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PRECURSORS TO SOCIAL INFORMATION PROCESSING

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The way children process information about social interactions plays an important role in how children feel about, understand, and behave in social situations. Social information processing skills have been associated with children's social competence. Aggressive and peer-rejected children exhibit deficits in social information processing and are more likely to show a hostile attributional bias when interpreting social situations. The purpose of this study is to explore the development of biased social information processing in early childhood by identifying early childhood precursors to later social information processing. Few studies have addressed the developmental roots of social information processing deficits in the early childhood period.

**Social Information Processing**

**The Crick and Dodge Model**

The theoretical framework of the social information processing model explains how children process information about social situations and how this processing influences children's social behavior. Crick and Dodge (1994) propose that children unconsciously and automatically follow a sequential pattern of six processing steps as they engage in social interactions. These steps are 1) encoding social and situational cues 2) interpretation of those cues 3) selection of a goal 4) searching through possible responses 5) deciding on a response and 6) conducting the response. Although these steps are described in a linear sequence, actual processing occurs almost simultaneously.

This process begins with encoding and interpreting cues from the social situation. In the first step, children search, receive, and encode social cues from the situation using their sensory processes. Children focus on those situational cues that seem most relevant to the current situation. After the cues are encoded, children form mental representations
of these cues in step 2. Children enter into this step equipped with a database of past social experiences, relevant knowledge, and biological capabilities, which they draw upon to search for a possible interpretation or meaning of the perceived cues.

In step 3, children form and use goals when dealing with a social situation. These goals may be revised or new ones could be created in response to new social stimuli. Goals are defined by Crick and Dodge as focused arousal states which are used to get a desired outcome and may be internal (e.g., regulating feelings and emotions) or external (e.g., getting a desired external outcome). Goals are influenced by a child’s feelings, temperament, adult instruction, cultural norms, and the media.

After a situational goal has been set, children must search for and retrieve an array of possible behavioral responses from their memory bank during step 4. The number of responses retrieved and the content of those responses are significant to distinguishing between maladaptive and competent behavioral responses.

In step 5, children evaluate their responses and select the most positively evaluated response. This step is a complex cognitive process that includes accessing possible consequences to each response. The content of each response, the child’s outcome expectations, and the child’s personal self-efficacy to perform each response influence their response decisions. Finally, the selected behavioral response is carried out in step 6.

Deficits in Social Information Processing

In the social information processing model processing inconsistencies or errors cause aggressive behaviors and not the social situation itself. Maladaptive behaviors can
result due to processing biases at one or more of the six social information processing steps (Dodge, 1986).

Aggressive children have poor encoding and interpreting patterns. During the first two steps of the social information processing sequence, maladjusted children have a difficult time recalling all relevant social cues and instead attend specifically to aggressive social cues. Maladjustment during steps one and two can also be caused by deficits in memory that make it difficult to store and retrieve social information. In addition, aggressive children may select more aggressive cues to attend to or have well-developed schemas that block their ability to encode and interpret the immediate social situation (Crick & Dodge, 1994). In step one, aggressive children use fewer external cues and rely more on their own internal stereotypes that have been developed from their past social experiences (Coie & Dodge, 1998).

During step two, aggressive children may react to social situations by interpreting others' intentions as hostile even though the situation is ambiguous. For example, when presented with a situation appearing that a peer had knocked over a tower of blocks, a maladjusted child may immediately attribute this event as purposeful instead of accidental. This is called hostile attributional bias and is recognized as an integral component in the cause and maintenance of aggressive behavior in children (Dodge, 1980).

Children with this hostile attributional bias respond to perceived or imagined hostility with aggressive actions (Staub, 1999). For children who have a difficult time interpreting ambiguous social stimuli, aggressive behaviors are simply defenses against a perceived threat (Crick & Dodge, 1996). During step 4, aggressive children typically
generate a smaller number of responses than do non-aggressive children and these responses are more aggressive in nature (Dodge, 1986). While evaluating and selecting a response in step 5, aggressive children will likely evaluate aggressive behavior more positively than non-aggressive children. Aggressive children will also be more impulsive and select the first response that comes to mind with little or no evaluation (Coie & Dodge, 1998). Finally, response enactment is dependent upon motor and verbal skills. If a child is deficient in competent strategies, including being able to handle the situation verbally, then aggressive behavior may happen by default. Now that the child has carried out a maladaptive behavior, this hostile or aggressive social situation will now enter into the child’s database of social experiences waiting to be drawn upon in the next social situation (Parke & Slaby, 1983).
Possible Predictors of Social Information Processing

As young children experience new social situations and learn more about their social world, they are acquiring mental structures and interpretations of the world that will in time be the lens through which they process new social interactions. These early social interactions, both adaptive and maladaptive, will form the social memory database that future social information processing will draw from. When faced with a social encounter, children try to make sense of the situation by using existing memories of past social experiences as a reference. It is hypothesized that as children develop and mature cognitively, they will also be more skillful in their social information processing. However, with this maturity comes a stronger reliance on existing processing patterns and tendencies (Crick & Dodge, 1994). Therefore, if a young child has maladaptive patterns of social information processing, it is likely that this pattern will continue into adulthood.

Most research on social information processing thus far has been conducted with children between the ages of eight to ten. There is insufficient research in the area of social information processing in early childhood. Another area of social information processing research focuses on outcomes of maladaptive processing. Aggression and antisocial behavior, peer rejection, and prosocial behaviors have been outcomes found to be linked with maladaptive and competent social information processing.

In this study, however, early predictive factors will be explored which will give insight to the development of social information processing. Understanding early signs of maladaptive social information processing will assist researchers, clinicians, counselors, and teachers to predict children’s potential social adjustment difficulties.
This study will address four possible precursors of social information processing: aggression, maternal positive affect, maternal social and emotional cognitive mediation, and infant cognitive development.

**Aggression and Social Information Processing**

Aggressive behavior is a highly stable individual characteristic and the early onset of aggression and conduct problems is a risk factor for a sequence of negative developmental consequences (Patterson, DeBaryshe, & Ramsey, 1989). Consistent and high levels of aggression negatively affect children’s social relations, academic motivation, and school success (Schwartz, 1999). Antisocial, aggressive youth typically associate with other antisocial peers (Cairns & Cairns, 1991), which places these youth at elevated risk for early drug and alcohol abuse, sexual risk-taking behavior, and committing violent crimes (Lennings, Copeland, & Howard, 2003). Early childhood aggression is a strong predictor of adolescent and adult aggression and violence (Huesmann, Moise-Titus, Podolski, & Eron, 2003). Aggression reported in children at age 8 can predict criminal behavior, alcohol abuse, and self-reported aggression at age 26 (Puikkinen & Pitkanen, 1993). This level of continuity has led to an interest in prevention efforts that start in the early childhood and early elementary school periods. For example, the American Psychological Association (APA) in conjunction with the National Association for the Education of Young Children (NAEYC) have developed ACT (Adults and Children Together) Against Violence for all children ages 0 – 8 (American Psychological Association & National Association for the Education of young children, 2002) and the Fast Track intervention program for at-risk children grades 1 through 10 (Conduct Problems Prevention Research Group, 2002).
Children with externalizing behavioral problems have been shown to have less effective social information processing awareness. A study examining social competence differences between a group of oppositional defiant disorder children and a group of typically developing children found that young children with behavior problems have fewer positive social skills and more deficits in their awareness and interpretations of social cues (Webster-Stratton & Lindsay, 1999). In addition, aggressive children have been found to retrieve more aggressive responses than non-aggressive children (Richard & Dodge, 1982), are more likely to see aggressive behaviors as favorable, and expect a more favorable outcome from an aggressive behavior than their peers (Crick & Dodge, 1994). Aggressive behavior was also found to be linked to high levels of hostile attribution of intent (Orobio de Castro, Veerman, Koops, Bosch, & Monshouwer, 2002).

Another destructive result of aggression is peer rejection. Children who exhibit excessive and inappropriate aggressive behavior are more disliked by their peers and are at a much higher risk of being rejected. Dodge (1981) (as cited in Parke & Slaby, 1983) placed groups of unfamiliar children together for eight separate play sessions and found that children who were physically and verbally aggressive and hostile within the play sessions were rejected by the group.

Peer rejected children have a difficult time regulating emotion, solving social problem tasks, and encoding and interpreting cues from peers; skills which are typically developed through interactions with peers (Dodge, et al, 2003). Because the opportunities for learning positive social skills through peer interaction is decreased, children who are rejected by their peers may have limited knowledge of socially acceptable behavior.
(Parke & Slaby, 1983) and may have a more maladaptive pattern of social information processing than socially accepted children. (Dodge, et. al, 2003).

Although research on aggression is very abundant, research has not shown if aggression at an early age can create a pattern of behaviors that assist in the development of maladaptive social information processing. This study will use two important and distinct measures of aggression as possible predictors of social information processing; a general measure of conduct disorder tendencies and a measure of aggression specifically directed to peers during social interactions. These two measures will show a more comprehensive picture of aggression by illustrating differences between general aggression and aggression in peer interactions.

It was hypothesized that early aggression, both general and directed towards peers, will be an early indicator or predictor of maladaptive social information processing, and therefore result in lower levels of social information processing.

**Maternal Affect and Social Information Processing**

The amount of positive affect felt between mother and child can influence a child’s behaviors. Parental warmth helps to establish and maintain positive moods in both parent and child and it assists in the development and maintenance of a warm mutual relationship. When parents and children are in a positive mood, they both become more concerned about the needs of the other, and children become more willing to comply and accept parental guidance (Maccoby & Martin, 1983).

A mother’s positive affect has been shown to have a negative relationship with aggressive behaviors at different age groups. Infants as young as 3 months of age have been shown to respond to their mother’s positive affect. Three month old infants who
had mothers with high positive affect were found to mirror that affect and had higher levels of prosocial behaviors, as measured by smiles and cooing. Mothers’ positive affect was measured by maintaining their child’s attention and engaging their child, expressions of warm sensitivity in response to infant cues, and imitating infant social cues such as smiles and vocalizations (Legerstee & Varghese, 2001).

At 1 year of age, maternal unresponsiveness was found to be a variable linked to externalizing aggressive behaviors in boys at both 2 and 3 years of age (Shaw, Keenan, & Vondra, 1994). Another longitudinal study found maternal warmth at age 4 to be negatively related to aggressive behaviors at age 8 (Booth, Rose-Krasnor, McKinnon, and Rubin, 1994).

Positive affect also shows negative relationships with aggression in concurrent studies. Five-and six-year-old boys and girls both showed negative relationships between maternal positive affect and concurrent externalizing problems (Bates & Bayles, 1988). Older children’s social processing styles were also affected by their mother’s positive affect. Ten-year-old children who experienced more positive maternal interactions concurrently had more adaptive social information processing styles and less aggressive behavioral response strategies (Criss, Shaw, & Ingoldsby, 2003).

Negative affect manifested in harsh, unresponsive, and negative parenting will result in more aggressive behaviors. Antisocial behavior in both boys and girls were found in children who came from negative family environments in which there was angry and aversive behaviors and interactions between family members (Compton, Snyder, Schrepferman, Bank, & Shortt, 2003; Kilgore, Snyder & Lentz, 2000). Harsh physical discipline of young children can result in more aggressive behaviors and more
maladaptive social information processing pattern years later, even after controlling for SES, child temperament and marital violence (Weiss, Dodge, Bates, & Pettit, 1992).

Research thus far shows a negative relationship between positive affect and maladaptive behaviors. More research is needed, however, to find a relationship between a mother's affect towards her child and subsequent social information processing in the preschool and early childhood age ranges.

In this study, it is hypothesized that the quality of maternal warmth and affect given by mother and received by child will be positively related with positive social information processing and negatively related with attributional bias.

Maternal Social and Emotional Cognitive Mediation and Social Information Processing

Children grow and learn within the context of their environment. An important part of that learning environment is parent mediation. Mediation happens when parents guide, support, and tutor their children both verbally and non-verbally to help them learn or acquire something. Through repeated quality interactions, a mother or father can assist in the cognitive development of their child by generating experiences that challenge the child to plan and problem solve. Parents use a variety of techniques to mediate cognitive skills with their children, including asking and answering questions, teaching the child about objects or events, demonstrating how things work, motivating, correcting errors, and managing the child and his or her environment (NICHD, 1998).

This study will explore the amount of cognitive mediation a mother gives to her child specific to their social and emotional world. It is hypothesized that more maternal cognitive mediation in the social and emotional contexts will result in higher levels of competence in social information processing.
Social Mediation

Children who have prosocial behaviors are generally well accepted amongst their peers, cooperate easily with others, and act as constructive leaders. They are helpful, friendly, and have a good sense of humor (Erdley & Asher, 1999). Conversely, children with maladaptive behaviors have difficulties in forming and maintaining social relationships with both parents and peers and lack basic social skills (Webster-Stratton & Lindsay, 1999).

Prosocial skills in children may be an indicator of higher levels of social information processing. Peer and teacher observed measures of socially competent behaviors in children grades 1-3, correlated significantly with concurrent social information processing (Dodge & Price, 1994). This is likely because as children interact with others, they first have to encode and interpret social cues using relevant social knowledge acquired through previous experiences (Crick & Dodge, 1994). Because we know that young children can have difficulties in social situations, a mother who scaffolds and models social rules and cues helps to build a database of positive social knowledge and experiences for her child to draw upon in later peer interactions.

Prosocial skills are acquired by children through observation and mediation. Lessons about conventional social behavior, such as greetings and manners, labeling social relationships and events, and discussing different social roles all help to mediate a child’s social skills. This mediation can be in the form of a discussion, a lesson, or even pretend play. For example, when a mother pretends to be a customer in a store and the child is the cashier. By role playing, the mother is teaching or mediating social roles in
their environment by showing the child what is expected of a customer and how that customer interacts with the cashier.

This study will explore the amount of social mediation a mother gives to her child during interactions. It is hypothesized that early maternal social mediation will result in more positive child social information processing.

*Emotional Mediation*

It has been proposed that emotion processes are an integral and inseparable part of the social information processing model. In Crick and Dodge’s (1994) reformulated model of social information processing, they propose that because thinking and feeling go hand in hand, emotions are an important part of each social information processing step. The intensity of the emotion being experienced, the ability to regulate emotions, and the child’s affect and mood can all have an effect on a child during each social information processing step (Lemerise & Arsenio, 2000). For example, emotional and affective cues must be interpreted along with other situational cues in steps 1 and 2. In addition, the nature of the emotional relationship between peers will also affect behaviors because a child will be less likely to have a maladaptive goal towards a friend.

Emotional competence at 3 and 4 years of age can predict social competence concurrently and two years later. Emotional competence, measured through observations of displayed emotions, understanding of emotions, and reactions to peer’s emotions, made significant contributions to teacher and peer reports of social competence in preschool and kindergarten (Denham, Blair, DeMulder, Levitas, Sawyer, Auerbach-Major, & Queenan, 2003). Conversely, negative emotionality was found to be a strong predictor of low levels of social competence at all age groups in a longitudinal study.
involving students from ages 4 – 10 (Eisenberg, Fabes, Shepard, Murphy, Guthrie, Jones, Friedman, Poulin, & Maszk, 1997).

Emotions of anger and depression have also been shown to hinder emotional and social understanding. Seven- to ten-year-olds who demonstrate higher aggressive behavior have more intense and more frequent expressions of anger and a less effective and sophisticated method of understanding that emotion (Bohnert, 2003). Additionally, children who exhibit both aggression and depression show a hostile attributional bias, as compared to children who do not exhibit aggression and depression (Quiggle, Gerber, Panak, & Dodge, 1992).

In this study, the amount of emotional modeling a mother gives her child during interactions will be explored. It is hypothesized that more emotional modeling will result in higher emotional competence and therefore higher social information processing.

**Infant Cognitive Development and Social Information Processing**

A child's level of intelligence has been found to correlate significantly with social and emotional competence. For example, a study of preschool aged children found that children with high standardized intelligence scores scored higher on tests of social-emotional competence measuring self-confidence, autonomy, quality of social interactions, and coping techniques (Brar, 1992). Even as early as 8 months of age, sociability was found to be linked to cognitive performance. Infants who responded more socially to their mother and the examiner were found to have higher cognitive scores measured using the Bayley Scales of Infant Development (Lamb, Garn, & Keating, 1981).
Perspective taking is a sociocognitive skill that has been theorized to be a cognitive predictor of prosocial behaviors in children (Radke-Yarrow, Zahn-Waxler, & Chapman, 1983). Perspective taking is the ability to use cognitive processes, such as accessing stored social scripts, using theories, or making deductions, to gain knowledge about others' internal states. Children with this ability are able to take another person's perspective visually, affectively, and cognitively and are better able to identify, understand, empathize, and sympathize with others' emotions (Eisenberg & Fabes, 1998). Because of these abilities, children with competent perspective taking skills also have more prosocial skills (Buckley, Siegel, & Ness, 1979). Underlying cognitive abilities assist children in perspective taking. Higher levels of mental processes are needed to do these cognitive tasks and therefore children with higher mental development will likely have better perspective taking. Perspective taking is a skill commonly associated with prosocial skills and cognitive ability, however, not much research has been conducted to find relationships between intelligence and perspective taking.

More research is needed in the important areas of mental development, specifically with respect to social cognitions. This study hypothesizes that a higher level of general mental development gives a child the ability and capacity to learn more complex ways of understanding emotions and correctly perceiving social situations, and subsequently a higher level of social competence and a lower level of hostile attribution of intent. Thus, it is hypothesized that general cognitive skills will be positively associated with later information processing skill.
Research Hypothesis

The research hypothesis for this study is that infant cognitive development, general aggression, aggression with peers, maternal emotional and social mediation, and maternal affect will be significant predictors of variance in attribution of intent and social problem solving and cognition.
Method

Participants

Data used in this study were from the National Institute of Child Health and Human Development Study of Early Child Care (SECC) (NICHD Early Child care Research Network, 1993). The SECC follows children from birth through adolescence. Data collection began in 1991 with a sample of 1,364 full-term, healthy children and their families. Phase I of the study continued until 1994, when the participants were turning 3. The nationwide sample included participants from 10 different major regions across the United States. Although a diverse sample was taken from the East Coast, the West Coast, the Mid-West, the North and the South, the majority of the sample, 80%, were from white families. In 1991, the mean age of the mothers was 28 years.

Phase II of the study was conducted between 1995 and 2000 and followed 1,226 of the same children from age 3 through their second year in school. Of the Phase II participants, most of the mothers had graduated from high school, with 69% having some level of college education and 56.6% working outside the home. Only 2.4% of the fathers did not work and 85% of them lived with the child’s mother. Sixty eight percent of the families answered that they were not receiving public assistance and/or food stamps; however, 27.4% of the families did not answer this question.

Measures

The measures used were those included in the SECC database that best matched the theoretical constructs of interest. In each case, the selected measures were scale scores or composite variables developed by the SECC research team. Psychometric information reported on these scale scores are based on the SECC sample.
General Aggression

The measure of general aggression was derived from maternal report on the Child Behavior Checklist (CBCL) (NICHD Early Child care Research Network, 1999). Mothers rated their child on 100 items describing their child’s behavior within the last two months. Responses were on a likert scale as follows; 2) Very true or often true, 1) somewhat or sometimes true, and 0) not true (as far as you know). The CBCL’s subscales had good test-retest reliability (p<.001; \( r = .71 - .93 \)) and stability coefficients were significant over a one year period (NICHD, 1999). For this study, the Aggressive Behavior subscale score (Mom) (BAGRSM36), which was collected when the child was 36 months of age, was used. The skewness (0.42) and kurtosis (-0.03) were normal. The standard deviation for this variable was 5.03. (NICHD Study of Early Child Care, 1996).

Aggression with Peers

Aggression with peers was an observational measure obtained at 36 months. The peer observation coding form was created for the NICHD Study and used to measure several aspects of children’s social competence with peers (NICHD Early Child Care Research Network, 2003). Each child was observed interacting with a familiar same sex peer in a three-part, structured play session totaling approximately 12 minutes. The children were given one magnadoodle for 4 minutes, a kitchen set for 5 minutes, and two flashlights (one working and one not working) for 3 minutes. Most observations were conducted in the child’s out-of-home childcare setting. For children who were not in childcare, observations were conducted at the study child’s home or the laboratory playroom. Each family selected a peer to participate with their child in the observation task. The peer was required to be between 30 – 48 months of age, of the same gender as
study child, familiar with study child, and not a sibling or another participant in the study. Participants who could not find a peer were not included in this observation.

The hostile aggression variable (HSAGA036) derived from the peer observation protocol was used for this study. Observers used a 5-point likert scale ranging from 1 (none) to 5 (high) to rate the level of aggression exhibited during each of three play episodes. Hostile aggression was defined as negative or physical acts for no apparent reason that was clearly directed towards the peer. Typically, this aggression was accompanied by anger. A score of 1 indicated no observed aggression, 3 meant some aggression, possibly verbally demeaning or slight pushing or shoving. A score of 5 would indicate angry physical or verbal attacks on the peer. Internal consistency was moderate (alpha = .50). Standard deviation for this variable was 0.43, with a skewness of 3.24, which was within acceptable limits for this study. The kurtosis of 11.97, however, was high (NICHD Study of Early Child Care, 1996).

Maternal Affect

Maternal affect was derived from a semi-structured mother-child teaching task called the Three Boxes Procedure. This procedure was conducted in a laboratory setting when the child was 36 months of age. During this 15-minute task, mothers showed their children toys that were in three sequential color coded boxes. All mothers were given a standard set of instructions. An excerpt of these instructions is as follows: "This activity will take about 15 minutes. Please help your child play with the items in the three boxes in the way you would at home if you were able to spend 15 minutes of free time alone with your child. Have CHILD start with the red box and finish with the green box. You can divide the time as you like." (NICHD Early Child Care Research Network, 1993)
These interactions were videotaped and analyzed using rating scales adapted from Egeland and Heister (1993).

The play session included three boxes of toys, in which parents were instructed to help their children play with. Box 1 consisted of a box of 8 washable colored markers, a tablet of blank white paper, and 4 stencils (rabbit, penguin, dolphin, and elephant). Box 2 had dress up clothes including 1 pair of men’s shoes, 1 pair of women’s shoes, 1 flashy vest with glitter and gold, and 1 child sized cape. This box also had a pretend cash register and 8 pennies. The toys in box 3 were a set of duplo preschool building set along with a laminated color picture of a constructed model made from those blocks. Coding began when a toy was removed from the second box and ended after five minutes.

For this study, the felt security dyadic code variable (SECSIO36/COUT36) was used. This variable was designed to measure the warm affect given by the mother and the feeling of security felt by the child. Observers coded the interactions for mutuality of emotions and feelings of security between the mother and the child by paying special attention to verbal and non-verbal cues and feelings of emotion shared between the two.

Interactions were coded on a 7 point likert scale, ranging from 1 (Very Low) to 7 (Very High). A score of 1 indicated that there was underlying conflict and tension in the interaction and that mother and child were somewhat disconnected emotionally. A very high score of 7 indicated that emotion and communication flowed freely between mother and child and that experiences, smiles, and eye contact were frequently shared.

The felt security variable had a standard deviation of 1.34, a skewness of -1.08 and 1.24, which was appropriate for this analysis. (NICHD Study of Early Child Care, 1996)
Social and Emotional Cognitive Mediation

The mothers as mediators of cognitive development protocol used the same five minute three boxes procedure videotaped interaction that was explained previously. A coded system was used to record the way in which mothers teach cognitive contents and skills to their child during a 15 minute videotaped laboratory interaction session when the child is 36 months old. Mothers can use both verbal and nonverbal activities to teach cognitive skills to their children; such as asking and answering questions, teaching about objects, demonstrating how something works, motivating and supporting, correcting errors, and managing the environment. A coding system was applied to a 5 minute segment of the videotape that attempted to gather information about both how the parent imparted cognitive information as well as the content of that information.

Two scales relating to maternal mediation were used in this study -- Social/Role playing (MMMRPO36) and Emotional (MMMEMO36). The social role playing scale served as the measure of maternal social mediation. Social/Role playing was coded when the mother instructed the child about conventional social behavior, labeled things in the social world, or when the mother discussed social roles, attributes, and relationships. The emotional scale served as the measure of maternal emotional mediation. Emotional is coded when the mother labels or explains the emotional world to her child (NICHD Early child care Research Network, 1998).

This instrument had a low internal reliability (alpha=0.45). Other psychometric data was not available for this instrument.
Infant Cognitive Development

Cognitive development was measured when the child was 24 months of age, using the Bayley Scales of Infant Development (MDI) (NICHD Early Child Care Research Network, 1993). The Bayley scales of infant development evaluates a child's mental and motor developmental status. For the purposes of this study, the Bayley Mental Development Index 24 months (MDI24024) was used. This instrument was administered in a laboratory setting and uses blocks, stacking cubes, nesting cups, crayons, and pegs. Among other things, the toddler was asked to build, place, and stack blocks, place and sort pegs by color, discriminate and recall pictures and shapes, imitate strokes with crayons and paper, name colors, pictures, and objects, discriminate patterns and sizes, and attend to and respond to books. There was no data report on this instrument; therefore no psychometric information was available.

Social Problem Solving

Social problem solving was measured by the Social Problem Solving test (NICHD Early Child Care Research Network, 1995). The Social Problem Solving test measures the child's ability to process social situations. In this test, the child is presented with five different drawings and is read a corresponding short story of a situation in which the story character is trying to accomplish a goal. Three of these stories are about object acquisition (stories 1, 3, and 4) and two about friendship (stories 2 and 5). The child is then asked three questions: "1. What do you think (child in story) could say or do so that s/he could (obtain object, be friends with new child, etc.)? 2. If that didn't work, what else could (child in story) do or say? 3. What do you think YOU would do or say?". Responses are recorded verbatim and then coded into 22 quantitative categories.
For this study, the Socially Competent variable (SOCASC54) was used. This variable is a composite variable including the total number of prosocial categories, the average flexibility, and the total number of different categories for all stories. The prosocial categories for the object acquisition stories were ask, politeness, tell-prosocial, wait, fair share(turns, plan for future, and loan. For the friendship stories, the prosocial and complimentary category was used. The average amounts of novel solutions and different categories of solutions presented by the child in all five stories were also used to calculate this variable. This variable had good internal reliability (alpha = 0.83), a skewness of -0.49, and kurtosis of .25 (NICHD Study of Early Child Care, 1999).

**Attribution**

Attribution was measured at 54 months, using the Attribution Bias Questionnaire (NICHD Early Child Care Research Network, 2002). The attribution bias questionnaire is administered immediately after the social problem solving test and measures a child’s social cognition. The child is read four short scenarios without pictures and after each scenario is asked to select one of two attributions for each cartoon. The child may select an attribution with a hostile intent or one with a benign or ambiguous one. For example, “Did Nancy hit you in the back by accident or did Nancy want to hit you in the back?” There are both boy and girl versions of this test. In this study, the negative attributions variable (NATRBC54), which represents the number of negative attribution responses made by the child, was used. The Cronbach’s Alpha for this variable was .64, with a skewness of .13 and kurtosis of -1.20 (NICHD Study of Early Child Care, 1998).
Data Analysis

Descriptive statistics, correlational analyses, and multiple regression analyses using the six independent variables (infant cognitive development, mutual affect, general aggression, aggression with peers, social cognitive mediation, and emotional cognitive mediation) and two dependent variables (social competence and attribution) were conducted.
Results

Descriptive Statistics

Descriptive statistics for all study variables are shown in Table 1.

Table 1. Descriptive Statistics of All Variables

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<th>Variable</th>
<th>M</th>
<th>SD</th>
<th>Skew</th>
<th>Kurtosis</th>
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</thead>
<tbody>
<tr>
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<tr>
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<td>5.03</td>
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<td>-0.03</td>
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<tr>
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<td>5.25</td>
<td>1.34</td>
<td>-1.08</td>
<td>1.24</td>
</tr>
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<td>Aggression with Peers</td>
<td>1.16</td>
<td>0.33</td>
<td>2.51</td>
<td>6.49</td>
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<tr>
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<td>5.72</td>
<td>1.40</td>
<td>1.07</td>
</tr>
<tr>
<td>Emotional Cognitive Mediation</td>
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<td>0.31</td>
<td>6.00</td>
<td>46.3</td>
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<tr>
<td>Social Problem Solving</td>
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<td>2.40</td>
<td>-0.493</td>
<td>0.25</td>
</tr>
<tr>
<td>Attribution</td>
<td>4.70</td>
<td>2.04</td>
<td>-0.24</td>
<td>-0.070</td>
</tr>
</tbody>
</table>

Correlational Analyses

Correlational analyses were conducted on all of the variables to ensure that the independent variables were not too highly correlated with each other and to verify whether significant relationships existed between the independent variables and the dependent variables. Twelve out of twenty eight correlations (43%) were statistically significant; however, the strength of the correlations between the independent variables was not strong (see Table 2). The highest correlations were between maternal positive affect and infant cognitive development (.38), maternal positive affect and social cognitive mediation (.26) and social problem solving and infant cognitive development (.25). All three of these correlations were significant at the .01 level.
Table 2. Correlation Matrix of All Variables

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
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<tr>
<td>1. Infant Cognitive Development</td>
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<td>2. General Aggression</td>
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<td></td>
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</tr>
<tr>
<td>3. Maternal Affect</td>
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<td>-.18**</td>
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<td></td>
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</tr>
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<td>.04</td>
<td>-.11</td>
<td></td>
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<tr>
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<td>-.10**</td>
<td>.26**</td>
<td>-.01</td>
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<td>6. Emotional Cognitive Mediation</td>
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<td>.03</td>
<td>.03</td>
<td>.003</td>
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<td>7. Social Problem Solving</td>
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<td>.05</td>
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<td>.04</td>
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<td>-004</td>
<td>-.02</td>
<td>-.01</td>
<td>-.12**</td>
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</table>

** Correlation is significant at the 0.01 level (2-tailed).

Regression Analyses

Social Problem Solving

All six independent variables were entered into a simultaneous multiple regression equation to predict social problem solving. The equation was statistically significant, $F(6) = 6.70, \ p<.0010$ and explained a small but significant 8% of the variance in the dependent measure, $R^2 = .08$, adjusted $R^2 = .06$. Regression coefficients (see Table 3) show that infant cognitive development, maternal affect, and aggression with peers were significant independent contributors to the variance in the dependent variable at the .05 level, while social cognitive mediation, emotional cognitive mediation, and general aggression were not.
Table 3. Results of regression analysis to predict social problem-solving

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>B</th>
<th>SE</th>
<th>Standardized Beta</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mental Development</td>
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<td>.20</td>
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<tr>
<td>Maternal Affect</td>
<td>.22</td>
<td>.09</td>
<td>.11</td>
<td>.02</td>
</tr>
<tr>
<td>Aggression with peers</td>
<td>.67</td>
<td>.34</td>
<td>.09</td>
<td>.05</td>
</tr>
<tr>
<td>Social cognitive mediation</td>
<td>-.02</td>
<td>.02</td>
<td>-.04</td>
<td>.38</td>
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<tr>
<td>General Aggression</td>
<td>-.02</td>
<td>.02</td>
<td>-.04</td>
<td>.33</td>
</tr>
<tr>
<td>Emotional Cognitive mediation</td>
<td>.38</td>
<td>.36</td>
<td>.05</td>
<td>.29</td>
</tr>
</tbody>
</table>

**Attribution**

The second regression analysis was also a simultaneous model conducted with the same six independent variables; in this case, Attributions served as the dependent variable. The overall equation to predict attribution was statistically significant $F(6) = 2.90, p = .009$ and explained a small but significant 3% of the variance in the dependent measure $R^2 = .03$, adjusted $R^2 = .02$. Regression coefficients in table 4 show that infant cognitive development was a significant independent contributor to the variance in the dependent variable at the .05 level. Mothers’ social cognitive mediation made a marginally significant contribution ($p = .09$). However, the beta was .03, which is in the opposite direction of prediction.
Table 4. Results of regression analysis to predict attribution

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>B</th>
<th>SE</th>
<th>Standardized Beta</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infant Cognitive Development</td>
<td>-.02</td>
<td>.01</td>
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<td>.001</td>
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<td>Maternal Affect</td>
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<td>Aggression with peers</td>
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<td>Social cognitive mediation</td>
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<td>General Aggression</td>
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<td>.01</td>
<td>.85</td>
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<tr>
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<td>.31</td>
<td>-.01</td>
<td>.87</td>
</tr>
</tbody>
</table>
Discussion

This study explored the predictors of social information processing in young children. The results supported the initial expectation that there are statistically significant predictors to social information processing. Both the social problem solving and attribution regression models were statistically significant, although not all of the predictors contributed significant variance to the outcomes. Three out of the six independent variables (infant cognitive development, maternal affect, and aggression with peers) contributed statistically significant amounts of variance to the outcome of social information processing, as measured by social problem solving. Only infant cognitive development, however, contributed statistically significant amounts of variance to attribution.

Although it was predicted that infant cognitive development would have a significant relationship with social information processing, it was interesting to see that this variable was the only statistically significant individual predictor for both social problem solving and attribution.

A possible reason why cognitive development consistently predicted higher levels of social information processing in this study could be that social information processing is a highly cognitive process requiring higher levels of mental development. Young children with higher mental development may have more developed memories and can therefore store and retrieve more social situations and experiences in their memory banks for longer periods than their peers. Higher mental development may also assist in the
generation and evaluation of response strategies to social situations. All of these things have been said to contribute to higher levels of competent social information processing.

However, attempting to measure cognitive development in 2-year-olds can be complicated. A higher score on the Bayley Scales of Infant Development may actually mean that a child had better developed verbal skills, was more compliant, had a longer attention span, or was simply more mature. Verbal skills were indirectly measured when the young children were asked to name colors, pictures, and objects. Well developed verbal skills would assist children in carrying out more adaptive and competent behavioral strategies in social situations. Children with more competent verbal skills would be better able to express their feelings, emotions, and frustrations to peers, which may lead to more competent social information processing responses available for selection in steps four through six.

In this instrument, children were asked to do a variety of structured activities at an age where structured activities are challenging. The children who excelled in these activities could have been more compliant than their peers. However, simply because a child doesn’t want to sit down and do an activity doesn’t mean that he or she cannot. The scores on this instrument could have been measuring toddler compliance and/or attention span, not cognitive development. Finally, a child with higher cognitive development scores may have developed earlier than his or her peers and therefore has more mature social behaviors. However, would these children still have higher levels of social information processing at a later age, when their peers have caught up to them developmentally?
The relationship between cognitive development and social information processing is one that could use further exploration. Are children with higher cognitive development really more prone to competent social information processing? Would there be as significant a relationship when the children are older in age or is it something prevalent only in children very young? General intelligence has been found to be linked to more competent perspective taking and role taking, which is thought to contribute to prosocial behaviors. Future studies could investigate the relationships between perspective taking, role taking, and social information processing.

The weak relationship between general aggression and social information processing was unexpected. What was more interesting, however, was that the aggression with peers variable was a significant predictor in social problem solving but it was in the opposite direction of what was expected. Aggression with peers had a significant positive relationship with social problem solving. A possible reason for this anomaly could be that this variable was actually measuring something other than aggression with peers, such as assertiveness versus shyness in a social situation. The mean score for this variable was 1.19 and although the maximum score for the measure was 5, the maximum score in the data set was only 3. More than half of the children scored at 1 (no aggression). This indicates that all participants were only mildly aggressive to not aggressive at all towards peers. There could be also be a disparity on what a child says he or she would do when given a scenario and what that child actually does when confronted in a similar situation. The child may be simply trying to give the “right” answer to the tester.
Finally, the unexpected results could simply be a poor instrument. Participants had to select their own peer, which eliminated more than half of the participants. This also makes the relationship between the two peers one of close friendship, which may make aggression towards each other less likely. Additionally, the observation was for a very short period of time, which did not allow for much conflict to occur. As a result, it is likely that there was restricted range on the peer aggression measure, which could result in an obtained correlation that under-estimated the actual population-level association between aggression and SIP. Future studies should further explore early peer relationships and the contribution it has on social problem solving but should find a more accurate instrument to measure aggression with peers. Observations of study children could be made for longer periods and include more than one peer, which could give more accurate information on peer aggression. Teacher and parent observations and questionnaires about their view of the study child’s aggression towards peers could provide additional information.

Another puzzling finding was that the two variables of social and emotional cognitive mediation did not contribute any significant variance in explaining the dependent measures. Although this finding was disappointing, the data and the instrument may be at the root of the cause. Neither of these variables was normally distributed, which could have affected the statistical results of this study. In addition, one of the limitations of using an existing database is that the instruments used to gather data may not be the best one suited for what is being measured in the particular study. This may have been the case with social and emotional cognitive mediation as well as maternal affect.
Social and emotional cognitive mediation was measured by the Mothers as Mediators of Cognitive Development, which used the same three box format as the Mother-Child Interaction (Maternal affect). The limitation with these two measures is that the variables being used by this study were from a list of variables being measured during a single videotape observation. Both instruments were designed to assess a broad range of mother affect and cognitive mediation. Therefore, the social and emotional cognitive mediation variables were two variables from a total of 28 variables within the measure and the maternal affect was one from a list of 9. Observers were coding behaviors as they witnessed it during a very short 5 minute segment of a 15 minute videotaping. Because they were looking for and coding many different variables, it would be very easy to have some significant and appropriate behaviors slip through without being coded. In addition, generalizing behaviors found in a five minute window to actual real life behaviors is problematic, especially in this age group where there is a wide range of varied and unpredictable behaviors.

Future studies should attempt to find a more relevant assessment technique of maternal mediation and maternal affect. A study following children and their parents for a length of time, possibly a whole day or week, in the home or somewhere familiar to both parent and child could better illustrate the parent-child relationship. Settings could also be more appropriate for the variable. For example, to find out about parental emotional mediation, researchers could observe situations which are more emotionally charged, such as separating from a parent. Following the observations, parents could also be interviewed on their parenting style. A better maternal mediation and affect
measurement may give better insight into the effect a mother or father plays in developing social information processing.

Although general findings in this study were statistically significant, results were obscure and unexpected. Therefore, care must be taken in generating implications from this study. Future studies should focus on finding more valid and reliable instruments, possibly even having composite scores of multiple measures for each construct. Having an aggregate of three or four different measures including observations, interviews, and questionnaires could provide a wider picture of each construct.

Future studies should also discover an improved method of measuring social information processing. Because there is no single instrument measuring social information processing, compiling scores from different measurements could suffice. However, each measurement should be designed to assess for specific steps of the social information process. A recommendation would be to include some actual observations of behaviors in place of vignettes, especially with children of this young age.

In addition to the unpredicted results, the coefficients found were very modest in strength. The regression equation explained 8% of the variance in the social problem solving outcome variable and only 3% of the variance in attribution. Future studies should investigate what is explaining the other 92-97% of the variance.

Despite the instrument and data challenges in this study, there is still much potential for future study in discovering early precursors to social information processing. Future studies on social information processing, however, should focus on finding more appropriate instruments to measure both the independent and dependent variables. Longitudinal studies with longer time spans between the predictor and the outcome or
assessing predictors at older ages could also provide interesting and useful data. Possible additional future studies could also explore different demographic variables, such as socio economic status, children in daycare versus at home, ethnicity, or gender of child. Finding potential early predictors of maladaptive social information processing can assist educators in targeting children at risk and in creating and implementing social information processing curriculum in the classroom. With the right instruments and research design, it still can be done.
References


NICHD Early Child Care Research Network. (1995, June). The NICHD Study of
Early Child Care Manual (Chapter 37.7). Research Triangle Park, NC: Author.


Vanderbilt University.


Schwartz, Wendy ERIC Clearinghouse on Urban Education New York NY. Preventing violence by elementary school children. ERIC/CUE Digest Number 149. VOLUME 30, NUMBER 1 -January 1999


