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Does Engaging in Prosocial Behavior Make Children See the World Through Rose-Colored Glasses?

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Sparse research suggests that children's social information processing has links not just with aggressive behavior but also with children's prosocial behavior (e.g., Nelson & Crick, 1999). However, the past work that has been done has not been longitudinal, so the direction of links between social information processing and prosocial behavior remains unclear. In this study, we used data from the National Institute of Child Health and Human Development Study of Early Child Care and Youth Development (NICHD Early Child Care Research Network, 2010) to examine longitudinally the links between prosocial as well as aggressive behaviors and social information processing. Children completed multiple assessments of social information processing (including attribution biases and strategy response selection) from the 3rd to 5th grades. Mothers and teachers completed measures of children's prosocial and aggressive behavior from the 3rd to 6th grades. Overall, the findings demonstrated that some of the links between social information processing and social behavior are bidirectional but that the direction of effects depends on when such links were assessed. At Grade 3, it was mostly children's social behavior that predicted social information processing. At Grades 4 and 5, however, social information processing predicted children's social behavior.

Keywords: prosocial behavior, social information processing, aggression

A number of theorists have emphasized the links that social cognition has with social behavior (see Coie, 1990; Rubin & Krasnor, 1986; Shantz, 1983). In particular, one of the most influential theories of social cognition, social information processing theory (Dodge, 1986), has been widely evoked to explain children's aggressive behavior (see, e.g., Burgess, Wojslawowicz, Rubin, Rose-Krasnor, & Booth-Laforce, 2006; Crick & Dodge, 1994; Crick, Grotpeter, & Bigbee, 2002; Orobio de Castro, Veerman, Koops, Bosch, & Monshouwer, 2002). Social information processing theory suggests that children are involved in a number of processes when engaged in social interaction, including encoding and interpreting social cues, clarifying goals, developing strategies to achieve goals, evaluating strategies, and enacting responses (see Crick & Dodge, 1994; Dodge, 1986). Several decades of research has demonstrated that children who are aggressive demonstrate differences in all steps of social information processing compared with nonaggressive children. Aggressive children, for example, are less likely to accurately encode social information, more likely to attribute hostile intent to others, less likely to generate relational goals, and are more likely to generate and positively evaluate aggressive strategies to achieve their goals than nonaggressive children (see Crick & Dodge, 1996; Dodge, 1980; Orobio de Castro et al., 2002).

Although the bulk of the work on social information processing research has focused on explaining aggressive behaviors, there are good reasons to believe that social information processing is related to children's social competence (Crick & Dodge, 1994). However, few studies have examined the links that social information processing shares with socially competent behavior as well (for exceptions, see Dodge, Petit, McClaskey, & Brown, 1986; Dodge & Price, 1994; Nelson & Crick, 1999). Nonetheless, there are reasons to believe that socially competent children might be skilled in terms of their social information processing. The limited work that has been done has supported connections between socially competent behavior and some aspects of social information

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processing. Thus, for example, Dodge et al. (1986) found that children who could successfully navigate peer group entries were more likely to use social cues appropriately, were more likely to generate and to positively evaluate nonaggressive strategies to achieve goals, and were more successful at enacting selected strategies.

In addition, researchers have also found links between sociometric nominations of peer acceptance and children's social information processing (see, for example, Feldman & Dodge, 1987; Keane, Brown, & Crenshaw, 1990), which lends support to the idea that peer competence might be linked with social information processing. The results from these studies suggest that average and popular children demonstrate less of a hostile attribution bias and are more likely to evaluate aggressive strategies negatively than rejected children (Feldman & Dodge, 1987; Lemerise, Gregory, & Fredstrom, 2005). Moreover, children with high levels of peer acceptance (e.g., popular children) have been found to generate more prosocial solutions to dealing with social dilemmas than children with lower levels of peer acceptance (Mayeux & Cillessen, 2003). In one of the few studies in which average and popular (nonaggressive) children were compared directly on social information processing, Lemerise, Fredstrom, Kelley, Bowersox, and Waford, (2006) found popular children rated relational goals as more important when faced with angry provocateur than both average and rejected children. The bulk of the work that has been done on peer acceptance and social information processing has tended to compare rejected children with average or popular children, and thus, it is not clear whether popular children outscore average children on dimensions of social information processing beyond just goal selection (see Lemerise et al., 2006). In addition, recent work suggests the some well-liked children (e.g., popular children) demonstrate a mix of prosocial and aggressive behavior (Hawley, Little, & Card, 2007), and thus, it is not clear from this work if social information processing relates directly to specific types of socially competent behaviors, such as prosocial behaviors.

Prosocial behaviors consist of wide range of cooperative, helpful, and supportive actions that are focused on benefiting others (Eisenberg & Fabes, 1998). It is widely believed that prosocial behaviors serve to create connectedness between people (Sober & Wilson, 1998). As a result, it is not surprising that prosocial behaviors have been linked with greater social competence and less aggressive behavior in children (Denham & Holt, 1993; Eron & Huesmann, 1984; Hastings, Zahn-Waxler, Robinson, Usher, & Bridges, 2000; Kokko, Tremblay, Lacourse, Nagin, & Vitaro, 2006; Romano, Tremblay, Boulerice, & Swisher, 2005). Because prosocial behavior has consistently been found to have inverse links with aggressive and externalizing behavior, especially beyond early childhood (see Eisenberg, Fabes, & Spinrad, 2006, for a review), there are reasons to believe that children who demonstrate high levels of prosocial behavior might demonstrate quite different patterns of social information processing than nonprosocial children. Thus, these children might be more accurate at encoding social cues, they might demonstrate a benign attribution bias (rather than a hostile attribution bias), and they might be more likely to select relational goals and to generate and evaluate positively socially competent strategies for achieving those goals than nonprosocial children (see Nelson & Crick, 1999).

In the one study conducted to directly examine the links between prosocial behavior and social information processing, Nelson and Crick (1999) found that children who were nominated as prosocial were more likely to attribute benign intentions to peers in ambiguous provocative situations than were children who were not nominated as prosocial. This "benign" attribution bias (see Nelson & Crick, 1999; see also Erdley & Asher, 1996) likely buffers prosocial children against being aggressive in situations where the intent of the actor is not clear, but an aggressive response might be justified. Thus, prosocial children who share a benign attribution bias might be less likely to be aggressive to others, because they give others the benefit of the doubt, even in situations where others accidentally (or intentionally) transgress against them. Moreover, it seems likely that this benign attribution bias is closely tied with children's positive relational schemes (or internal working models) of others that are developed as a result of supportive interactions in close relationships (see e.g., Bretherton & Munholland, 1999; McElwain, Booth-LaForce, Lansford, Wu, & Dyer, 2008).

In addition to the benign attribution bias, there is some evidence that prosocial children also demonstrate competencies in other dimensions of social information processing, especially with regards to strategy generation and evaluation. For example, there is evidence that children who are prosocial are more likely to generate and evaluate positively prosocial strategies for solving hypothetical peer conflicts (see e.g., Mayeux & Cillessen, 2003; Warden & MacKinnon, 2003). Similarly, prosocial children are less likely to select aggressive strategies as appropriate solutions for dealing with peer conflicts (Nelson & Crick, 1999). Response decisions ultimately involve making moral judgments about whether a particular strategy for a social conflict is morally acceptable (Nelson & Crick, 1999), and research supports the idea that highly prosocial children use more sophisticated moral reasoning than less prosocial children (see Eisenberg et al., 2006, for a review). Thus, it is not surprising that children's response decisions in measures of social information processing might be tied to their prosocial behavior.

Although some preliminary research suggests that prosocial children might show positive biases in social information processing, all of the work that has been done has been cross-sectional in design, so the direction of effects is not clear. In fact, a number of researchers doing work on aggression have argued for the idea that the links between social information processing and social behavior are bidirectional (Crick, 1995; Crick & Dodge, 1994). For example, children with hostile attribution biases may create self-fulfilling prophecies. The negative responses and rejection that these children evoke from others with their aggressive behavior likely only cement their belief that others have ill intent or are "mean" (see, e.g., Dodge et al., 2003). Following the same logic, a positive attribution bias in children may also become a self-fulfilling prophecy. Prosocial children may evoke positive responses from others by being prosocial to them, and over time, these positive responses likely increase children's beliefs in others as "nice" and "trustworthy" (see Carlo & Randall, 2001).

Therefore, the goal of this study was to examine the possible bidirectional links between social information processing and children's prosocial behavior using longitudinal data from National Institute of Child Health and Human Development Study of Early Child Care and Youth Development (SECCYD; NICHD Early Child Care Research Network, 2010). To our knowledge, this is the first study in which links between aspects of social information processing and prosocial behavior have been longitudinally exam-

ined. For the study, parents and teachers reported on children's prosocial behavior in Grades 3 through 6. Two of the most common assessments of social information processing (i.e., attribution bias and response selection) were administered in Grades 3–5. We predicted that both children's benign attributions and their endorsement of socially competent strategies for dealing with hypothetical peer conflicts would predict children's subsequent prosocial behavior. We also predicted, however, that the reverse would also be true: that children's engagement in early prosocial behavior would predict their subsequent attribution biases and strategy endorsement.

In addition, we also included a measure of aggression that mothers and teachers completed from third to sixth grades. We hoped to replicate previous findings that hostile attribution bias and aggressive response selection would predict children's aggressive behavior. Consistent with Crick and Dodge's (1994) theorizing, however, we also expected these links to be bidirectional. Most of the studies that have been conducted on children's information processing and children's aggressive behavior have involved concurrent assessments of social information processing and aggression (see Crick & Dodge, 1996; Dodge, 1980; Graham & Hudley, 1994; Lochman & Dodge, 1994; Quiggle, Garber, Panak, & Dodge, 1992; Waldman, 1996). In a few longitudinal studies, however, researchers have found links between aspects of earlier social information processing (including hostile attribution and response generation) and subsequent aggressive behavior (see, e.g., Lansford et al., 2006; Runions & Keating, 2007). Cross-lagged models examining the bidirectional links between aggression and social information processing have been rare (for exceptions, see Fontaine, Yang, Dodge, Bates, & Pettit, 2008; Lansford, Malone, Dodge, Pettit, & Bates, 2010) and have not directly examined whether the links between hostile attribution biases, response selection, and aggression are bidirectional.

Method

Sample

The current project examined data from the NICHD Study of Early Child Care and Youth Development (SECCYD). The SECCYD followed 1,364 children from soon after the child's birth until the age of 15 years. The study included four phases of data collection. The current analyses focused on Phase III data, which was drawn from more than 1,100 children followed through their seventh year in school. However, only data collected at four time points were used (i.e., third grade, fourth grade, fifth grade, and sixth grade). The original sample was relatively diverse in terms of ethnicity, education, and income. In the full sample (N = 1,364), 24% of the children were ethnic minorities; 10% of the mothers and 6.8% of fathers had less than a high school education; and 14% of mothers were single when the child was born. Of the children in the current sample (N = 1,038), 50.3% were female and 81.3% were White (.3% American Indian, Eskimo, Aleutian; 1.5% Asian or Pacific Islander; 12.0% Black or African American; 4.9% other). The average annual family income of the sample at Grade 3 was $77,008.04 ($SD$ = $68,272.66). Missing data on the outcome variables (i.e., prosocial and aggressive behavior) by Grade 6 were associated with gender ($\chi^2 = 4.95$ $p = .026$); boys (186) were more likely to have missing data than girls (140). Also, parental education was associated with attrition, $F(1, 1362) = 31.02$, $p < .001$; children of more educated parents remained in the sample (M = 14.47, SD = 2.33, vs. M = 13.64, SD = 2.46). No other differences were found with regards to missing data.

Measures

Prosocial and aggressive behavior (third, fourth, fifth and sixth grades).[1] Mothers and teachers completed a questionnaire that was designed to measure the study child's relationships and behaviors with peers in third through sixth grades. It included 31 items from the Child Behavior Scale (Ladd & Profilet, 1996) that measures aggressive behavior, prosocial behavior, asocial behavior, and exclusion by peers. Both the prosocial and aggressive behavior scales were used for this study. Respondents rated the study child's social behavior with peers on a 3-point scale (0 = not true, 1 = *sometimes true*, and 2 = o*ften true*). This scale had adequate internal consistency with both reporters in the NICHD sample (αs ranged from .80 to .88). Because mother and teacher reports of prosocial and aggressive behavior were consistently correlated (rs > .28, $p < .01$) at each time point, they were averaged to provide a single index of prosocial and aggressive behavior at each time point.

Attribution bias (third, fourth, and fifth grades). Children's intent attributions were measured using stories that describe social interactions where the intent of the provocateur is ambiguous (Crick, 1995). Three stories depicted instrumental provocations that included acts that could potentially be perceived as overt aggression (e.g., a child spilling milk on the participant child) and two stories depicted incidents that could potentially be considered to be acts of rejection and relational aggression (e.g., discovering one's best friend playing with someone that the child does not like). For each story, children selected from among four possible reasons for the provocation, two of which were benign (e.g., "The kid slipped on something") and two of which were hostile (e.g., "The kid wanted to make fun of you"). In addition, each child was asked to indicate whether the provocative behavior was intended to be mean or not. Following Nelson and Crick (1999), a measure of benign attributions was computed using scores from these 10 items (αs ranged from .75 to .79). Thus, benign attribution scores indicated the proportion of times across the 10 items that children indicated a benign attribution.

Response selection (third and fifth grades). Children also completed a questionnaire designed to assess the child's response selection in social information processing (see Crick & Dodge, 1990; 1960; Crick & Werner, 1998). The measure presented children with six stories that involved conflict with a peer (e.g., a peer cutting in line). Three of the stories presented a relational conflict and three depicted an instrumental conflict. Children were asked to select among four possible strategies to manage the conflict, including one that was overtly aggressive, one that was relationally aggressive, one that avoided the conflict, and one that was assertive but friendly (e.g., "I would say, 'This is my spot, I was here first; please move.'"). The proportion of assertive friendly resolu-

[1] The Child Behavior Checklist (CBCL; Achenbach, 1991) was also given to parents and teachers across this period. The cross-lagged models show a similar pattern of findings if the CBCL is used instead of the Child Behavior Scale (Ladd & Profilet, 1996).

tions across stories that children selected was computed and used in this study as a measure of socially competent conflict resolution strategies.

Results

Descriptive information on the study variables appears in Table 1 and bivariate correlations appear in Table 2. Bivariate correlations revealed that all of the study variables (with the exception of some of the controls) were significantly correlated in the expected directions.

Data Analysis Plan

In order to examine the cross-lagged (i.e., bidirectional) relations among social behaviors and social information processing, we estimated an autoregressive cross-lagged model using structural equation modeling (Mplus statistical program; Muthén & Muthén, 1998–2010) framework. Maximum-likelihood estimation was implemented in Mplus in order to estimate missing data. However, missing data could not be estimated for individuals with missing data on all dependent variables in the model. Thus, the sample size retained in the final models ranged from 1,103 to 1,104. Two models investigating the relations among two social behaviors (prosocial and aggressive behavior) and social information processing were estimated: one modeling benign attribution bias and one modeling social competent strategies. All variables were regressed onto the previous time point at which the construct was assessed. Additionally, we examined bidirectional pathways by regressing later social behaviors onto the previous wave's social information processing variable (e.g., Grade 5 prosocial behavior was regressed onto Grade 4 benign attribution bias) and by regressing later social information processing onto the previous wave's social behavior (Grade 5 benign attribution bias was regressed onto Grade 4 prosocial behavior). Social behaviors at Grade 6 were included as an outcome even though corresponding social information processing variables were not available at this wave of data collection. Within-time covariances among all social behaviors and social information processing variables (e.g., Grade 5 prosocial behavior with Grade 5 benign attribution bias) were estimated at each time point. Finally, gender and parental education (collected just following the birth of the child) were controlled for in the models by regressing all social behaviors and social information processing variables onto these variables. Please note that not all of the above paths are depicted in Figures 1 and 2 (see note in these figures).

Table 1
Means and Standard Deviations for Main Study Variables

Variable	*N*	*M*	*SD*	Range
Benign attribution bias G3	1,015	0.71	0.22	0–1.0
Benign attribution bias G4	1,020	0.71	0.23	0–1.0
Benign attribution bias G5	1,005	0.67	0.27	0–1.0
Socially competent strategies G3	1,031	0.57	0.25	0–1.0
Socially competent strategies G5	1,023	0.52	0.27	0–1.0
Prosocial behavior G3	1,076	1.57	0.35	0.20–2.0
Prosocial behavior G4	1,059	1.56	0.37	0.10–2.0
Prosocial behavior G5	1,053	1.56	0.34	0–0.20
Prosocial behavior G6	1,038	1.57	0.34	0.30–2.0
Aggressive behavior G3	1,076	0.31	0.31	0–1.78
Aggressive behavior G4	1,059	0.28	0.30	0–1.78
Aggressive behavior G5	1,053	0.30	0.31	0–1.78
Aggressive behavior G6	1,038	0.29	0.30	0–1.89

Note. G = Grade.

Although there are various ways to examine model fit, we adopted the fit indices guidelines provided by Hu and Bentler (1998, 1999). To determine model fit, we used the combination of the comparative fit index (CFI) and the standardized root-mean residual (SRMR). Models were determined to fit the data well (i.e., to be acceptable) if they produced values of SRMR $\leq$ .08 (.10) and CFI $\geq$ .95 (.90; Hu & Bentler, 1999; Kline, 1998; Weston & Gore, 2006).

Model Results for Benign Attribution Bias

Model results for social behaviors and benign attribution bias using standardized coefficients can be found in Figure 1. Unstandardized coefficients, standard errors, and *p* values appear in parentheses below. Results demonstrated that this model had acceptable fit—model fit indices: $\chi^2(27) = 492.22$, $p < .001$; CFI = .914, SRMR = .082. Earlier aggressive behavior (Grade 3) significantly predicted future benign attribution bias (Grade 4) in hypothesized directions (unstandardized coefficient –.07, standard error [*SE*] = .03, $p = .008$). Likewise, prosocial behavior (Grade 4) significantly predicted benign attribution bias (Grade 5; unstandardized coefficient .07, *SE* = .03, $p = .014$). Additionally, earlier benign attributions (Grade 4) predicted greater prosocial behavior (unstandardized coefficient .09, *SE* = .04, $p = .018$) and less aggressive behavior at Grade 5 (unstandardized coefficient –.08, *SE* = .03, $p = .010$). All earlier waves of social behavior and benign attribution bias were significantly and positively related to later waves of the corresponding construct. Thus, prosocial behavior at Grade 4 was significantly predicted by prosocial behavior Grade 3 (unstandardized coefficient .55, *SE* = .03, $p < .001$), prosocial behavior at Grade 5 was significantly predicted by prosocial behavior at Grade 4 (unstandardized coefficient .49, *SE* = .03, $p < .001$), and prosocial behavior at Grade 6 was significantly predicted by Grade 5 prosocial behavior (unstandardized coefficient .55, *SE* = .03, $p < .001$). Aggression at Grade 4 was significantly predicted by aggression at Grade 3 (unstandardized coefficient .60, *SE* = .02, $p < .001$), aggression at Grade 5 was significantly predicted by aggression at Grade 4 (unstandardized coefficient .66, *SE* = .02, $p < .001$), and aggression at Grade 6 was significantly predicted by aggression at Grade 5 (unstandardized coefficient .58, *SE* = .02, $p < .001$). Finally, benign attribution bias at Grade 4 was predicted by benign attribution bias at Grade 3 (unstandardized coefficient .41, *SE* = .03, $p < .001$) and benign attribution bias at Grade 5 was predicted by benign attribution bias at Grade 4 (unstandardized coefficient .55, *SE* = .03, $p < .001$).

Cross-Lagged Model Results for Socially Competent Strategies

Path model results for the cross-lagged model for social behaviors and socially competent strategies (using standardized coefficients) can be found in Figure 2. Unstandardized coefficients, standard errors, and *p* values appear in parentheses. Results

Table 2
Bivariate Correlations Among Prosocial Behavior, Aggressive Behavior, and Social Information Processing

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Gender[a]	—	.02	.06	.06	.09**	.16**	.23**	.21**	.20**	.21**	.22**	−.18**	−.21**	−.20**	−.20**
2. Parent education		—	.12**	.19**	.17**	.15**	.10**	.22**	.27**	.27**	.23**	−.23**	−.21**	−.24**	−.25**
3. Benign attribution bias G3			—	.43**	.37**	.10**	.09**	.10**	.12**	.16**	.10**	−.16**	−.15**	−.15**	−.18**
4. Benign attribution bias G4				—	.51**	.07*	.10**	.19**	.20**	.20**	.15**	−.23**	−.22**	−.21**	−.20**
5. Benign attribution bias G5					—	.07*	.10**	.19**	.21**	.18**	.16**	−.22**	−.18**	−.20**	−.18**
6. Socially competent strategies G3						—	.30**	.10**	.15**	.14**	.19**	−.19**	−.17**	−.17**	−.17**
7. Socially competent strategies G5							—	.19**	.21**	.23**	.24**	−.21**	−.22**	−.21**	−.22**
8. Prosocial behavior G3								—	.57**	.51**	.46**	−.58**	−.44**	−.45**	−.36**
9. Prosocial behavior G4									—	.58**	.52**	−.49**	−.56**	−.48**	−.41**
10. Prosocial behavior G5										—	.57**	−.43**	−.43**	−.60**	−.43**
11. Prosocial behavior G6											—	−.38**	−.40**	−.45**	−.52**
12. Aggressive behavior G3												—	.70**	.65**	.62**
13. Aggressive behavior G4													—	.70**	.62**
14. Aggressive behavior G5														—	.67**
15. Aggressive behavior G6															—

Note. G = Grade.
[a] 1 = boys; 2 = girls.
* $p < .05$. ** $p < .01$.

showed that this model had good fit, $\chi 2(21) = 208.538$, $p < .001$, CFI = .939, SRMR = .053. Earlier socially competent strategies (Grade 5) significantly predicted Grade 6 prosocial (unstandardized coefficient .084, *SE* = .04, $p = .019$) and aggressive behavior (unstandardized coefficient –.087, *SE* = .03, $p = .001$) in hypothesized directions. Additionally, Grade 3 aggressive behavior significantly and negatively predicted socially competent strategies at Grade 5 (unstandardized coefficient –.06, *SE* = .03, $p = .046$). All earlier waves of social behavior and socially competent strategies significantly and positively predicted later waves of the corresponding construct. Thus, prosocial behavior at Grade 5 was significantly predicted by prosocial behavior Grade 3 (unstandardized coefficient .49, *SE* = .03, $p < .001$) and prosocial behavior at Grade 6 was significantly predicted by Grade 5 prosocial behavior (unstandardized coefficient .55, *SE* = .03, $p < .001$). Aggression at Grade 5 was significantly predicted by aggression at Grade 3 (unstandardized coefficient .56, *SE* = .02, $p < .001$) and aggression at Grade 6 was significantly predicted by aggression at Grade 5 (unstandardized coefficient .59, *SE* = .02, $p < .001$). Finally, socially competent response selection at Grade 5 was predicted by socially competent response selection at Grade 3 (unstandardized coefficient .27, *SE* = .03, $p < .001$).

Discussion

The goal of this study was to examine the links between social information processing and children's prosocial and aggressive behaviors across time. We predicted that the links between social information processing and children's social behaviors would be bidirectional and mutually influential. Overall, the pattern of findings provided some support for bidirectional links between social behavior and social information processing, but the pattern varied across time. In particular, earlier in development (between Grades 3 and 4), it was mostly children's social behaviors that predicted children's subsequent benign attribution biases and socially competent response strategies. Closer to the end of middle childhood, however, children's social behavior was predicted by their social information processing (i.e., benign attribution biases and socially

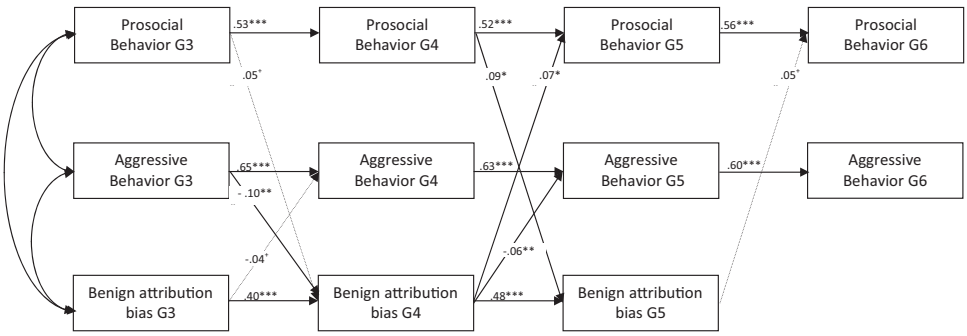

Figure 1. Path model results for the cross-lagged model for prosocial behaviors, aggressive behaviors and benign attribution bias. Model fit indices: $\chi^2(27) = 492.22$, $p < .001$, comparative fit index = .914, standardized root mean square residual = .082. Standardized coefficients are presented. Control variables including gender and parental education, within-time covariances, and nonsignificant cross-lagged paths are not depicted in the figure but have been included in the model. G = Grade. + $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

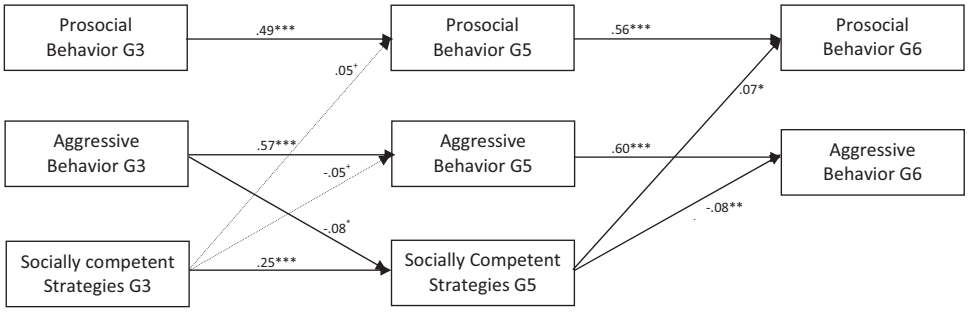

Figure 2. Path model results for the cross-lagged model for prosocial behaviors and socially competent strategies. Model fit indices: $\chi^2(21) = 208.538$, $p < .001$, comparative fit index = .939, standardized root mean square residual = .053. Standardized coefficients are presented. Control variables including gender and parental education, within-time covariances, and nonsignificant cross-lagged paths are not depicted in the figure but have been included in the model. G = Grade. $^{+}p < .10$. $^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

competent response strategies). These findings are consistent with those of other studies examining aspects of social cognition and social behavior across childhood (see, e.g., Davis-Kean et al., 2008; Huesmann & Guerra, 1997). For example, Huesmann and Guerra (1997) found that children's normative beliefs about aggression were predicted by their earlier aggressive behaviors, and it was not until later in childhood that normative beliefs about aggression predicted children's aggressive behavior. These researchers (Huesmann & Guerra, 1997; see also Davis-Kean et al., 2008) argued that children develop beliefs based upon their interactions with others and that these beliefs do not become crystalized (and therefore predictive of behavior) until later in childhood. It may also be true that other aspects of social cognition, including attribution biases and response selection, also do not crystalize early in development and become predictive of social behavior until later childhood (see also Lansford et al., 2006). Our findings add some support for this idea, especially because the correlations between the social information processing variables were modest across time, particularly when compared with the substantial stability in social behavior across time.

Consistent with previous work and theorizing (see e.g., Nelson & Crick, 1999), we found that children's competence in social information processing after fourth grade was related to their subsequent prosocial behaviors. Thus, we found that children's benign attribution biases at Grade 4 predicted high levels of prosocial behaviors at Grade 5. In addition, children's selection of socially competent response strategies at Grade 5 predicted high levels of prosocial behaviors at Grade 6. Thus, children who demonstrate benign attribution biases (i.e., who give others the benefit of the doubt in situations where intent is unclear) and who are capable of solving hypothetical social problems in ways that are constructive are more likely to engage in empathic and prosocial behavior. These links may be partially accounted for by the fact that prosocial children demonstrate higher levels of prosocial moral reasoning and perspective taking (see Eisenberg et al., 2006), which lead to more appropriate judgments about the intentions of others and about prosocial ways to solve social conflicts.

Moreover, this study also found links between children's social information processing and their later aggressive behavior. In particular, children with benign attribution biases at Grade 4 were less likely to be aggressive at Grade 5. Similarly, children who selected socially competent responses to solving hypothetical peer conflicts at Grade 5 were less aggressive at Grade 6. These findings are consistent with a large body of research that has demonstrated that children's hostile attribution biases and aggressive response selection are related to children's development of aggressive behavior (see e.g., Dodge, 1986; Lansford et al., 2006; Orobio de Castro et al., 2002). Longitudinal evidence of these links, however, has been rare (see Fontaine et al., 2008; Lansford et al., 2010, for exceptions), especially during middle childhood. Lansford et al. (2010) found few direct links between social information processing and aggression in early childhood; their findings, coupled with our own, suggest that the influence of social information processing on children's aggressive behavior occurs mostly in later childhood, again potentially after these biases in social information processing crystalize.

More interestingly, the findings suggested that children's engagement in prosocial behavior is linked to children's subsequent social information processing. Specifically, children's engagement in prosocial behavior at Grade 4 was related to children's subsequent benign attribution bias at Grade 5. This is consistent with the idea that engaging in prosocial behavior likely evokes positive responses from others, which, in turn, cements children's positive internal working models and trust in the goodness of others. Although researchers have found links between prosocial behavior and self-related processes, such as self-esteem (see, e.g., Huebner & Mancini, 2003; Laible & Carlo, 2004), researchers have not tended to examine the links between prosocial behavior and children's beliefs in others (for an exception, see Salmivalli, Ojanen, Haanpää, & Peets, 2005). The findings from this study suggests that children's early positive peer and relational experiences might shape children's working models of others in ways that are consistent with attachment theory (e.g., Bowlby, 1980). Furthermore, such evidence is consistent with social cognitive theories of prosocial development that emphasize social feedback influences on social cognitions that result from engaging in prosocial behaviors (Carlo & Randall, 2001). Together with recent research that suggests bidirectional effects in relations between parenting and prosocial behaviors (Carlo, Mestre, Samper, Tur, & Amenta, 2010; Padilla-Walker, Carlo, Christensen, & Yorgason, in press), the overall findings demonstrate the important developmental consequences of engagement in early prosocial behaviors.

The findings from this study also provide evidence of the idea that early engagement in aggressive behavior predicted children's later social information processing. Thus, engagement in aggressive behavior at third grade was inversely related to children's subsequent benign attributions at Grade 4 and to socially competent response selection at Grade 5. This suggests that children's engagement in aggressive behavior may eventually color the way in which children interpret or perceive others. Aggressive behavior likely evokes negative responses and rejection from others, which may limit aggressive children's ability to represent others' negative actions as unintentional. In fact, there is longitudinal evidence that social information processing variables mediate the links between peer rejection and aggression (see Dodge et al., 2003; Lansford et al., 2010). Moreover, these children likely also begin to associate aggressive strategies for solving peer problems as successful in achieving goals (such as dominance), perhaps inhibiting the formation and endorsement of positive strategies for solving peer conflicts (e.g., Crick & Dodge, 1996; Dodge, Lochman, Harnish, Bates, & Petitt, 1997; Erdley & Asher, 1996).

There were a number of study limitations and possible directions for future research. A narrow set of social information processing variables were included as part of the NICHD SECCYD and more work is needed to examine other aspects of social information processing (e.g., cue utilization, goal formation, and strategy generation and evaluation) and prosocial behavior. Moreover, the measures of social information processing in this study were designed to assess children's aggressive biases and not prosocial biases. Future researchers might want to focus on developing new measures of social information processing that might tap children's prosocial or socially competent biases. Also, the study design is correlational and although the cross-lagged design provides a test of the direction of effects, experimental and intervention studies are needed to more confidently determine causal relations. Intervention programs aimed at improving social information processing have supported the causal links between social information processing and aggressive behavior (e.g., Fraser et al., 2005), but analogous research on prosocial behavior remains to be done. In addition, our findings and those of others (e.g., Dodge et al., 2003; Lansford et al., 2010) lend support to the notion that peer experiences are influential in shaping children's social cognition. More work, however, is needed on the role of prosocial behavior and positive peer experiences on social cognition.

Nonetheless, the present findings have important implications for research and intervention. First, researchers need to examine bidirectional links that prosocial behavior has with social information processing longitudinally in order to better understand children's prosocial development. Second, this study adds to the mounting evidence on the relevance of social information processing models in understanding socially competent behaviors, such as prosocial behaviors (e.g., Dodge & Price, 1994; Nelson & Crick, 1999). And third, our study suggests future directions in research that examine the possible protective role of prosocial behavior in developing hostile attribution biases and aggressive behaviors. Such research could point to the importance of socially competent behaviors in promoting well-being and reducing aggressive and externalizing behaviors (see Carlo, 2006; Consortium on the School-Based Promotion of Social Competence, 1994).

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