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Emotions in Social Information Processing and Their Relations With Reactive and Proactive Aggression in Referred Aggressive Boys

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We studied emotional aspects of social information processing (SIP) and their specific relations with reactive and proactive aggression in 54 boys ages 7 to 13 who had been referred for aggressive behavior problems and a comparison group. Participants listened to vignettes concerning provocations by peers and answered questions concerning SIP, own and peer's emotions, and emotion regulation. Aggressive boys attributed more hostile intent, happiness, and less guilt; reported more anger; mentioned less adaptive emotion-regulation strategies; generated more aggressive responses; and evaluated aggressive responses less negatively than comparison boys. Hypothesized specific relations with reactive and proactive aggression were found, except for emotion regulation that was negatively related with both kinds of aggression. Potentially confounding effects of socially desirable answering, verbal intelligence, and recall of vignettes were controlled for.

The reformulated social information processing model (SIP; Crick & Dodge; 1994; Dodge, 1986) is an important element in theoretical accounts of the development of aggressive behavior. The model proposes that behavioral responses to social situations depend on a sequence of information-processing steps. According to the model, information is encoded and interpreted. Interaction goals are then specified, triggering generation of responses to attain these goals. One of these responses is then selected and enacted. Numerous studies indicate that aggressive behavior by nonreferred children is related to atypical encoding, interaction goals, response generation, response selection, and enactment (e.g., Dodge, 1993; Dodge, Pettit, McClaskey, & Brown, 1986). The few studies concerning children with clinically severe aggressive behavior problems have found these children to be less apt at encoding, to generate more aggressive responses, and to select more aggressive responses than children without such problems (Coy, Speltz, DeKlyen, & Jones, 2001; Lochman & Dodge, 1994; Matthys, Cuperus, & van Engeland, 1999; Milich & Dodge, 1984; Webster-Stratton & Lindsay, 1999). Interpretation has almost exclusively been studied in the sense of attribution of intent to peers. Intent attribution and aggressive behavior are related, though findings vary with methods used, and data concerning clinically aggressive children are scarce (Orobio de Castro, Veerman, Koops, Bosch, & Monshouwer, 2002). Interestingly, aggressive behavior is predicted by specific SIP patterns, and interventions targeting these patterns are relatively effective (e.g., Lochman & Wells, 2002).

It has recently been suggested that further progress can be made by integrating emotion processes in the SIP model (e.g., Lemerise & Arsenio, 2000) and by determining whether specific SIP patterns relate to specific kinds of aggressive behavior (e.g., Dodge, 1991a;

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Hubbard et al., 2002). However, even though these issues are strongly related, they have rarely been studied together at all, let alone in clinically aggressive children. The aim of this study was to address these caveats by studying emotion processes in SIP and their relation to reactive and proactive aggression in a clinically aggressive sample.

Emotion processes theoretically form an integral part of SIP (Crick & Dodge, 1994; Dodge, 1991a). Yet, even though emotions are implicitly present in the model as "energy" driving the whole process (Dodge, 1991a), emotion processes were not explicitly addressed in the original SIP models, and little is known about the roles of emotion processes in SIP (Crick & Dodge, 1994; Lemerise & Arsenio, 2000). Scholars (Gottman, 1986; Lemerise & Arsenio, 2000) have long noted a marked contrast between this implicit role of emotions in SIP models and accumulating evidence that emotion processes play important roles in aggressive behavior (Eisenberg et al., 1996; Graham, Hudley, & Williams, 1992; Hubbard et al., 2002) and as targets for interventions (e.g., Coping Power; Lochman & Wells, 2002; PATHS; Greenberg, Kusche, Cook, & Quamma, 1995).

Several authors (Graham et al., 1992; Lemerise & Arsenio, 2000; Lochman & Wells, 2002) have therefore suggested the following integrations of emotions in the SIP model. Encoding and interpretation may concern one's own and other people's emotions. Such interpretations may trigger emotional action tendencies that trigger emotion-specific interaction goals, response generation, evaluation, and enactment. These emotion processes may be subject to regulatory processes subsumed under the general term *emotion regulation*—that is, attempts to control, modify, and manage the experience and expression of emotions (Cole, Martin, & Dennis, 2004).

Despite the theoretical integration of emotion processes in SIP, SIP and emotion processes have so far been studied only separately. Several studies of emotion processes and aggressive behavior may be relevant to the SIP model. Concerning encoding and interpretation, studies of emotion attribution in aggressive boys have shown that aggressive behavior problems are related to atypical labeling of emotion expressions (Cook, Greenberg, & Kusche, 1994; Izard, Schultz, & Ackerman, 1997). Whether this involves systematic attribution of specific emotions (for example, to consider a sad facial expression angry) and how these attributions relate to the intent attributions studied in the SIP framework is, however, unclear. It seems likely that in the provocative situations generally used in SIP research, aggressive children would attribute happiness and glee to provocateurs as they would expect peers to enjoy provocations, either because they attribute hostile intentions or because they expect people to enjoy their misfortune.

Studies of emotional action tendencies and aggressive behavior have focused on anger. Findings on anger and aggression in nonreferred samples are inconsistent. Although Graham et al. (1992) did find that children who were both aggressive and rejected by peers reported more anger than their nonaggressive and nonrejected peers, other studies did not (Quiggle, Garber, Panak, & Dodge, 1992; Waas, 1988). Possibly, the effect only occurs in severely aggressive children, such as the referred aggressive boys in this study.

Studies of emotion regulation have shown that even intense anger does not necessarily lead to aggression. Most children learn to regulate anger and other negative emotions in circumstances in which expression of these emotions would have aversive consequences (Campos, Campos, & Barrett, 1989). Eisenberg et al. (1996) demonstrated that the relation between high emotionality and behavior problems depends on the quality of emotion regulation. Hubbard, Parker, Ramsden, and Smithmyer (1998) found aggression was related to lack of skill and motivation to regulate emotion in a nonreferred sample. There has, however, been surprisingly little research on relations between emotion regulation and SIP. As far as we know, this relation has never been studied in boys with severe aggressive behavior problems.

In sum, it is unclear whether the theoretical integration of emotion processes in SIP is valid and to what extent it may contribute to our understanding of aggressive behavior problems.

Over time, each adaptation of the SIP model has added more constructs to the model. The model evolved from five (Dodge, 1986) to six processing steps (Crick & Dodge, 1994), and emotion processes were then added to each of these steps (Lemerise & Arsenio, 2000). Notwithstanding sound theoretical grounds for each addition to the model, it is unclear whether all additions are parsimonious, because their added value has not been tested empirically. Therefore, we aimed to test whether emotion processes explain variance in aggressive behavior over and above the original SIP constructs by means of hierarchical regression analysis.

The SIP model proposes that certain elements contribute only indirectly to aggressive behavior via relations with other elements in the model. For example, the explanatory value of response generation lies not only in a direct relation with aggressive behavior, but also in its relation with response selection, that is in turn related to aggressive behavior. To test whether the indirect structural relations proposed by the integration of emotion processes in the SIP model matched our data, structural equation modeling was used.

The second aim of this study was to specify the proposed relations between SIP and aggression to reactive and proactive aggression. Reactive aggression is aggressive behavior performed in anger, in reaction to

a presumed threat, whereas proactive aggression is planned, instrumental and "cold blooded" behavior (Dodge, 1991b). Research indicates that these forms of aggression are related to different precursors, correlates, and prognoses (Dodge et al., 1997; Vitaro, Brendgen, & Tremblay, 2002). Consequently, it has been suggested that these two forms of aggression may require different interventions.

Concerning SIP, it has been suggested that reactive and proactive aggression may be uniquely related to different steps in the SIP model (Dodge, 1991b). Encoding and interpretation are hypothesized to be uniquely related to reactive aggression, whereas response evaluation is hypothesized to be uniquely related to proactive aggression. Most research concerning this issue has so far been conducted with nonreferred samples, and not all findings are in agreement. For example, Crick and Dodge (1996) found support for specificity of response evaluation, but not for intent attribution, whereas Dodge et al. (1997) found support in one of the two studies they described. Thus, the evidence for specificity of SIP patterns to reactive and proactive aggression is not conclusive, and data concerning severely aggressive children are scarce. Therefore, we studied these relations in our referred sample.

A secondary aim of this study was to avoid a number of methodological problems that may have influenced previous studies of SIP. Specific concerns have been expressed about psychometric properties of SIP measures, adequacy of stimuli and answering formats, and confounding influences of ability to recall presented vignettes, socially desirable answering tendencies, and intelligence (e.g., Crick & Dodge, 1994; Vasey, Dalgleish, & Silverman, 2003). In this study, care was taken to avoid these methodological pitfalls. Stimuli and answering formats were designed and selected in cooperation with samples from the target population and their mentors. Both open-ended and rating-scale response formats were used, and they were combined into reliable SIP variables. To control for the aforementioned potentially confounding effects, we assessed group differences on measures of these constructs and controlled for their influence when necessary. To accommodate different points of view regarding the appropriateness of controlling for verbal intelligence (Miller & Chapman, 2001; Orobio de Castro et al., 2002), we present results both with and without control for verbal intelligence where appropriate.

Method

Participants

Eighty-four 7- to 13-year-old boys ($M = 10.10$, $SD =$ 17 months) participated in the study. Participants in the aggressive group ($n = 54$) were recruited from behavior disorders departments of clinics for child psychiatry ($n = 24$) and special education for children with behavior problems ($n = 30$) in the Netherlands. In the Netherlands, children are only referred to these two types of institutions if the severity of their behavior problems significantly impairs social functioning and prohibits participation in regular education, according to parents, teachers, and diagnosticians.

All but two clinic-referred boys were diagnosed with *Diagnostic and Statistical Manual of Mental Disorders* (fourth edition; American Psychiatric Association, 1994) oppositional defiant disorder by clinic psychiatrists, in five cases comorbid with attention deficit hyperactivity disorder, in two cases with conduct disorder, and in one case with reactive attachment disorder. No diagnoses were obtained for the remaining two boys because these were not given at their treatment facility. Nine boys in the aggressive group were taking medication (eight used Ritalin and one Dixarit). For ethical and practical reasons, medication was not stopped at the time of testing. Clinic and special education referred boys did not differ in mean aggressive or delinquent behavior problems (see the Measures section). In exploratory analyses of differences between these subgroups on SIP and emotion variables, no group differences were found. Therefore, type of referral was not included in further analyses.

The nonreferred comparison group ($n = 30$) was recruited from two elementary schools in low to middle socioeconomic status neighborhoods of the same cities. Two participants in the clinic-referred group refused to complete parts of the interview, therefore the sample size varied from 82 to 84.

Group differences in aggressive behavior were tested with two group analyses of variance on the Teacher Report Form (TRF) aggressive behavior problems, reactive aggression, and proactive aggression scales (see Measures section). TRF aggressive behavior problems were more severe in the aggressive ($M =$ 65.0, $SD = 9.4$) than in the comparison group ($M =$ 54.6, $SD = 5.3$), $F(1, 82) = 37.8$, $p < .001$. In the aggressive group, 93% of participants received TRF aggressive behavior scores in the borderline or clinical range. Aggressive boys were also considered more reactively ($M = 3.45$, $SD = .88$) and proactively aggressive ($M =$ 2.55, $SD = 1.02$) than comparison boys ($M = 2.38$, $SD =$ .91 and $M = 1.56$, $SD = .56$), respective Fs(1, 82) = 28.1, 24.1, ps $< .001$. Groups did not differ in mean age, country of birth, or nationality. Seventy boys were born in the Netherlands, seven boys in African Mediterranean countries, and seven boys elsewhere. Families of 24 boys had social security benefits as their sole income. Socioeconomic status based on fathers' and mother's occupation was generally low and did not differ between groups.

Procedure

Participants were individually tested by trained graduate students blind to the hypotheses under study and the first author. Each session lasted between 1 and 1½ hr. Participants were told they would listen to stories about events they could experience any day and were asked to imagine that they experienced the stories themselves. It was emphasized that no wrong answers could be given, and participants were assured of the confidentiality of their answers. Each participant then listened to a set of four audiotaped vignettes, each followed by questions concerning SIP and emotions. Next, participants filled out the Socially Desirable Answering-Tendency Scale (see the Measures section). All items of this scale were read aloud by the interviewer and filled out while the experimenter watched. Thus, demand characteristics comparable to being interviewed were created to maximize relevance of the Socially Desirable Answering measure for the SIP and emotion interview.

Measures

Behavior problems. Behavior problems were assessed with the TRF and the Reactive and Proactive Aggression Questionnaire. The Dutch version (Verhulst, van der Ende, & Koot, 1997) of the TRF (Achenbach, 1991) contains 118 multiple-choice behavior items and 2 open-ended questions. For each multiple-choice item, teachers indicate 0 (*not true for the child*), 1 (*somewhat true for the child*),or 2 (*very often true for the child*). Achenbach (1991) reported high 15-day test–retest reliability, 2-month stability, and validity for this instrument. Norms for Dutch children (Verhulst et al., 1997) were used to calculate *T* scores for behavior problems.

The six-item Reactive and Proactive Aggression Questionnaire (Hendrickx, Crombez, Roeyers, & Orobio de Castro, 2003) is a Dutch translation of the reactive and proactive aggression items in an instrument developed by Dodge and Coie (1987). Three items describe reactive aggression; for example, "When this child has been teased or threatened, he or she gets angry easily and strikes back." The other three items describe proactive aggression; for example, "This child uses physical force in order to dominate other kids." The answer format is a 5-point Likert scale ranging from 1 (*never*) to 5 (*almost always*). Reliability, factor structure, and validity are adequate (e.g., Hendrickx et al., 2003; Hubbard et al., 2002). Cronbach's αs in this sample were .87 for reactive aggression and .90 for proactive aggression. Reactive and proactive aggression were highly correlated, $r = .71$, $p < .001$.

SIP. Two parallel sets of four audiotaped vignettes each were constructed and randomly distributed over participants. All vignettes concerned being hindered by a peer whose intentions are ambiguous. This context has been shown to be the most important source of social conflict at school for this population (Dodge, McClaskey, & Feldman, 1985). To obtain relevant and ambiguous vignettes, observations of boys at the psychiatric institution and consultation with staff were used to provide story themes. Vignettes were pilot tested with 15 boys in a psychiatric clinic and 20 boys from regular schools near the clinic. Only vignettes experienced by most participants, invoking self-reported negative affect and with sufficiently ambiguous attribution of intent scores (30% to 70% hostile intent attribution) were used in this study. For example:

> Imagine: You and a boy in your class are taking turns at a computer game. Now it's your turn, and you are doing great. You are reaching the highest level, but you only have one life left. You never came this far before, so you are trying very hard. The boy you are playing with watches the game over your shoulder. He sees how far you have come. Then he shouts "Watch out! You got to be fast now!" and he pushes a button. But it was the wrong button, and now you have lost the game!

SIP and emotion processes were assessed with open-ended questions and rating scales concerning each vignette. To assess interrater reliability of coded open answers, trained graduate students independently coded transcriptions of 30 randomly selected boys' answers.

Hostile intent attribution was assessed with an open-ended question and a 5-point rating scale. Answers to the open-ended question "Why did he [behavior in vignette]?" were coded as *benign*, *accidental*, *ambiguous*, or *hostile*. On rare occasions when multiple answers were given, participants were prompted to provide one definitive answer. Interrater agreement and kappa were 94% and .91. An open-answer hostile attribution variable was created by counting the number of hostile answers. Scores on the rating scale were averaged over the four vignettes. Because the open-answer and rating-scale intent attribution variables were strongly correlated, $r = .82$, they were combined by standardizing each variable and then taking their average. Cronbach's α for the resulting hostile intent attribution variable was .77.

Emotion attributions were assessed with an open-ended question and rating scales. Answers to the open-ended question "How does the other boy feel when [negative event in vignette]?" were coded as *angry/mad, sad/disappointed, not happy/bad, happy, guilty/ashamed,* or *don't know/irrelevant.* Occasionally, more than one emotion was mentioned in a single answer; the first emotion mentioned was then coded. Interrater agreement and kappa were 97% and .96. The number of times each code applied was counted. In addition, scores for *sad/disappointed, not happy/bad,* and

guilty/ashamed were merged to obtain an omnibus score for mentioning negative emotions other than anger. Nine-point rating scales in the shape of thermometers were presented to rate the intensity of the other's anger, sadness, and happiness. Ratings for each emotion were averaged over vignettes. For each emotion, open answers and ratings were strongly correlated. Therefore, variables concerning each emotion were combined in the manner described previously for hostile attribution. Thus, the three variables *other's anger, other's sadness/guilt,* and *other's happiness* were created with respective reliabilities of .61, .56, and .72. The boys' own emotions were also assessed with open-ended questions and rating scales. Interrater agreement and kappa were 96% and .94. As for emotion attribution, variables concerning each emotion were combined into the variables of own anger, own sadness, and own happiness, with respective reliabilities of .70, .68, and .67.

Emotion regulation was assessed with the questions "When you feel so [negative emotion mentioned], can you think of something that could make you feel better? What can you think of?" Answers to these questions were coded as *solutions* when an attempt to solve the problem was mentioned (i.e., "I'll go to the teacher and explain what happened"), as *distraction* when an attempt was made to find distraction ("Go to my room and play my music"), as *cognitive* when a cognitive strategy was suggested ("I'll think it was only a game"), as *aggressive* when any form of aggression was mentioned ("Yes! Beat him up! Then it's my turn to laugh!"), as *by other* when only acts by another person were mentioned ("When he gives me a new one"), or as *don't know/irrelevant*. Interrater agreement and kappa were 95% and .72. The number of answers to which each category applied was counted. Because all resulting variables were skewed, $\log(x + 1)$ transformations of the variables were used (skewnesses < 1). By summing the number of vignettes in which solutions, distractions, or cognitive strategies were mentioned, an omnibus adaptive emotion regulation variable was created with reliability of .73.

Response generation was assessed with the question "What would you do now?" Answers were coded following a procedure designed to obtain a valid interval scale for response aggressiveness (Orobio de Castro, 2000). Each response was coded as *physical or destructive aggression* (i.e., "punch him in the face"), *verbal aggression or coercion* ("if you don't fix it, I'll beat you up"), or *nonaggressive* ("Let's build a new one, and careful with the big logs!"). Interrater agreement and kappa were 88% and .74. Normative data on aggressive and nonaggressive boys' ratings of the aggressiveness of these response categories were then used to assign weights to these codes. Physical or destructive aggression was assigned 2 points, verbal aggression or coercion 1 point, and nonaggressive responses zero points. If multiple codes applied, the highest category was scored. Scores were then averaged over vignettes, resulting in an aggressive-response generation variable with a minimum of zero (solution attempts or avoidance in all vignettes), a maximum of 2 (physical or destructive aggression in all vignettes), and reliability of .62.

To assess response evaluation, participants were presented with two responses to each vignette in random order. One response was clearly aggressive but functional for obtaining the desired instrumental outcome. The other response was prosocial and equally functional. Participants were asked to evaluate these responses by indicating on 5-point rating scales to what extent they would enact the response themselves and to what extent they approved of it. Ratings were averaged over vignettes into the variables enactment of aggression, approval of aggression, and enactment and approval of prosocial responses. Respective Cronbach's αs for these scales were .64, .68, .71, and .72.

Potentially confounding variables. Recall of each vignette was scored as the mean number of elements participants mentioned when asked "What happened in this story?" Four elements were distinguished in each vignette: an outline of the situation, a statement of the participant's goals, a description of the provocateur's behavior, and a description of the outcome. A recall variable was constructed by counting the number of recalled story elements.

Intelligence was estimated with the Information, Vocabulary, Block Design, and Arithmetic subtests of the Wechsler Intelligence Scale for Children–Revised (WISC–R). These subtests are most highly correlated with the three Kaufmann factors derived from full administration of the Dutch WISC–R (WISC–R projectgroep, 1986). When clinic or school records of participants contained WISC–R scores on the subtests taken within 2 years before the experiment, these data were used instead. Normalized standard-scores based on Dutch norms were calculated and averaged over subtests.

Socially desirable answering tendencies were assessed with the nine social desirability items from the Dutch translation of the Social Anxiety Scale for Children (Dekking, 1977). Each item consists of an extremely socially desirable or undesirable self-referent statement (e.g., "I'm always kind to other children"). Participants were asked to choose whether a statement applied to them in a forced-choice dichotomous response format. The number of endorsements of socially desirable and negations of undesirable statements was summed. The resulting variable was strongly skewed, because nearly all participants gave nil or one socially desirable answer. To reduce skewness, a $\log(x + 1)$ transformation was conducted. Cronbach's α was .74.

Results

SIP and Emotion

Two group analyses of variance were conducted to test for group differences on the SIP, and emotion variables as shown in Table 1. Aggressive boys attributed more hostile intent and more happiness to peers than comparison boys, respective *F*s(1, 81) = 7.38, 7.01, *p*s < .01. Exploratory analysis of separate codes for the open-answer emotion attributions revealed aggressive boys less often said the provocateur would feel guilty or ashamed, $F(1, 81) = 3.65$, $p = .017$. No other effects for attribution were found. Concerning own emotions, aggressive boys reported more anger than comparison boys, $F(1, 81) = 7.25$, $p = .009$. Groups did not differ in own sadness or happiness.

Aggressive boys mentioned less adaptive emotion-regulation strategies than comparison boys, $F(1, 81) = 38.12$, $p < .001$. To examine the possible source of the considerable group difference in adaptive emotion regulation ($d = 1.45$), frequencies of the separate emotion-regulation categories were analyzed separately. Boys in the comparison group more often mentioned solutions ($M = 2.06$, $SD = 1.34$) and distraction ($M = 1.09$, $SD = 1.31$) than boys in the aggressive group ($M = 1.24$, $SD = 1.15$ and $M = .24$, $SD = .53$), respective *F*s(1, 80) = 8.44 , 16.74, *p*s < .01. Boys in the aggressive group more often did not know a strategy to regulate their emotion ($M = 1.05$, $SD = 1.32$) and more often said their emotion could only be regulated by others ($M = .60$, $SD = .93$) than boys in the comparison group ($M = .24$, $SD = .58$ and $M = .11$, $SD = .35$), *F*s(1, 80) = 10.40, 7.28, respectively, *p*s < .01. The mean number of vignettes for which aggression was mentioned as an emotion-regulation strategy did not differ between groups, $F(1, 80) = 2.81$, $p = .097$, even though more than half the aggressive boys (56%) compared to a quarter of the comparison boys (25%) mentioned aggression as a way to regulate emotions at least once, $\chi^2(1, N = 82) = 6.50$, $p = .011$.

Aggressive boys generated more aggressive responses, $F(1, 81) = 13.75$, $p < .001$, and gave higher ratings for enactment and approval of aggressive responses than comparison boys, respective *F*s(1, 81) = 7.51, 8.82, *p*s < .01. Note, however, that the means for aggressive-response evaluation displayed in Table 1 are below the center of the scale (3), indicating that on average both groups evaluated aggressive responses negatively. Enactment and approval of prosocial responses did not differ between groups, *F*s < 1.

Table 1. *Social Information Processing and Emotion in Referred Aggressive and Comparison Boys*

	Aggressive		Comparison		
	M	*SD*	*M*	*SD*	*p*
Hostile intent attribution	.20	.93	–.37	.90	.008
Anger attribution	.07	.83	–.13	.71	*ns*
Sadness attribution	–.05	.84	.09	.91	*ns*
Happiness attribution	.20	.91	–.35	.87	.010
Own anger	.19	.77	–.33	.95	.009
Own sadness	–.04	.83	.05	.66	*ns*
Own happiness	.08	.94	–.15	.56	*ns*
Adaptive emotion regulation	1.68	1.41	3.38	.91	.000
Aggressive response generation	.83	.53	.37	.42	.000
Aggression approval	2.45	1.19	1.62	1.06	.004
Prosocial approval	3.74	1.17	3.74	1.12	*ns*
Aggression enactment	2.50	1.13	1.80	1.21	.008
Prosocial enactment	3.66	1.25	3.60	1.10	*ns*

Potential Confounds

Two group analyses of variance were conducted on the potentially confounding variables recall, socially desirable answers, and verbal intelligence. Mean verbal intelligence was lower for the aggressive group ($M = 87.4$, $SD = 13.2$) than for the normal comparison group ($M = 95.9$, $SD = 16.2$), $F(1, 82) = 6.80$, $p = .011$. The potential effects of verbal intelligence were controlled for with two group analyses of covariance on the open answer based SIP variables with verbal intelligence as a covariate. When doing so, all the aforementioned univariate effects remained. Groups did not differ in recall of story elements or socially desirable answers. More aggressive-response generation was related to more socially desirable answering, $r(80) = .26$, $p < .01$. Thus, the more aggressive responses to the vignettes appear to be underestimates of actual aggressive-response generation. No other relations with socially desirable answering or recall were found.

Parsimony

To test whether emotion variables accounted for variance in aggressive behavior over and above the SIP variables, an aggregate aggressive behavior variable was created by averaging over standardized reactive, proactive, and TRF aggression variables. This aggregate aggression variable then served as dependent variable in a hierarchical regression analysis. In the first step of the analysis, the SIP variables concerning intent attribution, response generation, and response evaluations were entered blockwise. In the second step, the emotion variables concerning own and other's emotions and adaptive emotion regulation were entered to test whether they explained variance over and above SIP variables. SIP variables entered in the first step of the analysis explained 11% of variance in aggression, $F(1, 80) = 9.59$, $p = .003$. This effect was entirely due to hostile intent attribution, $\beta = .33$, $p < .05$. Emotion variables increased explained variance with 16% over and above SIP variables, $F(1, 79) = 16.99$, $p < .001$. This effect was entirely due to

adaptive emotion regulation, $\beta = -.41$, $p < .001$. Thus, aggression was most parsimoniously explained as a function of hostile intent attribution minus adaptive emotion regulation.

Structural Relations

Agreement of the data with the SIP model, including emotion processes depicted in Figure 1, was tested with structural equation modeling based on maximum likelihood estimation (AMOS; Arbuckle & Wothke, 1999). This analysis was motivated by the assumption that bivariate relations exist between the variables under study, as shown in Table 2. Calculation of correlations over the entire sample was warranted because frequency distributions of aggression for the entire sample were unimodal and not skewed (skewnesses < 1).The overall fit of the model was found to be acceptable, as indicated by $\chi^2(28, N = 82) = 34.57$, $p = .18$, goodness-of-fit indexes (comparative fit index = .973; Normed Fit Index = .995), and a root mean square error of approximation of .053, with a 95% confidence interval of .001 to .109. All parameter estimates shown in Figure 1 and listed in Table 3 were significant, with the notable exceptions of the path from own anger to response generation and the path from response decision to aggressive behavior. It should be noted that, due to the relatively small sample size for structural equation modeling, confidence intervals for all parameters listed in Table 3 are quite broad.

Unique Relations With Reactive and Proactive Aggression

Zero-order and partial correlations between SIP and emotion variables on the one hand and reactive and proactive aggression on the other hand are presented in Table 4. Reactive aggression was uniquely related with hostile intent attribution, less attribution of sadness, own anger, and aggressive-response generation. Proactive aggression was uniquely related with approval of aggressive responses. Adaptive emotion regulation was negatively related to both types of aggression. No other partial correlations were found.

Discussion

The main aim of this study was to further our understanding of emotion processes in SIP and their relations with reactive and proactive aggression in referred aggressive boys. Boys referred for aggressive behavior problems were found to differ from comparison boys in both SIP and emotion processes. Aggressive boys attributed more hostile intent and happiness, indicated they become more angry, generated more aggressive responses, mentioned far less adaptive emotion-regu-

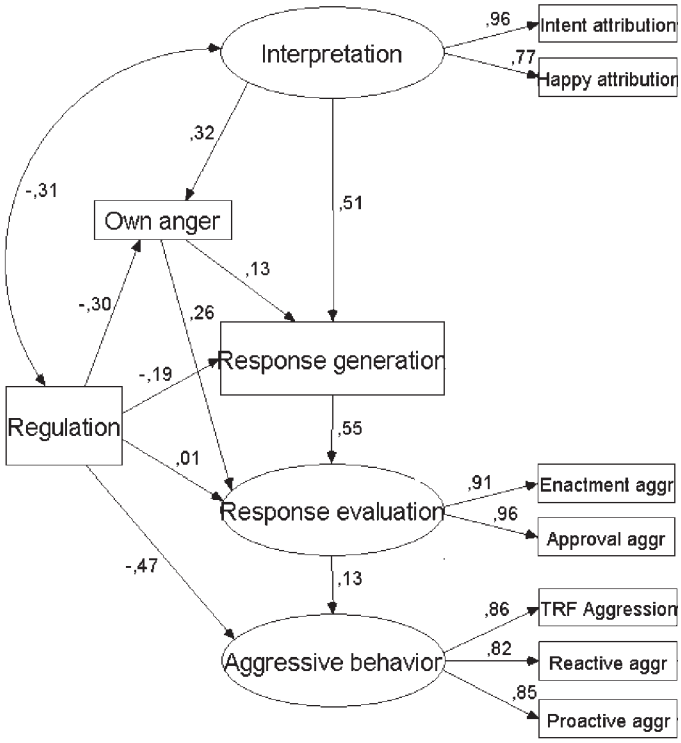

Figure 1. Structural equation model of emotion processes in SIP. Model structure adapted from Lemerise and Arsenio (2000). For clarity, residual terms are not depicted in Figure 1. Because paths coefficients were smaller than .10, other's anger and sadness were removed from the original measurement model for representation; and sadness and happiness were omitted from the measurement model for own emotion.

Table 2. *Bivariate Correlations Between SIP and Emotion Variables*

	1	2	3	4	5	6	7	8	9	10	11	12
1. Hostile intent attribution												
2. Anger attribution	–.03											
3. Sadness attribution	–.12	.10										
4. Happiness attribution	.74**	–.04	–.33**									
5. Own anger	.40**	.15	.06	.31**								
6. Own sadness	.17	–.06	.24*	.12	–.05							
7. Own happiness	.02	.02	.00	.21	–.39**	–.08						
8. Adaptive regulation	–.30**	.09	.10	–.22*	–.40**	.00	.20					
9. Aggressive generation	.60**	–.03	–.02	.48**	.41**	.02	–.05	–.40**				
10. Aggression enactment	.45**	.16	.13	.45**	.48**	.24*	–.08	–.21	.58**			
11. Aggression approval	.43**	.07	.09	.45**	.45**	.19	–.08	–.34**	.64**	.88**		
12. Prosocial enactment	.09	.16	–.05	.14	.03	.21	.05	.11	–.23*	.01	–.01	
13. Prosocial approval	–.05	.08	–.06	–.02	.07	.16	–.09	.03	–.22*	–.03	–.06	.80**

Note: $N = 82$. SIP = social information processing.
*$p < .05$. **$p < .01$.

Table 3. *Standardized Maximum Likelihood Estimates and 90% Confidence Interval for the Structural Equation Model of Emotion Processes in Social Information Processing*

Path	Estimate	Lower Bound	Upper Bound
Interpretation to hostile intent attribution	1*		
Interpretation to happiness attribution	.77	.64	.89
Interpretation to own anger	.32	.16	.48
Interpretation to response generation	.51	.34	.67
Own anger to response generation	.13	–.06	.25
Own anger to response evaluation	.27	.08	.41
Regulation to own anger	–.30	–.43	–.16
Regulation to response generation	–.19	–.34	–.04
Regulation to response evaluation	.01	–.17	.20
Regulation to aggressive behavior	–.47	–.61	–.28
Response generation to response evaluation	.55	.38	.68
Response evaluation to approval of aggression	1*		
Response evaluation to enactment of aggression	.91	.83	.98
Response evaluation to aggressive behavior	.13	–.09	.35
Aggressive behavior to TRF aggression	1*		
Aggressive behavior to reactive aggression	.82	.72	.89
Aggressive behavior to proactive aggression	.86	.75	.92

Note: TRF = Teacher Report Form; * = fixed parameter.

Table 4. *Zero-Order and Partial Correlations of Reactive and Proactive Aggression With SIP and Emotion Variables*

	Reactive Aggression		Proactive Aggression	
	r	Partial r^a	*r*	Partial r^b
Hostile intent attribution	.30**	.18*	.26*	.06
Anger attribution	–.14	–.17	–.02	.11
Sadness attribution	–.16	–.19*	–.04	.11
Happiness attribution	.23*	.09	.24*	.10
Own anger	.31**	.29**	.15	–.10
Own sadness	–.04	–.15	.10	.18
Own happiness	–.08	–.13	.02	.11
Adaptive emotion regulation	–.43**	–.20*	–.43**	–.20*
Aggressive response generation	.29**	.19*	.22*	.01
Aggression approval	.14	–.05	.23*	.19*
Prosocial approval	.17	.09	.14	.04
Aggression enactment	.12	.01	.17	.10
Prosocial enactment	.09	.04	.06	.00

Note: SIP = social information processing.
[a]Controlling for proactive aggression. [b]Controlling for reactive aggression.
*$p < .05$. **$p < .01$.

lation strategies, and evaluated aggressive responses less negatively than comparison boys.

Despite the bivariate relations of each of these variables with aggressive behavior, they did not all contribute uniquely to explained variance in aggression. In search of a parsimonious model, aggressive behavior was consecutively regressed on SIP and emotion variables. Once hostile intent attribution was entered in the regression equation, no other SIP variables explained additional variance in aggression. Adaptive emotion regulation, however, did explain variance in reactive and proactive aggression over and above hostile intent attribution. Thus, aggression was most parsimoniously explained as a function of hostile intent attribution minus adaptive emotion regulation.

A preliminary test of the structural model concerning emotion processes in SIP proposed by Lemerise and Arsenio (2000) fitted the data reasonably well. Anger attribution contributed significantly to the interpretation step of the SIP model, and interpretation was a good predictor of own anger. Emotion regulation appeared to be particularly important in the structural model, explaining variance in aggressive behavior, own anger, and aggressive-response generation. Interestingly, the SIP variables were related as proposed by the model, except for the relation between response decision and aggressive behavior, which was nonsignificant.

Response decision appears to be less relevant to the explanation of aggressive behavior in boys with severe aggressive behavior problems. In fact, response evaluations by aggressive and comparison boys were similar, in the sense that both groups clearly preferred prosocial over aggressive responses. The large effects for emotion regulation may perhaps explain this finding. When provoked, boys with aggressive behavior problems may not arrive at an evaluation of multiple alternative responses, but rather enact their primary aggressive response tendency that they do not regulate adaptively. This explanation is clearly highly speculative and will require close examination of actual emotional processes in vivo.

Hypotheses concerning the specificity of SIP and emotion processes to reactive and proactive aggression were partly supported. Reactive aggression was uniquely related with hostile intent attribution, less guilt/shame attribution, own anger, and aggressive-response generation. Proactive aggression was uniquely related with less negative evaluation of aggressive responses. However, contrary to hypotheses, adaptive emotion regulation was negatively related to both types of aggression.

The relation between emotion regulation and proactive aggression may seem surprising because proactive aggression is, by definition, "cold blooded," instrumental behavior. As proactively aggressive boys may—by definition—not be expected to become very angry in response to provocation, their emotion regulation may not concern regulation of anger. Our questions concerning emotion regulation referred to improving one's emotional state, not just to regulating anger. As a consequence, proactively aggressive boys' answers to these questions may have concerned emotion-regulation strategies to make them feel good, rather than less angry. Indeed, some aggressive participants' referred to getting fun, glee, or "kicks" out of emotion-regulation strategies we coded as maladaptive, for example, coercing others, taking revenge, or "punishing" others. If so, distinct relations of emotion regulation with reactive and proactive aggression may not lie in the extent to which regulation is maladaptive, but in its quality. Reactive aggression may be related to unregulated anger, whereas proactive aggression may be related to evocation of positive emotions through aggressive strategies. These hypotheses are clearly highly speculative and need to be tested in future studies of the exact nature of emotion-regulation strategies in highly aggressive boys.

An alternative explanation for the unexpected relation between emotion regulation and proactive aggression is that the presented vignettes may have primarily evoked reactive aggression as they all concern being hindered. If so, little variation in the dependent variables would have been attributable to proactive aggression. However, although we cannot be sure that the vignettes evoked both kinds of aggression equally, we specifically designed these vignettes to concern issues that evoke most of the actual problematically aggressive behavior of the participating boys in daily life. Provocation is the context of most aggressive behavior problems according to teachers (Dodge et al., 1985), and the most relevant issues in this context for our sample were selected for inclusion in this study. Thus, regardless of their relatively more reactive or proactive nature, the vignettes were suitable to investigate the most pertinent aggressive behavior problems according to teachers. Nonetheless, researchers in future studies would be well advised to include vignettes that more specifically evoke proactive aggression. It may very well be that proactive aggression is less easily observed by teachers, because children may conduct such instrumentally aggressive behavior outside teachers' view. Furthermore, disconfounding reactive and proactive aggression in research will be more feasible if vignettes that specifically evoke either reactive or proactive aggression are used.

Ideally, participants' responses to these vignettes would have been coded as reactively or proactively aggressive. Thus, we would have been able to test whether the vignettes evoked both kinds of aggressive responses and whether they corresponded to the concomitant teacher ratings of aggression. Unfortunately, coding participants' responses in this manner was not possible, because distinguishing between reactive and

proactive aggression ultimately depends on qualities of responses that we could not discern in participants' answers, such as motivation and emotional state.

This study provides the first insights into the relations among emotion, SIP, and aggressive behavior. However, the study has several limitations. We only assessed self-reported SIP and emotion processes in hypothetical situations. It is unclear to what extent such measures reflect actual emotion and cognitive processes in real-life situations. Some studies have shown moderate relations between hypothetical and real-life responses (e.g., Dodge et al., 1986), but these studies did not concern all variables we studied. This problem is not limited to the study of SIP. A long research tradition concerned with the relations between intended and actual behavior has shown only moderate relations that depend considerably on characteristics of the situations concerned. It will be important to gain further insight into determinants of the relation between hypothetical and actual responses, for example by studying the effects of participant state (Orobio de Castro, Slot, Bosch, Koops, & Veerman, 2003) and research methods (Vasey et al., 2003) on processing of social information.

Nine aggressive boys were taking medication for attention deficit hyperactivity disorder, which may have influenced their performance. Exploratory analyses revealed no relation between medication and any of the dependent variables within the aggressive group, but power of these tests was obviously limited. However, given the purpose and known effects of this medication, any effects it might have on these findings would have gone against the study hypotheses. Furthermore, given these boys' extended daily usage of this medication, sudden disruption of medication might have been more disrupting of their usual social-cognitive, emotional, and behavioral functioning than continuation and might thus have led to an overestimation of effects. It seems likely that, if medication had any effect, it diminished the effects under study, rather than inflated them.

Another limitation of this study is its relatively small sample size in relation to the number of variables under study. Sample size is particularly problematic for the structural equation analysis, resulting in the large confidence intervals for the parameter estimates shown in Table 3 and little power to reject the model. Therefore, even though the root mean square error of approximation indicated acceptable fit is in principal, independent of sample size, we advise caution in interpreting the model and particularly its exact path estimates. The model test was included as a first preliminary test of the tenability of an integrated model of emotion processes in SIP by referred aggressive boys. Given the small sample size, it may serve as a first indication of the place of emotion processes in the SIP model, but by no means as definitive proof. Furthermore, the correlational design of our study does not permit conclusions regarding causal relations. One may speculate that reciprocal influences occur over development as social interactions shape emotion processes and SIP and vice versa. Longitudinal-experimental studies are needed to establish how these relations shape the developmental course of behavior problems.

Notwithstanding these limitations, controlling for the influence of several confounding factors enhanced the validity of the study's results. Group differences could not be explained by systematic differences in socially desirable answering tendencies, recall, or intelligence.

Considering the strengths and limitations together, our findings suggest promising avenues for further study. It may be particularly important to replicate the findings in larger samples, permitting tests of different structural equation models for reactive and proactive aggression, to include SIP vignettes that specifically evoke either reactive or proactive aggression, to construct a coding system for response generation that allows distinction between reactively and proactively aggressive responses, and to investigate the effects of experimental variations in presented social stimuli on participants' SIP and emotion regulation. Concerning emotion regulation, it would be interesting to assess more general measures of emotion-regulation dispositions and to relate these to the situational emotion-regulation responses in the SIP measures.

We believe research into relations among SIP, emotion processes, and aggressive behavior has important implications for the prevention and treatment of aggressive behavior. Previous studies of SIP have supported the development of cognitive–behavioral interventions. Our findings suggest additional targets for intervention. If referred aggressive boys are driven to respond in ways they disapprove of by hostile attributions and anger they cannot regulate adaptively, they can perhaps be motivated to learn skills to prevent their anger from taking over. These findings suggest that such skills may include attribution of benign intent in ambiguous circumstances, accurate representation of other children's emotions, emotion-regulation strategies, and spontaneous generation of less aggressive responses to social provocations. Given the effects of emotional state on SIP (Orobio de Castro et al., 2003) and the intense emotions the reactively aggressive boys in this study report, it seems essential to practice these skills in vivo in emotionally significant situations. These findings thus support the rationale for current treatment programs that emphasize training in representation of own and other's emotion and emotion regulation.

Given the severity of participants' behavior problems, it may be tempting to interpret their atypical social–cognitive and emotional functioning as deviant, biased, or dysfunctional. We strongly caution against

such interpretations without further study of the reasons *why* individual boys deviate from peers in SIP and emotion processes. That a certain processing style is related to aggressive behavior does not necessarily imply it is dysfunctional. A closer look at these findings suggests that certain aspects of referred aggressive boys' SIP and emotional functioning may be considered maladaptive, whereas other aspects rather seem qualitatively different, or even functional in some of the contexts in which these boys live. The limited generation of adaptive emotion-regulation strategies may be considered maladaptive inasmuch as it reflects that a certain skill or knowledge is missing. Hostile intent attribution and aggressive-response generation, however, are not necessarily maladaptive. For many referred aggressive boys, they may make sense, because they are—or have been—functional over their particular life history (Thompson & Calkins, 1996). To expect hostility from others may, for example, be wise for a child constantly victimized by peers and adults. Even if these expectations are not always justified, it may be safer to err toward expecting hostility too often than to wrongly attribute benign intentions only once and be taken advantage of. Yet in interaction with nonaggressive peers, hostile attribution tendencies lose their functionality. Thus, atypical SIP and emotion processes may make sense given a child's developmental history, but at the same time help maintain maladaptive behavior. A thorough understanding of the causes, functions, and consequences of these deviations is essential to the design of effective cognition and emotion-focused intervention programs.

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