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THE ROLE OF INTRAVERBAL EXCHANGES IN ASSESSING PARENT–CHILD RELATIONSHIPS

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The present investigation evaluated the role of verbal exchanges between parent and child (intraverbal exchanges) in relation to two contemporary measurements of the parent–child relationship, mutual responsive orientation (MRO) and synchrony. Data were collected from 30 mother–preschool child dyads (19 girls, 11 boys) during a laboratory assessment. Rates of intraverbal exchange, MRO, and a major aspect of synchrony, dyadic reciprocity, were obtained during four separate interactions: two structured puzzle tasks, a semi-structured play activity, and an unstructured snack period. Results indicated that the rate of intraverbal exchange was stable within dyads and highly correlated with the two other, more complex measures. The findings challenge the restricted view of the utility of the behavior analytic approach, implicitly maintained in socialization and attachment theories within developmental psychology, demonstrate the value of measures of intraverbal exchanges for assessing parent–child relationships, and suggest practical applications in parent and caregiver training.

Key words: parent and child, parenting, verbal behavior, parent responsiveness, socialization

Verbal communication is undeniably one of the most important human characteristics that sets our species apart and, as a result, has generated much discussion (Chomsky, 1972; Pinker, 1994; Premack, 1976, 2010; Schlinger, 2002; Skinner, 1957; Whorf, 1956). This is especially obvious in the areas of emotional development, attachment, and socialization, wherein one of the primary mechanisms of development is based upon verbal interactions

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between child and caregiver (Thompson, 2010). Studies that investigate a process as complex as socialization naturally consider both intrinsic factors, such as the genetic determination of factors such as temperament, effortful control, and attention span, and extrinsic factors, such as cultural context and parent/peer interactions. Research has contributed immensely to our understanding of the biological factors involved in children's emotional and social development (Auerbach, Faroy, & Ebstein, 2001; Calkins, Fox, & Marshall, 1996; Fox et al., 1995) and has carefully delineated important elements implicated in children's interactions with different socializing agents, including caregivers. One interesting consequence of the rigorous exploration in this area has been a paradigm shift from the unidirectional, parent-centered focus in the process of socialization to a more complex, bidirectional understanding of parent–child relationships (Belsky, 1984; Kochanska, 1997; Kuczynski, 2003; Maccoby, 1999), which seems to parallel Skinner's (1957) focus on the function of language and his simultaneous interest in both the speaker and the listener in verbal behavior. This shift, naturally, has generated a number of constructs in this domain of mutuality (Bugenthal & Grusec, 2006) to operationalize the dyadic qualities of the parent–child interaction. Two of the most investigated and well-established measures are mutual responsive orientation (MRO; Kochanska, 1997; Kochanska, Aksan, Prisco, & Adams, 2008; Kochanska & Murray, 2000) and dyadic synchrony (Harrist & Waugh, 2002; Lindsey, Cremeens, Colwell, & Caldera, 2008). Both are complex measurements with behavioral coding schemes developed to investigate the cocreated, systemic nature of the parent–child interaction.

Kochanska (2002) defined MRO as "a relationship that is close, mutually binding, cooperative, and affectively positive" (p. 191). She (1997) initially posited two major components of a parent–child relationship that play a significant role in the process of socialization: mutual cooperation or responsiveness (i.e., how the parent and the child respond to each other's needs, signs of unhappiness, bids for attention, or attempts to exert influence) and shared positive affect or good times (i.e., pleasurable, harmonious, smoothly flowing interactions containing positive emotions experienced by both). Originally, the assessment of both components of MRO necessitated an examination of each member of the dyad separately, given the same context of interaction, as each component represented a result of a multistep aggregation of various behavioral measures. Although the measures proved to be valuable in predicting a number of critical socialization components, including conscience, emotion regulation, self-esteem, and other prosocial behaviors, the observational coding and rating systems of the variables were extremely labor intensive and time consuming (Kochanska et al., 2008). For the sake of easier scoring and increased utility, Kochanska and her colleagues recently expanded these concepts further into four major components of MRO, measuring the dyadic quality explicitly, rather than tallying and aggregating it from separate measurements of parent and child (Aksan, Kochanska, & Ortmann, 2006). These components included (1) coordinated routines (i.e., assessment of daily routines—choppy versus smooth interactions, as well as any signs of shared expectations by the parent–child dyad within the engagement of routines), (2) mutual cooperation (i.e., assessment of effective resolution of potential conflict, openness to each other's influence, and attunement between parent and child), (3) harmonious communication (i.e., assessment of both verbal and nonverbal flow—an effortless, connected, back-and-forth quality in parent–child interactions versus a difficult, disconnected communication), and (4) emotional ambiance (i.e., assessment of emotional atmosphere, indicating either clear pleasure or displeasure in each other's company, including quantified expression of affection). This novel reconstruction of MRO clearly incorporates and examines the type and quality of communication between parent and child as a significant aspect of a dyadic relationship.

Another construct that clearly reflects the bidirectionality of a parent–child relationship is that of synchrony. In the developmental psychology literature, synchrony-related concepts have been defined in a number of ways, from "reciprocal responsiveness" (Ainsworth, Bell, & Stayton, 1974) and "mutual contingency" (Tronick, Edward, Als, & Brazelton, 1977) to "behavioral harmony" (Schölmerich, Fracasso, Lamb, & Broberg, 1995) and, most recently,

"dyadic synchrony" (Harrist, Pettit, Dodge, & Bates, 1994; Harrist & Waugh, 2002). To clarify the specific constituents of this contemporary, organizing construct of dyadic synchrony, Lindsey et al. (2008) identified and studied five components. A global measure of "dyadic reciprocity" assessed the level of coordinated and contingent behavioral and verbal exchange between parent and child (i.e., sharing the same focus of attention, maintaining the same topic, mirroring each other's emotional state). A microanalytic "shared emotion" component was divided into two separate categories, one tapping the expression of contingent positive emotion, in which simultaneous smiles, chuckles, and laughter were scored as "shared positive emotion," and another for "shared negative emotion," wherein simultaneous contingent sadness, upsetness, or anger were displayed. The fourth component measured the degree of "mutual initiation" (i.e., the balance in parent and child initiations to influence each other's behavior). Working with toddlers, these researchers counted vocal behavior as well as nonvocal behavior such as gestures, pointing, and eye gaze. The last component was a measure of "mutual compliance" to the other's initiation (i.e., compliance by a member of the dyad to the initiation made by the other).

Both measures, MRO and dyadic synchrony, seem to measure similar domains: MRO's coordinated routines and mutual cooperation are tapped by dyadic reciprocity in dyadic synchrony, harmonious communication is parallel to mutual initiation and compliance, and certainly emotional ambiance is the focus of shared emotion. Although these two current, detailed constructs are useful to sort out subtle differences and nuances in communication style, as well as other qualities of parent–child relationships, the data collection and analysis process, as noted by the researchers themselves (N. Aksan, personal communication, January 8, 2009; Aksan et al., 2006; Kochanska et al., 2008), are complex and arduous. This may also limit the practical and clinical use of the concepts. As clinical behavioral scientists, then, we set out to investigate if a more parsimonious measure of verbal exchange between parent and child could resonate with these well-established constructs of social development. Although the detailed analysis of these constructs and their measurements reveals different components, it seems possible that a single domain tapping the quality of parent–child relationship is being assessed. Given the importance of verbal communication in human relations, that domain, perhaps, may be a single component of verbal behavior that captures the nature of all human interactions, including the parent–child dyad. For example, using basic behavior-coding systems to study the role of parents in the cognitive (linguistic) development of toddlers, Hart and Risley (1995) found that qualitative aspects such as parental affirmations versus prohibitions differed between groups of different socioeconomic status (the study focused on the means to conduct a "war on poverty"). In other words, even though they pointed out that high-interaction families were characterized by approving rather than disapproving parent-to-child verbal exchanges, the primary meaningful factor affecting vocabulary development, IQ score, etc., was *frequency* of parental utterances to children, not type or richness of utterance between parent and child. In turn, this suggested to us that the basic aspect of interpersonal interaction, the verbal exchange, might serve as a primary factor affecting attachment and socialization.

Following the thoughtful path Skinner (1957) laid out in his analysis of verbal behavior, emphasizing the interface between speaker and listener, investigators have developed many fruitful research domains, including stimulus equivalence relations (Sidman, 1994, 2000), relational frame theory (Hayes, Barnes-Holmes, & Roche, 2001), verbal operants (Sautter & LeBlanc, 2006), and verbal behavior developmental theory (Greer & Longano, 2010), addressing the complexities involved in meaning, communication, and the function of verbal behavior. Even though the critique of Skinner's *Verbal Behavior* (1957) by Chomsky (1959) was seen by some as a fatal blow to the "science of verbal behavior," such an illusion has been consistently dispelled by many for whom Skinner's elegant understanding of verbal behavior has not been overlooked (Knapp, 1992; Leigland, 2007; MacCorquodale, 1969, 1970; Palmer, 2006; Schlinger, 2008; Wyatt, Hawkins, & Davis, 1986). Most recently, Schlinger's (2008) account of why Skinner's concept of verbal behavior is thriving elicits a puzzling question of why there has been little empirical

research studying verbal behavior among developmental scientists, besides those who use applied behavioral analysis in the areas of language acquisition and communication disorders associated with developmental disabilities. For many years, the analysis of verbal behavior was criticized for being unable to account for language acquisition, despite the fact that Skinner (1957) was not explaining language per se, but rather the contingencies that lead to and maintain communication (Skinner, 1987).

Notwithstanding the criticisms, many of the concepts in *Verbal Behavior* (1957) have been demonstrated to be vital in dealing with practical issues for children both with (Greer & Ross, 2008; Ingvarsson, Tiger, Hanley, & Stephenson, 2007; Sundberg & Michael, 2001) and without (Partington & Bailey, 1993; Perez-González, Herszlikowicz, & Williams, 2008) language delays and developmental disabilities; the emphasis of the research has primarily remained in the area of language development, that is, vocabulary, sentence structure, and linguistic richness. Perhaps this limited use of the analysis of verbal behavior to language abilities stems from Skinner's own silence to his critics, which he finally addressed toward the end of his life (Skinner, 1987). With this in mind, we attempted to answer the question: Can simple units of verbal exchange, as emphasized by Skinner, be applied to the natural processes of socialization and attachment, areas that historically have been solely the domain of psychodynamic models and, more recently, of neuroscience?

In our clinical work with preschoolers and their parents, we have explored the potential of a simple verbal-behavior metric, the intraverbal exchange, to be used in the application of teaching parent responsiveness. Taken from the general nomenclature of *Verbal Behavior* (Skinner, 1957), we defined the intraverbal exchange simply as vocal behavior of the listener that followed vocal behavior of the other member of the dyad, the speaker; hence, intraverbal exchanges can range from word associations to questions and answers to infant–caregiver give-and-take baby babble. Skinner (1957) identified an operant as verbal based on the fact that, unlike other operants, verbal behavior is mediated by other people rather than the natural world. Verbal operants include the mand, in which a response is reinforced by a characteristic consequence and is therefore under the functional control of relevant conditions of deprivation or aversive stimulation (Skinner, 1957, p. 36). The tact is a verbal operant in which a response of given form is evoked or at least strengthened by a particular object or event or property of an object or event (p. 81). The intraverbal is also a verbal operant, in which a verbal response is controlled by a verbal discriminative stimulus (p. 71). Verbal operants require an analysis of the reinforcement contingencies, which were not available in the current study. In the last few decades, the role of the listener in verbal behavior has been incorporated into Skinner's theory, leading to a more complete theory of the function of language as behavior, particularly the intercept of speaker and listener in speaker–listener interactions treated as social behavior (Greer & Speckman, 2009). However, we focused on the simple measure of the exchange of utterance because it is the most basic unit of conversation that might reflect the overall quality of parent–child interactions, and for that reason we used the term *intraverbal exchange*. In our study, we wanted to register a global tallying of intraverbal exchanges in hopes of establishing a clear and simple unit of parent–child interaction. We chose to work only with vocal behavior given the developmental stage of our children participants and for the ease of measurement, foreseeing the difficulty of including nonvocal behavior for this measure in subsequent applied work with parents and other caregivers.

The intraverbal exchange can be measured simply by counting the number of verbal responses to each vocalization by the speaker. Because the context of parent–child interactions becomes increasingly verbal as the child ages, the assessment of the parent–child relationship must also increasingly focus on verbal behavior and the qualities of verbal exchange (Laible & Thompson, 2000; Kochanska, 2002). In the present study, we evaluated the relationship between the rate of intraverbal exchanges initiated by parent or preschool child and MRO, as well as the principal component of dyadic synchrony, namely, dyadic reciprocity during four different situations involving mother–child interactions. We chose MRO and dyadic synchrony because both measures have been rigorously

investigated and have solid roots in research on socialization and attachment. The study was designed to assess whether this easy-to-use and possibly easy-to-teach verbal metric would, in fact, serve as a reliable measure paralleling these two more complex metrics of the parent–child interactive relationship. Furthermore, because both MRO and dyadic reciprocity emphasize the role of affect in the quality of parent–child interactions, verbal expressions of affect were also considered to be verbal behavior in this study.

Since parenting stress has been implicated in altering the quality of interactions between parents and children (Coyl, Roggman, & Newland, 2002; Paulussen-Hoogeboom, Stams, Hermanns, & Peetsma, 2008), we decided to assess the level of parenting stress using the Parenting Stress Index Software Portfolio (PSI–SP; Abidin, 1995). The PSI–SP assesses the parent's perception of stress related to the child (e.g., the child's distractibility and the child's moods) and stress related directly to the parent (e.g., stress regarding parent competence and health issues), as well as an overall measure of life stress from external factors. Since any of these three aspects of stress can influence parent–child relationships, the PSI–SP served to evaluate for these potential confounding variables. Finally, parents' own appraisal of their relationships with their children was examined using the Parent–Child Relationship Inventory (PCRI; Gerard, 1994) to support our behavioral observations and further delineate our sample. Both measures provide important information about the specific participants in the study and, perhaps, may enrich our understanding of the quality of parent–child relationships.

Method

Participants

Nineteen female and 11 male 5- and 6-year-olds (*M* age = 5 years, 11 months; *SD* = 6.7 months; range = 5 years, 0 months to 6 years, 11 months) and their mothers were selected from a sample of participants ($N = 32$) who partook in a larger longitudinal study of emotion regulation at Hunter College of the City University of New York. Two cases were eliminated due to incomplete data. Mean family income was \$104,695.70 ($n = 23$, *SD* = \$79,520.65) and ranged from \$10,000 to \$250,000.

Children and their mothers were recruited through fliers posted on day-care and preschool bulletin boards in New York City. Interested parents contacted the researchers via phone and, after receiving information about the nature of the project, scheduled a lab visit. Two days prior to the scheduled visit, the mothers received a reminder call. The research assistants who administered the experimental procedures were graduate or upper-level undergraduate students. Following the standard procedure in coding schemes with different measures to avoid response bias, three independent pairs of coders examined the videotaped recordings of the sessions to generate data for analyses. Each pair, which consisted of a master coder and an additional coder, was responsible for rating only one of the three measures: MRO, dyadic reciprocity, or intraverbal exchange. None of the coders interacted with the families prior to rating parent–child interactions.

Each mother and preschooler spent approximately 106 min, not including bathroom breaks, in a laboratory room designed for young children. Once the mother–child dyad was introduced to the novel laboratory setting and experimenter, two electrodes were applied to each child, one on the chest and the other on the lower torso, and an ambulatory Mini Logger (four-channel Series 2000 with IBI receiver option) with a Polar transmitter, fitted in a child's fanny pack, was placed around the child's waist to collect physiological data (part of the larger study's focus). Preschoolers, sometimes with their mothers, participated in a series of tasks designed to measure emotions and behaviors related to emotion regulation and temperament, four of which were used in the present study. Mothers were also asked to complete various questionnaires concerning demographic characteristics and child and parenting information before leaving the laboratory. The entire session was videotaped by two separate cameras, one placed on the ceiling of the experimental room and another behind a one-way mirror in an adjacent observation booth.

The mean number of individuals in the families was 4.07 (range = 2–7, *SD* = 1.11). The mean number of children in the families was 2.03 (range = 1–5, *SD* = 1.00). The mean number of hours of day care or school per week was 31.97 (range = 0–50, *SD* = 12.65). Only one of the 30 mothers reported that her child had a developmental delay. Six of the mothers noted their child had a food allergy. Mothers reported their own ethnicity as African-American (3), Hispanic (7), Caucasian (19), and Asian-American (1). They reported their child's ethnic identity as African-American (3), Hispanic (5), Caucasian (11), Asian-American (2), and Other (9). One parent–child dyad intermittently spoke to each other in Spanish. This videotape was translated and transcribed for the data analyses by one of the coders.

Procedure

Observations of parent–child interaction sequences. Four separate laboratory tasks were examined from the videotapes to measure MRO, dyadic reciprocity, and intraverbal exchanges. For data analyses, the exact time parameters of all four tasks of each mother–child dyad were identified based on the digital time readouts displayed on the videotapes in hours, minutes, and seconds.

Snack time. The unstructured, 8-min snack time (*M* = 8.37 min, *SD* = 1.74 min) provided a chance for children to reunite with their mothers after engaging in a series of tasks alone. The mothers were invited to join their children in the laboratory room as the preschoolers were offered a small snack choice (Teddy-Grahams© or raisins) and drink (juice or water). The mothers were also asked if they would like to drink tea, water, or coffee. For three dyads, a third person was present, in one case a father and twice a sibling.

Free play. The 8-min, semistructured free play session (*M* = 8.25 min, *SD* = 0.44 min) provided an opportunity to observe the interaction between parent and child without any challenges inherent in the task. The session began as the mother and child were seated around a table and provided with both Legos© and a "Go Fish" game. Before leaving the room, the experimenter stated, "You two can play with these toys while I get some other things to do. I'll be back in about 8 minutes."

Easy puzzle task. The easy puzzle task (*M* = 4.33 min, *SD* = 0.37 min) provided a chance to observe how the parent and child interacted with each other during a structured but minimally challenging task. An age-appropriate jigsaw puzzle consisting of 24 pieces in a frame was placed on the table as the experimenter explained, "You two work on this puzzle for a little while and see if you can finish it. Mom, help [Child's name] to work on the puzzle, but don't solve it yourself. I'll be back in a few minutes."

Difficult puzzle task. The difficult puzzle task (*M* = 5.24 min, *SD* = 0.27 min) was introduced to the dyad immediately following the easy puzzle task. After the participants either finished the easy puzzle or reached the time limit, the experimenter entered the laboratory room and stated, "Wow, you did a great job putting that puzzle together! Let's put this puzzle away now and try to do another one." After clearing the table, the experimenter gave the parent–child dyad the same instruction as in the easy puzzle task and placed a jigsaw puzzle with 98 pieces and no frame on the table.

Data coding. The videotapes of the parent–child interactions for each task were coded for MRO, dyadic reciprocity, and intraverbal exchanges.

Mutual responsive orientation (MRO). Each task was coded using recent MRO criteria (Aksan et al., 2006; Kochanska et al., 2008). Raters scored each task on 19 items that corresponded to four subcomponents of MRO: (1) coordinated routines, (2) mutual cooperation, (3) harmonious communication, and (4) emotional ambiance. Coders were trained based on the criteria from Kochanska's laboratory (G. Kochanska, personal communication, January 15, 2009; N. Aksan, personal communication, January 8, 2009) for each of the items with a 5-point scale from 1 (*very true*) to 5 (*very untrue*). When items were not appropriate, no score was given (e.g., there were no coordinated routines during snack time). The average of items for each component was calculated and then the score for each

subcomponent was averaged and a total MRO score was computed, with a range of 1 to 5. Our scoring method was a simplified version of the transformations done by Kochanska and her colleagues, such that the means and standard deviations of the total MRO value would be comparable to our scoring of dyadic reciprocity (see the following section).

To assess interrater agreement, MRO-based measurements were coded by a pair of coders consisting of one master coder who reviewed all the videotapes and gave ratings and a second coder who reviewed and rated 33% of randomly selected videotapes. Coders participated in 20 hours of training to familiarize themselves with the coding instructions of their given measurement and jointly practiced on a set of other videotapes showing parent–child interactions until they established a baseline reliability of 80% agreement. The Cohen's kappa coefficient for MRO was .76.

Dyadic reciprocity for dyadic synchrony. Dyadic synchrony criteria were based on a global measure of synchrony as measured by Mize and Pettit's (1997) 5-point scale of parent–child dyadic reciprocity. Parent–child dyadic reciprocity was scored after extensive training and review of Mize and Pettit's (1997) and Harrist et al.'s (1994) explicit anchors and criteria, based on when the parent and child shared the same focus of attention, when the dyad maintained the same topic, when the dyad mirrored each other's emotional response, and the responsiveness to the other's cues. For each of the four tasks, ratings were conducted in 30-s intervals and averaged across intervals. Each interval was rated on a scale of 1 to 5, with 5 signifying an interval of wholly shared attention and focus, mirroring of expressed emotion, and overall complete responsiveness to each others' cues, and 1 signifying that the dyad's attention differed during the majority of the interval, that action and affect did not follow from that of the other member, and that one partner was either disengaged or intrusive for most of the interval.

As with MRO, dyadic reciprocity assessments were also made by a separate pair that consisted of one master coder who reviewed all the videotapes and gave ratings and a second coder who reviewed and rated 33% of randomly selected videotapes. Coders participated in 20 hours of training to become familiar with the coding instructions of dyadic reciprocity and jointly practiced on a set of other videotapes showing parent–child interactions until they established a baseline reliability of 80% agreement. The Cohen's kappa for dyadic reciprocity was .79.

Intraverbal exchanges. The number of intraverbal exchanges was calculated by counting the number of times the mother initiated a verbal statement (spoke) to the child and the child gave a verbal response (P–C), and the number of times the child spoke to the parent and the parent responded verbally (C–P). During a dialogue, a response could also be scored as an initiation. For example, if the parent asked, "Does that go there?" and the child responded, "No, it doesn't fit. Can't it go here?" and the parent replied "Okay, try it," the interaction would be scored as a P–C and then as a C–P. The scoring system yielded a total C–P, a total P–C, and a grand total that was used to calculate a rate of intraverbal exchange (intraverbal/min).

During the unstructured snack time, we were interested in the total amount of verbal interaction. Therefore, the total time spent speaking was measured separately for each mother and child using a handheld electronic stopwatch (Hanhart GmbH & Co. KG, Stopstar 2).

To assess for emotional content, during each task we counted the number of verbal content references to feelings and emotions by both parent and child separately. For example, "How do you feel?" or "I am happy" are examples of content words regarding feelings and emotional states, that is, affective statements.

Another pair of coders, including one master coder who reviewed all the videotapes and a second coder who reviewed and rated 33% of randomly selected videotapes, counted C–Ps, P–Cs, and verbal expressions of affect. Coders participated in 1 hour of training to become familiar with the coding instructions for intraverbal exchanges and jointly practiced on a set of other videotapes showing parent–child interactions until they established a baseline reliability of 80% agreement. During the training, the difference between the coders' results of time

speaking for both parent and child was less than 7%. The Cohen's kappa was .77 for number of P–Cs and C–Ps, .82 for affect expression, and .82 for parent and child speaking time.

Self-report measures. Two separate maternal questionnaires were administered to provide data to support the behavioral observations.

Parent–Child Relationship Inventory (PCRI). The PCRI (Gerard, 1994) was completed by each mother. This self-report scale contains 78 items and assesses parents' perception of (1) the level of practical help and emotional support they receive (Support); (2) the level of satisfaction from their parenting (Satisfaction); (3) their involvement with their children (Involvement); (4) their communication and empathy with their children (Communication); (5) the effectiveness of their discipline and limit setting with their children (Limit Setting); (6) their willingness to promote independence and autonomy within their children (Autonomy); and (7) whether they endorse shared mother/father roles or more traditional, unshared mother/father child-rearing roles (Role Sharing).

Parenting Stress Index Software Portfolio (PSI–SP). The PSI–SP (Abidin, 1995) was also administered to each parent. This questionnaire, which contains 120 statements, assesses perceived stress in child and parent domains and provides a score for a total stress level and actual life stress. The Child Domain consists of six factors and evaluates stress levels based on (1) the child's distractibility/hyperactivity; (2) the child's adaptability to situations (e.g., the child's ability to adjust to changes in his/her physical or social environment); (3) how well the child's behavior is reinforcing to the parent (e.g., the frequency of smiles or other positive behaviors emanating from the child that produce good feelings in the parent about himself or herself during parent–child interactions); (4) how demanding the child is (e.g., the frequency of child demands placed upon the parent, such as crying, whining, physically hanging on the parent, and requests for help); (5) the child's overall mood (i.e., the positive or negative affect as demonstrated by signs of happiness or unhappiness); and (6) the acceptability of the child's behavior to the parent (i.e., the match between the child's physical, intellectual, or emotional characteristics and the parent's expectations). The Parent Domain consists of seven individual scales and evaluates stress levels based on (1) competence (i.e., the parent's sense of competence as to how to manage the child, including the level of knowledge about child development and appropriate child-management skills); (2) isolation (i.e., the absence of normal social and emotional support from spouse, friends, relatives, etc.); (3) attachment (i.e., the sense of emotional closeness experienced by the parent toward the child); (4) health (i.e., overall well-being and health issues of the parent); (5) role restriction (i.e., the sense of restriction on personal freedom and self-identity experienced by the parent as a result of parenthood); (6) depression; and (7) spouse. Finally, the Life Stress Domain measures stress perceived to be caused by situational circumstances that are often beyond the parent's control (e.g., the death of a relative, the loss of a job, etc.).

Results

Self-Report Measures

On the PCRI, the mothers scored an average above the 75th percentile on the Support, Satisfaction, Limit Setting, and Autonomy scales based on the normative sample. Both the Involvement and the Communication scale average scores were above the 85th percentile, and the sample reported having a very contemporary view of shared parenting roles (i.e., increased role of the father), with an average Role-Sharing score above the 90th percentile. In general, the PCRI responses indicated that mothers viewed themselves as being involved and empathetic with their children. Indeed, only six of the 210 scores obtained were below the 40th percentile. The PSI–SP overall scores showed little stress in the Child Domain. The average level of Child Domain stress was 92.4 (< 35th percentile), and none of the six individual scales were above the 55th percentile. In the Parent Domain, overall stress was also quite low (< 50th percentile), and of the seven individual scales only Health (65th percentile) and Spouse (70th percentile) were slightly elevated. The Life Stress Domain,

however, was reported as quite high (> 80th percentile). Generally, this sample of mothers reported having significant stress from external factors, but other than the pressure of health and spouse issues, they all indicated low overall stress regarding their children.

The relationships between the scales of the PCRI and the PSI–SP clearly demonstrated that higher scores for the Support, Involvement, Communication, Limit Setting, and Autonomy scales on the PCRI indicated lower total stress on the PSI–SP. Table 1 presents the intercorrelations between the two measures. High scores on the Support and Autonomy scales were related to less stress in the Parent Domain and many of the individual Parent Domain scales. On the other hand, high scores on the Limit Setting scale were correlated to lower scores in the Child Domain and five of the six individual Child Domain scales.

Table 1
Correlations Between Parent–Child Relationship Inventory and Parent Stress Index Software Portfolio

	PCRI						
PSI–SP	Support	Satisfaction	Involvement	Communication	Limit Setting	Autonomy	Role Orientation
Total Stress	−.65***	−.31	−.36*	−.42*	−.55**	−.56**	−.27
Child Domain	−.23	−.28	−.17	−.35	−.52**	−.24	−.21
Distractibility	.23	.02	.12	−.12	−.10	.09	.10
Adaptability	−.36	−.30	−.21	−.35	−.57**	−.28	−.23
Reinforces	−.25	−.25	−.25	−.27	−.49**	−.23	−.21
Demandingness	−.18	−.10	−.03	−.29	−.41*	−.26	−.10
Mood	−.27	−.39*	−.24	−.26	−.40*	−.18	−.35
Acceptability	−.32	−.39*	−.31	−.33	−.49**	−.32	−.31
Parent Domain	−.76***	−.23	−.39*	−.33	−.37*	−.62***	−.22
Competence	−.61***	−.45*	−.44*	−.38*	−.46**	−.44*	−.20
Isolation	−.53**	−.04	−.24	−.15	−.14	−.26	−.27
Attachment	−.56**	−.29	−.29	−.34	−.19	−.39*	−.17
Health	−.32	−.04	−.24	−.22	−.37*	−.63***	−.14
Role restriction	−.62***	.03	−.19	−.09	−.13	−.53**	.08
Depression	−.66**	−.15	−.33	−.24	−.35	−.70***	−.09
Spouse	−.38*	−.11	−.13	−.19	−.13	−.10	−.32
Life Stress	−.19	−.26	−.06	−.04	.04	−.21	−.16

Note. PCRI = Parent-Child Relationship Inventory; PSI–SP = Parent Stress Index Software Portfolio. $N = 30$.
*$p < .05$, two-tailed. **$p < .01$, two-tailed. ***$p < .001$, two-tailed.

Parent–Child (P–C) and Child–Parent (C–P) Intraverbal Exchanges

To determine the consistency of P–C and C–P intraverbal exchange measures, we first looked at the correlation between the tasks (intertask reliability) for each of the measures. Because of the varying observation times, rate (intraverbal/min) was used. There was no relationship between the rate of C–P intraverbal exchanges during the unstructured snack time and the other three tasks, but there were reliable correlations between the rate of C–P intraverbal exchanges in free play and both the easy and difficult puzzle tasks, $rs(30) = .61, .58$, $ps < .001$, and between the two puzzle tasks, $r(30) = .44$, $p < .05$. In terms of P–C intraverbal exchanges, four of the six correlations were significant, snack time with free play, $r(30) = .40$, $p < .05$, and the difficult puzzle task with snack time, free play, and the easy puzzle task, $rs(30) = .50, .65, .64$, $ps < .01, .001, .001$, respectively. There was

substantial consistency within each dyad in the rate of P–C and C–P intraverbal exchanges over the four tasks. Next, we looked at the relationships between the total rate of intraverbal exchanges during each task and found reliable correlations for snack time with free play and with the easy puzzle task, *r*s(30) = .36, .44, *p*s < .05, respectively, for free play with both the easy puzzle task and the difficult puzzle task, *r*s(30) = .52, .60, *p*s < .01, .001, respectively, and between the two puzzle tasks, *r*(30) = .56, *p* < .01.

Next, we measured the correlation between rate of P–C intraverbal exchanges and rate of C–P intraverbal exchanges during each task to see whether there was a relationship within each dyad. Three of the four tasks yielded significant correlations between rate of C–P intraverbal exchanges and rate of P–C intraverbal exchanges: free play, the easy puzzle task, and the difficult puzzle task, *r*s(30) = .50, .45, .46, *p*s < .01, .05, .01, respectively.

MRO

The relationship of MRO between tasks for dyads was consistent in that five of the six between-task correlations were significant. The correlations were snack time with free play, *r*(30) = .70, *p* < .001, snack time with the difficult puzzle task, *r*(30) = .40, *p* < .05, free play with the easy puzzle task, *r*(30) = .60, *p* < .001, free play with the difficult puzzle task, *r*(30) = .62, *p* < .001, and between the two puzzle tasks, *r*(30) = .59, *p* < .001.

Dyadic Reciprocity

The relationship of dyadic reciprocity between tasks showed significant correlations for snack time with the difficult puzzle task, *r*(30) = .46, *p* < .01, free play with the easy puzzle task, *r*(30) = .47, *p* < .01, and between the two puzzle tasks, *r*(30) = .38, *p* < .05.

Relationships Among Intraverbal Exchanges, MRO, and Dyadic Reciprocity

The correlations between the rates of intraverbal exchanges, MRO, and dyadic reciprocity were calculated for each task. Table 2 shows that rate of intraverbal exchanges was correlated to each of the more complex measures on all but one task, MRO during the easy puzzle task. Overall, the rate of intraverbal exchanges was more strongly correlated with dyadic reciprocity. The totals of all tasks indicated that intraverbal exchange rate predicted about 31% of the variance of the MRO measure and about 72% of the dyadic reciprocity measure. The MRO and dyadic reciprocity measures were also related to each other with about 59% shared variance.

Amount of Time Speaking

The amount of time parents and children spent speaking was not related, *r*(30) = .24, *ns*. However, parent speaking time was related to snack time MRO and snack time dyadic reciprocity, *r*(30) = .39, .50, *p*s < .05, .01, respectively. Likewise, child speaking time was correlated with snack time MRO and snack time dyadic reciprocity, *r*s(30) = .54, .39, *p*s < .01, .05, respectively.

Verbal Expressions of Affect

Verbal expressions of affect were measured simply by counting the number of affective content words spoken within each dyad. The correlation between parent affect statements and child affect statements was *r*(30) = .59, *p* < .01. We also looked at the correlations between the number of parent affect statements and rate of intraverbal exchanges, MRO, and dyadic reciprocity, which were *r*s(30) = .47, .37, .49, *p*s < .01, .05, .01, respectively. The correlations between the number of child affect statements and rate of intraverbal exchanges, MRO, and dyadic reciprocity produced only one significant relationship, with rate of intraverbal exchange, *r*(30) = .41, *p* < .05. The correlations between number of child affect statements with MRO and dyadic reciprocity were *r*(30) = .22, .32, *ns*, respectively.

Table 2
Correlations Between Rate of Intraverbal Exchanges, Mutual Responsive Orientation (MRO), and Dyadic Reciprocity

Measure	1	2	3	*M*	*SD*
Snack					
1 Intraverbal rate	-----	0.55**	0.58***	4.69	1.37
2 MRO			0.70***	3.70	1.03
3 Dyadic reciprocity			-----	3.29	0.78
Free play					
1 Intraverbal rate	-----	0.52**	0.52**	4.14	1.39
2 MRO			0.32	3.56	0.93
3 Dyadic reciprocity			-----	3.33	0.83
Easy puzzle					
1 Intraverbal rate	-----	0.34	0.59***	3.59	1.60
2 MRO			0.55**	3.48	0.94
3 Dyadic reciprocity			-----	3.19	0.79
Difficult puzzle					
1 Intraverbal rate	------	0.39*	0.68***	3.26	1.15
2 MRO			0.53**	3.37	1.04
3 Dyadic reciprocity			-----	3.04	0.90
Totals					
1 Intraverbal rate	-----	0.56**	0.85***		
2 MRO			0.77***		
3 Dyadic reciprocity			-----		

Note. $N = 30$.
*$p < .05$, two-tailed. **$p < .01$, two-tailed. ***$p < .001$, two-tailed.

Relationship Between Intraverbal Exchanges and Self-Report Measures

Although we used the PSI–SP and PCRI to define our sample, we did look at the relationships between intraverbal exchange rates and these measures. Interestingly, the average rate of intraverbal exchanges was correlated with the PSI–SP Child Domain scores, $r(30) = -0.39$, $p < .05$, but not the Parent Domain scores, $r(30) = .01$, *ns*. As for the PCRI, average rate of intraverbal exchanges was correlated with only one scale, Satisfaction, $r(30) = .45$, $p < .05$.

Discussion

Developmental research has produced an extensive repertoire of constructs referring to the quality of parent–child relationships. Despite the recent increasing attention given to the role of biological mechanisms in the research on socialization and attachment processes, the domain of parent–child relationships and their importance in development has held firm based on the strength of empirically derived concepts supported by an impressive array of experimental data. Procedures to investigate such constructs, including the number of factors embedded in a given measure as well as their behavioral coding schemes, however, have led to a level of complexity that seems to distance them from practical use. Furthermore, the extensive training required to reach interrater reliability agreement appears to isolate the various laboratories according to their own operational definitions and, in turn, impede collaboration between different theoretical positions. The main objective of the present research was to introduce a simple and reliable behavioral

verbal measure that can contribute to the understanding of a dyadic quality between parent and child, and further extend its use to parent training. The results of the study indicate that the intraverbal exchange can be used as a straightforward assessment tool to describe measures such as MRO and synchrony, measured as dyadic reciprocity.

Specifically, the rate of intraverbal exchanges in the current study was strongly correlated with MRO and dyadic reciprocity scores across a range of structured and unstructured parent–child interactions. This trend held through all observations, except for the easy puzzle task, where the intraverbal exchange correlation with MRO did, however, approach significance ($p < .10$), perhaps because the child was controlled by the reinforcement effects of being able to do the easy puzzle task. Our intraverbal exchange measure, which was reliably trained in less than 10% of the time needed to train coders for MRO or dyadic reciprocity, thus served as a good and quick assessment of the dynamic flow between parent and child. There was also substantial consistency in the rate of intraverbal exchanges within each dyad over four observations; only one relationship, between snack time and the difficult puzzle task, did not yield a significant correlation. This could be explained by the nature of the task demand and structure of these two very different laboratory situations. For the most part, therefore, parents and children tended to be consistent in the quantity of their verbal interactions, in that dyads that spoke and responded often to each other did so across all tasks. Within each task, there was a relationship between the rate of C–Ps and the rate of P–Cs, except during snack time. Since snack time was unstructured and involved eating, in many cases one or the other member of the dyad spoke more often, as opposed to free play and both puzzle tasks, wherein dyads had more opportunities for a balanced and reciprocal conversational interaction.

During snack time, we also recorded the total amount of time each member of the dyad spoke. While this measure was naturally related to rate of intraverbal exchange, we wanted to see if this measure would be related to MRO and dyadic reciprocity. Indeed, both measures were correlated with the amount of time both parents and children spoke. Hence, although MRO and dyadic reciprocity assess many specific factors, such as cooperation and shared attention, both constructs seemed to be directly related to the total amount of verbal interaction within parent and child dyads.

In addition, because both MRO and dyadic reciprocity emphasize shared emotions, in each task we also counted verbal expressions of affect, as a pilot measure, regardless of its function. We found that the number of parent affect statements correlated with the number of child affect statements, and, for parents, the number of affect statements correlated with both MRO and dyadic reciprocity. Since our study did not evaluate nonvocal expressions of affect, nor did it categorize the affect statements according to their positive or negative valence (Hart & Risley, 1995), these findings should be interpreted cautiously, especially in regard to the number of child affect statements not correlating with the two quality-focused measures of parent–child relationships.

To support our behavioral measures, we assessed both the mothers' appraisal of their relationships with their children and current stressors that could impact their parenting and, in turn, parent–child interactions. The PCRI scores indicated that the mothers in our study viewed their relationships with their children positively. They reported high involvement in their children's lives and stated strong empathy and elevated interest in parent–child communication. It should be noted that even with this highly homogeneous sample of reportedly involved parents, the rate of intraverbal exchanges discriminated both the levels of MRO and dyadic reciprocity. The PSI–SP scores showed little stress in both the child and parent domains, suggesting that these mothers viewed their own children and parenting as contributing very little to their overall stress. The mothers, however, scored extremely high on the overall "everyday" life stress indicator, suggesting that they felt taxed and pressured by the demands of day-to-day, 21st-century urban living. The mothers in our sample further indicated their own health- and spouse-related issues as two major sources of pressure influencing their parenting. The relationship between the scales of the PCRI and the PSI–SP clearly demonstrated that higher PCRI scores indicated lower total

stress on the PSI–SP. Specifically, high scores for having strong emotional support from others and for being interested in developing autonomy for the child were related to less stress in the Parent Domain. On the other hand, high scores on the ability to discipline (limit setting) were correlated to lower stress scores in the Child Domain. With regard to verbal behavior, the rate of intraverbal exchanges was inversely related to the PSI–SP Child Domain scores and was positively correlated with reported parental satisfaction. Future research may explore why parent–child verbal exchange rate is related to the degree to which a mother attributes her stress to her child.

Increasing evidence from within cognitive neuroscience emphasizes that the speaker–listener context controls many of the details of language, especially emotion communication (Stephens, Silbert, & Hasson, 2010). For example, Goldstein, King, and West (2003) demonstrated how the pattern of social interactions between parents and their 8-month-olds, which shaped babbling, was similar to those used by mother birds teaching specific songs to their offspring. This back-and-forth nature of verbal interaction appears to have a global validity in the development of socialization and communication even beyond human relations. Cognitive linguists such as Garrod and Pickering (2004) have posited that conversation is easier for the brain than monologue; they emphasize that interlocutors (conversation partners) rapidly align to each other in content and context. These studies clearly imply that our biology is organized toward an interaction system between a speaker and a listener through which socialization processes occur. Similarly, Dale and Spivey (2006), using statistical linguistic analysis of grammatical recurrence, constructed a model of syntactic coordination between parent and child that is based upon the intraverbal exchange concept. Finally, there is evidence that suggests that rate of discourse between a parent and child, a concept similar to the intraverbal exchange, influences various critical developmental constructs such as attachment, security, and conscience (Laible & Thompson, 2000; Ontai & Thompson, 2002, 2008; Welch-Ross, 1997). This emphasis on speaker–listener context suggests that the behavior analytic approach, which has been criticized as sterile and experimental, might be helpful in assessing and studying the development of the most human aspects of socialization, such as attachment and responsiveness.

Ironically, the strength of utilizing the intraverbal exchange—its simplicity in teaching and using—also reflects its greatest limitation. In other words, the intraverbal exchange could be seen as an oversimplification of the complexity of the parent–child verbal interaction. We suggest that this potential critique of the intraverbal exchange needs to be considered in light of its practical usefulness and its potential as a foundational unit upon which complexity can be built. Our results indicated that teaching the intraverbal-exchange coding system and establishing good interrater reliability developed more rapidly in comparison with MRO and dyadic reciprocity. This finding perhaps validates the utility of such a behavioral concept, as its operational definition relies on a more quantifiable and tangible nature of its assessment criteria. One reservation is that we focused only on vocal intraverbal exchanges. Clearly for younger children, an appropriate assessment scheme would necessarily include nonvocal behavior that identifies the specific aspects of gestures and facial expressions between a parent and child (Lodhi & Greer, 1989). Recently, developmental researchers have also emphasized the need to devise a parent–child relationship measurement system that reflects the continuum of dyadic interactions, from relatively nonvocal exchanges in infancy to increasingly vocal behavior that considers other factors, such as affect expression and reviewing past shared experience (Crystal, 2006; Greer, 2008; Kochanska, 2002). Perhaps the intraverbal exchange relation can serve as a core dyadic construct of relationships as they evolve from a basic echoic and nonvocal format to more complex cognitive exchanges. In addition, the parent sample included in our study represented a high socioeconomic urban population with healthy children under comfortable laboratory conditions. In one regard, this is clearly a shortcoming of our research. Furthermore, being limited in age range and relatively homogeneous in terms of parent–child relationship, our small sample does not allow us to generalize our findings. On the other hand, we believe that since the intraverbal exchange demonstrated good correspondence with both MRO and dyadic reciprocity in this limited sample, there is cause to suggest further research

with other, more heterogeneous groups. While not directly assessed, the fact that the dyads reflected good attachment from both MRO and dyadic reciprocity measures, as well as the parent self-reports, may explain why the strictly quantitative measure of intraverbal exchange accounted for so much of the seemingly qualitative measures. In addition, close examination of these two measures reveals that both are highly grounded in counting behaviors and specific action, in spite of the fact that they seem to be based on qualities of relationship.

By examining other levels of parent–child relationships, we may be able to assess if and wherein the quantity of verbal exchange becomes less potent and specific qualitative factors become more important in the socialization process. Although it is possible that high rates of intraverbal exchange could occur in dyads that were not mutually responsive (e.g., the child responding about the color of the sky to a question about school), we suspect this is not the case; further research will bear this out. Perhaps by expanding the analysis to include the rates of individual parent and child responses, as well as the ratio to both P–C and C–P exchanges, while developing the means of assessing the quality of verbal exchanges, we can further explore the role of verbal behavior in attachment and socialization. This suggests that further, specific analysis, such as identifying subclasses of intraverbal exchanges, both vocal and nonvocal (Chase, Johnson, & Sulzer-Azaroff, 1985), and including the difference between solo tacts, sequelics, and conversational units (Greer & Ross, 2008), may lead to the integration of operant nomenclature with developmental psychology. The relevance of such integration, perhaps utilizing operants such as the tact to operationalize developmental concepts that are cognitive in nature, such as the *internal working model* used by attachment theorists, is to bring forth paradigms that can be incorporated in functional analyses that lead to direct intervention strategies to improve, facilitate, and perhaps even remediate secure attachment. For example, Laible and Thompson (2000) found that securely attached children scored higher in appraisal of other children's spontaneous emotions and interpreting unusual emotional reactions given by puppets during a story. They found that by coding aspects of mother–child communication (e.g., frequency of reference to emotion, frequency of the description of causes and outcomes of emotions, linking emotions to everyday situations, and frequency of maternal requests for information from the child about emotions) they could predict secure attachment and greater affective perspective in the children two years later (Ontai & Thompson, 2002). Close inspection of their work reveals that behavioral concepts such as the mand, tact, and autoclitic can be directly applied to their analyses, making it possible to reframe these cognitive-emotional developmental concepts into operant terminology. In Hart and Risley's (1995) extensive longitudinal study, where complex verbal exchanges were analyzed between parents and children to investigate cognitive and language development, the frequency of verbal exchanges alone accounted for much of the differences. Perhaps starting with a parsimonious verbal concept such as intraverbal exchange and then building our understanding of socialization processes around it may revamp the direction of attachment and socialization theories.

A number of behavior analysts (Dymond, O'Hora, Whelan, & O'Donovan, 2006; Greer, 2008; Leigland, 2007; Sautter & LeBlanc, 2006; Schlinger, 2008) have recently focused on the fact that verbal behavior still holds promise after 50 plus years; however, its scarcity in developmental psychology, especially in theories of attachment and socialization, is palpable. The present study was designed to introduce a unit of interaction that may contribute to applying behavioral concepts to cognitive-emotional components of parent–child communication and relationships. We hoped that by demonstrating the simplicity of the intraverbal-exchange measurement with such a sample, we could expand the utility of a behavioral approach, which has been neglected in the area of attachment and socialization, and further establish the intraverbal exchange as a valuable principle for parent training, not only for specific clinical groups with social skills and language deficits, but also for general parent-training models designed to improve attachment and enhance parent–child intimacy. It is one thing to communicate with parents about the complex components of constructs such as MRO and synchrony to help them understand what constitutes a healthy relationship with their children and another to simply describe and define an

exchange where one initiates a verbal response to which the other responds. This simple back-and-forth flow in communication can easily be taught to parents. By being able to monitor their verbal exchanges, parents are more likely to be able to improve communication with their children. We are by no means suggesting that all it takes to have a healthy relationship is simply verbal exchange. The content and affect of what is being said or expressed during these interactions are of course vital components of any relationship. The intraverbal exchange, however, can be used as a starting point. Perhaps colored by our own theoretical orientation, we are always seeking a bridge between laboratory contexts and their practical implications in real-life settings. With this introduction of the concept of intraverbal exchange to the socialization literature, we aspire to follow Skinner's (1957) mandate to study the underlining mechanisms of any behavior, including verbal, beyond the laboratory in order to find its utility in improving human relations.

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