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Ruth Feldman^a, Esther Bamberger^a & Yaniv Kanat-Maymon^b

^a Department of Psychology, Bar-Ilan University, Ramat Gan, Israel

^b Interdisciplinary Center, Herzlia, Israel

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Parent-specific reciprocity from infancy to adolescence shapes children's social competence and dialogical skills

Ruth Feldman^{a*}, Esther Bamberger^a and Yaniv Kanat-Maymon^b

^aDepartment of Psychology, Bar-Ilan University, Ramat Gan, Israel; ^bInterdisciplinary Center, Herzlia, Israel

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Reciprocity – the capacity to engage in social exchange that integrates inputs from multiple partners into a unified social event – is a cornerstone of adaptive social life that is learned within dyad-specific attachments during an early period of neuroplasticity. Yet, very little research traced the expression of children's reciprocity with their mother and father in relation to long-term outcomes. Guided by evolutionary models, we followed mothers, fathers, and their firstborn child longitudinally and observed mother–child and father–child reciprocity in infancy, preschool, and adolescence. In preschool, children's social competence, aggression, and prosocial behavior were observed at kindergarten. In adolescence, children's dialogical skills were assessed during positive and conflict interactions with same-sex best friends. Father–child and mother–child reciprocity were individually stable, inter-related at each stage, and consisted of distinct behavioral components. Structural equation modeling indicated that early maternal and paternal reciprocity were each uniquely predictive of social competence and lower aggression in preschool, which, in turn, shaped dialogical skills in adolescence. Father–adolescent reciprocity contributed to the dialogical negotiation of conflict, whereas mother–adolescent reciprocity predicted adolescents' dialogical skills during positive exchanges. Results highlight the role of parent–child reciprocity in shaping children's social collaboration and intimate relationships with non-kin members of their social world.

Keywords: fathering; mothering; reciprocity; social competence; longitudinal studies

Social reciprocity – the capacity to engage in social exchange that integrates inputs from multiple partners into a unified social event – is a cornerstone of adaptive social life. The origins of reciprocity, which provides the foundation for social collaboration, empathy, and prosocial behavior, have been controversial since Darwin published his seminal work, as reciprocity seems to contradict the biological drive to control environmental resources and prefer one's progeny (Clutton-Brock, 1991; Davis & Daly, 1997). Still, reciprocity was theorized to evolve in ecological niches that included large groups of non-kin members who needed to form collaborative societies (Hauser, McAuliffe, & Blake, 2009). It has long been postulated that the evolution of mammals implied that mammalian young receive their training for social reciprocity not within the large group – as is the case, for instance, with the social insects – but in the context of the nursing dyad, or in biparental species within relationships with both mother and father (Rosenblatt, 1965; Wheeler, 1928; Schneirla, 1946). Reciprocity, therefore, is an experience infants must

*Corresponding author. Email: feldman@mail.biu.ac.il

partake during an early period of neuroplasticity in order to become collaborative members of their social world (Feldman, 2012).

The central role of early reciprocal experiences in supporting the individual's lifetime social functioning, emotional well-being, and future intimacy is a tenet of many theories on human nature, including attachment theory (Bowlby, 1969), psychoanalytic object relations theory (Winnicott, 1956), and models on emotion regulation (Fogel, 1993), morality (Hoffman, 2000), and empathy (Emde, 1994). Yet, although much empirical and clinical work has been conducted assuming such continuity, no study to our knowledge has traced the development of social reciprocity with mother and father, detailed the unique characteristics of each, and tested their role in shaping children's social-emotional outcomes over time. In the current study, we followed the expression of mother-child and father-child reciprocity from infancy to adolescence and examined their long-term effects on social adaptation. Following evolutionary models, social adaptation was defined as the ability to function competently with non-kin members of society at two levels; the first involves global adaptation to the eco-social niche, the second addresses the skills required to form and maintain intimate bonds with non-kin (Clutton-Brock, 1991; Davis & Daly, 1997; Eibl-Eibesfeldt, 1989).

Reciprocity and social adaptation: developmental and evolutionary perspectives

Developmental studies indicate that parent-child reciprocity, variously termed as reciprocity, synchrony, coordination, co-regulation, or mutual responsiveness, is a key element of early social relationships that underpins social-emotional growth (Feldman, 2007a; b; Kochanska, 1994). Research has shown that mother-infant synchrony predicted attachment security at one year (Jaffee, Beebe, Feldstein, Crown, & Jasnow, 2002), self-regulation at two years (Feldman, Greenbaum, & Yirmiya, 1999), and moral orientation and empathy in childhood and adolescence (Feldman, 2007b). In research spanning infancy to adolescence, mother-infant reciprocity was related to lower adolescent depression and better adjustment (Feldman, 2010). Other studies have documented longitudinal outcomes of early maternal sensitivity, including the effects of maternal sensitivity in infancy on social maturity in adolescents at risk for depression (Murray, Halligan, Adams, Patterson, & Goodyer, 2006) and social adaptation in adopted adolescents (Jaffari-Bimmel, Juffer, van IJZendoorn, Bakerman-Kranenburg, & Mooijaart, 2006)

Much less research addressed the contribution of fathering to social adaptation and no study to date has utilized longitudinal observations of father-child interactions from infancy to adolescence. Several studies examined reciprocity in both mother-infant and father-infant interactions in early childhood. Kochanska, Aksan, Prisco, and Adams (2008) found that a mutually responsive orientation with mother and father predicted self-regulation and moral internalization at the preschool years. Synchrony with mother and father were found to predict lower behavior problems at two years (Feldman & Eidelman, 2004) and symbolic competence at three years (Feldman, 2007c). Very few studies controlled for maternal effects in assessing father effects and this has been considered a major drawback in research on fathering (Pleck & Masciadrelli, 2004; Sarkadi, Kristiansson, Oberklaid, & Bremberg, 2008; Stolz, Barber, & Olsen, 2005). The few studies that controlled for mothering showed unique father effects on reducing boys' behavior problems (Aldous & Mulligan, 2002) and enhancing children's adaptation to school (Flouri, Buchanan, & Bream, 2002). Volling, Blandon, and Gorvine (2006) found that shared positive affect in father-child interactions predicted toddler compliance above and beyond the maternal effects.

Research in both humans and bi-parental species described unique styles of early social behavior in mothers and fathers, suggesting that although levels of reciprocity are comparable between parents (Feldman, 2000), they consist of different behavioral components that likely support distinct aspects of social functioning. Paternal care is observed in 3–5% of mammalian species, bi-parental species that exhibit active paternal involvement in childcare (Geary, 2000). In most such species, fathering is facultative, i.e., enhances infant social adaptation in the context of maternal care. Facultative fathering implies that both mothering and fathering make separate contributions to offspring but fathering functions to increase the maternal effects. Fathering in bi-parental species shows within-species variability related to multiple proximate conditions and the provision of paternal care affords infant a competitive advantage in social fitness (Clutton-Brock, 1991; Krebs & Davies, 1993; MacDonald, 1988). Typically, father contributions occur via two types of mechanisms: father-specific investments and mechanisms related to the co-evolution of mothering and fathering that are mutually enhancing in the context of two-parent caregiving (Belsky, 1997; 1999; Geary, 2000; Zigler, 2000). Bi-parental mothers and fathers exhibit gender-specific constellations of parenting behavior. Whereas maternal behavior involves licking, grooming, and the species-typical form of touch-and-contact, paternal behavior includes stimulatory activities, exploration, and physical energy (Carter et al., 2005; Lonstein & DeVries, 2000). Human mothers and fathers engage in similar gender-specific patterns. Mothers prefer face-to-face interactions that involve social gaze, co-vocalizations, and affectionate touch (Feldman, Weller, Zagoory-Sharon, & Levine, 2007), whereas fathers induce high positive arousal, exploratory focus, and rough-and-tumble play (Flanders, Leo, Paquette, Pihl, & Sequin, 2009; Parke, 1996; Yogman, 1981). Pups reared without fathers show compromised social adaptation and increased aggression (Veenema, 2012), underscoring these factors as central outcomes of father care. Thus, with regards to parent-specific mechanisms, it can be expected that the “maternal” and “paternal” styles will exert independent effects on social adaptation. As to parent-general effects, the emphasis on reciprocity as the foundation of mammalian social life (Feldman, 2012; Hauser et al., 2009) suggests that reciprocity is a parent-general mechanism through which mothers and fathers join their efforts in order to initiate their child into the social world.

Human research lends support to both the parent-specific and parent-general hypotheses. By practicing a reciprocal dialogue children learn to respect the other’s social signals, read the partner’s intentions, and acquire dialogical skills for interactions with non-kin (Feldman, 2007a), and such practice may be learned through exchanges with both mother or father (Lamb, 2010). In parallel, research has addressed the unique contribution of fathering, particularly to self-regulation and the management of aggression. For instance, father–child rough-and-tumble play was associated with lower aggressive behavior in 2–6-year-olds when father provided dominant control over the interaction, indicating that the regulatory elements in father–child play are central for aggression regulation at preschool (Flanders et al., 2009). Similarly, cross-generation studies have linked harsh fathering with child aggression and externalizing symptoms (Conger, Ge, Elder, Lorenz, & Simons, 1994) and children reared by single mothers were more prone to aggression, peer conflict, and anti-social conduct (Tamis-LeMonda & Cabrera, 2002). Thus, whereas reciprocity may be a parent-general orientation that supports children’s social adaptation through the mutual influences of mothering and fathering, unique father effects may be noted in the child’s management of aggression and the ability to negotiate conflict, while unique maternal effects may relate to dialogical abilities during relaxed, positive social interactions (Feldman, 2007c).

The current study

In light of the above, the current study focused on social reciprocity and traced the expression of father–child and mother–child reciprocity from infancy to adolescence in an attempt to define similarities and differences with each parent, their inter-relatedness, and the unique effects of maternal and paternal reciprocity on social outcomes. We observed dual-earner parents and their firstborn child in infancy, preschool, and adolescence in separate interactions with mother and father. At preschool, children were also observed at childcare and their social competence and aggressive behavior with peers were assessed. In adolescence, children were also filmed during positive and conflict interactions with their same-sex best friends.

Our conceptualization, measures, and hypotheses were informed in part by the evolutionary framework. First, evolutionary models suggest that the study of social adaptation should focus on *behavior* and that behavior is the vehicle through which parents exert both parent-general and parent-specific effects. We thus observed children's social behavior from infancy to adolescence with multiple partners: mothers, fathers, the peer group, and best friends. Second, evolutionary models underscore reciprocity as a mechanism through which young become members of social groups and indicate that mammalian young are initiated into social collaboration through reciprocal bio-behavioral exchanges within the parent–infant bond (Feldman, 2012). Consistently, our main study goal was to examine how parent–child reciprocity supports children's social adaptation over time. Third, these models indicate that social adaptation includes both functioning in large groups and the ability to maintain bonds with non-kin. We thus examined children's social outcomes in both the peer group and with best friends and hypothesized that the paternal reciprocity, which involves stimulatory activity, would uniquely impact the modulation of aggression, whereas maternal reciprocity, which centers around affective sharing, would predict positive dialogue. These hypotheses are supported by multiple accounts from social psychology, which indicate that early interactions with the caregiver shape the way children interact with the social world, with peers, and with close friends and future partners (Asher & Gottman, 1981; Bowlby, 1969; Parke & O'Neil, 1999; Schneider, Attili, Nadel, & Weissberg, 1989; Sroufe, 1996), and postulate mechanisms ranging from ethological-based models of attachment to social learning and social cognition.

The timing of observations was chosen to reflect central milestones in children's social maturation. Infancy, preschool, and early adolescence mark three critical periods in social adaptation (Erickson, 1963). In the first months of life, infants enter social relatedness through interactions with the caregiver and form unique attachments with each parent (Belsky, 1981). In the preschool years, children begin to form close relationships with friends (Feldman, Gordon, Infuls, Gutbir, & Ebstein, 2013; Howes, 1988) and must learn to function competently within the social milieu and master rudimentary tactics to handle conflicts (Asher & Gottman, 1981; Hartup, 1989). Early adolescence marks the period when children begin to exhibit dialogical skills, along the maturation of abstract thought and the capacity to acknowledge multiple perspectives to controversies (Piaget, 1963). Dialogical abilities involve the capacity to acknowledge other's opinions and emotions; view oneself in someone else's position; discuss disagreements with empathy while maintaining positive affect; and engage in a give-and-take, fluent, and non-constricted exchange while maintaining an autonomous stance (Batson, 1991; Day & Tappan, 1996; Feldman, 2007b). Early adolescence is also the time when children consolidate close friendships with same-sex best friends and must learn to dialogue joint positive plans as well as interpersonal conflicts within the relationship (Hartup, 1989).

In line with research showing that mother–child reciprocity is stable from infancy to adolescence (Feldman, 2010) and that father–child reciprocity is stable across early childhood (Belsky, Gilstrap, & Rovine, 1984; Feldman & Masalha, 2010), parent–child reciprocity was expected to be individually stable over time. We also expected mother–child and father–child reciprocity to be mutually-influencing and to provide the parent–general framework for social adaptation. Structural equation modeling was used to chart independent effects of maternal and paternal reciprocity across early childhood on preschoolers’ social competence and aggression with peers and adolescents’ dialogical skills in conflict and positive dialogue. We hypothesized that maternal and paternal reciprocity would each have an independent effect on children’s social adaptation and expected father-specific effects specifically on the reduction of aggression in the preschool years and on the capacity to negotiate conflict in more dialogical ways in adolescence.

Method

Participants

Mothers, fathers, and their firstborn child were observed in their natural ecology (home and childcare) at 5 months, 3 years, and 13 years. The initial sample at five months included 100 dual-earner parents and their firstborn infant (52 boys, 48 girls) All parents completed high school, most (83%) had an academic degree, and all were considered middle class and were employed in skilled or semi-skilled professions. At the initiation of the study, mothers’ age averaged 27.7 years ($SD = 3.93$) and education 15.25 years ($SD = 1.69$), and fathers’ age averaged 30.37 years ($SD = 4.99$), and education 14.54 years ($SD = 1.64$). Families were recruited from Well-Baby and were screened for parental mental and physical health and infant physical health. Infants were all healthy since birth and were born in a term singleton birth with birthweight of 2700 g and above. All parent–child assessments were conducted in the family’s home and interactions with the two parents were counter-balanced for order.

Procedure

Infancy

In a home visit including interviews with each parent, questionnaires, and direct observations of dyadic and triadic interactions, infants ($M = 20.5$ weeks, $SD = 3.14$) were videotaped interacting with their mothers and fathers for 5 minutes each. Parents were instructed to interact with the child freely and 5 minutes of interaction with each parent were filmed. Parents chose how to position the child, whether in infant seat, on sofa or carpet, or in their lap.

Preschool

Eighty-six families (44 boys) were seen again at the preschool age ($M = 33.74$ months, $SD = 4.43$). Assessments included two lengthy home visits and a childcare visit. During the first home visit, children were videotaped with mother and father in two consecutive sessions of 10-minutes each (counterbalanced for order) using age-appropriate toys. Parents and children were given a box of toys which were found in previous research to elicit the child’s creativity and imagination (Feldman, 2007b; Keren, Feldman, Namdari-Weinbaum, Spitzer, & Tyano, 2005; Tamis-LeMonda & Bornstein, 1994).

Toys included: two dolls, bottle, blanket, tea set including two cups, two plates, sugar and milk pots, and a boiler pan, wallet, colored necklace, a pair of plastic sunglasses, a sponge, three work tools, two small cars, telephone, two pet animals and two wild animals, and a small tool set.

Within a month of the home visit, children were observed at childcare for about 1.5 hours (including free play, teaching, snack time, and outdoor play). Applying the Nursery Assessment Scale (Feldman, Masalha, & Alony, 2006), trained assistants followed the target child and provided a continuous narrative of the child's activities, entering actual time every 5 minutes. Special attention was paid to encounters with peers (e.g., child plays alone, initiates contact, cooperates, aggressive behavior) and adults (e.g., seeks contact, keeps rules, avoids adults). Each conflict between the child and a peer was described in detail, and the mode of conflict resolution for each conflict was coded as *prosocial* – conflict resolved by some sort of compromise or rudimentary dialogue (e.g., “you have the red color first and then I take”), *aggressive* – child getting his/her way by force (hitting, screaming, pulling toy), and *turning to adult* (e.g., “he hit me”). The number of prosocial solutions was used here to index the child's *prosocial behavior*.

The ongoing narrative was summarized offline into 28 scales, each coded from 1 (low) to 5 (high). Factor analysis yielded three factors with Eigenvalue > 2.5 and the following scales (loading > 0.50) were summarized into each composite: *Social Competence* (alpha = 0.86): child is sociable, able to maintain physical proximity and active involvement with children and adults, initiates social interactions, is accepted by peers, high activity level, cooperates with adults and peers in various group contexts, and child is relaxed in the company of others. *Aggression* (alpha = 0.82): child disobeys rules, initiates conflicts, uses physical power, and displays disruptive behavior. *Dependence* (alpha = 0.78): child stays in adult proximity, relies on adult for help, and prefers solitary activities. The *Social Competence* and *Aggression* composites were used in the current study as social outcomes.

Assistants completed extensive training prior to observations. Assistants train first on a pilot sample of five children and their written narratives were compared. Next, assistants coded 10 written narratives of children not from the current sample into the 28 scales, and only after achieving 90% reliability in coding the narratives reliably into scales observations at childcare began. For inter-rater reliability, 27 observations (20%) were conducted by two assistants that provided separate narratives and scoring of scales and reliability of the two coders averaged, $r = .93$ (range = e.88–.98). In additional 15% of the cases, comparisons were made between the visiting assistant and an assistant coding the scales from the narrative, and inter-rater reliability, computed for each scale, averaged, *intra*class $r = .90$ (range = .83–.94).

Adolescence. Sixty-eight families (36 boys) were visited in early adolescence ($M = 12.68$ years, $SD = 0.51$). Attrition was mainly related to inability to locate families or families moving to far locations and no differences were found between children who were or were not seen in adolescence on any demographic or social variables. Adolescents were observed in two 10-minute conflict discussions with each parent, in which the dyad was asked to select and negotiate a common conflict between them. Adolescents were then observed in two interactions with same-sex best friend who was invited in advance. In a “positive interaction” the two had to plan a campaign to introduce new idea/activity/product to their school, and the “conflict discussion” involved friends describing a common conflict in their relationship and ways to resolve it.

Coding

All sessions with parents and friends were coded with the Coding Interactive Behavior manual (CIB; Feldman, 1998). The CIB is a global rating system for social interactions that includes 52 codes rated on a scale of 1 to 5 which are aggregated into several composites. The system has been validated in multiple longitudinal studies of normative and high-risk populations in infancy, preschool, and adolescence interacting with mother and father, and has shown adequate psychometric properties, including construct validity, test-retest reliability, and predictive validity (Feldman, 2010; Feldman & Eidelman, 2006; 2009; Feldman & Klein, 2003; Feldman & Masalha, 2010; Feldman, Masalha, & Nadam, 2001; Keren et al., Tyano). The mother-child reciprocity construct analyzed with the CIB has shown individual stability across six observations in a different sample from 3 months to 13 years and adequate internal consistency at each age (Feldman, 2010). The father-child reciprocity in both Israeli and Palestinian fathers showed individual stability and internal consistency from infancy to the preschool stage (Feldman & Masalha, 2010). The child-friend version of the CIB for adolescence was developed for the present study and 30 additional children not included in the current study were piloted. The child-friend CIB was based on a previous child-friend version validated for younger children, which showed longitudinal links with maternal and paternal behaviors and parental oxytocin (Feldman, 2012). Inter-rater reliability was computed for 20% of observations at each age. Reliability coefficients (*intraclass r*) for the codes composing the dyadic reciprocity scale averaged Infancy: mother-child = .94 (range = .86-.99) father-child = .96 (range = .88-.98), Preschool: mother-child = .92 (range = .82-.97), father-child = .91 (range = .81-.94), Adolescence: mother-child = .90 (range = .81-.95), father-child = .93 (range = .85-.98).

The *Dyadic Reciprocity* construct was used for father-child and mother-child interactions at the three ages. Reciprocity addresses the formal features of the interaction and describes an exchange where the dyad is moving in harmony, each is engaged and contributes to the mutual exchange, the interaction is the end product of the input of both partners, and the atmosphere is one of collaboration and joint activity, whether the activity is verbal or non-verbal, focuses on social give-and-receive or on object manipulation. Reciprocity was the average of the following codes: parent and child engage in give-and-receive interactions that are sensitive to micro-level verbal (e.g., child mutters "Oh, No!") and nonverbal (e.g., gaze aversion, quick smiles, gestures, heavy breathing) cues, dyad adapt to each other's needs and communications, and interactions are fluent, harmonious, and rhythmic (*alpha*: infancy = 0.92, preschool = 0.88, adolescence = 0.84). Examples of Dyadic Reciprocity are mother and infant engage in sing-song co-vocalization, matching their social gaze and taking turns in smiling; father and toddler on the floor moving a car, each running to get the toy and both burst together into high intensity laughter; or parent and adolescent engage in a discussion characterized by positive affect, warm tone of voice, occasional smiles, and mutual acknowledgement of each other's perspective on the conflict.

To examine the "behavioral content" differentially linked with maternal and paternal reciprocity, two composites were created from the CIB codes: *Object-Oriented Physical Play* was the average of the following codes: physical manipulation – parent moves the child's limbs, engages in stimulatory or proprioceptive (moving the child in space) touch, or rough-and-tumble play; high positive arousal – interactions are marked by bursts of positive arousal, such as laughing, bursts of motor energy, or loud exclamation colored by positive energy; and object focus – interactions focus on manipulating objects and not on

face-to-face social exchanges (α : infancy = 0.81, preschool = 0.79). The *Social-Oriented Affective Play* included the following codes – gaze at partner, warm (and in infancy “motherese”) vocalizations, expression of warm affect, and affectionate touch (e.g., hugs, caresses, kisses, soft touch that express affection and do not have an instrumental purpose, such as cleaning the child’s nose) (α : infancy = 0.91, preschool = 0.83). These codes were created for the infancy and preschool interactions that involved play. For the adolescent–parent interaction, we examined the associations between reciprocity and parental intrusiveness, a construct that denotes parental interruptions of the child’s stream of activity or communication, parental overriding child’s behavior or suggestions, and parent pushing the parental agenda rather than following the child’s.

Adolescent–friend interactions were coded using the same system and employing similar codes. The behaviors of each partner were coded separately and only the target child’s information was used here. *Dialogical Skills* – was the average of the following codes: acknowledgement of other’s position and perspective; empathy to friend’s feelings, hurts, emotions, or point of view; elaboration of suggestions/ideas suggested by partner; attention is focused on partner; maintaining positive affect, vocal clarity and warm tone of voice, reciprocity and give-and-receive mutuality; adaptation to content, expressed affect, or position of partner; and interactions are fluent and rhythmic (α : positive = 0.91, conflict = 0.90). Inter-rater reliability for 15 dyads for the dialogical skills codes averaged *intraclass* $r = .92$ (range = .86–.96) for the positive interaction and *intraclass* $r = .91$ (range = .84–.96) for the conflict interaction.

Results

Results are organized in two sections. In the first, we examined (a) mean-level developmental changes in reciprocity, (b) individual stability in father–child and mother–child reciprocity from infancy to adolescence, and (c) the unique behavioral content of reciprocity with each parent. The second section presents a structural equation model assessing direct and mediated paths leading from mother–child and father–child reciprocity in early childhood to parent–child reciprocity in adolescence and social outcomes in both preschool and adolescence.

Developmental change, individual stability, and behavioral content of father–child and mother–child reciprocity from infancy to adolescence

Developmental change

A repeated measure ANOVA with father–child reciprocity at 5 months, 3 years, and 13 years as the within-subject factor and child gender as the between-subject factor showed no overall change in reciprocity with time but a significant time by child gender interaction, $F(2, 65) = 3.59$, $p < .05$, $\eta^2 = 0.13$. Examination of the means showed no differences between father–son and father–daughter reciprocity at the first two assessments, but significantly higher father–daughter reciprocity compared to father–son reciprocity in adolescence, $F(1, 67) = 8.03$, $p < .01$.

A similar repeated-measure ANOVA of mother–child reciprocity at the three ages showed a significant main effect for time, $F(2, 65) = 6.20$, $p < .01$, $\eta^2 = 0.19$, and polynomial contrast indicated a linear trend, $F(1, 66) = 10.87$, $p < .01$. Mother–child

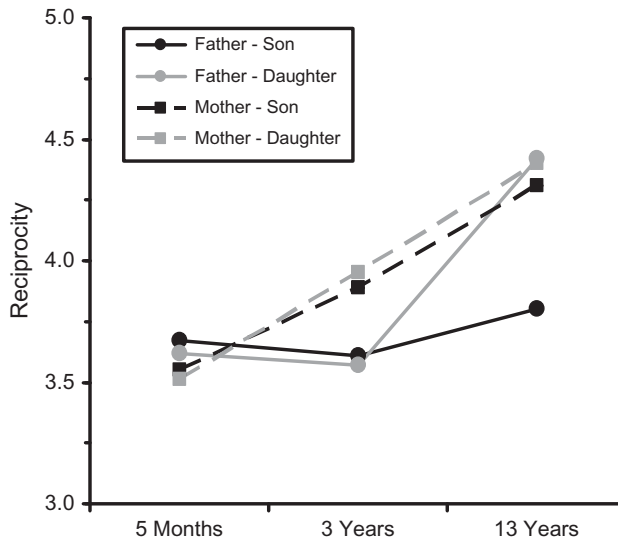


Figure 1. Trajectories of mother-child and father-child reciprocity with sons and daughters from infancy to adolescence.

reciprocity increased from 5 months to 3 years and from 3 years to 13 years. No time by child gender interaction was found.

Assessment of mother-father differences in *Reciprocity* showed no parent gender or parent gender by child gender differences at 5 months and 3 years. However, at 13 years both a parent gender main effect, $F(1, 70) = 6.52, p < .01, \eta^2 = 0.053$ and a parent gender by child gender interaction effect, $F(1, 70) = 13.86, p < .001, \eta^2 = 0.11$, were found (Figure 1).

Individual stability

Father-child reciprocity was individually stable from infancy to adolescence. Correlations between infancy and preschool were $r = .35, p < .01$, between preschool and adolescence were $r = .32, p < .05$, and between infancy and adolescence were $r = .29, p < .05$. Similar stability was found for mother-child reciprocity: infancy to preschool, $r = .34, p < .01$; preschool to adolescence, $r = .35, p < .01$; and infancy to adolescence, $r = .30, p < .05$. Mother-child and father-child reciprocity were inter-related at each age: Infancy, $r = .36, p < .01$; preschool, $r = .35, p < .01$; and adolescence, $r = .29, p < .05$. These findings indicate that reciprocal parenting is a moderately stable orientation within each parent and is a mutually-influencing phenomenon between parents.

Behavioral content

Father-child reciprocity at both 5 months and 3 years tended to co-occur with quick-paced high positive arousal, physical manipulation, and object focus. Correlations between reciprocity and Object-Oriented Physical Play in father-child interactions were $r = .69, p < .001$ in infancy and $r = .57, p < .001$ in preschool. On the other hand correlations with Social-Oriented Expressive Play, including shared gaze, co-vocalization, and affectionate

touch, were substantially lower: $r = .19, p < .05$ in infancy, and $r = .16, ns$, in preschool. Conversely, mother-child reciprocity was closely linked with Social-Oriented Expressive Play, $r = .71, p < .001$ in infancy and $r = .62, p < .001$ in preschool, and did not correlate with Object-Oriented Physical Play, $r = -.16, ns$, in infancy, $r = .03, ns$, in preschool.

Parent-adolescent interactions did not include play with objects or physical manipulation. Yet, whereas mother-adolescent reciprocity negatively correlated with maternal intrusiveness, defined as the parent's interrupting child's communications and introducing the parental agenda, $r = -.23, p < .05$, father-child reciprocity showed marginal positive associations with father intrusiveness, $r = .22, p = .054$, suggesting that parental interruptions and insistence on parent-own agenda are more disruptive to the reciprocity formed between mothers and adolescents whereas such behaviors can be more tolerated in the context of father-adolescent reciprocity.

Path analysis leading from reciprocity to social outcomes in preschool and adolescence

In order to overcome potential dependence stemming from both dyadic dependence and longitudinal dependence, we used longitudinal structural equation modeling. Such modeling provides an unbiased estimate of individual stability by separating over time variance unique to individuals from concurrent and over-time variance that is shared by members of the dyad. This technique has been used to estimate mothers' and fathers' attachment-related views (Cook & Kenny, 2005) and stability of child aggression over time (Adams, Bukowski, & Bagwell, 2005).

We used path analysis with maximum-likelihood method in AMOS (Arbuckle, 2009). Prior to computing the model, a composite of parent-child reciprocity in early childhood was computed by averaging parent-child reciprocity at 5 months and 3 years for each parent. Table 1 presents the correlation among the research variables. Social outcomes at preschool and adolescence were predicted by parent-child reciprocity in early childhood. We also tested whether early parent-child reciprocity predicts social outcomes in adolescence directly or whether the effects of early parent-child reciprocity on adolescent

Table 1. Correlations among study variables.

	1	2	3	4	5	6	7	8	9
Mother-child reciprocity	–								
Father-child reciprocity	0.27**	–							
Mother-adolescent reciprocity	0.38**	0.16	–						
Father-adolescent reciprocity	0.25*	0.26*	0.84**	–					
Prosocial behavior	0.19†	0.24*	–0.11	0.01	–				
Aggression	–0.35**	–0.30**	–0.13	–0.12	–0.05	–			
Social competence	0.20†	0.38**	–0.01	0.09	0.24*	–0.25*	–		
Positive dialogue	0.28*	0.17	0.29*	0.24*	0.04	–0.24†	0.02	–	
Conflict dialogue	0.12	0.09	0.29*	0.36**	–0.07	–0.05	–0.14	0.40**	–
Mean	3.93	3.79	4.13	4.14	2.21	1.59	3.72	4.14	4.02
SD	(0.76)	(0.70)	(0.89)	(0.83)	(1.77)	(1.61)	(0.97)	(0.88)	(0.97)

† $p < 0.10$; * $p < 0.05$; ** $p < 0.01$.

outcomes are mediated by concurrent parent–adolescent reciprocity. Moreover, we examined whether preschool social outcomes directly predict outcomes in adolescence. No child gender-related paths were significant and they were excluded from the final model.

Model fit was assessed using the following goodness-of-fit indices (see Hu & Bentler, 1999): chi-square (Tabachnik & Fidell, 2007), Comparative Fit Index (CFI; Rigdon, 1996), Tucker-Lewis Index (TLI; Bentler & Bonett, 1980), and Root-Mean-Square Error of Approximation (RMSEA; Browne & Cudeck, 1993). A non-significant chi-square, CFI and TLI equal to or greater than .95, and RMSEA equal to or less than .07 (Hu & Bentler, 1999; Tabachnik & Fidell, 2007) are indicative of an acceptable fit.

Only significant standardized path coefficients and model fit indices are presented in Figure 2. As seen, the model has a good fit for the data: $\chi^2(22) = 16.36$, $p = .79$; CFI = 1.00; TLI = 1.01; and RMSEA = 0.00. Children's social competence at childcare was positively and independently predicted by father–child and mother–child reciprocity across early childhood. Similarly, children's aggression was negatively and independently predicted by father–child and mother–child reciprocity across early childhood. Finally, the child's prosocial orientation was positively predicted only by father–child reciprocity in early childhood.

Predicting adolescents' dialogical skills from parent–adolescent reciprocity showed that better dialogue with a friend during positive encounters was predicted by mother–adolescent reciprocity. On the other hand, child–friend dialogue during conflict interactions was predicted by father–adolescent reciprocity. Dialogical skills in adolescence were not directly predicted by parent–child reciprocity in early childhood above and beyond parent–child reciprocity in adolescence. However, indirect significant effects emerged for early parent–child reciprocity on adolescents' dialogical skills through parent–adolescent reciprocity. As indicated by a significant Sobel test, $Z = 1.99$, $p < .05$, for mediational

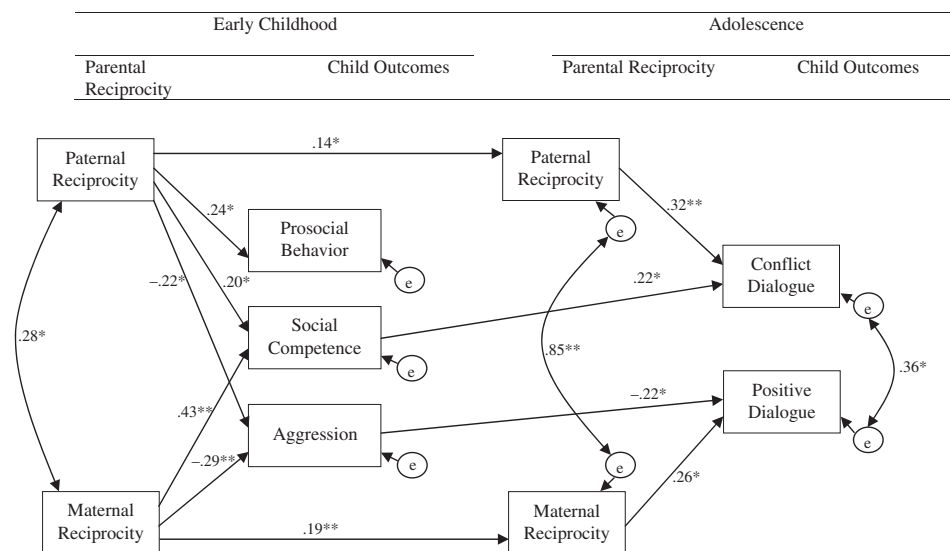


Figure 2. Structural equation modeling charting paths from mother–child and father–child reciprocity across childhood to child social outcomes in preschool and adolescence.

Note: Path values are standardized regression coefficients. $\chi^2(22) = 16.36$, $p = .79$; CFI = 1.00; TLI = 1.01; RMSEA = 0.00. * $p < .05$; ** $p < .01$.

analysis (Sobel, 1982), early father–child reciprocity predicted father–child reciprocity in adolescence, which, in turn, predicted dialogical skills in conflict encounters with best friend. Similarly, dialogical skills in positive encounters in adolescence were predicted by early mother–child reciprocity through mother–adolescent reciprocity, Sobel’s $Z = 2.07$, $p < .05$. Lastly, we examined whether preschool social outcomes – social competence, aggression, and prosocial orientation – predict social outcomes in adolescence. Results indicated that dialogical skills during positive encounters in adolescence were negatively predicted by aggression in the peer group during the preschool stage. On the other hand, dialogical skills during conflict encounters in adolescence were positively predicted by the level of preschoolers’ social competence in the peer group.

Discussion

Social reciprocity has been conceptualized as the cornerstone of mammalian social life (Hauser et al., 2009) and as a critical early experience in the development of human attachment and well-being (Bowlby, 1969), yet little research has traced its expression from infancy onward in relation to long-term social outcomes. In this study, we followed the reciprocity formed between children and their mother and father from infancy to adolescence and described the developmental trajectories, individual and within-family stability, and unique effects of each type of reciprocity on social adaptation in preschool and adolescence. Results indicate that reciprocal parenting is a moderately stable characteristic of attachment relationships across the first 13 years of life and is mutually-influencing between parents at each stage. Mother–child and father–child reciprocity experienced in early childhood were each uniquely predictive of lower aggression and higher social competence in preschool. Mother–adolescent reciprocity contributed to better dialogical skills during positive encounters with best friends whereas father–adolescent reciprocity predicted the capacity to handle conflicts in more dialogical ways. Finally, although early reciprocity did not directly predict adolescent outcomes, the stability of parent–child reciprocity over time mediated the effects of early reciprocity on adolescent outcomes. Overall, the study highlights reciprocity as a meaningful construct that resonates in both evolutionary and mental health frameworks and as a central feature of close relationships that facilitates adaptation to the social world.

Evolutionary models indicate that maternal and paternal investments operates via two types of mechanisms: one relates to the co-evolution of mothering and fathering and manifests in parent-general effects, the other defines unique fathering effects in the context of mothering (Geary, 2000). In this context, “reciprocity” appears to describe a parent-general attribute that is shaped through mutual influences between mothers and fathers through mechanisms of coparenting, for instance, via biological synchrony between mothers’ and fathers’ brain activations in socio-cognitive and empathy circuits in response to infant cues (Atzil, Hendler, Zagoory-Sharon, Weintbrub, & Feldman, 2012). The current findings show that reciprocal interactions that build on mutual exchanges between parent and child and integrate inputs from both partners into a joint dialogue support children’s social adaptation in both the peer group and within intimate friendships across childhood and up until adolescence. Yet, the data also show that children co-construct distinct types of reciprocity with mother and father. Similar to the style of biparental fathers, the behavioral content of paternal reciprocity in humans is directed outside the dyad and toward the social world, fosters exploration, builds high positive energy, is more overtly rewarding, and provides exercise in rough types of physical contact (Parke, 1996; Pruett & Pruett, 2009). Still, a reciprocal exchange implies

that this high energy, rough contact, and open reward are well-contained within the relationship and follow basic rules of social conduct (Feldman, 2003). Such energetic yet mutually-regulated play may be especially important for the regulation of aggression at the stage when children first enter the social world, which may explain the added effects of father-child reciprocity to reduced aggression and increased social competence with peers above and beyond the effects of maternal reciprocity and the general parenting effects. These findings accord with findings that eliminating paternal investment in biparental mammals compromised social fitness and increased aggression (Veenema, 2012). Social competence and low aggression in preschool, in turn, impacted dialogical skills in adolescence. These findings are among the first to describe longitudinal associations between early adaptation to the peer group when children enter the social world and their functioning within intimate relationships in adolescence, a period when intimacy is among the central developmental goals children must negotiate.

Differences in the content of parent-child reciprocity were observed in adolescence as well, despite the fact that interactions did not contain physical play or toy manipulation. Father-adolescent reciprocity tended to co-occur with the father's intrusive interruptions and focus on the paternal agenda, perhaps mimicking the more rough interactions in the real world. In contrast, the mother-adolescent reciprocity maintained its focus on face-to-face position, social gaze, and warm affect. The developmental trajectories of mother-child and father-child reciprocity also revealed a parent-specific pattern. The socially-oriented mother-child reciprocity showed a steady increase from infancy to adolescence and no child gender effects. On the other hand, the high-energy physical father-child reciprocity did not increase from infancy to preschool and, at the transition to adolescence, when parents must shift from playing with their children to dialoguing with them, showed a marked increase with daughters but not with sons, perhaps in relation to girls' greater ease in emotional dialogue. Possibly, father-son reciprocity in adolescence is achieved through physical, outward-oriented actions, such as sports or joint home construction, and the tasks required here did not tap this unique reciprocity. At the same time, reciprocity with both parents showed medium-level stability over the 13-year period and inter-relatedness between mother and father at each time-point. This intra-individual and between-couple stability probably establishes a predictable home environment which affords children a clear sense of the reciprocity they can expect to receive and facilitates the lasting effects of reciprocity on outcome. Indeed, the structural model shows that parent-child reciprocity in early childhood did not predict adolescent outcomes directly but shaped adolescents' dialogical skills through the stability in the reciprocity with each parent across the 13-year span.

Father-adolescent reciprocity was independently predictive of children's ability to handle conflict in dialogical ways, whereas mother-adolescent reciprocity shaped children's dialogical skills during positive encounters. Dialogical abilities, defined as the capacity for perspective-taking and empathy, are central components of the moral orientation (Day & Tappan, 1996) and are thought to develop on the basis of early experiences with the mother (Emde, Biringen, Clyman, & Oppenheim, 1991; Feldman, 2007b). The first studies on empathy (Dymond, 1949; Stryker, 1962; Taft, 1955) postulated that empathy is based on familiarity with the other's behavioral patterns, which affords correct inferences about their emotional state and, thus, empathy is always learned within close relationships. The current findings support these perspectives by showing that adolescents' dialogical abilities were predicted by reciprocal exchanges with their parents. The father-specific reciprocity was particularly important for the adolescent's ability to negotiate conflict, perhaps consistent with research showing that father absence increases

children's externalizing behavior and conflict with society (Tamis-LeMonda & Cabrera, 2002). It is possible that during father-child exchanges children practice "rougher" forms of contact and learn to maintain reciprocity in the face of the other's intrusive behavior and insistence on his or her own agenda. Such practice, not experienced in the more harmonious mother-child interaction, may provide important inputs for the adolescent's capacity to handle conflicts, discuss differences, and manage interpersonal disputes while maintaining a dialogical stance. In contrast, maternal reciprocity, which is especially adapted to provide a predictable and comfortable atmosphere, may establish a sense of security that affords collaboration in joint positive social activities and supports creativity and social initiation. Both skills are critical for the individual's social adaptation, are important components of social collaboration, and define the lifetime capacity to function competently with non-kin members of the eco-social niche.

Finally, limitations of the study should be remembered in the interpretation of the findings. First, the sample size is relatively small. Yet, smaller samples afford the opportunity for in-depth observations and substantial coding across multiple relationships and ecological contexts and over a lengthy period. The insights drawn from such smaller samples can be applied to larger samples that draw more heavily on self-reports. Second, the sample includes middle-class well-adapted parents who are actively involved in childrearing, and thus the findings need replication in higher risk groups before generalizations can be made. Still, a select group of mothers and fathers who are willing to participate in long-term research may provide an important first step. Along the new research fronts addressing the epigenetic effects of early maternal care on gene expression and physiological regulation (Meaney, 2010), the lack of physiological data that can address the long-term effects of mothering and fathering on adolescent physiology is a clear study limitation. Much further research is required to address the biological, epigenetic, and behavioral effects of social reciprocity from infancy and examine its impact on children's functioning within multiple attachments and across various social settings in an attempt to describe how early reciprocal exchanges shape the individual's capacity to become a collaborative members of the social world.

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