), 11 out of 96 mothers reported clinical levels of depression.

Externalizing behavior problems—Mothers reported on children's externalizing problems via the Child Behavior Checklist (CBCL/1.5-5; Achenbach & Rescorla, 2000). The externalizing problems subscale reflects poor attentional control, hyperactivity, and physically aggressive behavior. 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 = 0.89). Eleven out of 96 children had T-scores above the clinical cutoff ($T = 64$) for mother-reported externalizing problems.

Analytic Plan

To analyze interaction dynamics in real time, we used multilevel continuous-time survival analysis (MSA; Stoolmiller & Snyder, 2006), also called event history analysis or Cox hazard regression modeling (Snyder, Brockman, & Stoolmiller, 2012; Snyder, Stoolmiller, Wilson, & Yamamoto, 2003). MSA models the timing and transitions among behaviors to produce a likelihood of a given behavior within a certain time frame. These time frames are defined by periods in which the participant is “at risk for” (capable of) experiencing the

behavior of interest, meaning that they are not currently experiencing it; once the behavior occurs, the clock starts over. Thus, the time frames between the onsets of the behavior of interest vary in length and recur throughout the interaction. Accordingly, MSA has the advantage of incorporating duration in the examination of behavioral state transitions as compared to other methods (e.g., sequential analysis). MSA also allows one to investigate the effects of time-varying and time-invariant covariates on the occurrence of these repeating events during the course of real-time interaction. We used MSA to examine variability in parents' moment-to-moment behaviors during the entire interaction, in relation to dyadic risk factors that were time-varying during the interaction (episodes of dyadic parent-child negativity), and in relation to individual parent and child risk factors that were time-invariant (maternal hostility, maternal depressive symptoms, and child externalizing problems).

Our main behavior of interest was variability in parenting behavior in response to children's off-task behavior. We measured the likelihood that the parent would change from any one behavior to any other behavior (see Appendix A for behavioral codes); on average, parents changed among these behaviors frequently. For example (see Figure 1), a parent might direct her child to put a piece in the puzzle (Directive), monitor to see if the child complied (Engagement), repeat the command if the child did not (Directive), add more instructions to help the child do it (Teaching), and then monitor the child's behavior again (Engagement). In this sequence, parent behavior changed four times and the latter four behaviors occurred while the child was off-task.

MSA makes use of the time lengths between onsets of the behaviors of interest (the survival or *hazard rate*) to examine the hazard rate of parent behavior change (in our case, changes among the nine parenting behaviors coded) as an index of behavioral variability, with positive hazard rates indicating greater variability (shorter time until a behavior change), and negative hazard rates indicating lesser variability (longer time until a behavior change). We examined overall hazard rates for the entire interaction, hazard rates dependent on particular time-varying behavioral states (e.g., children's off-task behavior), and how these overall and state-dependent hazard rates varied in relation to risk covariates (e.g., externalizing problems).

Hazard ratios are then calculated as the exponentiated hazard rates, which allows for an interpretation of the likelihood of the behavior relative to a constant value. We interpret the hazard ratio for a particular covariate (e.g., externalizing problems) as the ratio of the hazard rate given a one-unit increase in the covariate, as compared to the hazard rate without that increase (Mills, 2011). A hazard ratio less than 1 suggests that the covariate is associated with a lower likelihood (or slower rate) of the behavior, a hazard ratio of 1 suggests no relation between the covariate and the likelihood of the behavior, and a hazard ratio greater than 1 suggests the covariate is associated with a greater likelihood (or faster rate) of the behavior (Mills, 2011).

RESULTS

Preliminary Analyses

First, variable distributions of the risk factors were explored. Descriptive, untransformed data are presented in Table 1. Child externalizing problems showed a normal distribution, $D(96) = 1.03$, $p = .19$. Maternal depressive symptoms were non-normally distributed toward zero, $D(96) = 1.90$, $p < .01$, standardized skewness = 9.23. Standardized skewness of an absolute value greater than 1.96 for the present sample size warranted transformation (Ghasemi & Zahedaisl, 2012); thus, a natural logarithmic transformation was performed. The standardized skewness after transformation was 1.41, indicating that a more extreme transformation would not be necessary. Maternal hostility was also non-normally distributed, $D(96) = 2.81$, $p < .001$, with 53% of the sample reporting a 1 (never or rarely) on all three items (i.e., no hostility reported). Thus, this variable was converted to a dichotomous variable for primary analyses: those reporting no hostility (53%) and those reporting some hostility (47%).

Next, we investigated whether there were sufficient changes in parenting behavior, children's off-task behavior, and dyadic negative episodes to warrant the planned analyses. Parents changed behaviors an average of 9.48 times per min ($SD = 3.90$). Change in parent behavior was normally distributed, $D(96) = 0.57$, $p = .20$. All children demonstrated off-task behavior except for three children. Off-task behavior constituted 28.6% of child behavior on average, ranging from 0% to 82.0%. The distribution of off-task behavior was normal, $D(96) = 1.31$, $p = .14$. Thus, this state was sufficiently frequent to examine parenting variability in the context of these episodes. Only 28 out of 96 families experienced dyadic negative episodes. These missing data did not pose a problem for primary analyses, which involved the use of full information maximum likelihood estimation in Mplus (Muthén & Muthén, 1998-2007); however, the main effects of dyadic negative episodes should be interpreted in light of the fact that only 29% of the families experienced these particular states (as compared to other possible dyadic states). There was no statistically significant difference in the rate of parent behavior change between children's on-task and off-task episodes in paired sample t -tests, $t(92) = 0.61$, $p = .55$. The rate of parent behavior change was higher during dyadic negative episodes than during all other episodes combined, $t(27) = 4.35$, $p = .001$.

Bivariate correlations indicated that maternal depressive symptoms were correlated with maternal hostility, $r = .29$, $p < .01$, and child externalizing problems, $r = .22$, $p < .05$, but maternal hostility and child externalizing problems were not correlated, $r = .03$, $p = .75$. Time spent in off-task behavior was correlated with maternal ratings of child externalizing problems, $r = .32$, $p < .01$, but was not correlated with maternal depressive symptoms, $r = .04$, $p = .71$, or maternal hostility, $r = -.06$, $p = .55$. Time spent in dyadic negative episodes was not correlated with any parent or child risk factors (maternal hostility, $r = .03$, $p = .78$, maternal depressive symptoms, $r = -.04$, $p = .72$, child externalizing problems, $r = .08$, $p = .45$). When recomputed with only those families who experienced dyadic negative episodes ($n = 28$), these correlations remained non-significant.

Primary Analyses

To answer our primary research questions, multilevel continuous-time survival analyses were applied to the 4 min of parent-child interaction data from the PCCT using Mplus version 5 (Muthén & Muthén, 1998-2007). These analyses belong to the Cox regression model (Singer & Willett, 2003), and the profile likelihood method was used for model estimation (Asparouhov, Masyn, & Muthén, 2006). Separate models were applied to test each of our four research questions. When individual parameters (hazard rates) were significant, these hazard rates were then converted into hazard ratios for the purposes of interpretation.

Our first question (RQ1) examined whether there was a basic difference in the variability of parent behavior during child off-task versus on-task episodes. Results showed that parent behavior was less variable during off-task episodes, Hazard Rate = -0.101 , $SE = 0.038$, $p = .008$. We exponentiated the hazard rate to derive the hazard ratio, Hazard Ratio = 0.90 , 95% CI [0.84 , 0.97], which reflects the ratio of the hazard rate for a one-unit increase of the covariate relative to the hazard rate without that increase, and which we interpret as the likelihood relative to a constant value of 1. Therefore, compared to episodes of on-task behavior, mothers were 10% less likely to change their parenting behavior when children were off-task.

Our second question (RQ2) involved examining the main effect of dyadic negative episodes on overall variability in parenting behavior during the interaction. Results are in Table 2. During dyadic negative episodes, maternal behavior became more variable, Hazard Rate = 0.287 , $SE = 0.095$, $p = .002$. We interpreted the hazard ratio as the likelihood relative to a value of 1, Hazard Ratio = 1.33 , 95% CI [1.11 , 1.60]. Thus, compared to periods in which the dyad was not in a dyadic negative episode, mothers were 33% more likely to change their behavior when their children were off-task and they were concurrently engaged in negative parenting behaviors.

Our third question (RQ3) involved examining the main effects of individual risk factors (maternal hostility, maternal depressive symptoms, child externalizing problems) on the variability of parent behavior overall and also specifically during children's off-task episodes. Results are in Table 2. None of these individual risk factors had a significant main effect on parent behavioral variability overall or during off-task episodes.

Our fourth question (RQ4) involved testing the combined impact of individual parent and child risk factors on parent behavioral variability. We ran two interaction models: (1) the interaction of maternal hostility and child externalizing problems, controlling for dyadic negative episodes, and (2) the interaction of maternal depressive symptoms and child externalizing problems, controlling for dyadic negative episodes. We tested the impact of these interactions on both overall variability in parent behavior and variability specifically during off-task episodes. Results are in Table 3.

The interaction between maternal hostility and child externalizing problems had a significant effect on the parent's overall behavioral variability. Higher levels of hostility and externalizing problems were associated with markedly lower overall variability in parent

behavior during parent-child interaction, Hazard Rate = -1.325 , $SE = 0.204$, $p = .0001$. We interpret the hazard ratio as the likelihood relative to a value of 1, Hazard Ratio = 0.27 , 95% CI [$0.17, 0.42$]. Thus, when levels of maternal hostility and child externalizing problems were higher, mothers were less likely on average (73% less likely) to change their parenting behavior during interactions with their children, irrespective of child behavior. In contrast, when we analyzed children's off-task episodes specifically, this same interaction effect was associated with higher variability in parent behavior during these episodes, Hazard Rate = 0.310 , $SE = 0.156$, $p = .047$. Interpreting the hazard ratio value relative to 1, Hazard Ratio = 1.35 , 95% CI [$0.98, 1.86$], we find that mothers in dyads with higher maternal hostility and child externalizing problems were 35% more likely to change their behavior when their children went off-task. This is the opposite of the RQ1 results in which children's off-task episodes were generally associated with less variability, not more. Thus, higher levels of hostility and externalizing problems were associated with the combined pattern of markedly lower parenting variability overall but higher parenting variability when children went off-task.

In the analysis of maternal depressive symptoms and child externalizing problems, the pattern of findings was quite similar. Once again, the interaction between these two risk factors was associated with markedly lower variability in parenting behavior overall during parent-child interactions, Hazard Rate = -1.096 , $SE = 0.195$, $p = .0002$. Interpreting the hazard ratio value relative to 1, Hazard Ratio = 0.33 , 95% CI [$0.23, 0.49$], we found that mothers in dyads with higher maternal depressive symptoms and child externalizing problems were 67% less likely to change their behavior when interacting with their children. However, during episodes of child off-task behavior, this interaction of risk factors was associated with higher variability in parent behavior, Hazard Rate = 0.298 ; $SE = 0.140$, $p = .034$. Interpreting the hazard ratio value relative to 1, Hazard Ratio = 1.35 , 95% CI [$1.02, 1.77$], we find that mothers in dyads with higher maternal depressive symptoms and child externalizing problems were 35% more likely to change their behavior when their children went off-task. Thus, similar to the previous analysis, the combination of higher levels of parent and child risk factors was associated with a pattern of markedly lower variability in parenting behavior overall, paired with greater variability in parent behavior specifically when children were off-task (as compared to dyads with lower levels of risk factors).

In both interaction models we controlled for dyadic negative episodes, considering that dyadic negativity may have had an effect on variability in parent behavior. In both models, the previously established main effect of dyadic negative episodes contributing to greater variability in parental behavior remained significant, became more pronounced, and was comparable across models (Hazard Rate = 0.587 ; $SE = 0.133$, $p = .0004$ in the Hostility by Externalizing problems model, and Hazard Rate = 0.591 ; $SE = 0.131$, $p = .0004$ in the Depressive symptoms by Externalizing problems model). Interpreting the hazard ratio relative to 1 (Hazard Ratio = 1.80 , 95% CI [$1.39, 2.33$] in the Hostility by Externalizing problems model, Hazard Ratio = 1.81 , 95% CI [$1.40, 2.33$] in the Depressive symptoms by Externalizing problems model) suggests that, when mothers engaged in negative parental behavior while children were off-task and parental risk factors were higher, they were 80% and 81% more likely, respectively, to vary their behavior during those mutually difficult episodes.

DISCUSSION

Coercive cycles between parent and child represent a common pattern by which parenting efficacy is compromised (Patterson, Reid, & Dishion, 1992). Typically, parents do not intend to negatively reinforce misbehavior, but once they have done so, a pattern is initiated that is difficult to correct. In our efforts to prevent these cycles, it may be important to understand how such patterns emerge from the moment of the parent's initial response to the child's misbehavior, and how these response patterns map onto risk factors known to be associated with parent-child coercion. Although studies of microlevel dyadic interaction processes in response to specific, covarying behaviors have been relatively rare, related research has shown that parent-child coercion is associated with patterns of both behavioral rigidity (e.g., Dumas et al., 2001) and behavioral inconsistency (e.g., Dishion et al., 1991). Thus, we examined how parents responded to episodes of their children's misbehavior to attempt to clarify previously mixed findings and investigate whether tendencies toward reduced variability or increased variability in parenting behavior could be observed in moments that reflected the initial stages of the coercive cycle.

Given the novelty of our approach, we first examined parents' responses to children's off-task behavior in the absence of risk covariates, to establish a reference point against which to determine how risk covariates impacted parental response patterns. We found that, during a structured and highly incentivized task between parents and preschoolers, there was a slight reduction in the variability of parenting behavior when parents responded to children's off-task behavior, as compared to on-task episodes. Given that parental involvement was high on average in our sample (with 8 changes in behavior per min), this finding implies that, when children were distracted or misbehaving, parents tended to "stick to their guns" and persist with whatever parenting strategy they had already chosen when attempting to re-engage children.

Our second research question asked whether individual and dyadic risk factors related to coercion were associated with variability in parents' real-time responses to children's off-task behavior. We found that parental behavior became more likely to change during mutually negative episodes in which parents showed maladaptive parenting behaviors (e.g., criticism, intrusion) and children were off-task. Perhaps when parents used a poor parenting strategy, they were more likely to change their behavior because it was ineffective. It is also possible that mutually negative episodes were dysregulating for parents and made their behavior more volatile. Inconsistent and miscoordinated patterns (Weinberg et al., 2006) and predictable and rigid behavioral sequences (Cole et al., 2003) have both been linked to mutual parent-child negativity in prior research. But the present finding suggests that for typical families in early childhood, mutual negativity is associated with greater variability in moment-to-moment parenting, which may imply inconsistency in parenting (Gardner, 1989) as opposed to the rigidity we have found associated with mutual negativity in higher-risk populations (e.g., Hollenstein et al., 2004). Given that only about 30% of our families experienced dyadic negative episodes, future research on higher risk samples will be needed to replicate this finding.

None of the coercion-related risk factors we examined (maternal hostility, maternal depressive symptoms, or child externalizing problems) showed main effects on the variability of moment-to-moment parenting behavior. However, given that these risk factors tend to co-occur (Patterson, 2002), we also explored interactions among them. The interactions between maternal hostility and child externalizing problems, and between maternal depressive symptoms and child externalizing problems, were associated with the same pattern of real-time parenting behavior. Specifically, when maternal risk and child externalizing problems were high, parents were 67% to 73% less likely overall to change their behavior during problem-solving interactions with their children. This markedly reduced likelihood of behavior change might be interpreted as rigidity in overall parenting behavior. However, when children then went off-task during a structured, goal-oriented dyadic task, parents with higher levels of these risk factors then became quicker to change their parenting behavior, which could be interpreted as inconsistency in parenting behavior.

The link between higher risk and lower parenting variability parallels research showing that maternal hostility and depressive symptoms are associated with a less responsive or more unavailable parenting style in general (Bugental et al., 2003; Dix, Gershoff, Meunier, & Miller, 2004; Sturge-Apple, Davies, & Cummings, 2006). Depression has also been associated with parents' fewer resources to resolve challenging interactions (Lyons-Ruth, Lyubchik, Wolfe, & Bronfman, 2002) and experiential avoidance (Shea & Coyne, 2011). Parental hostility and depressive symptoms have both been associated with dyadic affective rigidity during parent-child interactions (Dumas et al., 2001; Hollenstein et al., 2004; Lunkenheimer et al., 2013). Parental rigidity may also be exacerbated when mothers rate their children higher on externalizing problems, considering the evocative effects of child behavior problems on reductions in parental support and structuring (Verhoeven, Junger, van Aken, Decovic, & van Aken, 2010). Thus, this finding extends prior research to parenting behavior in real time, and specifically in the context of combined parent and child risk. It should be noted that both main and interactive effects of risk on parenting have been demonstrated previously, whereas we found only the interaction of maternal and child risk to be associated with changes in patterns of parenting; these results may have been due to lower overall levels of risk in the present community sample such that any one risk factor in isolation was not enough to drive these changes. But it is striking that even in a community sample of typical parents and their 3-year-olds, during a laboratory problem-solving task in which parents have been expressly asked to guide their children to solve puzzles so that their child can win a prize, that higher levels of these combined risk factors were associated with such marked reductions in active parenting behaviors.

For these higher-risk dyads, this overall pattern of low variability then changed to one of higher variability when children went off-task. This finding was in contrast to earlier analyses that showed that, on the whole, parents tended to decrease, not increase, changes in parenting behavior when their children went off-task. Thus, the use of multilevel survival analysis allowed us to discover a unique profile of shifting real-time behavioral patterns associated with parent and child risk. Though limited in number, prior studies of parenting have shown a mix of rigidity and inconsistency associated with these risk factors depending on the construct, population, and time scale under study. For example, hostile parents have been shown to oscillate between rigid and unpredictable patterns of disciplinary responses

(Oldershaw et al., 1986), while depressed parents have been shown to oscillate between intrusive and avoidant parenting behaviors (Langrock, Compas, Keller, Merchant, & Copeland, 2002; Jaser et al., 2005). Thus, the present findings shed light on prior research: vacillating patterns of parental behavior associated with these risk factors may not be random, but may hinge on whether typical parent-child interactions or disciplinary responses to child behavior are being assessed. These may not be contradictory findings but rather actual differences in how higher-risk parents respond to different contextual demands in real time.

Limitations and Future Directions

One limitation of the present study was our reliance on maternal reports of parent and child risk, so there is the possibility of shared method variance. Given our community sample, there were lower levels of risk, so it will be important to examine these processes in higher risk families to determine generalizability. Maternal hostility toward the child was negatively skewed and mainly reflected physical hostility, which should be kept in mind when interpreting the findings. Also, we observed parent-child interactions at only one time point, making these correlational and not causal analyses. We employed a variable-centered framework, but a person-centered framework that reflected the presence of multiple risk factors (e.g., mothers with high levels of both hostility and depressive symptoms) could offer additional information. Finally, only a third of families experienced dyadic negative episodes, and given that this variable incorporated children's off-task behavior (which was positively related to child externalizing problems), these may have been the same families who showed higher risk. The overlap between child off-task episodes and dyadic negative episodes may explain the increased effect of dyadic negative episodes in the RQ4 models because it may be accounting for shared variance across these phenomena in families at higher risk.

We operationalized parenting variability as the greater or lesser likelihood of behavior change in real time. But one might also operationalize it as fluctuations in the strength of the contingency of parental responses (Crockenberg & Leerkes, 2004) or the predictability of responses over the course of an interaction (Granik & Dishion, 2003). Interpersonal process parameters are difficult to interpret in isolation (Lunkenheimer, Hollenstein, Wang, & Shields, 2012). In the present study, a highly structured task and the examination of risk factor covariates provided a context with which to interpret between-dyad variations in parenting variability, but the next question is whether the specific type and function of the parenting behavior are important. For example, parents changing from a maladaptive behavior (criticism) to an adaptive behavior (teaching) could be protective, whereas devolving from an adaptive to a maladaptive parenting behavior could be a risk factor. In other words, whether variability is “adaptive” or “maladaptive” will depend on the functions of those behaviors and the contexts in which they occur (Caron, Weiss, Harris, & Catron, 2006). For example, child off-task behavior may serve to re-engage disengaged mothers momentarily, even if it also has other undesirable consequences. Future work should apply a competing risks multilevel survival analysis model (e.g., Snyder et al., 2012) to examine whether movement into or out of specific parenting behaviors is associated with risk. Regardless, the present findings suggest that the examination of micro- and macro-level risk

factors and the inclusion of both individual and dyadic processes are useful in teasing apart the determinants of parenting behavior in real time.

Conclusion

Ample research has addressed how early parent-child interaction content relates to normative vs. atypical trajectories of child development. But we have more to learn about the dynamic structural or process parameters of these interactions: how aspects like the temporal coordination, predictability, and consistency of these interactions relate to child outcomes and familial risk factors. These parameters are important because they reflect the coregulation of behavior between parent and child, which has been linked to optimal development and mental health (Lougheed, Hollenstein, Lichtwarck-Aschoff, & Granic, 2015; Lunkenheimer et al., 2011), and also represent the primary processes family practitioners attempt to alter in family intervention. In the present study, bivariate relations between risk factors and observed behaviors were largely not significant, suggesting that a more static, linear approach would not have revealed the novel finding that shifting patterns of variability in parenting behavior are associated with specific parent and child risk profiles. This focus on microlevel interaction processes between parent and child can better inform our understanding of the etiology of developmental psychopathology as well as the tailoring of preventive interventions for families at risk.

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APPENDIX

APPENDIX A

Parent and Child Behavior Codes

Parent Positive	Description	Example
Proactive Structure	Parent encourages, guides or prompts the child to behave in a positive manner	"Let's pretend that the box is a house and help all the toys find their way back home."
Positive Reinforcement	Parent provides verbal support or praise	"Great job!" Giving a thumbs-up
Emotional Support	Parent empathizes with child, helps him/her label emotions, or physically comforts child	"Are you feeling kind of nervous?"
Teaching	Parent explains how something works or asks the child a task-related question and allows him/her the opportunity to respond verbally or behaviorally.	"I think the blue coin might go in the blue slot." "Does this match the picture?"
Directive	Parent uses commands that bid the child to respond in a specific way	"Don't throw that block." "Can you put the toys away?"
Engagement	Parent is engaged with the child through eye contact or non-task-related conversation	"What should we have for lunch today?"
Parent Negative		

Parent Positive	Description	Example
Disengagement	Parent is not engaging with the child, is ignoring the child, or seems spaced out during the interaction.	Parent ignoring child's request to play a game
Intrusion	Parent physically takes over the task or object, and/or physically completes some of the task for the child	When child has difficulty with a puzzle, parent taking piece away and completing it herself
Negative Discipline	Parent: (1) provides a harsh directive with a negative consequence, (2) criticizes the child, or (3) physically punishes the child	"Clean up now or I'll spank you"
Child On-Task		
Compliance	Child clearly responds to parent's bid for a behavior change	Child following the parent's request to put the toys in the box
Persistence	Child persists at completing a task without preceding prompts by parent	Child continues to put toys away on his/her own
Child Off-Task		
Social Conversation	Child is engaged with parent in play-related or non-task-related conversation	"Is Daddy going to come play later?" "Oink oink!"
Solitary or Parallel Play	Child is playing on his/her own without engaging with parent	Parent and child building two separate towers near one another
Noncompliance	Child does not comply with parent's bid for behavior change, either by ignoring, disagreeing with, or refusing the request	Child picking up the red block after the parent asked the child to leave blocks alone
Disengagement	Child is not engaged with parent or task, seems spaced out, or loses focus/has no particular direction	Child looks away from task and stares at the floor Child wanders around room
Behavioral Dysregulation	Child's dysregulated emotional episodes (positive or negative) with a clear physical or behavioral component	Child throws tantrum, withdraws by curling up into a ball, runs in circles around room giggling

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IMPLICATIONS FOR PRACTICE, APPLICATION, THEORY, AND POLICY

The present findings offer another window into understanding how parent-child coercive processes play out in real time. The coercive process occurs when a parent makes a disciplinary attempt but then gives up on that agenda in the face of child misbehavior, thereby negatively reinforcing that misbehavior (Patterson, 2002). Similarly, in the present study, when children misbehaved or when parent and child experienced mutually negative states, parents at higher risk were quicker to change their behavior, which could have reflected them relinquishing their particular agenda or strategy. Taken together, the present findings raise an important question about coercion theory: to what degree is the compromised parenting associated with the coercive cycle dependent on the parent's difficulty becoming "unstuck" from a rigid behavioral pattern in those instances when they need to respond to child misbehavior? Dynamic systems theory would suggest that behavioral rigidity reflects an attracting or absorbing state that is difficult to disengage from (Granic & Patterson, 2006); sudden, forced movement away from such a state to engage in the challenging effort of redirecting a child could be particularly disorganizing for parents. The parenting behavior that immediately follows may therefore appear inconsistent, and accordingly, the chance of intervening effectively on the child's off-task behavior may be quite low. Many evidence-based preventive intervention programs target the reduction of child behavior problems through the improvement of coercive parent-child processes, parental depressive symptoms, and parenting practices (Dishion et al., 2008; Sanders, 1999; Webster-Stratton, 2001). If the ineffective parenting associated with parental hostility and depressive symptoms partially hinges on overall parenting rigidity, there could be a particular advantage of interventions that target the improvement of both parent mental health symptoms and parent behavioral or cognitive flexibility (Bugental, Corpus, & Schwartz, 2012; Granic, O'Hara, Pepler, & Lewis, 2007) when attempting to reduce cycles of parent-child coercion.

Figure 1.

Event history history diagram for a hypothetical scenario using a selection of available parent behavior codes. Diagram represents the shifts in parent behavior concurrent with the child's changes in on-task and off-task behavior.

TABLE 1**Descriptive Data**

	<i>M</i>	<i>SD</i>	Range
Child off-task episodes (<i>n</i> = 93)			
Number of episodes	4.25	2.44	1.00—11.00
Duration in min	.94	.70	.02—3.47
Parent behavior changes per min: off-task episodes	9.60	4.38	1.20—26.40
Parent behavior changes per min: on-task episodes	9.36	3.42	1.20—18.60
Dyadic negative episodes (<i>n</i> = 28)			
Number of episodes	1.61	.99	1.00—4.00
Duration in min	.09	.09	.02—.40
Parent behavior changes per min: dyadic negative episodes	21.12	13.44	.00—61.80
Parent behavior changes per min: all other episodes	9.24	3.18	1.20—17.40
Maternal hostility (<i>N</i> = 96)	1.33	.50	1.00—3.33
Maternal depressive symptoms (<i>N</i> = 96)	7.48	7.40	.00—45.00
Child externalizing problems (<i>N</i> = 96)	10.54	6.61	.00—28.00

TABLE 2

Main Effects of Covariates on Variability in Parenting Behavior

Covariate	Overall Variability (Hazard rate, <i>p</i> value)	Variability During Children's Off-Task Episodes (Hazard rate, <i>p</i> value)
Dyadic negative episodes	.287, .002 ^{**}	N/A
Maternal hostility	-.093, .252	.084, .241
Maternal depressive symptoms	-.082, .066 [†]	.066, .368
Child externalizing problems	-.003, .612	.067, .354

Note. Hazard rates reflect the rate of change in parenting behavior, and are shown as raw regression beta coefficients. Positive hazard rates indicate the covariate is associated with a shorter duration until change in parent behavior (i.e., greater variability), and negative hazard rates indicate the covariate is associated with longer duration until a change in parent behavior (i.e., lesser variability). Dyadic negative episodes were not examined during children's off-task episodes because this variable already represented the combination of parent negative behavior and children's off-task behavior.

[†]
p < .10

^{**}
p < .01.

TABLE 3

Interaction Effects of Covariates on Variability in Parenting Behavior

Hostility × Externalizing Interaction	Overall Variability (Hazard rate, <i>p</i> value)	Variability During Children's Off-Task Episodes (Hazard rate, <i>p</i> value)
Dyadic negative episodes	.591, .000 ***	N/A
Maternal hostility	.286, .159	.034, .751
Child externalizing problems	.001, .889	-.001, .882
Hostility × externalizing problems	-1.325, .000 ***	.310, .047 *
Depressive Symptoms × Externalizing Interaction	Overall Variability (Hazard rate, <i>p</i> value)	Variability During Children's Off-Task Episodes (Hazard rate, <i>p</i> value)
Dyadic negative episodes	.584, .000 ***	N/A
Maternal depressive symptoms	.219, .206	-.031, .728
Child externalizing problems	.006, .369	-.002, .695
Depressive × externalizing problems	-1.096, .000 ***	.298, .034 *

Note. Hazard rates reflect the rate of change in parenting behavior, and are shown as raw regression beta coefficients. Positive hazard rates indicate the covariate is associated with a shorter duration until change in parent behavior (i.e., greater variability), and negative hazard rates indicate the covariate is associated with longer duration until a change in parent behavior (i.e., lesser variability). Dyadic negative episodes were not examined during children's off-task episodes because this variable already represented the combination of parent negative behavior and children's off-task behavior.

*
 $p < .05$

 $p < .001$.