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Family interactions and developmental risk associated with early cognitive delay: Influences on children's behavioral competence

Emily D. Gerstein¹ and Keith A. Crnic²

¹Department of Psychological Sciences, University of Missouri-St. Louis

²Department of Psychology, Arizona State University, 950 S McAllister, Tempe, AZ 85287

Abstract

Objective—Family interactions can be important contributors to the development of child psychopathology, yet the mechanisms of influence are understudied, particularly for populations at risk.

Method—This prospective longitudinal study addresses differences in whole family interactions in 194 families of young children with and without early-identified developmental risk associated with cognitive delay. The influence of family interactions on children's later externalizing behaviors, internalizing behaviors, and social skills was examined, and developmental risk was tested as a potential moderator of these relations.

Results—Results indicated the presence of cognitive developmental risk was linked to higher levels of family control than in families of typically developing children, but groups did not differ on dimensions of cohesion, warmth, organization, or conflict. Observed cohesion and organization were associated with better social skills for all children, regardless of risk status. Significant interactions emerged, indicating that higher levels of conflict and control were associated with higher levels of behavior problems, but only for families of typically developing children.

Conclusions—These findings underscore the importance of family-level assessment in understanding the development of children's behavior, and suggest the need for deeper analysis of the nuances of family process over time.

Keywords

family interaction; externalizing disorders; social skills; developmental delay; parent-child relationships

Whole family interactions have an important yet understudied role in the development of psychopathology during childhood. Theory as well as emerging research indicate that family constructs, such as cohesion, conflict, and control, can influence developmental processes (Halpern, 2004), and parents may behave differently within the higher-order whole family interactions than they do in more typically studied dyadic contexts (Lindsey & Caldera,

2006). Yet, this research has been limited by a predominant focus on parent-report of family functioning, and relatively rare use of observational methods. Further, with notable exceptions, there is almost no observational research examining family interactions of children at developmental risk associated with early cognitive delay despite indications that such risk adds stress to family systems (Crnic, Friedrich, & Greenberg, 1983), and substantially increase the likelihood of comorbid behavior problems (Baker, Blacher, Crnic, & Edelbrock, 2002). Whether family processes are equivalent across families with and without children with early developmental compromise such as general cognitive delay is an important area of inquiry with implications for general risk theory. This study examines the potential moderating influence of such developmental risk on the relation between whole family interactions and emerging psychopathology and competence in young children.

Family Interactions

Family systems theories engage the concept of “wholeness” to describe how an entire family is conceptualized as a different entity from individual or subsystem, and is not represented simply by the sum of its parts (Cox & Paley, 1997). However, despite the well accepted dynamic nature of family systems, most research has used more static self-report methods to measure the family process. Self-reports offer one perspective on the constructs, but lack the objectivity of observational methods and measure more of an individual’s perception of the family rather than the system itself (Margolin et al., 1998). In contrast, observational methods that engage whole family interactions appear better equipped to capture the inherent intricacies of the family system (Kerig, 2001).

The field is replete with studies of dyadic subsystems within the family (mother-child, father-child, and sibling interactions). Examining dyadic relationships, however, is not equivalent to whole family interactions, as family members likely behave differently in dyads than they do in triadic (or larger) interactions (Clarke-Stewart, 1978). Mothers appear to be less responsive, less involved, less sensitive, and more likely to display negative emotion in triadic rather than dyadic interactions when the father is not present (Lindsey & Caldera, 2006). Father-child interactions have shown a similar pattern in which fathers talked less and showed less affection in triadic interactions, despite similar levels of social play (Goldberg, Clarke-Stewart, Rice, & Dellis, 2002). Overall, mothers show significantly less engagement with their child in the context of triadic interactions (i.e. with father) across developmental periods (McHale & Rasmussen, 1998; Smetana, Abernethy, & Harris, 2000) than they do when interacting with only their child. It is possible that mothers may be less involved with their child because their attention is split between father and child, rather than simply being less involved. However, global likert-scale coding and lack of equivalent “involvement with father” measures make disaggregating these findings difficult. Further, these studies are typically limited by relatively small sample sizes, the evidence suggests that parents’ level of involvement and affective response varies as a function of the number of family members present in the interaction.

Family-level interaction constructs (i.e. low cohesion, low expressiveness, enmeshment, conflict, control, and low organization) have been associated with a number of child mental health problems, including behavior problems (Halpern, 2004; Pettit & Bates, 1989;

Schoppe, Mangelsdorf, & Frosch, 2001), anxiety (Jacobvitz, Hazen, Curran, & Hitchens, 2004), depression (Jacobvitz et al., 2004; Park, Garber, Ciesla, & Ellis, 2008), poorer academic achievement (Smith, Prinz, Dumas, & Laughlin, 2001), and social difficulties (Feldman & Masalha, 2010; Johnson, 2005). These family constructs, particularly when observed, have been found to predict child functioning even after controlling for other risk factors such as parental depression, parent-child interactions, and marital adjustment (Feldman & Masalha, 2010; Jacobvitz et al., 2004; McHale & Rasmussen, 1998). The “transition to school” period in which children face increased communications demands and changes to daily routine (Rimm-Kaufman & Pianta, 2000) may be a particularly significant time to examine the impact of family interactions on children’s emerging behavior patterns. During the transition to kindergarten, parent-reports of the family environment at child age 5 predicted children’s school competence a year later (Johnson, 2005), while observed family organization at age 6 predicted externalizing behavior problems a year later (Johnson, Cowan, & Cowan, 1999).

Developmental Risk

Children with early developmental risk present a unique opportunity to examine the impact of family interactions because of their added stress to the family (Crnic et al., 1983). Developmental risk may be reflected in any number of conditions or contexts. For the purposes of this study, developmental risk is represented by children with delays in cognitive development that exceed one standard deviation below the mean of IQ assessed at age 5. It therefore includes children who are at risk for developing an intellectual disability, as well as those who currently meet the cognitive criterion for such a diagnosis. Previous research has found that there is notable cognitive, academic, and social risk for children who score in the borderline range (IQ 75–84) of intellectual abilities, and their families are more akin to those with diagnosed intellectual disabilities than typically developing children (Fenning, Baker, Baker, & Crnic, 2014). Throughout the remainder of this study we use the term developmental risk to refer to this population of children.

Children with early developmental risk show increased risk for comorbid externalizing, internalizing, and attentional problems (Baker et al., 2002; Baker, Neece, Fenning, Crnic, & Blacher, 2010; Dekker, Koot, van der Ende, & Verhulst, 2002; Koskentausta, Iivanainen, & Almqvist, 2007). Indeed, epidemiological studies of children with intellectual disabilities have found a diagnosable behavioral or emotional disorder in up to half of the cases (Dekker et al., 2002; Koskentausta et al., 2007). Despite findings that behavior and emotional problems are highly prevalent in this population, and the substantial evidence in support of associations between family processes and psychopathology in general (Cummings, Davies, & Campbell, 2000), few studies have addressed family interactions as potential influences on children’s behavior under conditions of developmental risk.

Despite the wealth of research on developmental risk, little is known about the direct effects of having a child with early cognitive delays on whole family interactions. Early seminal work by Mink and colleagues (1983) identified five typologies of families with a child with intellectual disabilities, finding that cohesive and harmonious families had the highest self-esteem and school acceptance. Subsequent work has found that self-report measures of

cohesiveness were associated with improvement in children's social and communication skills (Hauser-Cram et al., 1999), while lower reported levels of cohesion and independence within the family were associated with more negative parent-child exchanges (Floyd, Harter, & Costigan, 2004). Although instructive, these studies are not conclusive with respect to the ways in which family functioning may be similar to families of typically developing children, or whether system level constructs such as cohesiveness might be differentially predictive of child behavior.

Although limited by its dyadic nature, research on dyadic mother-child interactions in children with and without developmental risk provides some insight into the ways in which developmental risk may operate to influence family interactions and subsequent child behavior. Mothers of children with early-identified cognitive delays have been found to be more negative, intrusive and didactic than mothers of typically developing children (Beck, Daley, Hastings, & Stevenson, 2004; Marfo, 1990; Spiker, Boyce, & Boyce, 2002), as well as less warm, sensitive, and more focused on teaching, rather than playing with children (Hodapp, 2002; Niccols & Feldman, 2006). Other findings suggest that mothers of children with developmental risk may be less sensitive toward their children, but only in more demanding parent tasks (Ciciolla, Crnic, & West, 2013). Although associations to more negative outcomes are far from ubiquitous (Blacher & Baker, 2007), the challenges to families are tangible.

Despite these challenges, parenting and family processes in risk contexts may have greater influence on later developmental competencies than in non-risk contexts (Crnic & Greenberg, 1987). For example, maternal scaffolding better accounted for social skills in children with developmental risk than for typically developing children (Baker, Fenning, Crnic, Baker, & Blacher, 2007), and increased directiveness and responsivity more strongly predicted language, social, and emotion functioning in children with developmental disabilities (Warren & Brady, 2007). In line with recent differential susceptibility conceptualizations (Belsky & Pluess, 2009), parenting may actually be differentially important for children with developmental risk, with responsive parenting being more important to children's competent social emotional development, and negative or critical parenting having stronger adverse effects.

It is unclear whether the same decreases in quality of interaction between typically developing families and families of children with developmental risk will be seen when examining whole family interactions. Further, given the presence of developmental risk, it is unknown if family interactions may play a stronger role in influencing children's behavior than in families of typically developing children.

Present Study

This study addresses the nature of observed whole family interactions, and the contributions of these family level attributes to children's emerging behavior problems and social competence during the transition to school period. This study aims to (1) contrast whole family interactions in children with and without developmental risk at age 6, (2) examine whether specific qualities of whole family interaction at age 6 are related to later child

behavior problems and social skills at age 7 beyond mother-child dyadic interactions, and (3) determine whether developmental risk moderates those relations. It is hypothesized that families of children with developmental risk will display higher levels of conflict and control, lower levels of cohesion and warmth, and similar levels of organization. Higher levels of cohesion, warmth, and organization are expected to be related to more social skills, while higher levels of conflict and control are expected to be related only to behavior problems. Conflict, control, and organization are expected to be differentially important in families of children with developmental risk.

METHOD

Design Overview

Data for the current study were drawn from a multi-site, longitudinal investigation that prospectively examined the interrelations among children's developmental risk, family functioning, child characteristics, and child behavior in children aged 3 to 9 years. Data were collected using a multi-method approach involving structured parent interviews, independent observations of parent-child interaction in naturalistic and lab-based settings as well as questionnaires assessing a range of issues related to the child, parent, and family. Children's cognitive ability was initially assessed at age 3 to determine developmental risk, and re-assessed at age 5. An additional cohort of 5 year old children with developmental risk was recruited in the second phase of the larger study. This additional cohort did not otherwise significantly differ on any demographic or study variables from the original group of children with developmental risk. The current study incorporated longitudinal data collected from both observational and questionnaire data at ages 5, 6, and 7.

Participants

The participants of the current study included 194 children and their families who completed a family game task at age 6. At age 5, children were identified as typically developing (TD) or having developmental risk (DR) using the Stanford-Binet Intelligence Test 4th Edition (SB-IV; Thorndike, Hagen, & Sattler, 1986). IQ Scores below 75 classify a child as delayed, while IQ scores between 75 and 85 are classified as borderline. In this study, the borderline and delayed groups were combined, and any scores below one standard deviation of the mean were categorized as DR ($IQ < 85$). Previous research with this population has found notable risk for these children with borderline IQ (Fenning et al., 2014). The study included 119 TD children ($Mean\ IQ = 103.84$, $SD = 11.91$, $Range = 85-137$) and 75 children with DR ($Mean\ IQ = 61.77$, $SD = 14.71$, $Range = 36-83$). Families were recruited primarily through state or community agencies, such as family resource centers, preschools and daycare centers. The exclusion criteria included non-ambulation or significant motor impairment, severe neurological impairment, or a history of abuse. Additionally, TD children had to have full term gestation and no known neurobiological difficulties. Families of TD children had mothers with significantly higher levels of education, $t(192) = 4.57$, $p < .001$ (TD $Mean = 15.88$ years, DR $Mean = 14.41$ years), fathers with significantly higher levels of education, $t(166) = 2.60$, $p = .010$ (TD $Mean = 15.67$ years, DR $Mean = 14.49$ years), and significantly higher incomes, $t(189) = 2.34$, $p = .020$ (median income \$50,000–\$70,000 versus \$35,000–\$50,000). There were no significant differences between groups in

the number of family members in the home (median=4 people), presence of a father in the family game (82.5%), gender of the child (57.7% male), race of the child (60.8% Caucasian, 15.5% Hispanic, 8.2% African-American, 1.0% Asian, 14.4% Native American or multiracial) or the percentage of married mothers (84.5% married at age 6).

Attrition was 7.3% across the two years of the study, and subjects who attrited did not significantly differ from subjects who remained on any demographic or study variables. Approximately one-fourth of the families were recruited from Central Pennsylvania, and three-fourths of the families were recruited from Southern California. Families from California had higher family incomes, mothers with more education, and more ethnic diversity than the families from Pennsylvania, so these variables were examined as potential covariates.

Procedure

The study was approved by the Institutional Review Boards at the three institutions where data was collected, and parental consent was obtained at ages 3 and 5. At age 5, children were brought into the lab, administered the SB-IV by trained graduate students, and participated in a free-play interaction with their mother. At age 6, a series of structured parent-child tasks was conducted and videotaped in the home. In the last task, the entire family, including siblings, played a 10-minute board game based on the game Sorry[®]. Families were instructed how to play the game, and the study's focal child was designated to be the first person to draw a card. Two additional rules set forth at the start of the game were that pieces could only be moved when it was one's turn, and everyone had to remain seated. The game was designed ("rigged") so that the focal child would initially do well and move around the game board quickly, but would begin to suffer setbacks once he or she appeared close to winning (creating some mild frustration) while the other players would begin to move ahead. The intention was to provide a whole family context for the observation of regulatory behavior when engaging in a typically enjoyable activity. However, there was no intervention if the family decided to move out of turn or change the rules of the game. Many families of both TD children and children with DR shuffled the deck, moved out of turn, or cheated in the game so that the focal child did win. Given that siblings of varying ages were also present, no differences in overall ability to play the board game or follow the rules were noted between the two groups of families. There were also no significant differences in family codes based on whether the game was played according to the rules. Every family was able to play the game, and many children, both participants and siblings, needed assistance in rolling dice, moving board pieces, and waiting their turn. Family demographic information was collected yearly, and mothers and fathers completed questionnaires to assess child functioning.

Measures

Developmental risk—Children's developmental risk was assessed at age 5 using the composite IQ score of the SB-IV (Thorndike et al., 1986). Children with scores one standard deviation or below the mean were categorized as at developmental risk (DR; $IQ < 85$). As expected, children with and without developmental risk differed on IQ, $t(192) = 20.84$, $p < .001$.

Mother-Child Pleasure—Mother-child dyadic pleasure will be used as a covariate in regression analyses to indicate whether family interactions are associated with child behavior, beyond more well-studied dyadic constructs. At age 5 years, children interacted with their mothers in a 10-minute free play in the laboratory. The free play was coded using the Parent Child Interaction Rating Scales (Belsky, Crnic & Gable, 1995). The mother-child dyadic pleasure scale was used in analyses, which measures the sense of mutual enjoyment and enthusiasm in the dyad. This free play at 5 years was chosen as a dyadic contrast to the family game because the free play was also designed to be an enjoyable and fun experience. In contrast, dyadic tasks completed when the child was age 6 were difficult homework tasks designed to be stressful to both parent and child, and were not associated with scores in the family game.

Socioeconomic status (SES)—Families filled out a demographic questionnaire yearly. A SES index was created by standardizing and averaging maternal education, paternal education, and family income ($\alpha = .66$) scores at age 6, as these variables all significantly differed among groups and may represent a similar underlying construct (Davis-Kean, 2005). SES significantly differed between groups $t(192) = 3.83, p < .001$, such that families of children with DR had lower SES Index scores than families of TD children.

Child behavior problems—At child age 7, both parents filled out the Child Behavior Checklist (CBCL) to report on their children's behavior problems (Achenbach, 1991). The CBCL is a 3 point rating scale, and has broad-band subscale scores for externalizing and internalizing behaviors, which were used in the study. Mothers and fathers reports were averaged for externalizing ($\alpha = .80$) and internalizing behavior problems scale ($\alpha = .67$). If only one parent completed a CBCL (almost exclusively the mother), only that report was used. Reliability for the CBCL has previously been reported as adequate ($\alpha = .87$; Achenbach, 1991), and was adequate in this study as well ($\alpha = .91$ for externalizing, $\alpha = .84$ for internalizing).

Child social skills—At child age 7, both parents completed the Social Skills Rating Scale (SSRS; Gresham & Elliot, 1990). The SSRS has 7 subscales and two index scores. The social skills index score (composed of cooperation, assertion, and self-control subscales) was used in analyses, and mother and father reports were averaged ($\alpha = .71$). If only one parent had completed an SSRS (almost exclusively the mother), only that one report was used. Reliability for the SSRS has been previously reported as adequate ($\alpha = .87$; Gresham & Elliot, 1990), and was adequate in this study as well ($\alpha = .85$).

Family interaction attributes—All family members played a structured game in the home when the focal child was age 6. Board games offer an activity for families in which the complexities in relationships among family members might be readily observed. The game was videotaped and coded using the Observational Assessment of Family Systems (designed for this study), which measures five global family interaction attributes on a 5-point scale: cohesion, warmth, conflict, organization, and control, with higher scores always equaling greater levels of the construct. The family interaction attributes were created based on prior family observational and self-report research, and have specific roots in the System for

Coding Interactions and Family Functioning (Lindahl & Malik, 2001) and the Family Structure And Processing coding system (Teichman, Cowan, & Cowan, 1988). Ratings were made by a master coder and a team of trained research assistants who were masked to the hypotheses of the study. Consensus scores were compared with the master coder on 20% of all observations. Reliability was established and maintained using a minimum kappa = .6. Intraclass correlation coefficients computed at the conclusion of the coding were as follows: cohesion (ICC = .948), warmth (ICC = .882), conflict (ICC = .889), organization (ICC = .923), and control (ICC = .840). In depth coding descriptions of each attribute are available from the first author on request.

Cohesion involved the degree of unity, closeness, and interaction within the family. Higher cohesion scores reflected high levels of conversation, collective focus and engagement (e.g. reading aloud, following when it was someone else's turn), while lower scores reflected disengagement, interpersonal distance, awkwardness, and stiffness.

Warmth described the degree to which families were nurturing, affectionate, caring, and responsive in warm ways with one another. High warmth was also defined by the level of positive emotional tone present, and could be assessed by voice, facial expressions, body language, as well as degree of affective sharing. In low warmth families, the affective tone was predominantly neutral/flat or not positive.

Conflict was considered as the degree to which there was an overall negative tone, anger, and tension within the family. Conflict included expressions of tension, frustration, anger, and hostility. It included fighting and arguing, but could also include more subtle signs, including negative/annoyed tones of voice, frustration evident in body language, impatience, and abruptness. There may be an individual child who became upset when the cards did not go their way, but was only coded if it affected the mood of multiple members or created conflict.

Organization was defined by the extent to which the family, their roles, and the family game were approached in structured ways. Higher levels of organization reflected understanding and elaboration of rules when necessary, assisting children to play (e.g. counting spaces), level of chaos, and appropriate turn-taking. If parents choose to change the given rules, organization was based on consistently following the new rules that the parents set up, and the degree to which the changes have improved organization. Organization also reflected family structure, such as when parents split up roles in order to make sure children are taken care of.

Control involved the degree to which members of the family attempt to dictate the behavior of other family members, over and above what is necessary. There was a feeling of restriction, little flexibility, and parents may leave little or no latitude for changes. Any member of the family can be controlling, although the control must create a feeling of restriction and over-demandingness that is felt throughout the family.

Data Analytic Plan

The first aim addresses whether family interaction attributes differ based on child developmental risk. This aim was tested using univariate Analyses of Covariance (ANCOVAs) along the five dimensions of family interactions in SPSS 22. SES, child gender, number of players in the game, and presence of a father in the game were each examined as covariates. SES was included given its historical association with parenting and child outcomes, gender was included as males with DR typically display higher levels of behavior problems (Baker et al., 2002), and presence of a father and numbers of players were included to control for different compositions of families. Number of game players was never a significant covariate in analyses, and was dropped from the final model. Presence of a father was also an indication of two parents, as there were no cases where a father participated without a mother. Each covariate was examined both as a potential main effect and as a potential interaction with developmental risk. While all main effects are in the final models, only significant or trending interactions are included in the final models.

The second and third aims addressed whether family interaction attributes were related to later child behavior, and whether developmental risk moderated those relations. To reduce the number of analyses and chance of Type II error, analyses were only run if a family interaction attribute was correlated with a specific child behavior in either or both families of TD or DR children. Interactions were tested in SPSS 22 according to the methods outlined by Aiken and West (1991), with simple slopes calculated using the method outlined by Preacher, Curran and Bauer (2006). While all main effects are included, only significant or trending interactions are included in the final models. Mother-child pleasure was used as covariate in analyses to indicate the difference between mother-child dyadic and family interactions. Continuous predictor variables were mean-centered, while the outcomes were uncentered. All dichotomous variables were dummy coded as the following: developmental risk (TD = 0, DR = 1); gender (female = 0; male = 1); father present (0 = not present; 1 = present).

The G*Power 3 software package was used to assess power. The G-Power analyses indicated that for the ANCOVAs, this sample size of 194 participants would yield power of .80 for medium effect sizes ($f = .24$), according to Cohen's (1988) benchmarks. For the regressions, this sample size would yield power of .80 for effect sizes that were below Cohen's (1988) medium benchmark but slightly larger than his small effect size threshold ($f^2 = .08$).

RESULTS

Descriptive Statistics

Descriptive statistics for all variables in the analyses are presented in Table 1. None of the variables showed significant skew or kurtosis, and there were no outlier variables. Families of children with DR had higher levels of observed control than families of TD children. Additionally, children with DR had higher levels of reported externalizing behaviors and substantially lower levels of social skills ($d = .88$) in comparison to their TD counterparts.

Correlations are reported in Table 2, examined separately by risk group. The family interaction attributes were generally correlated with one another. Of note, the correlation between conflict and organization was significantly stronger in TD families ($r = -.62$) than in DR families ($r = -.16$, $r = -.62$, $z = -3.72$, $p < .001$, TD-DR). Organization was associated with better social skills in both groups, and cohesion was associated with better social skills in children with DR (trending only in the TD children). The family interaction attributes were unrelated to externalizing or externalizing behaviors in children with DR. However, conflict and control were both associated with more externalizing behaviors in TD children, and control was also associated with more internalizing behaviors in TD children.

Group Differences on Family Attributes

In order to examine whether family interaction attributes at age 6 differed based on developmental risk, ANCOVAs were conducted for each of the five dimensions of family interactions. Only trending or significant interactions were included in the final models.

For cohesion, a non-significant, but marginal interaction between developmental risk and child gender emerged (Table 3), such that females with DR had the lowest levels of family cohesion. However, given that the interaction was only trending, the main effects for cohesion should be interpreted without the interaction. Overall, families with female children were less cohesive than families with males. Additionally, although SES and presence of a father were significantly related to cohesion when examined independently, they no longer provided significant independent contribution in the final model. Levels of family cohesion did not differ between groups, after controlling for covariates.

For family warmth and organization, there were no significant interactions with developmental risk (Table 3). However, presence of a father was significantly associated with higher levels of warmth and organization. Higher socioeconomic status was also associated with greater warmth. No significant differences emerged between groups on levels of family warmth or organization, after controlling for covariates.

No covariates were associated with conflict and control, nor were there any significant interactions with developmental risk. The level of family conflict did not differ between groups, $F(1, 189) = .84$, $p = .361$. However, a significant main effect of developmental risk was found for family control, $F(1, 189) = 5.29$, $p = .023$, such that families of children with DR had higher levels of control, $M = 2.27$ ($SE = 0.13$), than families of TD children, $M = 1.88$ ($SE = 0.10$).

Relation of Family Interaction Attributes to Later Child Behavior

The second aim addressed the ways in which family interaction attributes were related to later child behavior, and the third aim addressed whether developmental risk moderated any of the relations. Five models were examined based on the initial correlations: (1) control to externalizing behavior (2); conflict to externalizing behavior; (3) control to internalizing behavior; (4) cohesion to social skills; and (5) organization to social skills. Child gender, SES and presence of a father were used as covariates in all analyses. Mother-child pleasure was also controlled for in order to distinguish between dyadic and family interactions.

Control and Conflict to Externalizing Behavior—Results from the first regression showed a significant interaction between control and developmental risk (Table 4). Following Preacher et al. (2006), the significant control x developmental risk interaction was probed by examining simple slopes (see Figure 1). The simple slope for the TD group was significant ($b = 1.45$, $t = 2.31$, $p = .022$), such that higher levels of control were related to higher levels of externalizing behavior. The simple slope for the DR group was non-significant ($b = -.73$, $t = 1.09$, $p = .277$), indicating no significant relation between control and externalizing behaviors.

Results from the second regression model indicated a significant conflict x developmental risk interaction (Table 4). The significant conflict by developmental risk interaction was probed by examining simple slopes. The simple slope for the TD group was significant ($b = 2.10$, $t = 11.40$, $p < .001$), such that higher levels of conflict were related to higher levels of externalizing behavior. The simple slope for the DR group was non-significant ($b = -.06$, $t = .14$, $p = .891$) (see Figure 1).

Control to Internalizing Behavior—In the prediction of internalizing behavior, a significant control x developmental risk interaction emerged. This interaction was probed using simple slopes. The simple slope for the TD group was significant ($b = 1.08$, $t = 2.46$, $p = .015$), such that higher levels of control were related to higher levels of internalizing behavior. The simple slope for the DR group was non-significant ($b = -.26$, $t = .55$, $p = .584$). The interaction looks similar to the model examining control on externalizing behaviors (See Figure 1).

Cohesion and Organization to Social Skills—Initially, the fourth regression model indicated a non-significant cohesion x developmental risk interaction, $\beta = .07$, $p = .437$, so the interaction term was removed from the final model (Table 5). Social skills were predicted by both cohesion and developmental risk, such that children with DR had fewer social skills, and children in families in both groups with more cohesion had better social skills. The initial fifth regression model also showed a non-significant organization x developmental risk interaction, $\beta = .10$, $p = .257$, so the interaction term was removed from the final model (Table 5). Similarly to the cohesion model, children with DR had fewer social skills, and families with more organization had children with better social skills. There was also a main effect so that when a father was present, children had better social skills. Although trending, mother-child pleasure was not significantly associated with social skills in either the cohesion or organization models.

DISCUSSION

This study examined how whole family interactions are related to children's developing behavior problems and social competence, as well as the ways in which developmental risk may affect such relations. The findings suggest that family interactions are linked with behavior problems and social skills, over and above mother-child interactions and socioeconomic status. Yet, different attributes of family interaction provide unique contributions to child behavior. Cohesion and organization, which reflect positive and prosocial aspects of family interactions, were related to children's later social skills; whereas

conflict and control, which are more negatively valenced, were related to later externalizing behavior problems in typically developing children. Developmental risk proved to only be an influence on the relation between family interactions and behavior problems, and families of children with developmental risk were often similar in quality of family interaction to families of typically developing children. The specificity apparent in these risk pathways is indicative of the complexities inherent in the family system and will be discussed further below.

Family cohesion and family organization emerged as key family attributes for child socialization, regardless of developmental level, and on top of mother-child dyadic interactions and socioeconomic status. Although there were substantial differences in levels of social competence across the two risk groups, similar relations emerged in the prediction of social competence for both groups, suggesting the general salience of basic developmental processes (Cicchetti, 1984; Fenning, Baker, & Juvonen, 2011). Cohesion and organization are typically associated with better social competence and peer relationships (Feldman & Masalha, 2010; Johnson et al., 1999); however, developmental period is rarely considered among the important determinants or contexts for understanding family process. During the transition to school period, children are facing increased communication demands from teachers and peers, and peers are beginning to play a more central role in children's social development (Guralnick, 1999). Interactions with families certainly differ from interactions in the classroom and with peers, but similarities are apparent as well. Interactions in both contexts require engaging with multiple actors simultaneously, learning how to carry on a conversation, and following social rules and conventions. Families that routinely engage these skills may better scaffold their children's behavior, improving their social skills beyond what the child would be able to obtain on his/her own (Baker et al., 2007; Vygotsky, 1978). Cohesion and organization are key components that support both practice and scaffolding. Cohesion involves collective focus and high levels of interaction among family members, while organization provides a structure and role for each family member, and helps the child learn to play while gradually becoming more independent and self-sufficient in social interactions (Conner & Cross, 2003).

Although children with developmental risk exhibit more behavior problems than typically developing children, levels of family conflict did not differentiate these groups, contrary to hypotheses. Given the increased stress often reported in families of children with increased developmental risk (Baker et al, 2002), and findings that the high levels of child behavior problems in children with developmental disabilities can influence parenting (Ciciolla, Gerstein & Crnic, 2014), the similarity in the degree of family conflict was somewhat unexpected. It is even more surprising that the groups did not differ on family conflict given that families of children with developmental risk experienced greater socioeconomic difficulties, which is often related to experience of conflict in the literature (Cummings et al., 2000). This may be related to the resilient and self-righting tendencies of family environments, discussed below (Holmbeck & Devine 2010; Sameroff & Seifer, 1983).

Further, family conflict only predicting externalizing behavior for families of typically developing children. Irrespective of risk, there is substantial empirical support for the connection between hostile family interactions and increased aggression and externalizing

behaviors in children (Davies, Cummings, & Winter, 2004; McHale & Rasmussen, 1998). It is reasonable to expect that observed family conflict would be at least similarly disruptive for children with developmental risk. However, it may be that when a child is at developmental risk, the type of conflict experienced by the whole family may differ. In families of children with developmental risk, conflict may be more likely to arise from frustration and impatience around misunderstandings, rather than from outright hostility, which may then alter its association with child aggression. Although not possible to test in the way that this study measured conflict, disentangling the components of conflict would provide further understanding of these unexpected associations.

In addition, control was differentially associated with children's externalizing and internalizing behavior. For families of children without developmental risk, higher levels of family control were linked with greater internalizing and externalizing behavior problems, and higher levels of conflict were linked to greater externalizing problems, both operating in a fashion consistent with theory and research on authoritarian parenting styles (Barber, Stolz, Olsen, Collins, & Burchinal, 2005; Landry, Smith, Miller-Loncar, & Swank, 1997).

Yet, family control was not a precursor to behavior problems for children with early developmental risk, despite the evidence that families of children with developmental risk appear to engage in more control in comparison to families of typically developing children. Perhaps standard perspectives on family control as a negative attribute may be more appropriate for non-risk children who likely require less oversight to successfully negotiate daily challenges. Control also shares some qualities with directiveness, which has been defined as "maternal strategies that provide more control and structure through increased information and less choice" (p. 1044, Landry et al., 1997). Directiveness is somewhat unique in that it is often considered a negative parenting attribute, but is frequently associated with better outcomes in children with a variety of developmental risks (Spiker et al., 2002; Warren & Brady, 2007). Family control is defined differently, in that any member (not just a parent) can try to control the behaviors, and the focus is on restriction and demandingness, rather than controlled choices. However, looking at the research on directiveness may provide insight into the findings on family control, as control may operate similarly to directiveness within the context of a family game. Parents and siblings may be providing help that appears more negative or intrusive (e.g. grabbing a child's hand to move a piece, interjecting with the next step before a child would have a chance to try it on his own), but may actually be facilitative for a child with developmental risk as opposed to the more problematic consequences likely for children who are typically developing.

Although families of children with developmental risk were generally more controlling than were families of typically developing children, other attributes of cohesion, organization, warmth, and conflict were similar across the groups in spite of socioeconomic differences between groups. Although in this study, measures of mother-child pleasure were similar between groups, many studies of dyadic parent-child relationships in families of children with and without developmental risk have reported that parents of children with developmental risk may be less positive, less warm, and more negative (Crnic, Pedersen y Arbona, Baker, & Blacher, 2009). The contrasts between these levels of analysis support

conceptualizations of the family system as a distinct, higher-order unit that is separable from dyadic parent-child relationship constructs.

A family system has the advantage of having multiple members that can compensate for any one member or dyad that may be having difficulties. Thus, the whole family system may be better able to adjust and compensate under conditions of risk, while an individual parent-child relationship may be more challenged. Related research on families of children with spina bifida (Holmbeck & Devine, 2010) suggests that while families may be initially disrupted by a diagnosis, many families are resilient and adapt appropriately. Furthermore, Sameroff & Seifer (1983) suggested that caregiving environments can have “self-righting” tendencies, such that the environment regulates and adjusts appropriately in order to produce an optimal environment for the child. Differences between family and dyadic risk constructs may also have implications for interventions for children with developmental risk in that positive effects for the family might be maximized by including a focus on whole family constructs.

Research on family systems has heavily relied on self-report measures to explore the influence of family environment on children’s behavior (Margolin et al., 1998). In particular, self-reported organization has often been studied as a specific type of organization, such as level of neatness, amount of scheduled planning, or timeliness in the family. By taking a broader perspective on organization, our findings suggest that observational approaches can also capture structural aspects of family organization across both typical and non-typical families. Because we did not have the ability to compare observational and self-report measures of organization, it is unknown whether observed organization was capturing the same family system construct as measured by self-report. Observational measures can examine the effectiveness of organization in a family, which is different from knowing whether or not the family has a schedule. Future comparisons of observation and self-report assessments will advance understanding of the family system, as well as further validate observational and self-report approaches.

Father presence in the family game appeared to be important to multiple aspects of child and family functioning. Sensitive and involved fathers make important contributions to child development both directly through their interactions with the child and indirectly through providing emotional support to the mother (Lamb, 2010). However, father presence functioned mostly to indicate that there were two parents in the family, as there were no cases where only a father was present. Thus, we could not distinguish if it was the father’s influence on the dynamics of family interaction, or if having more adults in the room was associated with more warmth and organization. Studies of single-father in comparison to single-mother households may be useful in elucidating the effects of parent gender on family interactions.

There are several limitations in this study to be considered. First, the study included children with early-identified delays in cognitive functioning, and not a specifically defined or diagnosed intellectual disability. Although this inclusion of a broader range of cognitive delay allows the study of a larger swath of children at risk, adaptive functioning skills are core to the definition of intellectual disability in general and also play a role in the

development of behavior problems. In the current study, we did not include assessment of adaptive abilities, although such abilities may have differentially impacted child behavior.

Next, although the design and methodology of the family game task provides an excellent context in which to examine whole family interactions, it is still only a single specific context of family interaction. The game task was designed to capture elements of competitiveness and playfulness in families in situations which are to some degree rule bound. Although the board game context was adept at capturing aspects of whole family interaction, different family tasks might well encourage other family behaviors. For example, family discussion tasks, where the family has to make a joint decision or discuss a prior moment of conflict (Lindahl & Malik, 2001), are useful in capturing family conflict. Observation in multiple contexts will likely prove useful, or observational tasks should be designed to address specific constructs of interest.

Research should more often include direct comparisons of observed dyadic and whole family interactions in order to assess how various compositions of the family may differentially affect children's development. Although this study attempted to control for the quality of the mother-child relationship when accounting for whole family interactions, the larger research study from which the data were drawn was not initially designed for such comparisons. Thus, when assessing whether family interactions were associated with children's behavior beyond the established mother-child dyad, decisions had to be made whether to use similar dyadic and family tasks one year apart, or different tasks measured at the same time point. Although later probing revealed similar results by both methods, a better comparison would have been to have an enjoyable dyadic context at age 6 for comparison.

Further, although the sample size is relatively substantial for research on high-risk populations and was significantly powered to detect medium effect sizes, the absolute number of families limits the power to detect more subtle relations among constructs. Finally, this study employed multiple reporters, questionnaire and observational data in a fairly diverse longitudinal study in an effort to eliminate the biases inherent in single-reporter cross-sectional methods. Nevertheless, there was only a single follow-up year between the observations of family process and the reports on child behavioral outcomes. Continued longitudinal measurements across extended time points would help identify the salient transactional pathways that lead to child competence or behavior problems over specific developmental periods.

Although the family is a primary influence on children's development, approaches to family research have often taken a piecemeal approach to understanding the family, examining the influence of one parent or dyadic relationship factors on emerging behavioral competence. This study suggests that whole family interactions may also be critical for children's behavioral problems, and clear clinical implications can be derived. First, although systemic therapies are often used for children, they are rarely utilized for children with developmental risk. Therapies tend to focus on skills-building and parent-training, which while important, do not address the ways in which siblings and other family members may help the child with developmental risk in natural settings, when not directly focusing on skills training. Further,

families may often diverge into subgroups, rather than participate in activities as a whole family. Given the findings in this study, systemic therapies may not be helpful for reduction of behavior problems, but could be quite useful for building social skills in children with developmental risk. For example, systemic therapies built around developing cohesion in the entire family may be helpful for children with developmental risk in ways that cannot be gained simply through improving the parent-child relationship. Second, parent-training could incorporate how to improve organization in the entire family. While there is often a focus on creating schedules and organization for the identified child, a larger focus on organization throughout the family system may be useful.

The influence of developmental risk on the family is complex, affecting aspects of family interactions and relations between family interactions in child behavior in nuanced ways. Identification of observed family attributes that operate at various developmental time-points for specific children will help expand the ways in which we understand family contribution to children's well-being.

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Figure 1.

Interactions between Family Interactions and Developmental Risk on Externalizing Behavior. The graph on the left reflects the interaction between control and developmental risk on externalizing behaviors, while the graph on the right depicts the interaction between conflict and developmental risk on externalizing behaviors. These lines represent the simple slopes for each group, with mother-child dyadic pleasure, SES, child gender, and presence of a father controlled for in analyses. TD=Typically Developing. DR=Developmental Risk.

Table 1

Descriptive Statistics of Study Variables (n=194)

	Combined		Typically Developing (TD)		Developmental Risk (DR)		T-Test	Cohen's D
	Mean	SD	Mean	SD	Mean	SD		
Mother-Child Pleasure (5 yr)	2.07	1.06	2.11	1.14	2.00	.94	.75	.11
Cohesion (6 yr)	3.44	1.14	3.56	1.09	3.24	1.20	1.93 [†]	.20
Warmth (6 yr)	3.20	1.16	3.23	1.16	3.16	1.18	.39	.06
Conflict (6 yr)	1.62	.94	1.58	.92	1.69	.97	-.82	-.12
Organization (6 yr)	4.06	.99	4.12	.95	3.96	1.06	1.08	.16
Control (6 yr)	2.03	1.08	1.89	1.00	2.25	1.18	-2.22 [*]	-.33
Externalizing Behavior (7 yr)	8.38	7.10	7.15	6.82	10.33	7.14	-3.00 [*]	-.46
Internalizing Behavior (7 yr)	8.38	7.10	5.40	4.53	6.18	5.97	-.99	-.15
Social Skills (7 yr)	93.80	16.44	98.85	14.77	85.35	15.73	6.04 ^{**}	.88

[†] = p<.08,

* = p<.05,

** = p<.001

Table 2

Correlation Table of Study Variables, Split by Developmental Risk

	1	2	3	4	5	6	7	8	9	10	11	12
1. Cohesion (6yr)	--	.75**	-.41**	.32*	-.29*	.14	.13	.26*	.19	.11	.39**	.10
2. Warmth (6yr)	.74**	--	-.30*	.22 [†]	-.40**	.07	.07	.07	.29*	.27*	.16	.26*
3. Conflict (6yr)	-.40**	-.28*	--	-.16	.31*	-.04	.01	-.05	.08	.13	-.03	.00
4. Organization (6yr)	.35**	.31*	-.62**	--	-.16	-.15	-.10	.36*	-.02	.19	.07	.14
5. Control (6yr)	-.08	-.14	.31*	-.28*	--	-.138	-.12	.10	.01	-.02	.11	-.03
6. Externalizing Beh (7yr)	-.12	-.09	.25*	-.14	.21*	--	.69**	-.28*	-.06	-.03	.25*	-.12
7. Internalizing Beh (7yr)	-.10	-.13	.11	.01	.24*	.52**	--	-.14	.24*	-.08	.14	-.18
8. Social Skills (7yr)	.17 [†]	.11	-.16	.21*	-.13	-.51**	-.39**	--	-.05	-.11	.12	.22 [†]
9. SES Index (6yr)	.21*	.18*	.02	-.01	.05	-.14	-.05	.08	--	.41*	.16	.18
10. Presence Father (6yr)	.26*	.23*	-.11	.25*	-.05	-.06	-.05	-.08	.26*	--	.08	.14
11. Child Gender	.11	.06	.08	.07	-.03	.01	-.04	.03	-.02	-.07	--	-.03
12. M-C Pleasure (5yr)	.24*	.18 [†]	-.06	.17 [†]	.11	.01	.07	.15	.24*	.04	-.02	--

Note: Families of children with DR are represented above and to the right of the diagonal, families of TD children are presented below and to the left of the diagonal. M-C Pleasure=Mother-Child Pleasure. All dichotomous variables were dummy coded as the following: gender (female=0; male=1); father present (0=not present; 1=present).

[†] = p<.08,

* = p<.05,

** = p<.001

Table 3

Analysis of Covariance of Family System Attributes

Measure	Source	df	Ms	F	p	Partial η^2
<u>Cohesion</u>						
	Corrected Model	5	7.02	6.09	<.001	.14
	Intercept	1	275.75	239.26	<.001	.56
	SES	1	4.03	3.49	.063	.02
	Child Gender	1	14.82	12.86	<.001	.06
	Dad Present	1	4.21	3.65	.058	.02
	Dev. Risk	1	3.06	2.65	.105	.01
	Dev. Risk x Gender	1	4.07	3.53	.062	.02
	Error	188	1.15			
<u>Warmth</u>						
	Corrected Model	4	5.91	4.71	.001	.09
	Intercept	1	166.41	132.43	<.001	.41
	SES	1	5.72	4.55	.034	.02
	Child Gender	1	2.08	1.65	.200	.01
	Dad Present	1	8.68	6.91	.009	.04
	Dev. Risk	1	.26	.21	.651	.00
	Error	189	1.26			
<u>Organization</u>						
	Corrected Model	4	3.39	3.62	.007	.07
	Intercept	1	280.42	299.72	<.001	.61
	SES	1	1.74	1.86	.174	.01
	Child Gender	1	1.19	1.28	.260	.01
	Dad Present	1	11.32	12.10	<.001	.06
	Dev. Risk	1	1.74	1.86	.174	.01
	Error	189	.94			

Table 4
Multiple Regression Analyses Predicting Externalizing and Internalizing Behavior

Independent Variable	Externalizing Behaviors			Internalizing Behaviors		
	β	p	R ²	β	p	R ²
<u>Model: Control</u>			.12			.07
Child Gender	.13	.069		.07	.326	
SES	-.10	.223		-.11	.179	
Dad Present	-.02	.801		-.04	.625	
Mother-Child Pleasure	-.03	.669		-.03	.718	
Control	.23	.027		.24	.023	
Developmental Risk	.20	.010		.06	.476	
Developmental Risk x Control	-.27	.008		-.26	.015	
<u>Model: Conflict</u>			.12			
Child Gender	.10	.164				
SES	-.09	.263				
Dad Present	-.02	.858				
Mother-Child Pleasure	-.02	.767				
Conflict	.26	.008				
Developmental Risk	.19	.014				
Developmental Risk x Conflict	-.20	.040				

Note: All dichotomous variables were dummy coded as the following: developmental risk (0=TD, 1=DR), gender (female=0; male=1); father present (0=not present; 1=present). Control, Conflict, SES, and Mother-Child Pleasure are mean-centered.

Table 5

Multiple Regression Analyses Predicting Social Skills

Independent Variable	Social Skills		
	β	p	R^2
<u>Model: Cohesion</u>			.21
Child Gender	.02	.832	
SES	-.02	.830	
Dad Present	-.11	.126	
Mother-Child Pleasure	.13	.065	
Cohesion	.18	.022	
Developmental Risk	-.41	<.001	
<u>Model: Organization</u>			.27
Child Gender	.04	.519	
SES	.04	.572	
Dad Present	-.14	.048	
Mother-Child Pleasure	.12	.072	
Organization	.24	.001	
Developmental Risk	-.41	<.001	

Note: All dichotomous variables were dummy coded as the following: developmental risk (0=TD, 1=DR), gender (female=0; male=1); father present (0=not present; 1=present). Control, Conflict, SES, and Mother-Child Pleasure are mean-centered.