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The Dyadic Nature of Social Information Processing in Boys' Reactive and Proactive Aggression

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The correlation between boys' social cognitions and their aggressive behavior toward peers was examined as being actor driven, partner driven, or dyadic relationship driven. Eleven groups of 6 familiar boys each (N = 165 dyads) met for 5 consecutive days to participate in play sessions and social–cognitive interviews. With a variance partitioning procedure, boys' social–cognitive processes were found to vary reliably across their dyadic relationships. Furthermore, mixed models regression analyses indicated that hostile attributional biases toward a particular peer were related to directly observed reactive aggression toward that peer even after controlling for actor and partner effects, suggesting that these phenomena are dyadic or relationship oriented. On the other hand, the relation between outcome expectancies for aggression and the display of proactive aggression appeared to be more actor driven and partner driven that dyadic.

In most investigations of the social–cognitive correlates of children's aggressive behavior, aggression has been considered to be a general characteristic of individuals, because some children are consistently more aggressive than others. Although investigators have recently demonstrated that the peer partner plays an important role in the relation between aggressive behavior and social cognition (Perry, Williard, & Perry, 1990), the role of the dyad in this relation has not been examined to date. The goal of the current study is to test the hypothesis that boys' aggressive behavior and social–cognitive processes are related at the level of the dyad using direct observations of boys in a contrived play group setting. This work is important because it addresses the very nature of children's social information processing as being driven by individual-level, traitlike processes versus by dyad-specific experiences.

To understand the processes underlying aggressive behavior, researchers have related a generalized construct of trait aggression to traitlike patterns in children's social cognitions. For example, aggressive children are known to display a hostile attributional bias. They are up to 50% more likely than average children to attribute hostile intent to a hypothetical peer after an ambiguous provocation by the peer (Dodge, 1980; Slaby & Guerra, 1988; Waas, 1988), particularly when the provocation is directed toward the aggressive child (Dodge & Frame, 1982) and when the child is facing threatening conditions (Dodge & Somberg, 1987). Aggressive children have also been shown to display this bias in response to actual, as opposed to hypothetical, ambiguous provocations (Steinberg & Dodge, 1983).

Another social–cognitive mechanism that has been found to be related to trait aggression concerns children's expectations regarding the outcomes associated with aggressive behavior. Aggressive children anticipate that more positive outcomes and fewer negative outcomes will accrue following an aggressive act. When compared with average peers, aggressive children are more likely to believe that aggression will produce tangible rewards, reduce aversive treatment by others (Perry, Perry, & Rasmussen, 1986), make themselves and peers feel good (Deluty, 1983), increase self-esteem, and help to avoid a negative image (Slaby & Guerra, 1988).

An underlying assumption of all of the studies previously discussed is that children's aggression is a construct that operates at the individual level. That is, aggression is considered to be an internal, stable, personality-like trait (Parke & Slaby, 1983). Aggressive behavior patterns within an individual have been shown to be consistent across settings (Loeber & Dishion, 1983) and stable across time (Olweus, 1981). In addition, Dodge, Coie, Pettit, and Price (1990) found that over half of all aggressive behavior is displayed by just 10% of boys. These findings provide compelling evidence for aggression as a personality construct. This formulation implies that certain children can be labeled *aggressive* and that

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these children tend to behave aggressively toward all members of the peer group.

However, there is emerging evidence to suggest that children behave aggressively within the context of dyadic relationships. Using a methodology in which groups of 6 boys met in play groups for 5 consecutive days, Dodge, Price, Coie, and Christopoulos (1990) found that 50% of all aggressive episodes occurred in just 20% of the dyads. This concentration of aggression was not due solely to the fact that some boys were generally more aggressive than others. Even when only the most aggressive boys were considered, 46% of their aggressive behaviors occurred within just 20% of their dyadic relationships. Thus, without refuting the hypothesis that aggression is at least partially influenced by individual-level factors, this evidence emphasizes the role that dyadic relationships play in the display of children's aggressive behavior.

The relative importance of actor, partner, and dyadic factors in boys' aggressive behavior was illustrated recently by Coie et al. (1999). They examined the variance in the display of reactive and proactive aggression that can be accounted for by the individual child, by individual partners, and by the dyadic relationship. These data were collected as part of the same play group study described in the current article; they were analyzed using a variance-partitioning procedure for dyadic data described by Kenny (1994). For the display of reactive aggression, the dyadic component accounted for a greater percentage of variance (16%) than did the individual child component (9%) or the individual partner component (6%). For proactive aggression, the dyadic component accounted for as much variance (12%) as did the individual child component (12%) and more of the variance than the partner component (10%).

A second literature on the nature of aggression suggests that an important distinction should be made between two subtypes of aggressive behavior (Dodge, 1991; Dodge & Coie, 1987; Price & Dodge, 1989). *Reactive aggression*, which has theoretical roots in the frustration–aggression hypothesis (Berkowitz, 1963; Dollard, Doob, Miller, Mowrer, & Sears, 1939), is a defensive, retaliatory response to a perceived provocation from a peer and is accompanied by a display of anger. *Proactive aggression* is unprovoked, deliberate, goal-directed behavior used to influence or coerce a peer. The theoretical roots of proactive aggression can be found in social learning theory (Bandura, 1973), which postulates that aggression is an acquired behavior that is controlled by reinforcements. Proactive aggression may be object oriented or person oriented. Proactive aggression that is object oriented is aimed at the acquisition of an object, territory, or privilege and is equivalent to what has been labeled *instrumental aggression* in the past (Hartup, 1974). Proactive aggression that is more person directed has the goal of intimidating or dominating a peer and so includes instances of bullying.

Dodge and Coie (1987) undertook a series of studies to examine the construct validities of reactive and proactive aggression. They examined the reliability and convergent and discriminant validity of both constructs using a multitrait, multimethod approach (see Campbell & Fiske, 1959). Two measures of reactive and proactive aggression were assessed: teacher ratings, using a scale developed for this purpose, and behavioral observations of boys' social interactions in small play groups. Internal consistency of individual differences in these behaviors was supported by high intrascale correlations and coefficient alphas of the teacher rating items, by significant interobserver agreement in the observational data, and by the stability of session-to-session correlations in the observed rates of these two types of aggression. Support for convergent validity was provided by the finding that the teacher-rated measure of reactive aggression was positively related to the direct observational measure of reactive aggression, even when common variance due to proactive aggression was taken into account. The complementary finding also held for proactive aggression. Discriminant validity of reactive and proactive aggression was also supported, through factor analyses that revealed that teacher-rated items assessing reactive and proactive aggression tended to load on separate factors.

Dodge and Coie (1987) hypothesized that distinct social–cognitive processes are differentially related to each of these subtypes of aggression. Specifically, they hypothesized that reactive aggression is related to the tendency to overattribute hostile intent to peers in ambiguous provocation situations. They speculated that when a child interprets a peer's behavior as intentionally harmful, that child is likely to respond with angry retaliation or defense—in other words, reactive aggression. Conversely, children who expect that many positive and few negative outcomes will follow aggressive behavior are expected to engage in more goal-directed, deliberate proactive aggression that is not based in anger or retaliation but rather in external contingencies.

The hypothesis that reactive aggression but not proactive aggression is related to hostile attributional biases has been supported in several investigations. The samples used in these studies have included first- and third-grade boys (Dodge & Coie, 1987), fifth- and sixth-grade boys and girls (Crick & Dodge, 1996), and incarcerated adolescent boys (Dodge, Price, Bachorowski, & Newman, 1990). In addition, this finding has held when aggression subtypes have been assessed using direct observational techniques (Dodge & Coie, 1987) as well as teacher ratings (Crick & Dodge, 1996; Dodge & Coie, 1987; Dodge, Price, Bachorowski, & Newman, 1990).

To date, the hypothesis that positive outcome expectations for aggression are related to proactive aggression but not to reactive aggression has been supported in two investigations. Among a sample of third- through sixth-grade boys and girls, Crick and Dodge (1996) found that children rated by teachers as high on proactive aggression expected more positive outcomes for aggression than did other children, particularly in conflict situations. In a sample of incarcerated adolescent boys, Smithmyer, Hubbard, and Simons (2000) demonstrated that proactive aggression was related to positive outcome expectations for aggressive behavior; this relation held even when the variance due to the correlated construct of reactive aggression was removed.

In the current article, our aim is to integrate two emerging sets of findings with regard to children's aggressive behavior. On the one hand, boys' aggressive behavior has been shown to be influenced by the context of aggressive dyadic relationships. On the other hand, individual differences in reactive aggression are related to individual tendencies to make hostile attributions, and individual differences in proactive aggression are related to expectations that aggressive acts have positive consequences for the aggressor. In an effort to integrate these findings, we make two hypotheses, both heavily influenced by Kenny's Social Relations Model (Kenny, 1988a, 1994; Kenny & Kashy, 1991). We hypothesize (a)

that social–cognitive processes as well as aggressive behavior operate at the dyadic level and (b) that the specific relations that have been found between social–cognitive factors and subtypes of aggressive behavior at the individual trait level also exist at the dyadic relationship level.

Thus, our first question is whether social–cognitive processes operate within the context of dyadic relationships in a manner similar to that of individual aggressive behavior. In other words, are boys' social cognitions influenced by their dyadic relationships as well as by individual, personality-like tendencies? Previously, Coie et al. (1999) demonstrated that the dyadic relationship accounted for a significant proportion of the variance in proactive and reactive aggression, using the same data set that is used in the current article. We hypothesize that the dyadic relationships account for a significant proportion of the variance in boys' social–cognitive processes as well as in boys' aggressive behaviors.

Our second question concerns the relation between social cognitions and the display of aggressive behavior when both are considered at the dyadic level. In the past, researchers have asked the individual-level question "Are Child A's social cognitions about peers in general related to his or her aggressive behavior toward peers in general?" On the basis of Kenny's (1994) social relations model, the dyadic-level question that we are asking can be phrased as "Are Child A's social cognitions about Child B related to his or her aggressive behavior toward Child B?" We hypothesize that boys' social–cognitive processes and aggressive displays are related at this dyadic level.

Furthermore, we hypothesize that dyadic social cognition and dyadic aggressive behavior are differentially related in a manner similar to that found at the individual level. Specifically, we postulate that a boy's hostile attributional biases about a peer are related to his reactive aggression (but not his proactive aggression) toward that particular peer. Similarly, we predict that a boy's positive outcome expectancies for aggression against a peer are related to his proactive aggression (but not his reactive aggression) toward that particular peer.

Thus, we hypothesize that dyad-specific components of boys' social cognitions influence their dyadic aggressive behavior. An alternative hypothesis is that a child's aggressive behavior toward a peer occurs merely as a function of the child's general cognitive and aggressive tendencies (i.e., actor effects) and of the target's tendencies to elicit aggression and particular social cognitions from others (i.e., partner effects). Recently, and consistent with Kenny's (1988b) work on the influence of the partner in social interaction, researchers have documented that certain children are prone to become victims of their peers' aggression (Perry, Kusel, & Perry, 1988; Perry et al., 1990; Schwartz, Dodge, & Coie, 1993). Following from the logic of Kenny's Social Relations Model, we are interested in how much of the variance in aggression toward a specific peer (dyadic aggression) can be accounted for by social cognitions about the specific peer (dyadic social cognition), even when the variance attributable to actor effects and partner effects is removed. Therefore, in a final analysis, we include several factors other than social cognitions about a specific peer as predictors of dyadic aggression. These factors are (a) the boy's social cognitions about peers in general (generalized actor social cognitions), (b) the boy's level of aggressiveness toward peers in general (generalized actor aggression), (c) the level at which other children generally aggress against the peer (generalized aggression directed toward the partner), and (d) the way other children generally think about the peer (generalized social cognition directed toward the partner). We hypothesize that even though these four factors partially predict a boy's aggression toward a specific peer, the relation between dyadic social cognition and dyadic aggression remains statistically significant when all four of these variables are taken into account.

To test these hypotheses, we constructed a study in which 11 experimental play groups consisting of 6 familiar third-grade boys each met for 5 consecutive days. The boys were videotaped in free-play interaction for 45 min each day, and trained observers later coded acts of dyadic reactive and proactive aggression. To assess dyadic social cognitions, we interviewed the boys following the second and fourth play group sessions.

Method

Participants

In the spring of 1990, all dyads of boys in 11 third-grade classrooms in 11 schools in Durham, North Carolina, were screened through peer-assessed dyadic aggressiveness ratings. The boys ranged in age from 8 to 10 years ; the majority were 9 years old. Because these schools served a predominantly African American (85%) lower- to lower-middle-class population and because of the possibility of cross-ethnic group effects on dyadic behavior, only African American boys were considered for participation. Each boy was asked to evaluate the aggressiveness of dyads of boys in his classroom. Boys rated how often each member of a dyad started fights with the other member of the dyad on a 5-point scale ranging from 1 (*never*) to 5 (*always*). Because of the large number of possible dyads in each classroom, each boy rated a subsample of all possible dyads. Seventy-nine percent of all boys in the classrooms received parental permission to complete these ratings. Boys were advised about the confidentiality of their responses and were asked not to discuss the ratings with other children.

Dyadic aggression ratings were used to select the dyad in each classroom that peers considered to be the most mutually aggressive, and parental permission was requested for these 2 boys to participate in play groups the following summer. In the event that a member of the dyad that received the highest mutual aggression rating was not available to participate in the play groups (because of lack of parental permission or because his family moved to another area), the next most aggressive dyad was selected. In addition, 4 other boys from each classroom were randomly selected to participate in the play groups. Thus, 11 play groups were formed, each consisting of 6 African American third-grade boys from the same classroom.

Play Group Administration

Each play group met for 5 consecutive days during 1 week of the summer. Play group attendance was high, with only 6 absences occurring out of a possible 330 (66 boys × 5 sessions). Boys were driven from their homes to the laboratory, where they participated in a 45-min unstructured, free-play session in a room equipped with age-appropriate toys and games. At one end of the room, a video camera was positioned behind a one-way mirror; all play sessions were videotaped for later observational coding. No adults were present in the playroom during the sessions, although the boys were closely monitored by video camera.

Following each play session, the boys were interviewed individually. Data collected during the second and fourth interviews are described later in the article; the other interviews concerned behavioral nominations and sociometric ratings that are not relevant to the present study. On completion of the interview, boys were paid $1 each day for their participation and

driven home. Boys were paid a bonus at the end of the last session for participation in every session.

Dyadic Observations of Proactive and Reactive Aggression

According to an event-based system, trained observers coded videotaped records of play group interactions. Play group sessions were segmented into 270 intervals of 10 s each (45-min sessions × 6 intervals per minute). At the end of each 10-s interval, observers recorded the occurrence or nonoccurrence of reactive and proactive aggression initiated by 1 of the 2 boys in the dyad toward the other as well as which boy was the initiator. Observers focused on one dyad at a time, coding only the aggression between the boys in that dyad. Aggressive behavior of 1 boy in the dyad toward the other dyad member was coded regardless of whether the 2 boys were interacting alone or whether the aggression occurred in the context of an interaction that involved additional members of the play group. The two subtypes of aggression were operationalized as follows.

Proactive aggression included nonangry goal-oriented aggressive behaviors. This category was coded when a boy teased, made fun of, or showed physical aggression against his dyadic partner or used aversive means to reach an external material goal (e.g., acquisition of an object or position). Proactive aggressive behaviors were not accompanied by observable signs of anger.

Reactive aggression included angry retaliatory aggressive behaviors. This category was coded when a boy responded to his dyadic partner with frustration, hostility, and retaliatory counterattacking behaviors. Signs of overt hostility, frustration, or irritability (e.g., angry facial gestures or verbalizations) were often readily observable.

Two observers were trained over a period of 8 weeks to code the play group interactions. Observers met regularly during the training period and periodically during the actual coding to review progress and discuss coding disagreements. Observers were randomly assigned play group sessions to code, such that each observer coded three of the five sessions for each play group. Approximately 18% of the sessions (10 out of 55 sessions, containing 2,700 ten-second intervals) were randomly selected to be coded by both observers for agreement checks. Observers did not know which sessions were being checked by the other observer.

Assessment of interobserver agreement was based on a definition of concordance that required agreement on within-interval event occurrence or nonoccurrence, subtype of aggression, and identity of the initiating boy. We used kappa (κ) statistics as the index of agreement (see Cohen, 1960). Agreement for individual codes was $\kappa = .71$ for reactive aggression and $\kappa = .76$ for proactive aggression. Although these kappa statistics are fully within the range of acceptable agreement, it is important to note that the variables assessing reactive and proactive aggression used in data analyses are more reliable than these kappas suggest. This increased reliability is the result of the fact that the aggression variables used in analyses represent an aggregation across 5 days of play sessions, whereas the kappa statistics measure agreement on an event-by-event basis.

Dyadic Social Information Processing Interview Administration

Boys were interviewed following the completion of each play session. These interviews lasted approximately 15 min and were conducted privately with each boy. On the 2nd and 4th days of the play sessions, interview questions assessed outcome expectancies for aggression and hostile attributions within dyads. These data are described in the following sections.

Assessment of outcome expectancies for aggression within dyads. Boys were read each of six vignettes, in which they imagined aggressing against a peer. Three of these vignettes were administered following the second play session, and three were administered following the fourth play session. In addition, three of the vignettes involved imagining engaging in proactive aggression against a peer, and the other three vignettes involved imagining engaging in reactive aggression against a peer. For each vignette, participants were asked to imagine that the peer against whom they aggressed was a specific member of their play group. They then responded to a multiple-choice question regarding their expectation for the instrumental effectiveness of aggression against this peer in this situation (1 = *definitely not effective,* 4 = *definitely effective*). Next, boys were asked to imagine that the peer in the vignette was a different member of the play group and to respond to the same question. This procedure was repeated for all 5 members of the play group for each of the six vignettes.

The instructions given to the boys were as follows:

> I am going to read you some stories. I want you to pretend that these are things that happen between you and some of the other boys in your play group. Then I am going to make up some different things you could do next, and you tell me what would happen if you did each thing to each of the other boys in your group. There are no right or wrong answers for these stories, so just tell me whatever you think would happen.

A sample vignette involving proactive aggression was worded as follows:

> Pretend you are in the playroom, looking around, and you see the video game sitting on the table. No one is using it. You decide you want to play with it and walk over to get it. Suppose that when you get there, another boy in your group reaches for the game because he saw it there and decided he wanted to play with it too. Now pretend that boy was _____. Suppose you grabbed the game and told _____ to let go because you saw it first? Would _____ try to grab it back or would he let you have it? Definitely or maybe? (Repeat for the remaining 4 boys in the play group.)

A sample vignette involving reactive aggression was worded as follows:

> Pretend that you came to the play group one day with a new haircut. When you walked into the room, another kid in the group laughed and whispered to the others about it. Now pretend that boy was _____. Suppose you told _____ he better stop laughing or else you would hit him? Would _____ keep on making fun of you or would he play with you? Definitely or maybe? (Repeat for the remaining 4 boys in the playgroup.)

Boys received an outcome expectancy score for each of the 5 members of the play group; this was the average of their responses to the six outcome expectancy questions regarding that peer. Internal consistency of these data was adequate, with an alpha of .79 across the six questions.

Although half of the vignettes that were administered involved outcome expectancies for proactive aggression and the other half involved outcome expectancies for reactive aggression, these two types of vignettes were averaged together to create the outcome expectancy score for each boy for each of the 5 members of the play group. Although it was important to administer both types of vignettes, so as not to confound the outcome expectancy measure with subtype of aggression, our goal is not to explore differences in outcome expectancies for proactive aggression versus outcome expectancies for reactive aggression. Rather, we want to examine the association between outcome expectancies for aggression and the observed display of proactive versus reactive aggression in the play group setting. (This type of counterbalancing was not necessary for the hostile attributions vignettes, because those vignettes did not involve the display of aggression by the protagonist.)

Assessment of attributions within dyads. Boys were read each of six vignettes describing an ambiguous provocation by a peer toward the participant. Three of these vignettes were administered following the second play session, and three were administered following the fourth play

session. For each vignette, boys were asked to imagine that the peer who provoked them was a specific member of their play group. They then responded to a multiple-choice question regarding the intent that they attributed to this peer for each situation (1 = *accident*, 2 = *hard to tell*, 3 = *being mean*). Next, boys were asked to imagine that the peer in the vignette was another member of the play group and to respond to the same question. This procedure was repeated for all 5 members of the play group for each of the six vignettes.

The instructions given to the boys were as follows:

> I am going to read you some stories. I want you to pretend that these are situations that happen between you and some of the other boys in your play group, where the other boy does something that you don't like. Sometimes when kids do things, they are being mean, and other times, it is accidental. I am going to ask you about each of the other boys in your group, and I want you to tell me whether you think that boy is being mean, whether it is an accident, or whether it is hard to tell.

A sample vignette was worded as follows:

> Pretend you and another boy in your group are playing basketball. You get the ball and try to go up for a shot, but the other boy blocks it and hits you in the face. Sometimes when kids do this they are trying to be mean, and other times, it is accidental. Suppose the other boy was _____. Do you think _____ was being mean or do you think it was an accident, or is it hard to tell? (Repeat for the remaining four boys in the playgroup).

Boys received an attribution score for each of the 5 members of the play group; this was the average of their responses to the six attributional questions regarding that peer. Internal consistency of these data was adequate, with an alpha of .73 across the six questions.

Results

Overview

Data analyses consist of four steps. First, we report means and standard deviations for subtypes of dyadic aggression and for dyadic social cognition. Second, we use a procedure developed by Kenny (1994) to determine whether dyadic relationships accounted for a significant proportion of the variance in boys' aggressive behavior and social–cognitive processes (apart from actor and partner effects). Third, we report zero-order correlations among all of the variables used in the subsequent regression analyses. Finally, we use two sets of mixed models regression analyses to determine whether boys' social–cognitive processes and aggressive displays were related at the dyadic level, whether these relations reflected the degree of specificity that has been demonstrated at the individual level, and whether dyadic social cognition contributed uniquely to the prediction of dyadic aggression when measures of aggression and social cognition at the individual trait level were included as predictors.

Means and Standard Deviations for the Dyadic Variables

Table 1 lists the means and standard deviations for the two subtypes of aggression measured at the dyadic level. These means represent the number of proactive and reactive aggressive behaviors that 1 member of a dyad initiated toward the other member of the dyad during a play session, averaged across the five play sessions (N = 165 dyads). In addition, Table 1 includes the means and standard deviations for dyadic social cognition variables.

Table 1
Means and Standard Deviations for Aggression and Social Cognition Measures in Dyads (N = 165)

Measure	*M*	*SD*
Aggression		
Proactive	4.84	5.25
Reactive	1.56	2.72
Social cognition		
Outcome expectancies	2.50	0.83
Hostile attributions	1.69	0.51

Note. Aggression scores represent the mean number of aggressive behaviors that 1 member of a dyad initiated toward the other member of the dyad during a play session, averaged across the five sessions. Aggression means were corrected for minor variations in the total time that each boy was observed (i.e., means were divided by the actual number of 10-s intervals observed and then multiplied by 270, the average number of 10-s intervals observed across all participants). Social cognition scores represent the average score across six vignettes. Outcome expectancy was scored on a 4-point scale ranging from 1 (*definitely not effective*) to 4 (*definitely effective*). Hostile attributions were scored on a 3-point scale ranging from 1 (*accidental*) to 3 (*being mean*).

The Dyadic Nature of Boys' Aggressive Behavior and Social Cognition

For each subtype of aggression and for each of the two social cognition variables, we used Kenny's (1994) variance-partitioning procedure for round-robin dyadic data (data in which each member of a group receives scores in relation to each other member). This procedure apportions the variance of a dyadic variable into four components: (a) an actor component that represents variance due to the individual, or the actor in the dyad; (b) a partner component that represents variance due to the second member of the dyad, or partner; (c) a relationship component that represents variance unique to the dyad itself; and (d) error variance. This procedure provides percentages, which total to 100% for these four components. In particular, because of the use of multiple indicators of the dyadic variable (i.e., multiple play group sessions in which to collect observations of aggressive behavior or multiple questions in the social–cognitive interview), an unconfounded measure of dyadic variance, separate from error variance, is obtained. In addition, the statistical significance levels for the actor, partner, and relationship components are provided; these test whether the proportion of variance accounted for by each component in question is significantly different from zero.

The results of these analyses are provided in Tables 2 and 3. As we discussed in the introduction, it is important to note that the findings in Table 2 regarding the variance partitioning of the aggression variables were previously reported by Coie et al. (1999) in an article designed to validate the dyadic ratings method for identifying aggressive dyads. These results are provided here as a summary for the reader. In terms of proactive aggression within dyads, the actor accounted for 12% of the variance, the partner accounted for 10% of the variance, and the dyadic relationship accounted for 12% of the variance. In terms of reactive aggression within dyads, the actor accounted for 9% of the variance, the partner accounted for 6% of the variance, and the dyadic relationship accounted for 16% of the variance. The dyad accounted for a significant proportion of the variance in dyadic proactive aggres-

Table 2
Variance Partitioning for Aggression Measures

Measure	Proportion of variance	t	p
Proactive aggression			
Actor	.12	3.12	.01
Partner	.10	3.09	.01
Relationship	.12	2.91	.01
Error	.61		
Reactive aggression			
Actor	.09	1.31	.11
Partner	.06	1.35	.10
Relationship	.16	1.56	.08
Error	.69		

sion and a marginally significant proportion of the variance in dyadic reactive aggression (see Table 2).

Similar findings regarding variance partitioning of the social cognition measures are reported in Table 3. In terms of outcome expectancies for aggression within dyads, the actor accounted for 28% of the variance, the partner accounted for 16% of the variance, and the dyadic relationship accounted for 16% of the variance. In terms of hostile attributions within dyads, the actor accounted for 19% of the variance, the partner accounted for 8% of the variance, and the dyadic relationship accounted for 21% of the variance. The dyad accounted for a significant proportion of the variance in dyadic outcome expectancies for aggression and in dyadic attributions (see Table 3).

Summary of Variables Included in Regression Equations

The structure of our data set was as follows: There were 11 groups, each composed of 6 boys. Within each group, each of the 6 boys served as the actor in 5 dyads, with each of the other 5 boys in the play group serving as his partner in 1 of these dyads. Thus, there were a total of 30 possible actor–partner dyads per group. The final data set included 330 lines of data, 1 for each of the 30 actor–partner dyads in each of the 11 groups.

For a line of data in which A was the actor, B was the partner, and C, D, E, and F were the 4 remaining members of the play group, the following variables were computed.

Scores for dyadic proactive aggression and dyadic reactive aggression were computed by averaging across the five play sessions the frequency with which the actor (A) initiated that subtype of aggression against the partner (B). Scores for dyadic outcome expectancies for aggression and dyadic hostile attributions were computed by averaging the actor's (A's) responses across the six vignettes for which the partner (B) was the focus. Scores for generalized actor proactive aggression and generalized actor reactive aggression were computed by averaging the dyadic aggression scores for that subtype of aggression across the four lines of data in which A was the actor and C, D, E, and F were the partners. Scores for generalized actor outcome expectancies for aggression and generalized actor hostile attributions were computed by averaging the dyadic social cognition scores for that type of social cognition across the four lines of data in which A was the actor and C, D, E, and F were the partners. Scores for generalized proactive aggression directed toward the partner and generalized reactive aggression directed toward the partner were computed by averaging the dyadic aggression scores for that subtype of aggression across the four lines of data in which C, D, E, or F was the actor and B was the partner. Scores for generalized outcome expectancies directed toward the partner and generalized hostile attributions directed toward the partner were computed by averaging the dyadic social cognition scores for that type of social cognition across the four lines of data in which C, D, E, or F was the actor and B was the partner.

We used this approach to calculate these scores for each of the 30 possible actor–partner combinations in each of the 11 groups, resulting in a total of 330 lines of data. As an example, we have included our data set for the first of the 11 groups as an appendix (see Appendix A).

Preliminary Analysis

Zero-order correlations among the six variables described previously are presented in Table 4, specifically with regard to proactive aggression and outcome expectations for aggression. These same statistics are presented in Table 5 for reactive aggression and hostile attributional biases.

We also ran a preliminary analysis to determine whether these data demonstrated, at the generalized level, the differential specificity between types of social cognition and subtypes of aggression that has been shown in previous investigations. Specifically, we predicted generalized actor proactive aggression from generalized actor outcome expectations for aggression and found that this prediction was significant, $F(1, 208) = 4.25$, $p < .05$. Similarly, generalized actor hostile attributional biases significantly predicted generalized actor reactive aggression, $F(1, 208) = 10.12$, $p < .01$.

Explanation of Regression Analysis Procedures

Given the round-robin and interdependent nature of our data set, the preferred method of addressing our hypotheses about the relations between dyadic aggression and dyadic social cognition would be to use the Social Relations Model program (SOREMO) developed by Kenny (1994). However, to have sufficient power to detect relations using this approach, it is necessary to obtain data on many groups of participants, because SOREMO conducts analyses at the level of the group (i.e., we would have $N = 11$). For some types of data, it is not difficult to collect data on many groups of participants, and the SOREMO procedure is ideal for these

Table 3
Variance Partitioning for Social Cognition Measures

Measure	Proportion of variance	t	p
Outcome expectancies			
Actor	.28	3.75	.00
Partner	.16	2.72	.02
Relationship	.16	4.08	.00
Error	.40		
Hostile attributions			
Actor	.19	2.97	.01
Partner	.08	1.67	.13
Relationship	.21	5.31	.00
Error	.51		

Table 4
Zero-Order Correlations Among the Proactive Aggression and Outcome Expectations for Aggression Variables

Variable	1	2	3	4	5	6
1. Dyadic proactive	—	.13*	.09	.35*	.44*	.09
2. Dyadic expectations		—	.53*	.10	.08	.26*
3. Generalized actor expectations			—	.17*	−.06	−.19*
4. Generalized actor proactive				—	−.09	−.04
5. Generalized proactive toward partner					—	.17*
6. Generalized expectations toward partner						—

Note. Dyadic proactive = dyadic proactive aggression; Dyadic expectations = dyadic outcome expectations for aggression; Generalized actor expectations = generalized actor outcome expectations for aggression; Generalized actor proactive = generalized actor proactive aggression; Generalized proactive toward partner = generalized proactive aggression directed toward partner; Generalized expectations toward partner = generalized outcome expectations for aggression directed toward partner.
* $p < .05$.

situations. However, collecting information on large numbers of groups becomes prohibitive in other situations, such as when working with groups that need to be formed especially for research purposes rather than with preexisting groups or when collecting observational data rather than simply interview or questionnaire data (our data collection fell into both of these categories). Therefore, we attempted to develop and use an alternative analytic procedure that would allow us to gain more statistical power. The SAS code for this procedure is included as Appendix B.

Because our data set is nested, we decided to use a mixed models regression approach. As a first step, we tested whether our criterion variables (dyadic proactive aggression and dyadic reactive aggression) varied across the 11 groups. We reasoned that if they did not, it would be possible to run our analyses without nesting within group, an approach that would result in considerably more statistical power. With group as the level of analysis, the between-groups variance was not significant for either proactive aggression (variance = 41.39, $z = 1.54$, *ns*) or reactive aggression (variance = 11.51, $z = 1.56$, *ns;* see Sections 1 and 2 of Appendix B). Furthermore, at the level of the group, the intraclass correlation for proactive aggression was .06, and the intraclass correlation for reactive aggression was .06. These findings suggest that when group is the level of analysis, significantly more of the variance in these two constructs is within-group variance as opposed to between-groups variance and, thus, that proactive aggression and reactive aggression did not vary by group. For these reasons, we decided that it would be acceptable to analyze our data without nesting within group.

Next, we investigated the appropriateness of nesting within actor. With actor as the level of analysis, the between-groups variance was significant for both proactive aggression (variance = 155.75, $z = 3.35$, $p < .001$) and reactive aggression (variance = 30.60, $z = 2.78$, $p < .01$; see Sections 3 and 4 of Appendix B). At the level of actor, the intraclass correlation for proactive aggression was .23, and the intraclass correlation for reactive aggression was .17. These findings suggest that when actor is the level of analysis, a significant proportion of the variance in the constructs of proactive and reactive aggression is between-groups variance. For this reason, we decided that it would be appropriate to analyze our data by nesting within actor rather than by nesting within group and then within actor. (It is important to note that it would have been possible to nest within partner instead of within actor. However, it is not possible to nest within both actor and partner simultaneously, because then there would only be as many lines of data as there are units of analysis, resulting in no within-group variance.)

Table 5
Zero-Order Correlations Among the Reactive Aggression and Hostile Attributional Bias Variables

Variable	1	2	3	4	5	6
1. Dyadic reactive	—	.19*	.11	.27*	.19*	.10
2. Dyadic attrib bias		—	.36*	.11*	.10	.10
3. Generalized actor attrib bias			—	.25*	−.01	−.20*
4. Generalized actor reactive				—	−.07	−.04
5. Generalized reactive toward partner					—	.29*
6. Generalized attrib bias toward partner						—

Note. Dyadic reactive = dyadic reactive aggression; Dyadic attrib bias = dyadic hostile attributional biases; Generalized actor attrib bias = generalized actor hostile attributional biases; Generalized actor reactive = generalized actor reactive aggression; Generalized reactive toward partner = generalized reactive aggression directed toward partner; Generalized attrib bias toward partner = generalized hostile attributional biases directed toward partner.
* $p < .05$.

The preceding procedures address the issue of gaining greater statistical power by avoiding nesting within group. However, these procedures do not address the interdependencies in our round-robin data set. We have attempted to address these interdependencies with our second set of regression equations. For example, when we enter generalized actor aggression (or social cognition) as a predictor of dyadic aggression, we at least partially account for the interdependency between A's aggression (or social cognition) toward B and A's aggression (or social cognition) toward C. Similarly, when we enter generalized aggression (or social cognition) received by the partner as a predictor of dyadic aggression, we at least partially account for the interdependency between A's aggression (or social cognition) toward B and C's aggression (or social cognition) toward B.

We readily admit that we have not fully removed all of the interdependencies in our data set. For example, A's aggression toward B is likely to be correlated with B's aggression toward A, an interdependency that we have not fully addressed. Therefore, our results should be interpreted with caution. However, we are hopeful that our analytic approach will allow us to shed some light on important theoretical issues that may be difficult for researchers in our field to address if they are required to collect data on a sufficient number of groups to make the use of Kenny's (1994) SOREMO approach feasible.

The Relation Between Dyadic Social Cognition and Dyadic Aggression

In the first set of mixed model analyses, each of the two dyadic aggression variables was predicted from each of the two dyadic social cognition variables. These analyses were designed to determine whether aggression and social cognition are related at the dyadic level and, more important, whether the hypothesized specificity between type of dyadic social cognition and subtype of dyadic aggression existed. Specifically, we hypothesized that outcome expectancies for aggression would be significantly related to proactive aggression (but not to reactive aggression) at the dyadic level. Similarly, we hypothesized that hostile attributions would be significantly related to reactive aggression (but not to proactive aggression) at the dyadic level.

The results of these analyses are provided in Table 6. Dyadic outcome expectancies for aggression were significantly related to dyadic proactive aggression but were not related to dyadic reactive aggression. Dyadic hostile attributions were significantly related to dyadic reactive aggression but were only marginally related to dyadic proactive aggression. Thus, the hypothesized specificity between type of dyadic social cognition and subtype of dyadic aggression was largely supported (see Table 6 and Sections 5–8 of Appendix B).

The Unique Contribution of Dyadic Social Cognition in Predicting Dyadic Aggression

The final mixed model analyses were designed to test whether the contribution of dyadic social cognition in predicting dyadic aggression remained significant when other likely predictors of dyadic aggression were entered in the mixed models regression equation. These other predictors included (a) generalized actor social cognition, (b) generalized actor aggression, (c) generalized aggression directed toward the partner, and (d) generalized social cognition directed toward the partner.

The first regression equation focused on the relation between proactive aggression and outcome expectations for aggression. Thus, dyadic proactive aggression was predicted from the following variables: (a) dyadic outcome expectations for aggression, (b) generalized actor outcome expectations for aggression, (c) generalized actor proactive aggression, (d) generalized proactive aggression directed toward the partner, and (e) generalized outcome expectations for aggression directed toward the partner. The results of this analysis are reported in Table 7. When the other four predictor variables were included in the model, dyadic outcome expectations for aggression did not significantly predict dyadic proactive aggression (see Table 7). Instead, the two variables that did significantly predict dyadic proactive aggression were generalized actor proactive aggression and generalized proactive aggression directed toward the partner (see Section 9 of Appendix B).

The second regression equation focused on the relation between reactive aggression and hostile attributional biases. Thus, dyadic reactive aggression was predicted from the following variables: (a) dyadic hostile attributional biases, (b) generalized actor hostile attributional biases, (c) generalized actor reactive aggression, (d) generalized reactive aggression directed toward the partner, and (e) generalized hostile attributional biases directed toward the partner. In Table 8 , the results of the regression analysis are reported. When the other four predictor variables were included in the model, dyadic hostile attributions still significantly predicted dyadic reactive aggression (see Table 8 and Section 10 of Appendix B).

Discussion

The findings of the current study are consistent with a model in which a boy's dyadic distribution of reactive aggressive behavior

Table 6
Mixed Models Regressions Predicting Dyadic Aggression From Dyadic Social Cognition

Criterion and predictor	Unstandardized regression coefficient	*SE*	*t*	*df*	*p*
Dyadic proactive aggression					
Dyadic outcome expectancies	3.65	1.83	2.00	1, 263	.05
Dyadic hostile attributions	4.81	2.80	1.72	1, 263	.09
Dyadic reactive aggression					
Dyadic outcome expectancies	−0.96	0.95	−1.00	1, 263	*ns*
Dyadic hostile attributions	4.63	1.45	3.18	1, 263	.00

Table 7
Mixed Models Regression Predicting Dyadic Proactive Aggression

Predictor variable	Unstandardized regression coefficient	*SE*	*t*	*df*	*p*
Dyadic outcome expectancies for aggression	0.63	1.83	0.35	1, 260	*ns*
Generalized actor outcome expectancies for aggression	1.93	2.47	0.78	1, 260	*ns*
Generalized actor proactive aggression	0.59	0.07	8.49	1, 260	.00
Generalized proactive aggression directed toward partner	0.68	0.07	10.49	1, 260	.00
Generalized outcome expectancies for aggression directed toward partner	1.44	2.64	0.54	1, 260	*ns*

occurs as a function of his dyadic mental representations of his partner as well as his generalized aggressive tendencies. This model suggests that boys' mental representations of hostile attributions are organized at the dyadic-relationship level. The influence of social cognition on dyadic reactive aggressive behavior seems to be best explained at the dyadic level of representation rather than at a traitlike general level of attribution tendencies. Dyadic mental representations are most likely derived through dyad-specific social experiences, although preexisting individual-level general social–cognitive tendencies also operate to influence dyadic social cognitions.

Several questions concerning dyadic processes in boys' social information processing are addressed here. The first question is whether the variance in boys' social cognitions includes a significant dyadic component. The results indicate that 16% of the variance in outcome expectancies for aggression and 21% of the variance in hostile attributions are attributable to the dyadic relationship in which these cognitions are embedded. Thus, as has been found previously for boys' aggressive behavior (Coie et al., 1999; Dodge, Price, Coie, & Christopoulos, 1990), boys' social–cognitive processes do not operate solely at the trait level but are significantly influenced by their dyadic relationships as well.

The next question is whether boys' dyadic social cognitions are related to their dyadic aggressive behavior. The findings indicate that dyadic hostile attributions are specifically related to dyadic reactive aggression but only marginally related to dyadic proactive aggression. This finding complements previous findings (Crick & Dodge, 1996; Dodge & Coie, 1987; Dodge, Price, Bachorowski, & Newman, 1990) by demonstrating that this relation holds at the dyadic level as well as the general level or what could be considered the level of personality traits.

The relation between hostile attributions and the display of reactive aggression at the dyadic level remained significant even when a boy's hostile attributions toward peers in general, his generalized level of reactive aggressive behavior, the generalized level of reactive aggression his partner receives from peers, and the generalized level of hostile attributions made toward the partner by peers were taken into account. The preservation of this relation in the presence of other powerful predictors of reactive aggression indicates the unique importance of this factor, controlling for other factors that might explain dyadic aggression, as suggested by Kenny's (1994) Social Relations Model. Thus, these findings suggest that the influence of hostile attributions on boys' reactive aggressive behavior is truly a dyadic phenomenon, something that has not previously been demonstrated or considered in the literature on human aggression. That is, the imputation of hostile motivations to specific peers is an important determinant of angry, aggressive reactions to these individuals, regardless of how likely a boy is disposed to become angry toward other children. Whether peer-specific attributions of hostile intention build up slowly as a result of repeated encounters with specific peers or whether these specific attributions emerge quickly on the basis of critical episodes that are viewed within a generally suspicious frame of reference cannot be determined from this study; however, reactive aggression clearly seems to be triggered by person-specific interpretations.

The preceding discussion suggests that dyadic hostile attributional biases are causally implicated in the development of aggressive relationships involving reactive aggression. Although it is

Table 8
Mixed Models Regression Predicting Dyadic Reactive Aggression

Predictor variable	Unstandardized regression coefficient	*SE*	*t*	*df*	*p*
Dyadic hostile attributions	3.52	1.48	2.39	1, 260	.02
Generalized actor hostile attributions	0.09	2.35	0.04	1, 260	*ns*
Generalized actor reactive aggression	0.44	0.09	5.10	1, 260	.00
Generalized reactive aggression directed toward partner	0.31	0.09	3.30	1, 260	.00
Generalized hostile attributions directed toward partner	2.48	2.71	0.92	1, 260	*ns*

common to consider appraisal processes as preceding behavioral outcomes, this direction of effects can only be inferred, because of the correlational nature of the data in this study. Alternatively, dyadic reactive aggression may play a causal role in the development of dyadic hostile attributional biases, or, most likely, the two constructs operate in a bidirectional or cyclical manner.

In contrast, the hypothesized relation between dyadic outcome expectancies for aggression and dyadic proactive aggressive behavior was not supported. As we hypothesized, dyadic outcome expectancies for aggression significantly predicted dyadic proactive aggression but not dyadic reactive aggression when dyadic outcome expectancies was the sole predictor entered into the model. However, this relation did not hold in the context of a model in which actor and partner effects were also considered as predictors of dyadic outcome expectancies of aggression. These findings suggest that the proximal mechanism for a dyadic act of proactive aggression may be the actor's evaluation of the likelihood of a positive outcome for aggressing toward that peer, but this evaluation is made as a function of the actor's general outcome expectancies, the actor's general tendency to engage in proactive aggression, and characteristics of the peer victim. Thus, the display of proactive aggression is not so much a dyadic phenomenon as it is an actor-driven and a partner-driven phenomenon. Boys target specific peers for proactive aggression because these peers have demonstrated through their submissive behavior that proactive aggression will be instrumentally effective against them (Perry et al., 1990; Schwartz et al., 1993).

Dodge, Price, Coie, and Christopoulos (1990) found that when dyads are characterized as asymmetrically aggressive, as opposed to mutually aggressive, 82% of the aggression is proactive, whereas almost half of the aggression in mutually aggressive dyads (45%) is reactive. Thus, asymmetric aggressive relationships seem to have an actor and a partner orientation, in which an aggressive relationship is formed and maintained on the basis of the reinforcements that one child receives from aggressing toward the other. In contrast, mutually aggressive relationships may have more of a relationship orientation, such that aggression between members of these dyads is based on the suspicions, anger, and dislike that each member evokes in the other.

In the past, researchers have investigated children's social cognitions in terms of hypothetical peers and events, focusing on social information processing as it occurs toward all peers (Dodge, 1986). The current findings do not contradict the results of these previous studies. When the relations between subtypes of aggression and social cognition are examined at the generalized level, our findings mirror what has been demonstrated in a number of earlier investigations.

It is only when these relations are examined at the level of the dyad that the importance of social cognitions about specific peers rather than social cognitions about peers in general emerges. How can these two views be integrated? It is possible that children or, in this case, boys use their generalized view of the social world at the beginning of relationships with unfamiliar peers. For example, when deciding whether to aggress against a new peer, boys may rely on their general sense of how effective aggression is against peers overall. Also, when responding to a provocation by a stranger, boys may use a generalized attributional bias to interpret the stranger's intentions. Over time, as boys gain experience with new peers, they may develop a set of social cognitions that are specific to each peer. For example, they may decide that aggression is often highly effective against one child but seldom effective against another. Also, boys may come to attribute hostile intentions to one peer but not to another.

If the dyadic relationship is crucial to reactive aggression, how do we explain the past findings of a traitlike relation between hostile attributional tendencies and reactive aggression? One possible explanation is that some children are primed to develop hostile expectations of peers because of earlier exposure to abuse and family conflict (Dodge, Bates, & Pettit, 1990). The emotional lability of these children makes them vulnerable to responding angrily to many peer misunderstandings or conflicts, so they develop hostile biases toward many classmates. These children come to have a generalized set of social cognitions that dispose them to draw hostile inferences from the behavior of new peer acquaintances more quickly than their peers do. Other children may develop hostile relationships with only a few peers, because of incompatible behavioral patterns or interests. The latter children exhibit reactive aggression more consistently in these few, specific relationships. Finally, there may be some children who either possess exceptional social skills or who are so nonthreatening with peers that they rarely evoke anger or suspicion in other children. These children would account for the partner component of reactive aggression, as would that group of children who consistently provoke others.

This proposed model suggests a fruitful avenue for future research. The development of social cognitions about specific peers could be examined by placing children in play groups with unfamiliar peers and having these play groups meet many times, perhaps a dozen. Children could be interviewed prior to the first play session and following every third or fourth play session thereafter. Vignettes similar to those used in this study could track the formation of a child's social cognitions about each of the members of the play group. These social cognitions could then be related to actual play group aggression, aggregated across three or four consecutive sessions. Research designs such as the one proposed here hold promise for enhancing even further our understanding of the complex relation between children's social information processing and aggressive behavior.

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Appendix A

Data Set Structure

Group	Actor	Partner	padyad	radyad	oedyad	hadyad	pagnac	ragnac	oegnac	hagnac	pagnpa	ragnpa	oegnpa	hagnpa
1	A	B	40.00	11.00	3.67	1.33	44.00	17.25	2.79	1.50	30.75	17.00	2.88	1.58
1	A	C	63.00	23.00	3.33	1.50	38.25	14.25	2.88	1.46	40.75	14.25	3.46	1.54
1	A	D	24.00	20.00	2.00	1.50	48.00	15.00	3.21	1.46	8.75	5.75	2.29	1.79
1	A	E	50.00	17.00	2.50	1.67	41.50	15.75	3.08	1.42	17.50	6.00	2.96	1.88
1	A	F	39.00	9.00	3.33	1.33	44.25	17.75	2.88	1.50	15.25	9.00	2.50	1.75
1	B	A	8.00	2.00	1.50	1.67	17.00	6.25	2.67	1.83	21.25	8.75	2.79	1.79
1	B	C	40.00	9.00	3.50	1.50	9.00	4.50	2.17	1.88	46.50	17.75	3.42	1.54
1	B	D	13.00	8.00	2.67	1.50	15.75	4.75	2.38	1.88	11.50	8.75	2.13	1.79
1	B	E	4.00	0.00	2.67	2.83	18.00	6.75	2.38	1.54	29.00	10.25	2.92	1.58
1	B	F	11.00	8.00	1.83	1.50	16.25	4.75	2.58	1.88	22.25	9.25	2.88	1.71
1	C	A	15.00	10.00	2.17	1.33	17.50	14.00	2.46	1.83	19.50	6.75	2.63	1.88
1	C	B	31.00	26.00	2.67	1.83	13.50	10.00	2.33	1.71	33.00	13.25	3.13	1.46
1	C	D	7.00	5.00	2.00	1.67	19.50	15.25	2.50	1.75	13.00	9.50	2.29	1.75
1	C	E	17.00	11.00	2.33	2.00	17.00	13.75	2.42	1.67	25.75	7.50	3.00	1.79
1	C	F	15.00	14.00	2.83	1.83	17.50	13.00	2.29	1.71	21.25	7.75	2.63	1.63
1	D	A	61.00	13.00	3.17	1.17	31.00	8.75	3.00	1.08	8.00	6.00	2.38	1.92
1	D	B	46.00	14.00	1.50	1.00	34.75	8.50	3.42	1.13	29.25	16.25	3.42	1.67
1	D	C	27.00	7.00	4.00	1.17	39.50	10.25	2.79	1.08	49.75	18.25	3.29	1.63
1	D	E	20.00	6.00	4.00	1.00	41.25	10.50	2.79	1.13	25.00	8.75	2.58	2.04
1	D	F	31.00	8.00	2.50	1.17	38.50	10.00	3.17	1.08	17.25	9.25	2.71	1.79
1	E	A	6.00	6.00	3.50	2.17	15.75	5.75	3.25	1.88	21.75	7.75	2.29	1.67
1	E	B	17.00	0.00	4.00	1.50	13.00	7.25	3.13	2.04	36.50	19.75	2.79	1.54
1	E	C	36.00	17.00	3.67	1.50	8.25	3.00	3.21	2.04	47.50	15.75	3.38	1.54
1	E	D	6.00	0.00	2.50	2.00	15.75	7.25	3.50	1.92	13.25	10.75	2.17	1.67
1	E	F	4.00	6.00	2.83	2.50	16.25	5.75	3.42	1.79	24.00	9.75	2.63	1.46
1	F	A	3.00	6.00	2.33	2.50	31.75	17.25	2.71	1.92	22.50	7.75	2.58	1.58
1	F	B	29.00	28.00	3.33	2.00	25.25	11.75	2.46	2.04	33.50	12.75	2.96	1.42
1	F	C	60.00	24.00	2.67	2.00	17.50	12.75	2.63	2.04	41.50	14.00	3.63	1.42
1	F	D	9.00	10.00	2.00	2.00	30.25	16.25	2.79	2.04	12.50	8.25	2.29	1.67
1	F	E	29.00	7.00	2.83	1.67	25.25	17.00	2.58	2.13	22.75	8.50	2.88	1.88

Note. padyad = dyadic proactive aggression; radyad = dyadic reactive aggression; oedyad = dyadic outcome expectations for aggression; hadyad = dyadic hostile attributions; pagnac = generalized actor proactive aggression; ragnac = generalized actor reactive aggression; oegnac = generalized actor outcome expectations for aggression; hagnac = generalized actor hostile attributions; pagnpa = generalized proactive aggression received by the partner; ragnpa = generalized reactive aggression received by the partner; oegnpa = generalized outcome expectations for aggression received by the partner; hagnpa = generalized hostile attributions received by the partner.

(*Appendixes continue*)

Appendix B

SAS Code for Running Mixed Model Analyses

```
1. proc mixed method = ml noclprint noitprint covtest;
   class group;
   model padyad = / solution;
   random intercept / sub = group type = un;
   run;

2. proc mixed method = ml noclprint noitprint covtest;
   class group;
   model radyad = / solution;
   random intercept / sub = group type = un;
   run;

3. proc mixed method = ml noclprint noitprint covtest;
   class actor;
   model padyad = / solution;
   random intercept / sub = actor type = un;
   run;

4. proc mixed method = ml noclprint noitprint covtest;
   class actor;
   model radyad = / solution;
   random intercept / sub = actor type = un;
   run;

5. proc mixed method = ml noclprint noitprint covtest;
   class actor;
   model padyad = oedyad / solution;
   random intercept / sub = actor type = un;
   run;

6. proc mixed method = ml noclprint noitprint covtest;
   class actor;
   model radyad = hadyad / solution;
   random intercept / sub = actor type = un;
   run;

7. proc mixed method = ml noclprint noitprint covtest;
   class actor;
   model padyad = hadyad / solution;
   random intercept / sub = actor type = un;
   run;

8. proc mixed method = ml noclprint noitprint covtest;
   class actor;
   model radyad = oedyad / solution;
   random intercept / sub = actor type = un;
   run;

9. proc mixed method = ml noclprint noitprint covtest;
   class actor;
   model padyad = oedyad oegnac oegnpa pagnac pagnpa / solution;
   random intercept / sub = actor type = un;
   run;

10. proc mixed method = ml noclprint noitprint covtest;
    class actor;
    model radyad = hadyad hagnac hagnpa ragnac ragnpa / solution;
    random intercept / sub = actor type = un;
    run;
```

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