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Social Information Processing in Preschool Children: Relations to Sociodemographic Risk and Problem Behavior

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Abstract

Using a multi-component, process-oriented approach, the links between Social Information Processing in the preschool years and a) sociodemographic risk, and b) behavior problems in preschool, were examined in a community sample of 196 children. Findings provided support for our initial hypotheses that aspects of social information processing in preschool are related to both sociodemographic risk and to behavior problems in preschool. Response evaluation, and in particular, the positive evaluation of an aggressive response, were related to both sociodemographic risk and children's aggressive behavior and partially mediated the links between sociodemographic risk and aggressive behavior in preschool.

Research based on the Social Information Processing model has produced a substantial body of empirical evidence about links between distorted social information processing patterns and social maladjustment and problem behavior in school (e.g., Crick & Dodge, 1994; Dodge, 1986; Dodge, Bates, & Pettit, 1990; Dodge, Laird, Lochman, &Zelli, 2002; Dodge & Price, 1994; Lansford et al., 2006; Schultz & Shaw, 2003; Zelli& Dodge, 1999). A smaller body of research has found that specific social information patterns are indicative of problem behaviors already in preschool (e.g., Hart, DeWolf, &Burts, 1992; Katsurada & Sguwara, 1998; Runions& Keating, 2007).

There is also an established body of literature that has demonstrated the relationship between sociodemographic factors and children's problem behavior in preschool and school. It was suggested that the mechanisms by which sociodemographic risk contributes to the development of maladaptive behaviors in children is through a stressful household environment that is marked by less parental involvement, more parental stress, and less desirable parenting behaviors and practices and that these circumstances are likely to result in poorer behavioral outcomes for the children (Gershoff, Aber, Raver, & Lennon, 2007). Sociodemographic factors that were linked to a stressful household environment include the family's income level, parental marital status, parental education, and the level of exposure to crime and violence in the child's environment (Goodman &Gotlib, 1999; Guerra,

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Huesmann, & Spindler, 2003; Harden et al., 2000; Margolin & Gordis, 2000; Schultz & Shaw, 2003; Schwartz & Proctor, 2000). When these factors are at favorable levels (e.g., higher parental education, coming from a two-parent household), they are considered to be predictive of socially competent behaviors and can serve as protective factors against maladaptive behaviors. However, when any of these factors are at unfavorable levels (e.g., lower parental education, exposure to crime and violence), the child is at greater risk to develop maladaptive behaviors in school.

Indeed, many studies have found the above mentioned sociodemographic risk factors to be predictive of behavioral maladjustment in school. *Lower income* and *Low maternal education* were found to predict lower levels of social competence in preschool (e.g., Downer & Pianta, 2006; Morris & Gennetian, 2003). Residing in a *single parent household* predicted lower levels of social competence as well as higher levels of conduct problems in school (e.g., Amato, 2001). Finally, early *exposure to crime and violence* in the house and neighborhood has been linked to multiple behavior problems in preschool and school (e.g., Mersky& Reynolds, 2007; Ziv, Alva, & Zill, 2010).

The cumulative effect of these “life stressors” further increases the likelihood that children will develop maladjusted behavior (Belsky, 2005; Corapci, 2008). There are indications that, in combination, these early environmental risk factors account for more variance in children’s maladaptive behavior than genetic factors (Brendgen, Vitaro, Boivin, Dionne, & Pérusse, D., 2006). In the present study, we examine whether these factors all converge into one single “cumulative risk index” and whether the index is related to social information processing and problem behavior in preschool.

Connecting these two bodies of literature, it has been suggested that social information processing is related to both sociodemographic risk and to maladaptive behavior in school and consequently has an important mediating role in the links between early risk factors for social maladjustment and disruptive behavior in school (Dodge et al., 1990; Guerra et al., 2003; Price &Landsverk, 1998; Schwartz & Proctor, 2000). Indeed, there is evidence that sociodemographic risk factors such as low maternal education and low family income predicts negative patterns of social information processing in school (e.g., Runions& Keating, 2007). However, no evidence has yet to be found regarding the mediating role of social information processing on the links between early sociodemographic risk factors and problem behavior in preschool. It is important to understand the cognitive foundations of early peer relations and how these are linked to early risk factors and to children’s behavior. Moreover, the success of interventions to change distorted social information processing patterns is related to the early onset of such interventions, before the distorted patterns are being fully ingrained (August, Egan, Realmuto, & Hektner, 2003). The ability to comprehensively examine social information processing patterns in preschool-aged children is a necessary precondition in order to develop successful representation-based interventions with this age group.

The current investigation is grounded in the strong theoretical foundation of the social information processing model proposed by Dodge and his colleagues (e.g., Crick & Dodge, 1994; Dodge, 1986). The model posits that individuals progress through a series of stepwise mental mechanisms that are activated in response to external social cues and deactivated upon the individual’s behavioral response. According to this model (see Figure 1), four mental steps take place before individuals enact a behavioral response to social cues: (1) encoding of social cues; (2) interpretation of the cue; (3) generation of a behavioral response; and (4) evaluation of the response (Dodge & Price, 1994). In steps (1) and (2), individuals selectively focus on particular social cues and, based on these cues, interpret the context of the situation (e.g., the intent of the other interactant). In steps (3) and (4),

individuals access possible responses from previous experiences stored in long-term memory, evaluate these responses, and then select one to enact (Crick & Dodge, 1994). In this loop-like process, each step affects, and is affected by, a database for social behavior. This database includes the memory storage of past situations, acquired social rules, social schemes, and knowledge of appropriate and inappropriate social behaviors.

Social cognition and social information processing

Widom (1989) suggests that to better understand the links between risk factors and children's social adjustment, research should be directed at the socio-cognitive processes that mediate the connections between early experiences and later social behavior. Indeed, efforts to examine children's social cognitions and their relationships with behavior have demonstrated the utility of socio-cognitive approaches to social adjustment (Crick & Dodge, 1994; Lemerise & Arsenio, 2000; Schwartz & Proctor, 2000).

To examine the cognitive mechanisms that guide children's responses to socially challenging and potentially frustrating interactions with peers, Dodge and Price (1994) created the Social Information Processing Interview (SIPI). Based on the multistep framework of the social information processing model, each step (i.e., encoding, interpretation, response generation, response evaluation) could be the source of individual differences in children's social information processing patterns (Zelli& Dodge, 1999), and thus is evaluated separately in the interview.

A large and productive body of research has demonstrated the utility of this approach, particularly in identifying the hostile attribution bias of aggressive elementary school boys. Compared to nonaggressive children, these children have been found to be less attentive to social stimulation (Dodge & Tomlin, 1987), less accurate in their interpretation of peers' social intentions (Dodge & Price, 1994; Dodge, Murphy, & Buchsbaum, 1984; Lansford et al., 2006; Sancilio, Plumert, & Hartup, 1989; Slaby & Guerra, 1988), more likely to generate aggressive or inept responses (Webster-Stratton & Lindsay, 1999), and more likely to expect positive instrumental and interpersonal outcomes for an aggressive response (Crick & Ladd, 1990).

Despite the findings indicating the importance of social information processing in understanding the behaviors of children as young as elementary school, it is still relatively understudied in younger populations. However, there are several studies that show that social information processing can be measured and explain meaningful differences in the behaviors of preschool children (Feshbach, 1989; Katsurada & Sguwara, 1998; Runions& Keating, 2007; Webster-Stratton & Lindsay, 1999).

Katsurada and Sguwara (1998) have shown that hostile/aggressive preschool children were significantly more likely to possess a hostile attribution bias than less aggressive children. Their results also indicated that preschoolers were capable of distinguishing between intentional and unintentional actions when stimulus materials used were concrete and familiar to them. Other studies have made distinctions among preschool-aged children in other social information processing steps. Hart and his colleagues have shown that preschoolers who engaged in more disruptive behavior also expected more positive instrumental outcomes for hostile methods of resolving conflict than their less disruptive peers. They also found that preschoolers who were more prosocial tended to envision friendly-assertive strategies as leading to more positive instrumental outcomes and enhanced social relations (Hart et al., 1992). Pettit and his colleagues have reported that preschool children's outcome expectations regarding aggressive and competent responses was predicted by the quality of their relationship with their parent (Pettit, Harrist, Bates, & Dodge, 1991). Lastly, a recent study using data from the NICHD Study of Early Childcare

found that hostile attribution measured during the preschool years is a better predicator of problem behavior in first grade than hostile attribution measured concurrently in first grade (Runions& Keating, 2007).

A related body of research focusing on the problem-solving abilities of preschool-aged children also has demonstrated the implications of social cognitive skills on social behavior in preschool. Measuring preschoolers' ability to think of alternate solutions to problems, Shure, Spivak and Jaeger (1971) found that good problem solvers were less aggressive and less inhibited in the classroom than poor problem solvers. Shure et al. (1971) emphasized the importance of developing strong interpersonal cognitive problem solving skills in the early years of life. Poor interpersonal cognitive problem solving skills have been associated with high-risk impulsive and inhibited behavior (Shure & Spivak, 1982). Longitudinal research has shown that poor interpersonal cognitive problem solving skills are associated with higher levels of violence, substance abuse, unsafe sex, and psychopathology (Parker & Asher, 1987; Roff, 1984; Rubin, 1985). More recent research indicates that children who are empathic and good problem solvers have developed effective interpersonal skills, as they have more friends and are less frustrated when things do not go their way (Shure & Aberson, 2005).

The role of social information processing in the relationship between risk factors and problem

In accordance with the model they created, Dodge and his colleagues have hypothesized that abrasive early experiences lead to chronic aggressive behavior by having an impact on the development of social information processing patterns (Dodge et al., 1990). For example, children who are exposed to violence and abuse early in their lives may develop distorted social information processing patterns, and, as a result, exhibit maladaptive behavior at a later age. These early experiences may cause them to incorrectly process social cues, such as failing to encode or misinterpreting important social cues, resulting in their enactment of disruptive behaviors. Alternatively, they may be hypervigilant toward hostile cues, which could lead them to misinterpret the behavior of others as threatening, resulting in aggressive or other socially undesirable responses.

Previous research with school aged children supports the assumption that social information processing mediates the relationship between risk factors and maladaptive behavior. In a study with elementary school children, Guerra et al. (2003) found that social cognitions such as normalizing violent behavior and aggressive fantasy mediate the relationship between children's exposure to community violence and subsequent aggressive behavior. Similarly, Schwartz and Proctor (2000) found that distorted social information processing patterns mediate links between exposure to community violence and social adjustment in the child's school peer group. Dodge and colleagues (1990) found that social information processing patterns fully mediated the relationships between early physical abuse and later aggressive behavior. Evidence was also found for a moderating role of social information processing on that link. In a study with maltreated children, Price and Landsverk (1998) reported that children who generated higher proportions of competent and nonhostile social information processing strategies were rated by their caregivers as more socially competent than maltreated children with hostile and less competent social information processing strategies.

The present study

The present study was designed to examine whether social information processing has a mediating role on the connection between sociodemographic risk and behavior problems in preschool and to provide a comprehensive, multistep, process-like description of social information processing patterns in preschool. A modified version of the SIPI for

preschoolers (SIPI-P) was developed. The new version includes a storybook easel describing challenging social situations with themes familiar and appropriate for preschool children (e.g., playing with blocks and play dough; see Figure 2 for an example). In designing this modified version, we took into account specific limitations in previous social information processing measures. First, open-ended questions in the original SIPI were replaced by close-ended questions in the SIPI-P to make it easier for shy children and younger children with limited language skills to provide responses. Second, the pictures in the storybook easel depict cartoon bears instead of real children as the story's characters (see Figure 2) to reduce the risk for race-specific biases (Leff et al., 2006). Third, "Boy" and "girl" versions of the storybook easel were developed that were identical except for the depiction of the main character bear (e.g., the "girl" bear had a ribbon in her hair, see Figure 2). Fourth, we shortened the interview considerably to accommodate the short attention span of preschool children while still enabling the examination of the complete social information processing model. The combination of these changes resulted in a measure of social information processing that aims to be (a) highly reliable and valid with preschool children; (b) compact and efficient enough to be used on a large scale basis; and, (c) appropriate to use in diverse populations of children.

Based on the premise that social information processing best explains the connection between risk factors for maladjusted behavior and children's social maladjustment and in order to examine the validity of the SIPI-P as a measure of social information processing in the preschool years, we included in this study measures of sociodemographic risk and children's problem behavior and posed the following hypotheses:

1. Higher levels of sociodemographic risk will be related to SIPI-P scores that reflect less competent social information processing patterns.
2. SIPI-P scores that reflect more competent social information processing patterns at the beginning of the preschool year will be related to better social behavior ratings at the end of the preschool year.
3. SIPI-P scores will mediate the expected link between sociodemographic risk and children's problem behavior. Specifically, the relations between sociodemographic risk and problem behavior at the end of the school year will be reduced significantly when SIPI-P scores are entered into the equation.

Method

Sample and procedure

The sample was drawn from a large metropolitan area and included 196 children (98 girls; 50%) ages 48 to 61 months at the beginning of the study (M = 55 months, SD = 6.1 months). Eligible families (families with 4- or 5-year old English-speaking children) were recruited through their preschool using fliers distributed in their mailboxes. More than 75% of eligible families agreed to participate in the study. Some of the recruitment efforts took place in local Head Start programs to get a sufficient number of children from low socioeconomic status (SES) backgrounds. This effort resulted in 47 children (23 boys) who were recruited from four local Head Start programs. Information on household income (parent report) was available for 167 recruited families; 38 (23%) reported household annual income lower than $50,000 per year, 15 (9%) reported an annual income of $50,000 to $75,000, and 114 (68%) reported a household annual income higher than $75,000. Information on race (parent or teacher report) was available for 175 children; 83 (47%) were White, 44 (25%) were Black, 34 (19%) were Asian, and 14 (8%) were Latino.

The data used in this study were collected from October to December of 2006 (Time 1) and from April to June 2007 (Time 2). Mothers of 167 children (85%) completed a parent questionnaire packet that included questions about sociodemographic characteristics of the family, the maternal psychosocial characteristics (e.g., locus of control), and other information about the child and the family. Teachers of 194 children (99%) completed a rating of the child's social behavior. SIPI-P data were collected from all 196 (100%) children in the study. The same three interviewers collected SIPI-P data at both time points. Sociodemographic data were collected only in Time 1. Social information processing and behavior data were collected in both time points.

Measures

The Social Information Processing Interview – Preschool Version (SIPI-P)—

This 20-minute structured interview depicts a series of vignettes in which a protagonist is either rejected by two other peers (in the "*peer-rejection*" vignette) or provoked by another peer (in the "*peer-provocation*" vignette). The peers' intent is portrayed as either ambiguous or nonhostile/accidental. Each type of vignette is combined with each type of peer intent to generate four stories: (1) a nonhostile rejection story (see Figure 2 and Table 1), (2) an ambiguous rejection story (e.g., the protagonist asks the other children to join their game but they do not answer), (3) an accidental provocation story (e.g., another child accidentally spills the protagonist's milk cup), and (4) an ambiguous provocation story (e.g., the protagonist watches TV, another child comes over and changes the channel). The stories are told by the interviewer using a storybook easel with illustrations of bears. There are parallel picture books for boys and girls (see Figure 2 for examples of boys' and girls' stimuli). As the child hears the story, the interviewer stops at scripted points and poses questions addressing the hypothesized information processing steps.

The SIPI-P was first piloted in a small study with 26 children (Ziv, 2007). In this pilot test, the SIPI-P had shown good psychometric properties with the exception of one open ended question referring to the social information processing encoding stage ("what happened in the story, from the beginning to the end?"). Due to that item's poor psychometric properties, it was not included in the main study.

An example for one of the stories is presented in Table 1 and Figure 2: Table 1 presents the specific text and questions accompanying the nonhostile rejection story illustrated in Figure 2; the interview structure is the same for each of the four stories. Using the storybook easel, the interviewer describes the basic vignette. The interviewer then asks if the other children are mean or not mean. Then the interviewer asks an open-ended question: "What would you say/do if this happened to you?" Next, the interviewer presents possible competent (e.g., asking the children if he can play next), aggressive (e.g., kicking the blocks), and inept (e.g., crying) responses and asks questions about possible outcomes of such responses.

Interviewers recorded the child's responses in their data collection sheet. For the open-ended item, interviewers wrote down the child's verbatim answer. Immediately after the interview was completed, interviewers coded the child's response as either "competent," "aggressive," or "inept." Examples of competent responses include: "I'll ask them again" or "I will say please." Other competent responses include those in which the child uses an authority figure to solve the problem, such as "I will tell the teacher." Examples of aggressive responses include: "I'll punch him in the nose" or "I'll hit them." Examples of inept responses include: "I'll cry" or "I'll be very sad and tell them they don't like me." For reliability purposes, each coder also coded 20 percent of each of the other two coders' interviews. The percent agreement among the three coders was 100 percent.

Text and questions for the other three stories are similar to those in the nonhostile rejection story presented in Table 1, with minor modifications for the specific aspects of the respective story.

Three main scores are derived from the SIPI-P. Step 2 – Interpretation, yields one score: Hostile Attribution. Step 3 – Response Generation, yields one score: Positive Response Generation. Step 4 – Response Evaluation, yields one score: Positive Response Evaluation. Table 2 presents the SIPI-P questions as they apply to the social information processing steps.

The *Hostile Attribution score* is a frequency count of the number of times the child describes the other child/children as being mean across the four stories. Thus, the range for this score is 0 to 4 with higher scores representing higher hostile attribution. Internal consistency reliability, as measured by Cronbach's Alpha was .76 in Time 1 and .74 in Time 2.

The *Positive Response Generation* score is derived from the child's responses to the open-ended item "What would you say or do if this happened to you?" The answers are used to create three, mutually-exclusive flag variables (coded 0, 1) for each story: competent flag, aggressive flag, and inept flag. For example, if the child's response is coded as "competent," then he or she is given a "1" for the competent flag, a "0" for the aggressive flag, and a "0" for the inept flag. The values for the three respective flags are combined across the four stories to create three scales: competence scale, aggressiveness scale, and inept scale. The final positive response generation score is then calculated by subtracting the aggressive and inept scores from the competent score. The original range of this score is minus four (only inept or aggressive responses) to four (only competent responses). However, to avoid negative scale scores, the scale was modified such that the presented possible range for this score is zero (only inept or aggressive responses) to eight (only competent responses). Internal consistency for the positive response generation was .78 in both Time 1 and Time 2.

The *Positive Response Evaluation* score is constructed from a combination of the 36 *Response Evaluation* questions (4 stories × 3 competent/aggressive/inept presented responses × 3 questions per presented response). The total number of non-competent responses (i.e., aggressive and inept responses) are summed across stories and subtracted from the total number of competent responses to create this score. After adjusting for negative scores, the possible range for this scale is 0–36 with higher scores representing higher positive response evaluation. Internal consistency reliability was .87 in Time 1 and .88 in Time 2.

Other Measures

Teacher ratings of problem behavior—The problem behavior scale items come from an abbreviated adaptation of the Personal Maturity Scale (Alexander & Entwisle, 1988), the Child Behavior Checklist for Preschool-Aged Children, Teacher Report (Achenbach, Edelbrock, & Howell, 1987), and the Behavior Problem Index (Zill, 1990). The *Aggressive Behavior* scale is composed of items such as "Hits or fights with others." The *Hyperactive Behavior* scale is composed of items such as "Can't concentrate, can't pay attention for long." The *Withdrawn Behavior* scale is composed of items such as "Keeps to herself or himself, tends to withdraw." For each item, the teacher is asked to judge whether the behavioral description is "not true," "somewhat or sometimes true," or "very true or often true" of the child. The Aggressive Behavior scale contains six items and could range in value from zero to 12. The Hyperactive Behavior scale is composed of three items and could range in value from zero to six. The Withdrawn Behavior scale contains four items and could range in value from zero to eight. The internal consistency scores for the three scales in Time 1 and Time 2 were $\alpha = .87$ and $\alpha = .83$ for the aggressive behavior scale, $\alpha = .82$ and

α = .85 for the hyperactive behavior scale, and α = .75 and α = .82 for the withdrawn behavior scale. Test-retest correlations between Time 1 and Time 2 scores were as follows: Aggressive behavior: r (170) = .62, p< .001; Hyperactive behavior: r (174) = .61, p< .001; Withdrawn behavior: r (171) = .42, p< .001. The reliability and validity of these measures were also established in multiple studies including large, nationally representative samples of preschool-aged children, such as the Family and Child Experiences Survey and the Head Start Impact study (ACYF, 2005, 2006).

Sociodemographic risk—Data used to compose the risk factors for maladaptive behavior come from the parent questionnaire. The maternal education question included five education categories from lowest (less than high school diploma) to highest (graduate degree). This score was reversed to create the "lower maternal education" risk factor (high school or less; 33 participants met this criterion). The household income question included four income categories from lowest (less than $25,000 per year) to highest (more than $75,000 per year). This score was also reversed to create the "lower household income" risk factor (less than $50,000 per year; 38 participants met this criterion). The marital status question included five marital statuses. The four non-married categories (i.e., divorced, separated, widowed, single/never married) were combined to create the "one parent household" risk category (43 participants). Finally, seven questions asked about exposure to crime and violence (example: "in the last year, has your child ever been a witness of domestic violence?"). If any of these questions was answered indicating exposure, the child was coded as being exposed to crime and/or violence (27 participants). An exploratory principal component factor analysis revealed that all four risk factors converge into one single factor with an Eigen value of 1.91 and 47% of the variance explained (Alpha for this combination was .73). This one factor was used in the study as the "risk index." The index was created by combining all four risk factors into one cumulative risk score with a range of zero (no risk) to four (risk in all four factors).

Picture Vocabulary subtest of the Woodcock-Johnson Psycho-Educational Battery –Third edition (McGrew and Woodcock, 2001)—This test was included to control for children's expressive language skills and is a measure of oral language development and word knowledge. The task requires the child to identify pictured objects. Although a few receptive items are offered at the beginning of the test, this is primarily an expressive language task. The items become increasingly difficult as children are asked to give the name of more obscure objects (e.g., monocle). The published internal consistency reliability was reported as .77 (McGrew & Woodcock, 2001). Internal consistency reliability in this study was .81 in Time 1 and .82 in Time 2. The test contains a total of 44 items, however the test includes a stopping rule when three consecutive items are answered wrong. As a result, preschool children are unlikely to receive all items.

Results

Preliminary analyses

Table 3 presents descriptive statistics of the three SIPI-P scores, the risk index, and the aggressive, hyperactive, and withdrawn behaviors and Table 4 presents the bivariate correlations among all of these variables. Note that correlations among the SIPI-P scores from Time 1 and Time 2 had shown only weak links between the different SIPI-P scores within each time period. Of the six possible correlations in Times 1 and 2, only two were significant: In Time 1 hostile attribution was significantly related to positive response evaluation: r (196) = .21, p< .01, and in Time 2 positive response generation was related to positive response evaluation, r (182) = .15, p< .05. On the other hand, correlations among

the problem behavior ratings were generally strong, especially between the two externalizing ratings: aggressive and hyperactive behaviors (see table 4).

Next, to identify possible control variables for the main analysis, correlations between the study's main variables(SIPI-P and risk index scores at Time 1 and problem behavior scores at Time 2) and possible control variables were conducted and are presented in Table 5. The control variables include various child characteristics (i.e., gender, race (minority/non-minority), age, and expressive language level), interviewer's identity, and maternal locus of control. There were no significant effects of interviewer, gender, and maternal locus of control. Some significant links were found between race, age, and expressive language and some of the study's main variables (see Table 5). Accordingly, race, age, and expressive language scores were entered as control variables in the main analysis.

Main analyses

First, to examine our first two hypotheses, the relations between the cumulative risk index, SIPI-P scores at Time 1 and behavior ratings at Time 2 were examined through a set of partial correlations, controlling for expressive language, ethnicity, age, and behavior ratings at Time 1 as applicable. Three significant correlations were found:positive response evaluation was negatively related to the risk index, r (167) = −.25, p< .01 (supporting hypothesis 1), and to aggressive, r (167) = −.33, p< .001, and hyperactive behavior r (168) = −.20, p< .01(supporting hypothesis 2).

Next, based on the partial correlation findings and following the procedures outlined by Kline (1998) and MacKinnon and colleagues (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002), we implemented structural equation modeling using Mplus 3.11 (Muthén, & Muthén, 2004) to examine the mediating effects of positive response evaluation on the link between the cumulative risk index and aggressive and hyperactive behavior (hypothesis 3). We included age, expressive language, and aggressive (or hyperactive) behavior at Time 1 as covariates in the examined models (including Time 1 behavior outcomes in the examined models meant that we are predicting change in these outcomes). These analyses also allowed examining the overall fit of each model to the data. Because it was suggested that there are no golden rules for cutoff values for SEM fit indexes (Marsh, Hau, & Wen, 2004) and that fit should be evaluated on multiple criteria, we implemented three commonly used indexes for goodness of fit (in samples smaller than 200): Root Mean Square Error of Approximation (RMSEA), Tucker-Lewis Index (TLI), and Comparative Fit Index (CFI). Guidelines for good model fit are where the RMSEA is smaller than .06, the TLI is larger than .95, and the CFI is larger than .95. To examine the level of mediation, we followed Kline's (1998) algorithm to calculate the standard error of the indirect effect: $SE_{ab}=\sqrt{b^2SE_a^2+a^2SE_b^2+SE_a^2SE_b^2}$. In our sample, which is smaller than 200, the ratio ab/SE_{ab} is interpreted as a t statistic (Kline, 1998) and represents a significance test for the mediation effect.

Figure 3a shows the model examining the mediating effect of positive response evaluation on the relationship between cumulative risk and aggressive behavior. The CFI and TLI indexes showed good model fit to the data, while the RMSEA did not: RMSEA = .09, TLI = .96, and CFI = .97. The mediating effect of positive response evaluation on the link between risk and problem behavior was β = .09 which represents 29 percent of the variance explained by positive response evaluation in the link between risk and aggressive behavior, t = 3.77, p< .001. The leftover direct effect of risk on problem behavior was β = .23 which means that the direct effect accounted for 71 percent of that link, t = 2.83, p< .01. No significant mediating effect for response evaluation was detected in the model examining the link between risk and hyperactive behavior.

To further explore the source of the mediating effect in positive response evaluation, the next set of analyses examined the mediation of the three response evaluation subscales (i.e., competent, aggressive, and inept) on the relationship between cumulative risk and aggressive behavior. Only the model with positive evaluation of an aggressive response as the hypothesized mediator was found to have significant path coefficient and/or to fit the data (Figure 3b). This model fit the data based on all fit indexes: RMSEA = .03, TLI = .99, and CFI = .99. The mediating effect of positive evaluation of aggressive response on the link between risk and aggressive behavior was $\beta = .122$ which represents 38 percent of variance explained by positive evaluation of aggressive response in the link between risk and aggressive behavior, $t = 4.53$, $p < .001$. The leftover direct effect of risk on problem behavior was $\beta = .20$ which means that the direct effect accounted for 60 percent of that link, $t = 2.59$, $p < .01$.

Discussion

This study extends the current knowledge base on preschool children's social information processing in regard to interactions with peers and its links to important antecedents (sociodemographic risk) and outcomes (problem behaviors) with some effect sizes that are considerably higher than those found in recent studies examining social information processing in preschool children (e.g., Runions& Keating, 2007). This is important because questions had recently been raised regarding the utility of social information processing measures as predictors of problem behaviors in community samples (Runions& Keating, 2007; Schultz & Shaw, 2003). Our findings regarding *response evaluation* suggest that specific measures of social information processing can effectively distinguish between preschool children with different levels of problem behaviors in a community sample. Moreover, these meaningful relationships were significant even when controlling for relevant differences among children in this study (i.e., race, age, and cognitive capacities).

Interpretation of cues and hostile attribution

Children's interpretations of cues were not significantly related to either risk or problem behavior in this study. This is surprising because previous studies have found *hostile attribution bias*, a tendency associated with distorted interpretation in the social information processing literature, to be related to risk (e.g., Dodge et al., 1990) and to aggressive behavior (e.g., Dodge & Price, 1994; Dodge et al., 1984; Lansford et al., 2006; Sancilio et al., 1989; Slaby & Guerra, 1988). Because hostile attribution was also found to capture meaningful variations in other studies with preschool children (Feshbach, 1989; Katsurada & Sguwara, 1998; Runions& Keating, 2007; Webster-Stratton & Lindsay, 1999), age does not appear to be the reason for not finding the expected links with hostile attribution biases in the current study. Nor does the method of assessment used in the study because the item used to assess hostile attribution bias was practically identical to those used in previous studies that have found such biases (e.g., Dodge & Price, 1994).

It may be that the failure to find any meaningful relations between hostile attribution and any of the problem behavior ratings is related to the unique combination between a) the age of the assessed children in this study; b) the characteristics of the current sample (a community sample and not a sample of children already identified with aggressive tendencies), and; c) the method of assessment used. The measurement of hostile attribution biases in preschool children may require more sophisticated assessments than those used in this study. It has been suggested that assessment methods targeting implicit processing might assess more adequately some aspects of social information processing than methods that use propositional knowledge paradigms (Burks, Laird, Dodge, Pettit, & Bates, 1999; Runions& Keating, 2007) such as those in the current study. The way the hostile attribution question was framed in this study ("Were the other kids mean or not mean?") could be

interpreted as priming, with children who select “mean” perhaps being more attentive to hostile cues rather than actually attributing hostile intent to others under ambiguous conditions.

This could also be viewed in the context of Dodge’s (2006) important suggestion that all human beings are born with the tendency to match intent with outcome (and thus when the outcome is negative to attribute negative or hostile intent to the issuer of the behavior), and that the ability to attribute benign intent to bad-outcome circumstances begins with development of theory of mind during the third year of life. If this is indeed the case, it may be that hostile attribution is challenging to measure in preschool children because many of them are still developing the ability to match benign intents with negative outcomes. In relation to our measure, the thought that our inability to show any links between hostile attribution and problem behavior may be related to a measurement problem is supported by a meta-analysis pertaining to the links between hostile attribution and aggressive behavior (Orobio de Castro, Veerman, Koops, Bosch, & Monshouwer, 2002). In their meta analysis, Orobio de Castro and colleagues have found that differences in finding connections between hostile attribution and aggressive behavior depended heavily on assessment and measurement variations for that construct.

Response evaluation

In contrast to the other two social information processing constructs, *positive response evaluation* was negatively related to both sociodemographic risk and to aggressive behavior and also mediated the direct link between these two constructs.

Why was the measure of response evaluation more informative in this study than the measures of hostile attribution and response generation? The answer may lie in the different formats of the respective questions. Items tapping positive response evaluation were close-ended and presented concrete examples of possible responses. In contrast, positive response generation was based on the only open-ended questions in the assessment and hostile attribution required the child to attribute intent to the other interactant in the story. While these items (or similar items) have proved informative with older children or those with more extreme behavior, they may not be appropriate for this population. Another possible explanation is that while the positive response evaluation scale is based on data from 36 items across the instrument, the hostile attribution and positive response generation scales are each based on four items of similar format. During the preschool years, when executive functions are still developing, it is widely held that the most effective way to measure cognitive capacities that are related to executive functions is to use a comprehensive and multi-faceted method that can facilitate the regulation of information in the developing mind (Towse, Lewis, & Knowles, 2007). Positive response evaluation, with its large set of items corresponding to a variety of possible responses, may better represent such a method than hostile attribution and positive response generation.

When the response evaluation construct was broken-up to its competent, aggressive, and inept components, it was found that only the response to the aggressive component significantly mediated the link between risk and behavior. These findings suggests that splitting up positive response evaluation into its components is an informative practice because it enabled a more specific identification of the source of mediation in that construct: the source of the mediation effect on the link between risk and problem behavior was in the responses to the aggressive scenarios. The findings related to the positive evaluation of an aggressive response might be the most important theoretical contribution of this study. They suggest that children who are perceived by their teachers as more aggressive also posses distorted beliefs about the beneficial outcomes of aggressive responses. Consequently, these children believe that aggression is a beneficial way to solve social conflicts. The importance

of these findings for intervention efforts cannot be overstated because they suggest that a behaviorally-based intervention to change aggressive tendencies may not be an effective way to intervene without the addition of a cognitive component aiming to alter the distorted perception.

Finally, we find it striking that the longitudinal links between children's positive response evaluation at Time 1 and their levels of problem behaviors (both aggressive and hyperactive behaviors) at Time 2 (six month apart) were stronger than the concurrent links between these two sets of variables in both Time 1 and Time 2 (.19 and .22 for the concurrent links and .41 and .30, for the longitudinal links, respectively, see also Table 4). This is somewhat similar to Runions and Keating (2007) finding(although with a different social information processing variable) that hostile attribution measured during the preschool years is a better predicator of problem behavior in first grade than hostile attribution measured concurrently in first grade (Runions & Keating, 2007). Taken together, these findings suggest that carefully designed social information processing measures could be used to predict children's later problem behaviors, again, an important attribute for early intervention efforts.

Implications for intervention with children at risk to develop maladaptive behavior

As mentioned, finding an association between children's perceptions of social relationships and their behavior as early as in the preschool years has significant implications for successful and early intervention efforts. Children's social adjustment is an important indicator of later life difficulties, mostly in relation to maladaptive behavior (Parker & Asher, 1987). Thus, the investigation of the cognitive processes that facilitate social behavior in childhood should be very useful in efforts to prevent children's maladaptive behavior. Moreover, because the social information processing model describes specific processes that can be taught to children through practice and demonstration, these processes could be targeted for change through intervention with socially maladjusted children. Such initiatives already exist with elementary school-age children (e.g., Conduct Problems Prevention Research Group, 1992, 1999; Fraser et al., 2005). However, because the range of negative responses is less likely to be ingrained in younger children, behavioral interventions are expected to be more effective at an earlier age (August et al., 2003).

Data from instruments tapping social information processing in preschool, such as the SIPI-P, could inform the development of effective interventions earlier than what was previously possible. Results with the SIPI-P in this study are promising for this purpose. Scores from the SIPI-P generally had good reliability and showed meaningful correlations with sociodemographic risk factors, as well as teacher ratings of children's behavior. Further work needs to be done to improve the instrument's assessment of encoding, hostile attribution, and response generation. However, the results from this study suggest that the SIPI-P represents a significant step in developing psychometrically sound measures for preschool children that can be used to guide future interventions with this age group. Our findings regarding the negative links between positive response evaluation and aggressive behavior suggest that this particular social information processing step may be explicitly targeted in interventions with preschool children. For example, preschool teachers could create role-play activities in which children are asked to evaluate the outcomes of specific behaviors. As part of these play activities, teachers could provide feedback that include corrections to misguided/non-competent evaluations and encouragements to evaluations that suggest common social knowledge. In that regard we can refer to programs such as the Making Choices: Social Problem Solving Skills for Children (MC; Fraser et al., 2005) that offer specific intervention goals such as the identification of relational goals and the design and selection of prosocial goals. These steps could be adapted with preschool children and

seem to be particularly relevant to the correction of biases in the ability to correctly identify the outcomes of competent and non-competent social actions.

Finally, note that while hostile attribution did not change from Time 1 to Time 2, both positive response generation and positive response evaluation positively changed during that same period. While the effect sizes of these changes were relatively small, these findings are still encouraging. These two social information processing construct are in many ways related to what many preschool programs (including Head Start)are trying to promote as early socialization: the ability to respond constructively to challenging social interaction, and the ability to evaluate the outcomes of one's own actions in a realistic and socially oriented way. That these two cognitive mechanisms change in preschool children without a guiding hand of a specific intervention program suggests that a positive base rate intervention effect may exists that could facilitate successful interventions with this age group. Whether the positive changes detected here are the result of simple maturation or due to the fact that all children in this study were in organized preschool programs could be the subject of future examinations.

Limitations and future directions

A few limitations to this study should be noted. First, the original Dodge and Price's SIPI included questions and observations pertaining to two additional social information processing steps: encoding and behavioral enactment which were not examined in the current study. The inability to measure the first step of the social information processing model—encoding—precludes us from reaching more comprehensive conclusions on the interaction between the social information processing steps to create distinct groups of children who are characterized by particular patterns of social information processing as well as about the place of encoding in predicting social behavior. For example, it was suggested that problems with encoding may be the result of selective attention towards social cues that reaffirm existing self-perceptions (Dykas& Cassidy, 2011; Kirsh & Cassidy, 1997).

The current measure is limited to social information processing of peer-related interactions but does not capture interactions with other important figures in the child's life such as parents, siblings, and teachers. These other sets of interactions should be considered in future studies examining social information processing in preschool children. For example, there are several similarities between the definitions of social information processing and attachment-related constructs such as the internal working model. As a result, future studies should include stories that tap attachment relationships directly, such as mother–child, attachment–sensitive interaction scenes. We are now in the process of developing an attachment-related social information processing interview.

Finally, future studies should examine social information processing theory with respect to new research in cognitive psychology and general information processing. Because the extant literature on, as well as the available measurement tools for, examining social information processing in preschool is relatively sparse, future researchers in that field should take advantage of approaches used in other information processing research. For example, much cognitive psychology research in recent years has focused on more heuristic processes such as executive functions and information-regulation (Garon, Bryson, & Smith, 2008; Miyake et al., 2000). Exploring the connections between social information processing and executive functions (such as the tendency to alter responses that would otherwise be produced because of prior associations) could lead to new and intriguing lines of research. This type of research could highlight the possible role of non-analytic cognitive factors in the processing of social information. The social information processing model is at its base an analytic model which assumes a logical and ordered procedure that repeats itself

the same way in every social situation. However, contemporary research in cognitive psychology is increasingly interested in heuristic, less-aware processes that provoke behavioral responses with apparently little (or at least less) overt processing. Indeed, executive functions are often thought to develop in ways that short-circuit automated, heuristic, or gist responses, allowing time for explicit analytic processing. Examining what is assumed as both analytic and non-analytic processes within the same study could have a major effect on our understanding on both type of processes.

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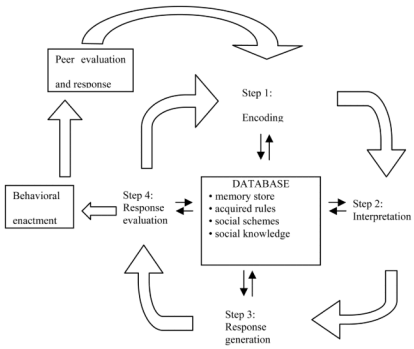

Figure 1.
The social information processing model (Adapted from Crick & Dodge, 1994).

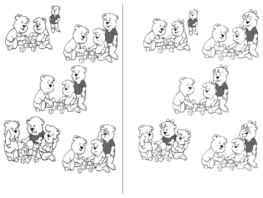

Figure 2.
Peer entry example: Boys version on the left, girls on the right – Story 1 - Nonhostile rejection. In the original measure, each picture appears on a separate page. Order of pictures: left to right, top to bottom. See Table 2 for text accompanying the pictures.

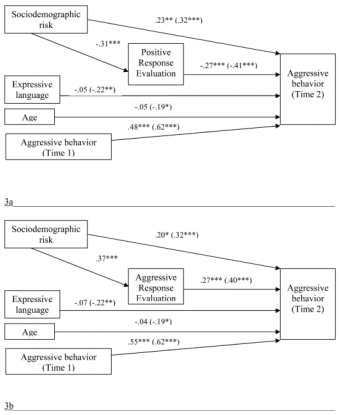

Figure 3.

Structural models showing the role of social information processing in mediating the link between sociodemographic risk and teacher-reported aggressive behavior. Coefficients in parenthesis represent the direct effect and coefficients outside the parenthesis represent the leftover effect. In the case of the direct link between risk and behavior, the leftover effect outside the parenthesis is for a model including only the SIPI-P variable as an additional predictor (to isolate the mediating effect of social information processing on that link). R-squared for the model presented in figure 3a is .48. R-squared for the model presented in figure 3b is .49.

* $p < .05$; ** $p < .01$; *** $p < .001$

Table 1

Text and questions accompanying stimuli presented in Figure 2

Picture	Text
1	In this story, these children are playing with blocks.
	POINT TO CHILD CLOSER TO MICHAEL. This child says: “These blocks are fun!”
	POINT TO CHILD FARTHEST FROM MICHAEL. This child says: “Yes. You know, Michael also wanted to play with me in the block area.”
	POINT TO MICHAEL. Michael is watching the other children playing.
2	POINT TO MICHAEL. Michael walks up to the other children and asks them: “Can I play with you?”
	POINT TO CHILD FARTHEST FROM MICHAEL. This child says: “Sorry. The teacher said only two can play in the block area.”
	E2. POINT TO THE OTHER CHILDREN AND SAY: Do you think the other children who didn’t let Michael play are mean or not mean?
	E3. Pretend that you ask your friends if you can play with them and they say that only two can play in the block area. What would you do?
	IF CHILD DOES NOT RESPONDS, SAY: What would you do if it happened to you?
	Now, let me show you some different things that Michael could do.
3	POINT TO MICHAEL. Michael could say, “Then can I play next?”
	E4. Is this a good thing or a bad thing for Michael to say?
	E5. If you did that, do you think the other children would like you?
	E6. Do you think the other children would let you play if you did that?
	Now, I’ll show you something else that Michael could do.
4	POINT TO MICHAEL. Michael could kick apart the blocks and say to the other children, “if I can’t play, then you can’t play either?”
	E4. Is this a good thing or a bad thing for Michael to say?
	E5. If you did that, do you think the other children would like you?
	E6. Do you think the other children would let you play if you did that?
	Now, I’ll show you something else that Michael could do.
5	POINT TO MICHAEL. Michael could cry and say, “it’s not fair.”
	E4. Is this a good thing or a bad thing for Michael to say?
	E5. If you did that, do you think the other children would like you?
	E6. Do you think the other children would let you play if you did that?

Note. Words in upper case letters represent instructions to the interviewers. Words in lower case letters represent the script read to the child.

Table 2

The SIPI-P questions, composite scores, and range of scores, as a function of the social information processing steps

Social information processing step	Question	Composite score	Possible Range
Interpretation	"Were the other kids mean or not mean?"	Hostile Attribution	0–4
Response generation	"What would you say or do if this happened to you?"	Positive Response Generation	0–8
Response evaluation	1. "Was it a good thing or a bad thing to say (do)?"	Positive Response Evaluation	0–36
	2. "If you did that, do you think the other children would like you?"		
	3. "Do you think the other children would let you play if you did that?"		

Note. Question presented in general form. See Table 2 for exact language used in the interview. Range of scores was calculated after combining the four stories.

Table 3

Descriptive statistics of the study's main variables

	Time 1			Time 2		
Study Main Variables	***M***	***SD***	**Observed Range**	***M***	***SD***	**Observed Range**
Risk Index	.75	1.02	0–4			
SIPI-P Variable:						
Hostile Attribution	2.63	1.44	0–4	2.66	1.36	0–4
Positive Response Generation	5.25	1.43	0–8	6.14	2.11	0–8
Positive Response Evaluation	29.30	5.34	14–36	31.24	4.88	15–36
Behavior Ratings:						
Aggressive Behavior	2.45	3.24	0–10	2.71	3.76	0–11
Hyperactive Behavior	1.90	2.42	0–4	1.81	2.52	0–5
Withdrawn Behavior	1.25	1.66	0–8	1.20	1.79	0–8

Note. Variables used to create the risk index were collected only at Time 1

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Table 4

Bivariate correlations among risk, social information processing, and problem behavior

	Risk	Ha1	Prg1	Pre1	Ha2	Prg2	Pre2	Ag1	Hp1	Wt1	Ag2	Hp2	Wt2
Risk	1	−.06	−.03	−.31***	−.05	−.28***	−.24**	.35***	.34***	.16*	.32***	.23**	.15*
Ha1		1	−.14	.21**	**.37****	−.12	.05	−.01	−.03	−.03	0	−.05	−.02
Prg1			1	.01	.01	**.25****	.28***	−.06	−.02	−.05	−.02	−.09	−.06
Pre1				1	−.05	−.17*	**.46****	−.19*	−.22**	−.01	−.41***	−.30***	−.06
Ha2					1	−.11	.07	−.09	−.02	−.05	.04	.05	−.10
Prg2						1	.15*	−.24**	−.15*	−.13	−.17*	−.11	−.05
Pre2							1	−.06	.13	−.07	−.17*	−.12	−.03
Ag1								1	.64***	.29***	**.62****	.48***	.15
Hp1									1	.32***	.47***	**.61****	.19*
Wt1										1	.25**	.21**	**.42****
Ag2											1	.72***	.27***
Hp2												1	.31***
Wt2													1

Note. Ha = Hostile attribution; Prg = Positive response generation; Pre = Positive response evaluation; Ag = Aggressive behavior; Hp = Hyperactive behavior; Wt = Withdrawn behavior. Coefficients in bold and underlined font represent test-retest correlation. *N*s = 167–196

* $p < .05$;

** $p < .01$;

*** $p < .001$

Table 5

Correlations between the study's main variables and potential control variables

Study's main variables	Race	Age	Expressive Language Time 1	Expressive Language Time 2
Risk Index	.15*	.14	−.21**	−.26***
SIPI-P Variable:				
Hostile Attribution	−.06	−.10	.08	.03
Positive Response Generation	−.22**	.19**	.18*	.30***
Positive Response Evaluation	−.07	.19**	.34***	.33***
Behavior Ratings:				
Aggressive Behavior	0	−.19*	−.29***	−.22**
Hyperactive Behavior	.11	−.17*	−.27***	−.19*
Withdrawn Behavior	0	−.15*	−.01	−.02

Note. SIPI-P scores are from Time 1. Behavior ratings scores are from Time 2.

* $p < .05$;

** $p < .01$;

*** $p < .001$