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A 12-Year Prospective Study of Patterns of Social Information Processing Problems and Externalizing Behaviors

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Abstract

This study investigated how discrete social information processing (SIP) steps may combine with one another to create distinct groups of youth who are characterized by particular patterns of SIP. SIP assessments were conducted on a community sample of 576 children in kindergarten, with follow-up assessments in grades 3, 8, and 11. At each age, four profiles were created, representing youth with no SIP problems, with early step SIP problems (encoding or making hostile attributions), with later step SIP problems (selecting instrumental goals, generating aggressive responses, or evaluating aggression positively), and with pervasive SIP problems. Although patterns of SIP problems were related to concurrent externalizing during elementary school, the consistency between cognition and future externalizing behavior was not as strong in elementary school as it was between grades 8 and 11. In some cases, youth characterized by the co-occurrence of problems in early and later SIP steps had higher externalizing scores than did youth characterized by problems in just one or the other.

Keywords

Social information processing; Externalizing behaviors; Aggression

Social information processing (SIP) theory (e.g., Crick & Dodge, 1994) describes a set of cognitive-emotional mechanisms that have been found to account, in part, for the link between a host of risk factors and the subsequent development of aggression. According to this theory, the way that children interpret a particular event influences how they will respond to that

situation. Within the field of developmental psychopathology, social information processing theory has been the major theoretical framework for addressing the question of which proximal factors give rise to aggression in particular situations.

Dodge and his colleagues (e.g., Crick & Dodge, 1994; Dodge, Bates, & Pettit, 1990; Dodge & Schwartz, 1997) have proposed several steps in a model of social information processing: encoding, making attributions, selecting a goal, generating responses, evaluating responses, and enacting responses. First, encoding is the process of taking in information from the environment. Second, making attributions involves deciding what motivates the behavior of other people; on the basis of information children encode from a particular situation, they could decide that others acted with benign, hostile, or ambiguous intent. Third, selecting a goal involves choosing the most desired outcome in a given situation. Fourth, generating responses is the process of thinking of behavioral reactions to a given situation. Fifth, evaluating responses occurs when children assess whether a response is a good one to use in a particular situation and whether that response will be associated with desired outcomes. Finally, enacting responses is the manner in which a child actually behaves. The following specific deficits in each of these six steps are related to aggressive behavior: (a) encoding problems involving either hypervigilance to hostile cues or neglecting to take in relevant nonhostile cues (Dodge, Bates, & Pettit, 1990); (b) making hostile (rather than benign) attributions (Dodge, Price, Bachorowski, & Newman, 1990); (c) selecting instrumental (e.g., winning a game) rather than interpersonal (e.g., maintaining a friendship) goals (Slaby & Guerra, 1988); (d) generating fewer behavioral responses overall and a higher proportion of aggressive responses to problems (Asarnow & Callan, 1985); (e) positively evaluating the likely interpersonal and instrumental outcomes of aggression (Crick & Ladd, 1990); and (f) skill in enacting aggressive responses (Dodge, McClaskey, & Feldman, 1985).

In most of the SIP literature, these steps have been conceptualized as being discrete processes through which individuals progress, albeit nonconsciously, when they encounter social stimuli. The steps are not presumed to be dependent on one another. It is possible for a given individual to be characterized by the situation-specific pattern of making hostile attribution biases, for example, without having problems with encoding, generating responses, or evaluating responses. However, even if overall an individual is characterized by problems in some but not other steps of processing, at the level of a particular event, processing during early steps may affect processing of later steps. Using sophisticated measurement and analytic techniques, several studies have demonstrated that discrete SIP steps have discriminant validity and that models that include these multiple steps fit the data better than do models that propose fewer SIP steps (e.g., Dodge, Laird, Lochman, Zelli, & Conduct Problems Prevention Research Group, 2002; Zelli, Dodge, Lochman, Laird, & Conduct Problems Prevention Research Group, 1999).

Despite the importance of individual SIP steps, we believe there is also value in examining how these discrete steps may combine with one another to create distinct groups of children and adolescents who have different SIP profiles. There is precedent for this approach in work that examines all SIP steps jointly as indicators of an overall, maladaptive processing style (Weiss, Dodge, Bates, & Pettit, 1992). However, to our knowledge, the current study represents the first person-centered, rather than variable-centered, attempt of this kind. Other studies that have looked at patterns of SIP in relation to different types of problematic adjustment suggest that this will be a fruitful endeavor. For example, Quiggle, Garber, Panak, and Dodge (1992) examined SIP in relation to aggression and depression among children in grades 3–6. Although the analyses were variable-centered and focused on comparing mean differences in discrete SIP steps between aggressive and nonaggressive and depressed and nondepressed children, it was possible to compare the SIP steps that distinguished aggressive and nonaggressive children with those that distinguished depressed and nondepressed children. Although both aggressive

and depressed children were more likely to make hostile attributions than were their peers, aggressive and depressed children differed from each other in their generation and evaluation of responses to hypothetical situations. Aggressive children were likely to report that behaving aggressively would be easy for them and would lead to positive outcomes, whereas depressed children generated fewer assertive responses, expected worse outcomes to be associated with assertive responses, and expected better outcomes to be associated with withdrawal (Quiggle et al., 1992). Thus, one reason that understanding how SIP steps act in conjunction with one another is important is that combinations of problems in different SIP steps may be related to specific behavioral problems.

Furthermore, although the proportion of variance in behavioral outcomes accounted for by any single SIP step is modest, SIP steps uniquely increment the prediction of outcomes such that the multiple correlation between the discrete steps and aggression is high (Dodge, Pettit, McClaskey, & Brown, 1986). What studies that adopt an incremental approach to SIP steps do not reveal, however, is whether there may be multiplicative as well as additive effects of having SIP problems in more than one step. It is possible, for example, that an examination of the way SIP steps interact would reveal that having problems in one step may amplify the risk associated with having problems in another step or that lacking problems in one step may reduce the risk associated with having problems in another step. Thus, although it is clearly important to demonstrate that discrete SIP steps are associated with behavioral outcomes, it is also important to understand how these steps may act in conjunction with one another to shape these outcomes.

We were especially interested in comparing four types of children: (a) children with no SIP problems; (b) children with SIP problems in early steps (encoding and making hostile attributions); (c) those with SIP problems in later steps (selecting goals, generating responses, and evaluating responses); (d) children with pervasive SIP problems across early and later steps. Problems in early versus later steps have been associated with different forms of aggression. Specifically, SIP problems in early steps (e.g., making inappropriate hostile attributions in the face of ambiguous or benign social stimuli) have been associated with reactive aggression (which has been characterized as an angry retaliatory response to perceived provocation; Dodge & Coie, 1987). In contrast, SIP problems in later steps such as evaluating aggression positively (Smithmyer, Hubbard, & Simons, 2000) and holding instrumental (e.g., obtaining a toy) rather than relational (e.g., becoming friends) goals in social interactions have been associated with proactive aggression (which is unprovoked and goal-directed; Crick & Dodge, 1996). At a broader conceptual level, the early SIP steps involve cognitions about input (i.e., taking in relevant cues from social stimuli and making attributions about others' intentions in those situations), whereas the later SIP steps involve cognitions about output (i.e., desired outcomes, possible responses, and interpretations of behavioral responses in social situations). Thus, we focused on comparing children characterized by different profiles of SIP problems in early versus later steps.

Although internal consistencies ranging from .70 to .79 were found when measures of discrete SIP steps were combined across four years from kindergarten through grade 3 (Dodge, Pettit, Bates, & Valente, 1995), the magnitude of these internal consistencies is likely influenced considerably by adjacent-year stability. Thus, a first developmental question is the extent to which SIP steps and profiles of SIP steps are stable over longer periods of time and across developmental transitions. We hypothesized that profiles of SIP steps would demonstrate some stability over time.

A second developmental question is whether there are developmental changes in the links between SIP and aggressive behavior. Longitudinal studies and experimental manipulations that have examined the timing of SIP problems in relation to the timing of externalizing

behavior have revealed that SIP deficits and biases have an impact on subsequent externalizing behavior problems (e.g., Rabiner & Coie, 1989). Interventions designed to prevent or reduce aggressive behaviors have sometimes capitalized on these temporal relations by implementing program components that attempt to alter children's processing of social information. There is evidence that altering children's SIP can indeed lead to reductions in antisocial behavior (Guerra & Slaby, 1990; Hudley & Graham, 1993). This temporal evidence indicates that changes in discrete SIP steps are related to changes in externalizing behaviors over time.

The present study takes this work a step further by examining how SIP profiles that reflect multiple SIP steps are related to externalizing behavior problems over time. There are three main possibilities for the form these associations may take. First, it is possible that problems in early or later SIP steps alone relate to concurrent or subsequent externalizing behavior. Second, it is possible that problems in both early and later SIP steps relate independently to concurrent or subsequent externalizing behaviors, suggesting additive effects wherein having problems in both early and later steps is related to more externalizing problems but that the effects of problems in either early or later steps do not depend on problems in the other steps. Third, it is possible that problems in early and later steps act multiplicatively such that the effects of problems in later steps depend on the level of early step problems or vice versa.

Furthermore, there are theoretical and empirical reasons to expect that SIP will become a stronger predictor of subsequent externalizing behavior as children develop. Using data from six longitudinal studies (including the one used in the present study), Davis-Kean et al. (2005) found that prior to 8 years of age beliefs do not predict future behaviors, whereas after 8 years of age, beliefs do predict future behaviors. Huesmann and Guerra (1997) also found that beliefs about aggression were more strongly linked with aggressive behavior in the later grade school years than in the early grade school years and that behavior seemed to be linked more strongly with changes in beliefs, rather than vice versa, until the later grade school years, when beliefs began to be associated with changes in aggression. In addition to examining whether there is stability in SIP across development, the present study is motivated by the goal of examining developmental changes in links between SIP and externalizing behaviors. We hypothesized that SIP would be a better predictor of externalizing behaviors in adolescence than during the elementary school years.

Method

Participants

The families in the current investigation were participants in an ongoing, multisite longitudinal study of child development (see Dodge, Bates, & Pettit, 1990; Pettit, Bates, & Dodge, 1997). Participants were recruited when the children entered kindergarten in 1987 or 1988 at three sites: Knoxville and Nashville, TN and Bloomington, IN. Parents were approached at random during kindergarten pre-registration and asked if they would participate in a longitudinal study of child development. About 15% of children at the targeted schools did not pre-register. These participants were recruited on the first day of school or by subsequent contact. Of those asked, approximately 75% agreed to participate. The sample consisted of 585 families at the first assessment. Males comprised 52% of the sample. Eighty-one percent (81%) of the sample were European American, 17% were African American, and 2% were from other ethnic groups. Follow-up assessments were conducted annually through grade 11. Seventy-four percent (74%) of the original 585 families provided grade 11 data for the present analyses; these participants were of slightly higher SES in kindergarten ($M = 40.31$, $SD = 14.32$) than were those who did not provide grade 11 data ($M = 37.37$, $SD = 12.91$), $F(1,568) = 4.88$, $p < .05$, but these two groups did not differ significantly by race, gender, or mother-rated externalizing behavior problems in kindergarten. The analyses used pair-wise deletion of missing data, so the number of participants involved in the analyses depended on how many provided data on

the measures included in a given analysis. The sample size for analyses ranges from 576 for analyses that use just kindergarten SIP profile to 342 for analyses that use both grade 8 and grade 11 SIP profiles.

Procedures and measures

During the summer before children started kindergarten or within the first weeks of school, in-depth interviews were conducted with mothers and children in their homes. Mothers completed additional interviews and questionnaires annually thereafter. Children completed additional face-to-face interviews when they were in grades 1, 2, 3, 8, and 11; children's interviews from grades 1 and 2 are not considered in this report to simplify the presentation of results. Inter-rater agreement on all open-ended SIP questions described below was good (kappa greater than .80 in all instances in kindergarten and grade 3, see Weiss et al., 1992; $r(96) = .86, .74, .80$ for steps 1–3, respectively, in grade 8; step 4 in grade 8 and all steps in grade 11 were assessed with close-ended questions).

Social information processing—In kindergarten and grade 3, children were presented with 24 video vignettes that depicted situations in which child protagonists attempted unsuccessfully to enter peer groups or encountered provocations from peers. In each vignette, children were told to imagine being the protagonist and were asked a series of questions after watching each vignette. Children also were presented with a series of cartoon pictures and brief verbal descriptions of the cartoon events and were asked questions to assess their processing of the cartoon stimuli.

Encoding was assessed by asking children to describe what happened in each of the 24 video vignettes. Responses were coded according to how much relevant information the child encoded (1 = a fully relevant response with clear attention to appropriate cues, 2 = a partially relevant response, 3 = a non-relevant response). Responses were averaged across vignettes to create a single encoding score ($\alpha = .79$ and $.61$ in kindergarten and grade 3, respectively). Attributions were assessed by asking children why they thought the peers in 8 cartoon stories behaved as they did in ambiguous situations. Each attribution was coded as hostile or non-hostile, and a composite attributions score was created by taking the proportion of the stories in which children interpreted the peers' intentions as hostile ($\alpha = .73$ and $.71$ in kindergarten and grade 3, respectively). Response generation was assessed by asking children how they would respond if each of the 24 video situations had happened to them. Each response was coded as being aggressive, withdrawn or inept, or assertive and competent. Children were separately presented with 8 cartoon stimuli and asked to generate solutions to the problems depicted in the cartoons. The proportions of aggressive responses generated for the video vignettes and cartoon stimuli were calculated, and scores were standardized and combined to create a single variable reflecting aggressive response generation ($\alpha = .66$ and $.61$ in kindergarten and grade 3, respectively). After each video vignette, children were shown alternative strategies (competent, aggressive, and inept) for dealing with the situation. Response evaluation was assessed by asking children to rate whether each alternative strategy was a good or bad thing to say or do (1 = very bad, 2 = bad, 3 = good, 4 = very good). Aggressive response evaluation was scored as the average of this item following the aggressive response across the 24 vignettes ($\alpha = .56$ and $.55$ in kindergarten and grade 3, respectively). Each of the 4 SIP variables (i.e., encoding, attributions, response generation, response evaluation) was created separately for kindergarten and grade 3 assessments, and higher scores indicated more SIP problems (for additional details see Dodge, Bates, & Pettit, 1990; Dodge et al., 1995).

In grades 8 and 11 the participants were shown 6 video vignettes that started with a social interaction and culminated in an ambiguous provocation by peers or adults directed toward a protagonist adolescent. Participants were asked to imagine being the protagonist. Three

vignettes depicted provocations that were relevant to both boys and girls and were presented to all participants; the remaining 3 vignettes were gender-specific. Each provocation segment was followed by two segments that presented an aggressive and a non-aggressive response to the provocation, respectively. After each of the video segments, questions were asked to assess SIP; the questions differed in format for grades 8 and 11, but the constructs assessed were similar. In grade 8, adolescents were also shown 9 drawings and presented with brief verbal descriptions of the drawn events and were asked questions to assess their processing of these stimuli. In grade 11, after the video presentations were completed, participants were shown 6 illustrations one at a time as an audio-recorded narrator read a related story about a hypothetical provocation directed toward the participant. After each story, the narrator read several questions as the text of the questions appeared on the screen. Participants were asked to follow along in a printed version of the questions and circle their answers.

In grade 8, encoding was assessed by asking adolescents to tell the interviewer the important things that happened in each video story. As with the kindergarten and grade 3 assessments, responses were coded according to how much relevant information the adolescent encoded (1 = fully relevant, 2 = partially relevant, 3 = non-relevant). Responses were averaged across vignettes to create a single encoding score ($\alpha = .66$). Hostile attributions were assessed by asking why each of the events depicted in the video vignettes and drawn stories occurred ($\alpha = .54$). Response generation was assessed by asking what the adolescent would do if each of the events depicted in the video vignettes and drawn stories happened to them ($\alpha = .71$). Response evaluation was assessed by asking adolescents whether aggressive responses to the video vignettes would lead to desired instrumental outcomes, how they would feel about themselves if they acted aggressively, and how much other people would like them if they acted aggressively ($\alpha = .83$). Higher scores on each of the 4 composite SIP variables reflected more SIP problems (see Burks, Laird, Dodge, Pettit, & Bates, 1999; Fontaine, Burks, & Dodge, 2002, for additional details).

In grade 11, SIP was assessed after each of the video vignettes and orally presented stories. Hostile attributions were assessed through questions regarding the perceived intent of the provocateurs in the videos and stories (whether the actor intended to be mean) and how angry the participants would be if the depicted provocation happened to them ($\alpha = .86$). Although encoding was not assessed in grade 11, we included a variable that reflected goal clarification instead. This measure was based on a question that asked participants to choose between an instrumental (want the other person to respect me) and an interpersonal (want the other person to like me) goal in response to the provocations depicted in the videos and stories. This score reflected the proportion of times that participants chose instrumental goals across the 6 video provocations and 6 illustrated stories ($\alpha = .80$). Instead of open-ended response generation questions used in the earlier assessments, in grade 11 participants were asked to choose between an aggressive and non-aggressive behavioral response to the provocations depicted in the videos and stories. This score reflected the proportion of times that participants chose aggressive responses to the video provocations and illustrated stories ($\alpha = .75$). Response evaluation was assessed through 4 questions that followed the videos depicting aggressive responses to the provocations. The questions concerned how good or bad the aggressive response was, how well one could achieve interpersonal goals by responding this way, how well one could achieve instrumental goals by acting this way, and how the participants would feel about themselves if they acted this way. These 4 variables were averaged across vignettes to create the response evaluation measure ($\alpha = .88$).

For each SIP variable, higher scores indicated more SIP problems. A cut-off of one standard deviation above the mean on each SIP step was used to distinguish children with problems in that step from children without problems in that step.

Externalizing behaviors—Children's mothers completed the 113-item Child Behavior Checklist (Achenbach, 1991a) when the children were in kindergarten and grades 3, 8, and 11. Mothers reported whether each item was not true (0), somewhat or sometimes true (1), or very or often true (2) of the child. Items reflecting delinquency (e.g., steals, lies or cheats) and aggression (e.g., gets in many fights, has a hot temper) were summed to create a 33-item scale reflecting externalizing behavior problems in each year. Children's kindergarten, grade 3, and grade 8 teachers completed the Teacher Report Form (Achenbach, 1991b), and youth themselves completed the Youth Self Report (Achenbach, 1991c) in grade 11. Comparable externalizing behavior problem scales were created for teacher and youth reports.

Results

Analysis plan

We conducted our analyses in three steps. First, we created mutually exclusive profiles that reflect four groups of youth in each year: (a) no SIP problems; (b) SIP problems in early steps (encoding or making attributions); (c) SIP problems in later steps (goal selection, response generation, or response evaluation); and (d) SIP problems in both early and later steps. Second, we conducted chi-square analyses to determine whether profile membership in one year predicted profile membership in subsequent years and whether profile membership was significantly related to gender or ethnicity. Third, we conducted multivariate analyses of covariance (MANCOVAs) to investigate whether profile membership predicted externalizing behavior problems concurrently and subsequently.

Social information processing profiles

We began by creating SIP profiles on the basis of the combination of scores youth had across SIP steps within a given year. The proportion of youth in each profile group in each year is shown in Table 1. As shown, the majority of youth had no SIP problems. Depending on the year, 4% to 22% of the youth had problems in at least one of the early SIP steps (encoding and making attributions); the small proportion of youth with early SIP problems in grade 11 reflects the absence of information about encoding in the grade 11 assessment and therefore reflects just problems in making attributions. Again depending on the year, 14% to 29% of the youth had problems in at least one of the later SIP steps (selecting goals, generating responses, and evaluating responses); the large proportion of youth with later SIP problems in grade 11 reflects the presence of information about goal selection in addition to information about generating and evaluating responses in grade 11 only. Finally, between 7% and 12% of youth had SIP problems in both early and later steps.

We conducted chi-square analyses to examine whether SIP profile membership in each year was related to SIP profile membership in each other year; note, however, that the different number of steps considered as evidence of problems in grade 11 compared to the earlier grades makes cross-year comparisons more difficult to interpret. As shown in Table 2, grade 8 profile membership was significantly related to grade 11 SIP profile membership, $\chi^2(9, N = 337) = 19.40, p < .05$; profile membership comparisons between other years did not reveal significant associations. Youth in each profile in grade 8 were overrepresented in the analogous profile in grade 11. Notably, 124 of 184 eighth graders who showed no deviant SIP continued to show no deviant SIP in grade 11 (i.e., 67% continued in the no SIP problem category); 73 of 158 eighth graders who showed any type of SIP problem still showed at least one SIP problem in grade 11 (i.e., 46% continued in an SIP problem category).

We conducted additional chi-square analyses to test the association between SIP profiles and gender and ethnicity. Gender was significantly associated with SIP profile in kindergarten, $\chi^2(3, N = 576) = 9.93, p < .05$, and grade 11, $\chi^2(3, N = 410) = 9.94, p < .05$. In kindergarten,

girls (48% of the total sample) comprised 55%, 41%, 43%, and 40% of the no problems, early problems, later problems, and pervasive problems profile groups, respectively. In grade 11, girls (48% of the total sample) comprised 54%, 28%, 42%, and 35% of the no problems, early problems, later problems, and pervasive problems profile groups, respectively. Thus, girls were relatively less likely to display SIP problems than were boys.

Ethnicity was significantly associated with SIP profiles in kindergarten, $\chi^2(3, N = 565) = 10.68, p < .05$; grade 3, $\chi^2(3, N = 469) = 14.83, p < .01$; and grade 8, $\chi^2(3, N = 388) = 7.82, p < .05$. African Americans (17% of the total sample) comprised 12%, 25%, 18%, and 22% of the no problems, early problems, later problems, and pervasive problems profile groups, respectively, in kindergarten; 11%, 24%, 23%, and 27% of the no problems, early problems, later problems, and pervasive problems profile groups, respectively, in grade 3; and 14%, 18%, 15%, and 32% of the no problems, early problems, later problems, and pervasive problems profile groups, respectively, in grade 8. Thus, overall, European American children were less likely to display SIP problems than were African American children.

Social information processing and concurrent externalizing behavior

We next tested the association between SIP profile membership and concurrent externalizing behavior problems. We conducted separate 2 (early step SIP problems or not) $\times 2$ (late step SIP problems or not) MANCOVAs for SIP patterns in each grade, with concurrent externalizing problems as the outcome. We controlled for gender, ethnicity, and prior externalizing problems. Results of these analyses are shown in Table 3.

In kindergarten, there were significant main effects of both early step and later step SIP problems on concurrent teacher and mother reported externalizing. When children were in grade 3, there were significant main effects of later step SIP problems on both teacher and mother reported concurrent externalizing. There were no significant interactions between early and later step SIP problems in kindergarten or grade 3.

In grade 8, significant main effects of both early and later step SIP problems were found for both mother-reported and teacher-reported externalizing problems. In addition, a significant interaction between early and later step SIP problems indicated a synergistic effect that exacerbated teacher-reported externalizing problems. Youth with no SIP problems had the lowest levels of teacher-reported externalizing in grade 8, and youth with either early or later step SIP problems had slightly higher levels of teacher-reported externalizing problems. However, youth with SIP problems in both early and later steps had considerably higher levels of teacher-reported externalizing problems than did the other three profile groups, suggesting multiplicative rather than additive effects of having SIP problems in both early and later steps.

In grade 11, a significant effect of early step SIP problems was found for mother-reported externalizing problems, and a significant effect of later step SIP problems was found for youth-reported externalizing problems.

Social information processing and subsequent grade 11 externalizing behavior

Similar analyses were repeated with SIP profiles as the independent variables and grade 11 externalizing problems as the outcomes, controlling for gender, ethnicity, and prior externalizing problems that were assessed in the same year as the SIP predictors (see Table 4). There was a significant main effect of early step SIP problems in kindergarten on mother reported externalizing problems in grade 11. Grade 3 SIP problems did not predict grade 11 externalizing problems.

Both early step and later step grade 8 SIP problems predicted grade 11 youth-reported externalizing problems. Furthermore, the interaction between early and later step SIP problems

was significant, indicating a synergistic effect. Consistent with the interaction effect found in the prediction of teacher-reported externalizing in grade 8 from grade 8 SIP profiles, youth with no SIP problems in grade 8 had the lowest levels of youth-reported externalizing in grade 11, and youth with either early or later step SIP problems in grade 8 had slightly higher levels of youth-reported externalizing problems in grade 11. Youth with SIP problems in both early and later steps in grade 8 had considerably higher levels of youth-reported externalizing problems in grade 11 than did the other three profile groups. This interaction effect also suggested multiplicative effects of having SIP problems in both early and later steps.

Discussion

Our overarching goals were to examine whether different SIP profiles characterize distinct groups of children and adolescents, whether SIP profiles in one year are related to SIP profiles in subsequent years, and how patterns of SIP that reflect multiple SIP steps are related to concurrent and subsequent externalizing behavior problems. Although variable-centered approaches that have been common in previous research of investigating individual SIP steps in relation to behavioral outcomes are important, we believed there would also be value in taking a person-centered approach to investigate how SIP steps act in conjunction with one another.

We did not find that SIP profile membership in elementary school was related to SIP profile membership in grade 8 or 11, but it is unclear whether that reflects a lack of comparability in the way SIP was measured at those times or a more substantive redefining of SIP profiles as children develop. We did, however, find that SIP profile membership in grades 8 and 11 were significantly related, despite the different measurement at those two times. Although our conclusions must be tentative because of the measurement limitations, the findings are consistent with Lochman and Dodge's (1994) cross-sectional finding of a shift in expectations regarding aggression between preadolescence and adolescence. In particular, Lochman and Dodge (1994) found that compared to preadolescent aggressive boys, adolescent aggressive boys were more likely to believe that aggression could effectively solve social problems. It is, therefore, possible that we did not find stability between SIP profile membership in elementary school and later grades because children experience a cognitive restructuring in beliefs about aggression over time. Reasoning from a group-level mean shift at different stages of development (in the case of Lochman & Dodge, 1994) to the current individual-level reorganization of cognition is complicated, though. Such reasoning would assume that patterns found at the population level would be found during the course of an individual's development as well.

Relative to boys, girls were overrepresented in the profile characterized by no SIP problems, and relative to African Americans, European Americans were overrepresented in the no SIP problems group. In the literature, externalizing behavior problems are often reported to be more prevalent for boys than girls and for African American than European American youth (see Coie & Dodge, 1997). The differences between these groups in SIP profiles suggests one proximal mechanism that would account for the demographic differences in externalizing problems.

Our next set of findings revealed differences in externalizing behaviors by patterns of SIP problems in six of the seven MANCOVAs. That is not surprising given findings showing that more problems with individual SIP steps are related to higher levels of externalizing behavior (e.g., Asarnow & Callan, 1985; Crick & Ladd, 1990; Slaby & Guerra, 1988). What is more novel is the patterns of SIP problems that were related to higher levels of externalizing behaviors, and how this differed depending on the year SIP was assessed and the outcome. With one exception, patterns of SIP problems during elementary school did not predict

externalizing behaviors in grade 11. However, patterns of SIP problems in grade 8 predicted two of the four measures of externalizing in grade 11. This pattern of findings is consistent with previous research showing that as children develop, social cognition becomes more strongly connected with actual behavior (Davis-Kean et al., 2005) and that beliefs about aggression begin to predict aggressive behavior after the age of eight years (Huesmann & Guerra, 1997). Thus, although patterns of SIP problems were related to concurrent externalizing during elementary school, the consistency between cognition and future behavior was not as strong as it was at an older age. A different possibility is that developmentally more recent experiences and characteristics have a greater impact on externalizing behaviors than do developmentally more distant characteristics.¹

Although the results were consistent across reporters in 11 of the 14 MANCOVAs, we did find differences across reporters in 3 of these analyses. Specifically, in grade 11 early step SIP problems predicted concurrent mother-reported externalizing, whereas later step SIP problems predicted concurrent youth-reported externalizing. In the prospective analyses, early step SIP problems in kindergarten predicted mother-reported but not youth-reported externalizing in grade 11, whereas both early and later step SIP problems in grade 8 predicted youth-reported but not mother-reported externalizing in grade 11. Overall, it may be that by grade 11 youth are more aware of their own behavior problems that are related to SIP problems in adolescence but that mothers still recognize externalizing that is related to early step SIP problems in kindergarten.

When significant interactions were found between early and later step SIP problems (in 2 of the 14 tested interactions), the results showed that youth characterized by the co-occurrence of problems in early and later SIP steps had far higher externalizing scores than did youth characterized by problems in one or the other (or neither). This provides some evidence that having problems in early or later steps amplifies the risk of having problems in the other set of steps. In those cases when the interactions were significant, having pervasive SIP problems conferred risk for externalizing problems multiplicatively, not just additively. One possibility is that problems in one SIP step can be offset by competence in another SIP step. For example, even if children make hostile attributions in the face of ambiguous social stimuli, if they are able to generate non-aggressive responses and evaluate those non-aggressive responses positively, they may be able to avoid behaving aggressively. Similarly, if children generate aggressive responses and evaluate aggressive responses positively but accurately encode information in social situations and do not mis-attribute hostile intent to others, they may not behave aggressively because they would not believe it was warranted in benign situations. Thus, problems in early steps (i.e., with cognitions about input) or problems in later steps (i.e., with cognitions about output) may result in only slightly elevated levels of externalizing problems compared with having no SIP problems. However, if children have biased cognitions regarding social input as well as deficits in cognition about behavioral output, there would be no cognitive buffers against behaving aggressively. These possibilities must be considered tentative because only a small proportion of the interaction effects were significant. Overall, we found more support for additive effects of having SIP problems in both early and later steps than for multiplicative effects.

¹We investigated this possibility by conducting three MANCOVAs, controlling for gender, ethnicity, and prior externalizing. In the first MANCOVA, early and later step SIP problems in kindergarten were examined as predictors of grade 3 externalizing; early step SIP problems significantly predicted grade 3 externalizing. In the second MANCOVA, early and later step SIP problems in grade 3 were examined as predictors of grade 8 externalizing; early step SIP problems significantly predicted grade 8 externalizing. In the third MANCOVA, early and later step SIP problems in kindergarten were examined as predictors of grade 8 externalizing; neither early nor later step SIP problems in kindergarten significantly predicted grade 8 externalizing. These findings lend support to the speculation that developmentally more recent characteristics have a greater impact on externalizing than do developmentally more distant characteristics.

Our study has a number of strengths, including the availability of long-term longitudinal data, data from multiple reporters, and the ability to control for prior externalizing behaviors in predicting subsequent externalizing behaviors. However, some limitations suggest directions for future research. The alpha coefficients for 3 of the 16 SIP measures were low (.56 and .55 for response evaluation in kindergarten and grade 3, respectively, and .54 for hostile attributions in grade 8), suggesting the need for replication of the findings. Furthermore, because social information processing has been found to be specific to particular social situations (e.g., Dodge et al., 2002; Zelli & Dodge, 1999), an important direction for future research will be to examine SIP profiles that reflect processing of social information in addition to the types assessed here. For example, as the adolescents in the present sample take on new roles of spouse and parent in adulthood, examining profiles of SIP in marital and parent-offspring relationships will become important. The present findings apply to social information processing in relation to provocative situations involving peers and authority figures. In turn, SIP problems in distinct domains have been found to relate to aggressive behavior in situations specifically associated with those domains (Dodge et al., 1986). Future research will also be needed to determine how profiles of SIP in different domains relate to externalizing behaviors.

Overall, our findings suggest the value of adopting a person-centered approach to understanding children's social information processing and externalizing behaviors. Our study is novel in explicating how different SIP steps combine to create profiles of social cognitive adjustment in individual children as well as how externalizing behaviors relate to these profiles (that consider multiple SIP steps simultaneously rather than just one step at a time, as is the approach in variable-centered analyses). We found profiles of children who were similar to one another in their patterns of SIP, and youth with different patterns of SIP problems often differed from one another in externalizing behavior problems, both concurrently and subsequently and even controlling for gender, ethnicity, and previous externalizing problems. Thus, it is not only problems in individual aspects of social information processing that are related to externalizing behaviors but the combination of SIP problems across different steps as well.

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Table 1

Social information processing profiles

SIP	No SIP problems	Early SIP problems	Later SIP problems	Pervasive SIP problems
Kindergarten	.53	.19	.16	.12
Grade 3	.55	.15	.21	.09
Grade 8	.53	.22	.14	.11
Grade 11	.60	.04	.29	.07

Note. Tabled values are proportions of youth with each profile in a given year.

Table 2
Cross tabulations of significantly associated SIP profiles across years

Grade 11 Profile	Grade 8 Profile				Total
	No SIP problems	Early SIP problems	Later SIP problems	Pervasive SIP problems	
No SIP problems	124 (60.1; 69.6)	45 (21.1; 57.7)	22 (10.3; 48.9)	18 (8.5; 51.4)	213 (100; 62.3)
Early SIP problems	7 (43.8; 3.8)	5 (31.3; 6.4)	2 (12.5; 4.4)	2 (12.5; 5.7)	16 (100; 4.7)
Later SIP problems	43 (47.8; 23.4)	23 (25.6; 29.5)	15 (17.8; 35.6)	8 (8.9; 22.9)	90 (100; 26.3)
Pervasive SIP problems	6 (26.1; 3.3)	5 (21.7; 6.4)	5 (21.7; 11.1)	7 (30.4; 20.0)	23 (100; 6.7)
Total	184 (53.8; 100)	78 (22.8; 100)	45 (13.2; 100)	35 (10.2; 100)	342 (100; 100)

Note. Tabled values are numbers and (in parentheses) row and column percents, respectively, in each cell of the cross tabulations.

Table 3
MANCOVAs Examining differences in concurrent externalizing behaviors by early and later step SIP problems

SIP	No SIP problems (<i>M</i> , <i>SD</i>)	Early SIP problems (<i>M</i> , <i>SD</i>)	Later SIP problems (<i>M</i> , <i>SD</i>)	Pervasive SIP problems (<i>M</i> , <i>SD</i>)	Main effect: Early (<i>F</i>)	Main effect: Later (<i>F</i>)	Interaction (<i>F</i>)
Kindergarten SIP (Pillai's <i>F</i>)					5.98**	7.07**	.64
Mother-reported externalizing	10.78 (6.73)	11.73 (6.93)	11.72 (6.81)	14.03 (7.70)	5.76*	5.44*	.88
Teacher-reported externalizing	4.31 (6.72)	6.62 (8.97)	6.82 (9.60)	10.14 (13.22)	8.88**	11.64**	.68
Grade 3 SIP (Pillai's <i>F</i>)					.29	4.84**	.36
Mother-reported externalizing	8.52 (6.90)	8.76 (7.75)	11.53 (8.65)	10.37 (7.64)	.01	7.51**	.01
Teacher-reported externalizing	5.30 (9.13)	6.17 (11.21)	8.56 (11.63)	9.39 (11.17)	.51	4.36*	.63
Grade 8 SIP (Pillai's <i>F</i>)					4.24*	4.07*	4.46*
Mother-reported externalizing	7.37 (6.34)	10.39 (7.68)	10.33 (7.32)	11.68 (7.84)	4.19*	5.19*	1.17
Teacher-reported externalizing	6.44 (10.33)	7.64 (10.92)	7.44 (9.25)	15.19 (16.03)	6.55*	5.21*	5.70*
Grade 11 SIP (Pillai's <i>F</i>)					3.44**	2.66*	.99
Mother-reported externalizing	7.04 (6.75)	10.00 (6.71)	7.70 (6.52)	12.79 (12.65)	4.66*	3.00	.96
Youth-reported externalizing	10.05 (6.34)	12.69 (8.24)	12.96 (8.00)	15.53 (9.48)	1.53	5.26*	.00

Note. Analyses control for gender (significant in the *k*, grade 3, and grade 8 analyses), ethnicity (significant in the grade 3 and 8 analyses), and prior externalizing behavior (significant in the grade 3, 8, and 11 analyses; not controlled in the *k* analyses because no prior externalizing was assessed).

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 4
MANCOVAs examining differences in grade 11 externalizing behaviors by early and later step SIP problems

SIP	No SIP problems (<i>M, SD</i>)	Early SIP problems (<i>M, SD</i>)	Later SIP problems (<i>M, SD</i>)	Pervasive SIP problems (<i>M, SD</i>)	Main effect: Early (<i>F</i>)	Main effect: Later (<i>F</i>)	Interaction (<i>F</i>)
Kindergarten SIP (Pillai's <i>F</i>)					3.86 [*]	1.32	3.23 [*]
Mother-reported externalizing	7.57 (7.14)	8.85 (7.45)	7.73 (7.58)	12.24 (9.16)	7.42 ^{**}	1.45	2.63
Youth-reported externalizing	11.01 (6.58)	12.54 (9.13)	11.69 (7.51)	11.64 (8.09)	.31	.27	1.34
Grade 3 SIP (Pillai's <i>F</i>)					1.22	.49	.01
Mother-reported externalizing	7.52 (6.76)	9.30 (8.63)	8.54 (8.05)	9.45 (9.05)	1.94	.21	.01
Youth-reported externalizing	11.53 (7.17)	11.40 (8.20)	11.20 (7.35)	10.84 (7.57)	.03	.96	.00
Grade 8 SIP (Pillai's <i>F</i>)					2.41 [*]	3.25 ^{**}	4.46 ^{***}
Mother-reported externalizing	6.74 (6.07)	8.77 (8.14)	8.71 (8.51)	9.38 (8.90)	.40	.02	.39
Youth-reported externalizing	10.62 (6.77)	11.23 (6.05)	11.34 (7.30)	16.52 (9.96)	4.76 [*]	6.63 [*]	7.23 ^{**}

Note. Analyses control for gender (not significant), ethnicity (significant in all 3 MANCOVAs), and prior externalizing (significant in all 3 MANCOVAs).

* $p < .05$.

** $p < .01$.

*** $p < .001$.