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Can We Fix This? Parent–Child Repair Processes and Preschoolers' Regulatory Skills

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Abstract

The repair of difficult parent–child interactions is a marker of healthy functioning in infancy, but less is known about repair processes during early childhood. We used dynamic systems methods to investigate dyadic repair in mothers and their 3-year-old children ($N = 96$) and its prediction of children's emotion regulation and behavior problems at a four-month follow-up. Mothers and children completed free play and challenging puzzle tasks. Repair was operationalized as the conditional probability of moving into a dyadic adaptive behavior region after individual or dyadic maladaptive behavior (e.g., child noncompliance, parental criticism). Overall, dyads repaired approximately half their maladaptive behaviors. A greater likelihood of repair during the puzzle task predicted better child emotion regulation and fewer behavior problems in preschool. Results suggest dyadic repair is an important process in early childhood and provide further evidence for the connection between parent–child coregulation and children's developing regulatory capacities. Implications for family-based interventions are discussed.

Keywords

Behavior problems; early childhood; emotion regulation; parent–child interaction; repair

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The ability to shift out of a negative state toward a positive one is a critical marker of healthy functioning across the life span. The consistent movement toward positive well-being in the face of difficult life circumstances forms the core of resilience (Masten, 2001; Yehuda, Flory, Southwick, & Charney, 2006), whereas difficulty moving away from negativity (e.g., rumination) is a hallmark of depression and other mental health problems (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008; Papageorgiou & Wells, 2004). Substantial research indicates that the ability to make these shifts is at least partially linked to social experiences (Sameroff & Rosenblum, 2006; Waller, 2001). Beeghly and Tronick (2011) suggested that one's ability to successfully face challenging life circumstances begins with the dyadic ability to resolve momentary instances of difficulty in infancy. During early childhood, when interactions with caregivers continue to act as the primary context for child development (Bronfenbrenner, 1986), early reparative interactions with caregivers may provide a foundation for the development of children's developing emotional and behavioral regulation skills.

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In this vein, Tronick (2003) hypothesized that the moment-to-moment transitions from a mismatched or negative state into a matched or positive state, referred to as "repair," is a key mechanism by which children internalize regulatory abilities. In work on mother–infant repair processes, Tronick (2003) suggested that consistent reparations serve as building blocks in the development of secure attachments and protect against the development of depressive symptomology in childhood. However, we know a great deal less about repair processes in the preschool years, even though children are still in the active process of internalizing self-regulatory strategies and skills from daily interactions with their parents during this period. Therefore, in the present study we examined dynamic processes of repair in mother–preschooler interactions and whether they contributed to children's regulatory skills in the preschool setting. Given Beeghly and Tronick's (2011) call for practitioners to support child well-being by strengthening parent–child repair capabilities, increased knowledge of repair processes could be an asset to family-based intervention work.

BACKGROUND

Operationalizing Repair During Parent–Child Interactions

Conceptually, repair represents the resolution of stress, negativity, or mismatch during a relational interaction. In early parent–child interactions it is normative for dyads to experience both coordinated (e.g., parent and child sharing joint attention) and miscoordinated interactions (e.g., parent or child disengaging from interaction; Feldman, 2007; Tronick & Gianino, 1986). Children's abilities to develop effective strategies for coordinating their behavioral and affective states with their external environment are bolstered when interactions with their primary caregivers can predictably move from quick instances of miscoordination back to coordinated interactions (Jameson, Gelfand, Kulcsar, & Teti, 1997). This movement from a miscoordinated to a coordinated state has been one way to operationalize repair.

Prior work has made use of two types of experimental tasks to assess these transitions. Some studies have created an experimentally induced event to set parent–child dyads up for a miscoordinated state (e.g., the Still Face Paradigm) to examine the dyad's capacity for repairing such experiences (e.g., Tronick & Cohn, 1989). Tronick (2003) described the utility of using the Still Face Paradigm (SFP) to assess rupture and repair patterns in a series of experiments. During the SFP, mothers are instructed to keep flat affect and not respond to their infant's bids for attention for a specified amount of time. Children commonly have an adverse reaction to this experience, showing distress by crying, withdrawing, or protesting for their mother's attention. In this task, "repair" is assessed with a formal repair period after the initial still-face condition, during which the mother is instructed to return to her normal interaction style. Dyads that are considered adept at repairing their interactions are those that are able to return to a coordinated interaction characterized by shared positivity (e.g., smiles, eye contact) during this period (Tronick, 2003). Similarly, in work with older children, Granic, O'Hara, Pepler, and Lewis (2007) utilized a two-part experimental structure that began with a stressful interaction (e.g., the family discussing the child's misbehavior), followed by a repair condition, where the family talked about a positive topic. These researchers operationalized successful repair as the family displaying only positive or neutral affective expressions during the latter repair condition (Granic et al., 2007).

Other work has examined more typical interactions (e.g., family conversation, free play) and identified instances of miscoordination, then assessed repair after these miscoordinated states (e.g., Skowron, Kozlowski, & Pincus, 2010). For example, Jameson et al. (1997) examined mothers' and toddlers' focus and attention during play. "Repair" referred to the action taken by one partner to achieve coordination (e.g., matched focus) after the other partner became uninvolved during the play (e.g., disengaged from the initial focus). In work with older children, Skowron et al. (2010) analyzed verbal exchanges between mothers and children during a series of conversations and defined a rupture as any time the mother or child engaged in a negative behavior (e.g., criticism, ignoring), and a repair as the return to a positive exchange (e.g., both mother and child engaging positively). We operationalized repair similarly as instances in which parent–child dyads transitioned from a state of either or both partners showing maladaptive behavior (e.g., mother unsupportive or child off-task behavior) to a state of mutually adaptive behavior (e.g., mother supportive and child on-task behavior). For example, a rupture occurs when children refuse to follow a specific parental directive (e.g., "Please put away the toys"), which shows off-task behavior. Sometimes the parent repeats the directive or tries a different, more supportive strategy (explaining his or her reasoning), then the child complies and the interaction is repaired; other times, the parent gives up or the interaction escalates in negativity, thus delaying or preventing repair.

Parent–Child Repair Processes: Correlates and Outcomes

Past work on repair has provided insight into two main realms: the relation between family risk factors and repair as well as the relation between repair and child outcomes. This work has indicated that in nonclinical samples, mother–child dyads show a typical pattern of engaging in coordinated interactions that are interrupted by brief instances of miscoordination (typically initiated by the child), which are then repaired, most often by the mother (Jameson et al., 1997; Tronick, 2003). This is consistent with the developmental needs of young children, who are less able to regulate their emotional and behavioral states and rely on caregivers to regulate their environment and relational experiences (Olson & Lunkenheimer, 2009).

Deviations from such patterns are related to key family risk factors in childhood (Jameson et al., 1997; Skowron et al., 2010; Tronick, 2003). For example, in samples with depressed mothers, dyads are less effective at repairing instances of miscoordination, which tend to occur more frequently in clinical than in healthy dyads (Weinberg, Olson, Beeghly, & Tronick, 2006). Jameson et al. (1997) found that in a sample of mother–toddler dyads, dyads with depressed mothers showed less coordination and fewer repairs during play. Skowron et al. (2010) demonstrated that impaired dyadic repair processes were more heightened in families with prior maltreatment incidents than in families without. Together, this work indicates that the presence of concurrent risk factors (e.g., parental depression, child maltreatment) negatively contribute to real-time repair processes in infancy and childhood.

Research has also identified the potential risk associated with infants' real-time reactions to failed repair attempts in interactions with their mothers. For example, when mother–infant dyads fail to repair miscoordinated interactions, infants tend to withdraw and attempt to soothe themselves (e.g., looking away, sucking their thumbs; Rosenblum, McDonough, Muzik, Miller, & Sameroff, 2003). Tronick (2003) has hypothesized that when such failures repeat over time, children could adopt the notion that their caregiver is unreliable or unavailable and could develop internalizing symptoms. Over time, these patterns could contribute to insecure attachments and other social difficulties (Biringen, Emde, & Pipp-Siegel, 1997). Conversely, consistent reparations in the face of miscoordinated interactions are thought to bolster children's long-term regulatory skills. Specifically, past work has proposed that the consistent repetition of repair processes during the earliest stages of childhood can support children's development of healthy self-regulation strategies, promote secure attachments, and increase children's confidence in their own abilities to resolve negativity or stress (Biringen et al., 1997; Lieberman, 1993).

Dyadic Repair and Regulatory Skills in Early Childhood

Although theoretical and empirical work on infants has been informative, a clear gap exists in empirical evidence for the effects of real-time repair processes on regulatory outcomes in early childhood. Broadly, self-regulation refers to one's ability to modulate attentional, behavioral, and emotional responding according to contextual demands in real time, in ways that align with socially adaptive outcomes (Posner & Rothbart, 2000; Thompson, 1994). In early childhood, self-regulation is typically assessed as children's abilities to manage difficult emotions, sustain attention, or suppress a dominant impulse and engage in a subdominant response when the context demands it (e.g., effortful control; Dennis, 2006; Kochanska, Murray, & Harlan, 2000). Self-regulation in early childhood has also been measured via the relative absence of dysregulated behavior problems (Olson, Sameroff, Kerr, Lopez, & Wellman, 2005). Understanding the familial antecedents of child regulation in preschool is particularly important as the child's self-regulation in preschool has been consistently linked to later academic success (Blair & Diamond, 2008; Ponitz, McClelland, Matthews, & Morrison, 2009), social relationships (Campbell, Spieker, Burchinal, Poe, & NICHD Early Child Care Research Network, 2006; Trentacosta & Shaw, 2009), and behavioral adjustment (Supplee, Skuban, Trentacosta, Shaw, & Stoltz, 2011), which implicates it as a central and critical component of healthy development.

Thus far, research has supported the notion that aspects of parent–child coregulation in early childhood influence regulatory abilities in preschoolers. For example, Lunkenheimer and colleagues have shown that more affectively flexible interactions between parent and child (Lunkenheimer, Albrecht, & Kemp, 2013) and tighter contingencies between parental autonomy support and child compliance in real-time interactions (Lunkenheimer, Kemp, & Albrecht, 2013) predict children's better self-regulation and fewer dysregulated behavior problems in preschool. In these studies, observed temperament-based self-regulation and caregiver-reported regulatory behaviors were both examined to obtain a comprehensive picture of the child's regulatory abilities in early childhood. In line with these and other studies, we examined a particular aspect of parent–child coregulation, dyadic repair, in predicting children's self-regulation and behavior problems in the preschool setting, while accounting for the child's baseline levels of temperament-based self-regulation (i.e., effortful control).

The Present Study

Interactive repair processes may occur up to hundreds of times each day (Tronick & Gianino, 1986), and a family's ability to repair interactions may be improved through intervention (Granic et al., 2007). But despite the potential importance of dyadic repair, we know more about the predictors than the outcomes of repair, and little about how dyadic repair affects children's regulatory capacities during early childhood, a developmental period that is critical for children's self-regulatory development. Thus, the present study sought to fill this gap related to the outcomes of repair processes during early childhood. To operationalize dynamic repair processes, we used continuously coded, second-by-second observational data of parent–child interactions during free play and puzzle tasks. Similar to Jameson et al. (1997) and Skowron et al. (2010), repair was calculated as the mean probability of a dyad moving into a state of mutually adaptive behavior (e.g., mothers engaged in supportive and children engaged in compliant behavior) directly after either or both partners engaged in a maladaptive behavior throughout the interaction (see Table 1 for behavioral codes).

Our first goal was to assess the baseline probability of repair for typical mother–child dyads during the preschool years. Although past work has assessed the proportion of time that dyads typically engage in coordinated versus miscoordinated interactions (Tronick & Cohn, 1989), less is known about the probability of repair or repair norms for mother–child interactions in early childhood. The second aim was to test how interactive repair relates to the development of children's regulatory skills in early childhood between 3 and 4 years of age, during which time rapid improvements are made in the child's internalization of these skills. On the basis of prior research and theory, we expected that consistent reparations of parent–child interactions would bolster regulatory capacities in preschoolers, operationalized as higher levels of teacher-reported emotion regulation and fewer dysregulated behavior problems in the preschool setting. Previous work has suggested that there may be distinct dyadic interaction patterns exhibited during structured and unstructured play (Ginsburg, Grover, Cord, & Ialongo, 2006). As such, we assessed repair during two different interaction contexts: a free-play task and a challenging puzzle task. We did not make specific hypotheses about how effects might differ across task contexts.

In testing these research questions, we controlled for certain variables. Previous research has found a consistent relation between maternal depression and the probability of dyadic repair (Jameson et al., 1997; Tronick, 2003). Thus, we controlled for maternal depressive symptoms in all primary analyses. We also controlled for children's effortful control as a measure of temperament-based self-regulation (Kochanska et al., 2000) to understand the influence of dyadic repair above and beyond stability in the child's self-regulation skills over time. Finally, the puzzle task we used was cognitively challenging; thus, we controlled for children's cognitive skills to account for the role of cognitive differences on task experience.

METHOD

Participants

Families were recruited through flyers in child-care centers and e-mails to county agencies serving families with young children. Originally, 100 dyads participated, but two families were excluded from the present sample because of problems with laboratory equipment that prevented observational coding, and two others were excluded as a result of outlying scores in maternal depressive symptomology (see the Results section). Thus, 96 mother–child (46% male) dyads were included in the present study. The dyads were 86% White, 8% biracial, 3% Asian, and 3% self-identified as "other race." Children were a mean of 41 months old (SD = 3 months) at Time 1 (T1), with Time 2 (T2) occurring four months later. Mothers' and fathers' education level tended to be high (68% were college graduates), and the median annual family income was $65,000 in 2010.

Procedure

At T1, dyads came to the laboratory to participate in individual and joint tasks that were videotaped and subsequently coded. At this time, mothers filled out several questionnaires regarding parenting, child behavior, and family well-being. Dyads participated in three dyadic tasks: (a) a 7-minute free-play task, (b) a 4-minute cleanup task, and (c) a 6-minute challenging puzzle task, which is described in more detail later. This visit lasted approximately two hours and families were paid $50. At T2, teachers ($N$ = 66) were offered a $20 gift card to complete online surveys regarding children's behavior in the preschool setting.

Measures

Dyadic repair—Dyadic repair was operationalized via observational coding of parent–child interactions during two tasks: free play and a challenging puzzle task (Lunkenheimer, Kemp, Lucas-Thompson, Cole, & Albrecht, 2016). During the 7-minute free-play task, the experimenter provided a box of developmentally appropriate toys to the dyad, including a cash register, several puzzles, puppets, cars, and blocks. After arranging all the toys on the floor, the experimenter instructed dyads to "play together as you normally would" and then left the room. During the challenging puzzle task, dyads were given seven three-dimensional wooden puzzle pieces to form designs using a corresponding guidebook (Castle Logix, Smart Toys and Games). Mothers were instructed to help their child complete three particular designs that increased in difficulty using only their words; dyads were told that if they completed all three designs, the child would win a prize. The puzzle was selected on the basis of manufacturer age recommendations for 3- to 8-year-old children; the latter two of the three designs were above the child's cognitive ability level and could not be completed without assistance. The baseline portion of the task lasted 4 minutes while the dyad worked on the puzzles, then an experimenter interrupted to tell dyads they only had 2 minutes left, initiating a challenge condition. The present study examined parent–child behavior during the baseline portion only in order to examine more typical parent–child problem-solving behaviors.

Noldus Observer XT 8.0 software was used to code behavioral observations for both tasks using a dyadic interaction coding system (Lunkenheimer, 2009). Parent and child behaviors were coded on a second-by-second basis throughout the observation, and codes were mutually exclusive, such that only one behavior was recorded for each person during the corresponding time period for that action (e.g., whether 2 seconds or 30 seconds long). If the same behavior occurred multiple times in succession without a new behavior occurring in the interim (e.g., three parental directives in a row), then the original behavior was coded continuously throughout that interval. Three coders were trained on the coding scheme and tested for reliability on 20% of the data set in relation to a standard set by the principal investigator and a trained graduate student. Drift reliability was also assessed on an additional 10 videos. Analyses of reliability were performed using the standard 3-second tolerance window in Noldus Observer XT 8.0. Interrater reliability was attained at a minimum of .70 and mean of .75 intraclass correlation (Nunnally, 1978).

GridWare 1.15 software (Lamey, Hollenstein, Lewis, & Granic 2004) was used to create State Space Grids (SSG) to track each dyad's movement between the adaptive and maladaptive behavior regions. The adaptive region of the grid indicated when both mother and child were engaged in neutral or positive supportive (mother) and on-task (child) behavior, and maladaptive regions encompassed times when the parent or child were engaged in a behavior that was not supportive or not on task (see Table 1 for full list of behaviors). Data derived from SSGs (Lamey et al., 2004) were utilized to calculate the conditional probability of repair during each task for each dyad. Repair was calculated as the proportion of instances where the dyad moved to the shared adaptive behavior state directly after an instance of maladaptive behavior, out of all visits to the maladaptive region of the grid. Conditional probabilities and contingency analysis have been used in prior research to understand the likelihood of specific sequences of parent–child interaction (e.g., Crockenberg & Leerkes, 2004).

Figure 1a illustrates an example of a dyad that never engaged in a maladaptive behavior and thus did not have a chance to repair; this dyad's repair score was 0. In our particular sample, no dyads transitioned into a maladaptive state early in the interaction and stayed there for the remaining duration of the task, so a score of 0 indicated that the dyad did not have the chance to repair, as opposed to not being able to repair the maladaptive state. In Figure 1b, the dyad engaged in a maladaptive behavior three times. The dyad immediately returned to the adaptive region after two of these instances, which resulted in a repair score of .67. Figure 1c shows a dyad that had two instances of maladaptive behaviors; each one was immediately followed by a return to the mutually adaptive state, for a repair score of 1.0.

Maternal depressive symptoms—Maternal depressive symptoms were measured using the Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977). The CES-D was developed to assess depressive symptoms in the general population and has demonstrated high internal consistency in community samples (e.g., $\alpha = .87$; Hann, Winter, & Jacobson, 1999). This 20-item survey asks participants how often they felt symptoms in the past week, including: "I had crying spells," and "I felt sad." Response options ranged from "rarely to none of the time (0 hours)" to "most or all of the time (5–7 days)."

Cronbach's alpha was .72, which is considered an adequate degree of internal consistency (Tavakol & Dennick, 2011).

Child effortful control (EC)—EC, a measure of children's temperamental self-regulation, is defined as the child's ability to activate and sustain a subdominant response in lieu of a dominant response (Kochanska et al., 2000). Child EC was controlled for to account for individual differences in regulatory ability at T1; differences in EC could also affect the child's ability to shift and sustain attention during the challenging puzzle task. EC was assessed using three observed tasks from a behavioral battery (Kochanska, Murray, Jacques, Koenig, & Vandegeest, 1996): the tower task, snack delay task, and gift delay task. The Tower Task is designed to assess the child's ability to suppress and initiate behaviors in a turn-taking situation with toys; the Tower Task score is equal to the proportion of times the child allows the experimenter to take his or her turn across two trials. The snack delay task is designed to assess the child's ability to delay gratification and suppress and initiate impulses concerning food; the snack delay score is based on the mean length of time the child was able to wait until a bell was rung to eat a provided snack across four trials. The gift delay task is designed to assess the child's ability to delay gratification and suppress and initiate impulses with respect to a desired object; the gift delay score is a standardized score taking into account both the strategies used (e.g., peek vs. touch) and the latency to touch or peek at the gift. EC tasks were introduced as "games," and children were reminded of the instructions midway through each task (see Kochanska et al., 1996, for more detailed information, including the validity and reliability of these measures). Individual subtest scores were standardized and a mean computed across subtests to create a total EC score (Cronbach's alpha = .79).

Child cognitive skills—Child cognitive skills at T1 were controlled for to account for the child's ability to understand the instructions and operations of the puzzle task. The Wechsler Preschool and Primary Scale of Intelligence (3rd ed., WPPSI-III; Wechsler, 2002) block-design task was used to measure cognitive skills, which has shown a strong positive correlation with full scale IQ ($r = .71$; Weschler, 2002). The 20-item block-design task tests children's perceptual and visuospatial abilities and involves the child having to replicate increasingly difficult designs with blocks presented by an experimenter; it has shown high internal consistency in prior research ($\alpha = .85$; Wechsler, 2002). The WPPSI is one of the most widely utilized assessments of cognitive abilities in early childhood and shows strong construct validity when compared to other measures of child cognition (e.g., Wechsler Individual Achievement Test; Wechsler, 2002).

Child emotion regulation—Child regulatory abilities at T2 were assessed via teacher report using the emotion regulation subscale of the Emotion Regulation Checklist (ERC; Shields & Cicchetti, 1997). The ERC is a continuous measure that asks raters to assess how often the child has shown specific reactions to various situations over the past six months (e.g., "The child is a cheerful child" or "The child is easily frustrated"). Items are scored on a four-point scale ranging from *rarely/never* (1) to *almost always* (4), which results in a potential range of summed scores from 8 to 32 for the eight-item regulation subscale. The subscale represents children's abilities to display appropriate affective responses, their emotional awareness, and empathy. Cronbach's alpha for our sample was .84. The ERC has demonstrated strong construct validity and reliability (Shields & Cicchetti, 1997).

Child dysregulated behavior problems—Behavior problems were assessed via teacher report at T2 using the Caregiver–Teacher Report Form (CTRF/1.5-5; Achenbach & Rescorla, 2000). The externalizing subscale reflects behavioral dysregulation in the form of poor attentional control and physically aggressive behavior, and the internalizing subscale reflects somatic complaints, anxiety, and depression. The items are rated on 3-point scales with response options ranging from *not true of the child* (0) to *very true or often true of the child* (2), which results in a continuous score, with a maximum possible score of 64 on the internalizing subscale and 68 on the externalizing subscale. The CTRF has high subscale and syndrome alphas, ranging from .52 to .96, and test-retest reliabilities ranging from .72 to .91 (Achenbach & Rescorla, 2000). Cronbach's alpha was .93 for the externalizing subscale and .90 for the internalizing subscale.

ANALYTIC PLAN

Goal 1: Repair Probabilities Across Tasks—Given that little prior research has examined repair rates during second-by-second, continuously coded parent–preschooler interactions, we first ran a series of analyses to determine whether repair showed a sufficient base rate and adequate variability to be analyzed in predictive models. Descriptive analyses were used to examine the mean probabilities of repair across dyads, as well as the distribution of repair probabilities for each task. Next, repeated measures analysis of variance (RM-ANOVA) was used to test for systematic differences in repair probabilities between the free-play task and the puzzle task.

Goal 2: Repair and Child Regulatory Outcomes—Second, separate multivariate multiple regression analysis (MMR) was used to examine whether dyadic repair during each task predicted later child regulation and dysregulation. MMR allowed for greater power in assessing the relationship between multiple predictors and outcomes than would conducting multiple separate regression analyses. In the present study, teacher reports of child emotion regulation, internalizing behaviors, and externalizing behaviors were assessed as a set of dependent variables in the MMR and were regressed on repair probabilities and on the control variables of maternal depression, child EC, and child cognitive abilities.

RESULTS

Descriptive Analyses

With regard to variable distributions, the distribution for repair probabilities during both tasks were nonnormal because of the number of dyads that did not engage in *any* instances of maladaptive behavior and thus lacked the chance to repair, giving them a repair probability score of 0. Given the qualitatively distinct meaning of a 0 score, implications of this nonnormal distribution were addressed in post hoc analyses. Children's EC, cognitive skills, emotion regulation, externalizing problems, and internalizing problems were normally distributed. Two mothers reported depressive symptom scores that were three or more standard deviations higher than the sample mean. Because these mothers were more representative of a clinical population than a community-based population, and because mothers' clinical depression has shown distinct effects on mother–child repair processes (e.g., Jameson et al., 1997), these two dyads were excluded from subsequent analyses.

Overall, the sample displayed characteristics consistent with typical community-based samples. For example, 9% of total mothers showed clinical levels of depressive symptoms (CES-D score ≥ 16), which is slightly lower than Campbell and Cohn's (1997) report of 13% in a low-risk sample. The sample mean score on the block-design task was consistent with the national mean on the WPPSI (Wechsler, 2002). Approximately one-third of children's teachers elected not to participate in data collection efforts at Time 2; Little's (1988) Missing Completely at Random (MCAR) test indicated that these data were missing at random: $\chi^2(2) = .57$, $p = .32$.

Repair probabilities did not differ by sociodemographic variables; that is, they were not statistically associated with child age, child gender, child ethnicity, maternal education, parent marital status, or family socioeconomic status. Thus, we did not control for these factors in primary analyses. In bivariate correlations, repair during the puzzle task was positively correlated with teacher-reported scores for child emotion regulation, though internalizing and externalizing scores did not show statistical correlations with repair during either task (see Table 2 for descriptive data and bivariate correlations).

Dyadic Repair Probabilities Across Tasks

The mean probability of repair was .54 during the free-play task and .47 during the puzzle task. An RM-ANOVA indicated that there was no statistical difference in repair probabilities across tasks, $F(1, 89) = 2.39$, $p = .13$, $\eta^2_{partial} = .03$. Thus, dyads repaired their interactions about half the time, regardless of whether they were engaged in an unstructured free-play task or a semistructured, challenging puzzle task.

Dyadic Repair Predicting Child Regulatory Skills

A series of MMRs were performed to predict child regulation and behavior problems at T2 from dyadic repair during the free-play and challenging tasks at T1. Teacher-reported child internalizing behaviors, externalizing behaviors, and emotion regulation at T2 were outcome variables. Separate models were estimated for the free-play and puzzle tasks, and both models controlled for maternal depressive symptoms, child EC, and child cognitive abilities.

Dyadic repair during the puzzle task statistically predicted child outcomes after accounting for control measures (see Table 3). Overall, repair accounted for 18.4% of the variance in the set of outcome variables, $F(3, 56) = 4.21$, $p < .01$. Repair during the puzzle task accounted for 14.9% of variance in child emotion regulation ($p < .01$), and 5.3% of variance in child externalizing behaviors ($p = .08$). Repair did not statistically explain variance in child internalizing behaviors ($p = .11$). Also, repair during free play did not statistically enhance the prediction of child outcomes after accounting for the control variables, $F(3, 56) = 0.71$, $p = .55$.

Post Hoc Analysis

Because of the nonnormal distribution of the repair variable and past work suggesting that there may be meaningful differences between dyads that repair and those that do not have a chance to repair as a result of having engaged in strictly positive interactions (e.g., Biringen et al., 1997), an additional model was estimated that included only dyads that had a chance to repair during the puzzle task ($n = 47$). This analysis was completed to ensure that the subgroup of dyads with repair scores of 0 ($n = 21$) was not driving the previous findings. Findings are reported in Table 4. The model including only dyads that had the chance to repair remained statistically significant, $F(3, 40) = 3.69$, $p = .02$, with repair accounting for 21.7% of the variance in outcome variables after controlling for maternal depressive symptoms, child effortful control, and child cognitive abilities. Repair accounted for 12.5% of the variance in child externalizing problems ($p = .02$) and 10.6% of the variance in child emotion regulation ($p = .03$). Once again, repair did not statistically explain variance in child internalizing behaviors ($p = .13$). Child cognitive abilities remained a statistical predictor and EC became a statistical predictor in this model, accounting for 18.3% and 17.6% of the variance in child outcomes, respectively.

DISCUSSION

DiCorcia and Tronick’s (2013) everyday stress resilience hypothesis posits that mother–child interactions are commonly filled with microstressors (e.g., discomfort, mismatched experiences, fussiness) and that such instances give dyads the opportunity to develop “regulatory resilience.” Regulatory resilience represents the dyadic capacity to effectively manage negative or difficult experiences through the reparations of these everyday stressors. When children develop in a context of consistent reparations with caregivers, their own ability to deal with difficult experiences is supported, which enables them to successfully learn to regulate such occurrences in real-time and future interactions (Beeghly & Tronick, 2011; DiCorcia & Tronick, 2011). The present study represented a necessary step in further understanding how these processes operate during the preschool period.

We investigated the role of repair by assessing real-time repair probabilities in mother–preschool dyadic interactions and hypothesized that higher rates of repair would predict better children’s self-regulation in the form of higher levels of regulatory abilities and fewer behavior problems in the preschool setting. This hypothesis was supported with findings indicating that dyadic repair during a challenging task predicted children’s lower behavior problems and higher regulation as reported by teachers four months later. This builds on previous research on dyadic repair, which has suggested that consistent mother–child repair processes promote healthy child behavior and regulation outcomes during infancy and toddlerhood (Biringen et al., 1997; Jameson et al., 1997; Tronick & Gianino, 1986). Interestingly, the relation between repair and child outcomes in preschool held true only for repairs made during the challenging task. This finding could suggest that the ability to repair difficulties during a challenging situation, one that invokes the need for the dyad to coordinate behavior in a problem-solving situation, may represent a higher-order dyadic skill that more strongly contributes to preschoolers’ development of regulatory capacities. The present findings allow for a more comprehensive understanding of the role of repair processes throughout the life span, as previous work has thus far focused on infancy and toddlerhood (Jameson et al., 1997; Tronick, 2003) and older children and adults (Gottman, 1998; Granic et al., 2007; Skowron et al., 2010).

This study also provided a preliminary examination of the probability at which parent–child dyads repair their interactions in real time during the preschool years. The dyads in our study followed a maladaptive exchange with an immediate return to a mutually adaptive interaction (e.g., repaired) about half the time during each task. An important strength of the present study was the investigation of repair in the form of behavioral transitions, given that much of the previous work on repair processes has focused on affective repair (Tronick, 2003). In early childhood, parents and children must navigate the child's burgeoning autonomy by attempting to coordinate their goals through control and compliance behaviors many times a day, every day (Olson & Lunkenheimer, 2009). Thus, findings of the present study contribute to the notion that repair is a multifaceted construct worth examining across different domains of functioning, including parent and child goal-oriented behaviors, and not solely affective exchanges.

There may be qualitative differences between parent–child dyads that do and do not have the opportunity to repair miscoordinated interactions. In our sample, dyads that experienced only positive and coordinated behaviors could represent parent–child relationships that have a much higher base rate of harmonious interactions. In a relatively high-functioning sample, we may not have been able to capture dyadic rupture or conflict in 13 minutes of total laboratory-based interaction tasks for certain dyads. So these particular dyads may be showing adaptive approaches to a challenging dyadic task in a lab setting, or more positive interactions in general. However, another possibility is that behaviors such as negativity, miscoordinated goals, or children's off-task behavior are not permitted in certain dyads through explicit or implicit socialization by the parent. In other words, these dyads could include parents with higher levels of anxiety or strict guidelines for the child, or children showing overregulated behavior, thus preventing them from experiencing instances of miscoordination. Although the goal of the present study was to understand the effects of repair when it occurs, and not to examine differences between dyads that did and did not get the chance to repair, future research could sample a broader array of families to continue to explore these questions.

Limitations

The present study had certain limitations. Only about two-thirds of teachers responded to requests for T2 data ($N = 66$). Although the data was missing at random, the lower number of dyads included in the final predictive analyses reduced our overall power to detect statistical relations between repair and later child outcomes. The sample of the present project was a local community sample, which primarily included White, middle-class, well-educated families. Therefore, findings may not be generalizable to other populations with differing sociodemographic factors or populations at higher risk. It is imperative that future work examine dyadic repair in early childhood in higher-risk and clinical samples, as past work on repair has found meaningful differences in repair processes based on family risk factors, such as parental depression (Tronick, 2003; Weinberg et al., 2006). Considering that we examined repair of parent and child goal-oriented behaviors rather than affect, the present study does not allow us to map these findings directly onto prior repair work on affective exchanges in infancy. Although this type of comparison was not an aim of this study, examining both affective and behavioral repair in early childhood will be a valuable area of exploration in future work. It will also be important for future research to model repair over multiple time points to strengthen confidence in the validity and reliability of the measure, in addition to obtaining a better understanding of developmental changes in dyadic repair over time.

Clinical Implications and Future Directions

The present study contributes to a common theme in the developmental literature, which broadly suggests that experiencing challenges (e.g., conflict, distress, anxiety) is a normative part of development, and that positive consequences may emerge when such experiences are repaired on a consistent basis (e.g., Biringen et al., 1997). Research on repair can be informative for parents, teachers, and clinicians, as it reminds us that interpersonal miscoordination is normative and that no one can engage in positive interactions at all times. Rather, children can be socialized to develop a capacity for transforming inevitable challenges and negativity into manageable experiences on a consistent, day-to-day basis through the reparations of interpersonal interactions with others.

Children’s dysregulated behavior problems are often presented as the focal problem in families entering family therapy. The narrative that the child is the main or only family member with difficulties can be misguided, as family well-being is made up of more than the sum of the parts and children do not develop independently from the family system (Mikesell, Lusterman, & McDaniel, 1995). It is the responsibility of clinicians and other helping professionals to challenge narratives of “problem children” and work to understand and intervene with families from a systemic perspective (Taylor & Biglan, 1998). Repair processes, the focus of the present study, could provide a familywide target for intervention that is ripe for use even during a clinician’s first interview. Although families often enter therapy at a time of crisis, current research suggests that there may be power in repairing even brief, momentary instances of negativity. From a broader perspective, dynamic systems theory suggests that the recurrence and entrainment of micro-level adaptive interactions encourages stability in adaptive dyadic profiles (Lunkenheimer & Dishion, 2009). Therefore, even within the treatment of larger family problems, clinicians may be able to use these findings to support parents in anticipating normative conflict within their interactions and targeting strategies for repairing the inevitable negativity that is part of all parent–child relationships (Beeghly & Tronick, 2011; Jameson et al., 1997).

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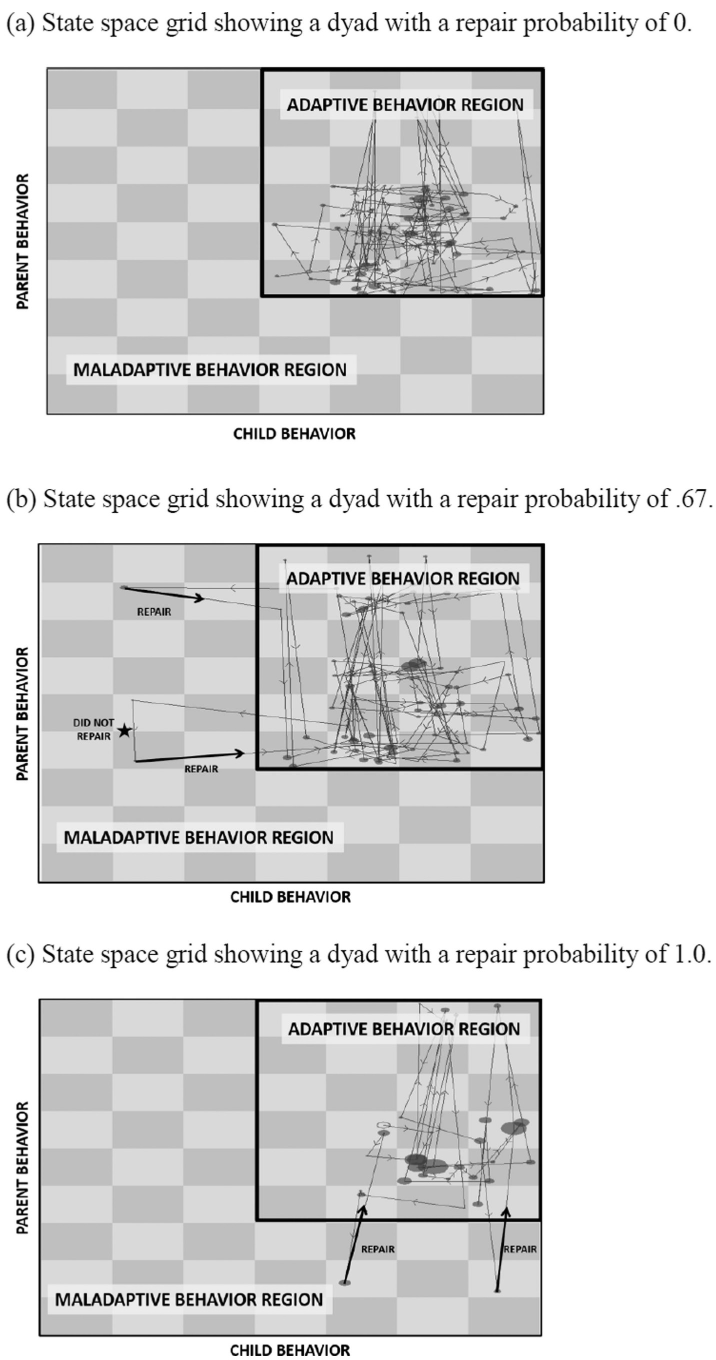

Figure 1.
State Space Grids (SSG) Illustrating Three Different Repair Probabilities During Observed Tasks.
Note. Columns and rows represent the behaviors listed in Table 1.

Table 1

Parent and Child Behavior Codes

Parent Adaptive	**Description**	**Example**
Proactive structure	Parent encourages, guides, or prompts child to behave in a positive manner.	"Let's pretend that the box is a house and help all the dolls 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 child label emotions, or physically comforts child.	"Are you feeling kind of nervous?"
Teaching	Parent explains how something works or asks child a task-related question and allows child 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 child to respond in a specific way.	"Don't throw that block." "Can you put it here?"
Engagement	Parent is engaged with child through eye contact or non-task-related conversation.	"What should we have for lunch today?"
Parent maladaptive		
Disengagement	Parent is not engaging with child, is ignoring 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 child.	When child has difficulty with a puzzle, parent takes piece away and completes it herself
Negative discipline	Parent (a) provides a harsh directive with a negative consequence, (b) criticizes child, or (c) physically punishes child.	"Get back here or I'll spank you"
Child adaptive		
Compliance	Child clearly responds to parent's bid for a behavior change.	Child places a piece of puzzle as requested by parent
Persistence	Child persists at completing a task without preceding prompts by parent.	Child continues to work on puzzle on his or her own
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 or her own without engaging with parent.	Parent and child building two separate towers near each other
Child maladaptive		
Noncompliance	Child does not comply with parent's bid for behavior change, by ignoring, disagreeing with, or refusing request.	Child picking up red block after the parent asked child to leave blocks alone
Disengagement	Child is not engaged with parent or task, seems spaced out, or loses focus or has no particular direction.	Child looks away from task and stares at floor Child wanders around room
Behavioral dysregulation	Child has dysregulated emotional episodes (positive or negative) with a clear physical or behavioral component.	Child throws tantrum, withdraws by curling into a ball, runs in circles around room giggling

Table 2

Means, Standard Deviations, and Intercorrelations for Key Study Variables

	N	*M*	*SD*	1	2	3	4	5	6	7	8
Predictor variables (T1)											
1. Maternal depressive symptoms T1	98	6.90	5.73	—							
2. Child effortful control T1	96	0.00	.71	−.07	—						
3. Child cognitive skills T1	95	17.75	4.96	−.01	.45**	—					
4. Free play repair	92	.54	.25	−.06	.15	.07	—				
5. Puzzle task repair	94	.47	.35	.04	−.27**	−.19†	.04	—			
Outcome variables (teacher report; T2)											
6. Child internalizing teacher report T2	66	6.79	7.27	−.05	.09	−.14	.15	−.18	—		
7. Child externalizing teacher report T2	66	7.85	8.93	.14	−.29*	−.39**	.10	−.03	.55**	—	
8. Child regulation teacher report T2	65	24.12	4.60	.10	−.02	.22†	−.08	.32*	−.44**	−.17	—

Note. T1 = Time 1; T2 = Time 2.

† $p < .10$.

* $p < .05$.

** $p < .01$.

Table 3

Puzzle Task Multivariate and Between-Subjects Tests, All Dyads

Predictor (T1)	Outcome variable (T2)	*F*	*p*	Partial eta squared (η_p^2)
Maternal depressive symptoms	Multivariate effect	0.50	.69	.03
Child effortful control	Multivariate effect	2.16	.10	.10
Child cognitive skills	Multivariate effect	4.53	< .01	.20
	Child internalizing	3.63	.06	.06
	Child externalizing	6.79	.01	.11
	Child emotion regulation	7.70	< .01	.12
Repair probability	Multivariate effect	4.21	< .01	.18
	Child internalizing	2.71	.11	.05
	Child externalizing	3.25	.08	.05
	Child emotion regulation	10.15	< .01	.15

Note. Individual beta parameters are only displayed for predictors for which the multivariate *F* was statistically significant.

Table 4

Puzzle Task Multivariate and Between-Subjects Tests, Only Dyads With Chance to Repair

Predictor (T1)	Outcome variable (T2)	*F*	*p*	Partial eta squared (η_p^2)
Maternal depressive symptoms	Multivariate effect	0.94	.43	.07
Child effortful control	Multivariate effect	2.89	.05	.18
	Child internalizing	0.45	.51	.01
	Child externalizing	3.50	.07	.08
	Child emotion regulation	0.15	.70	.00
Child cognitive abilities	Multivariate effect	2.99	.04	.18
	Child internalizing	3.13	.08	.07
	Child externalizing	1.88	.18	.04
	Child emotion regulation	7.77	< .01	.16
Repair probability	Multivariate effect	3.69	.02	.22
	Child internalizing	2.45	.13	.06
	Child externalizing	6.00	.02	.12
	Child emotion regulation	5.00	.03	.11

Note. Individual beta parameters are displayed only for predictors for which the multivariate *F* was statistically significant.