TEMPERAMENT MODERATES ASSOCIATIONS BETWEEN YOUNG CHILDREN'S HOSTILE ATTRIBUTIONS AND AGGRESSIVE BEHAVIOR

Darrell Meece

Jacquelyn Mize

John E. Bates

Kenneth A. Dodge

Gregory S. Pettit

Tom Luster

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Inquiries should be addressed to Darrell Meece, 410 A Hunter Hall, Department of Education, University of Tennessee at Chattanooga, e-mail: drmeece@tennessee.edu

Abstract

This study examined the hypothesis that the association between hostile attributions and aggressive behavior with peers is moderated by children's temperament among three samples of preschoolers. Hostile attributions were assessed through videotape-based and story-based laboratory procedures. Maternal ratings and laboratory-based assessment provided the measures of temperament, and children's teachers completed ratings of aggression. Results revealed significant interaction terms between hostile attributions and temperament in the prediction of aggression. For children rated well or moderately skilled in self- regulation there was no association between hostile attributions and aggression. For children rated as poorly skilled in self-regulation making hostile attributions was significantly associated with aggression. This pattern of associations was particularly apparent for boys.

Aggressive behavior during the early childhood years is an important risk factor for predicting later adjustment, particularly peer rejection, delinquency and antisocial behavior (see Coie, 2005). Theorists and researchers convinced of the importance of understanding factors internal to the child that may account for individual differences in young children's aggressive behavior with peers have focused on two main areas of research, children's social cognition and temperamental aspects of children's self-regulation. To date, these two areas of research have largely been carried out independently. However, theorists working from both social cognitive frameworks (e.g., Crick & Dodge, 1994; Huesmann, 1998) and temperament and self-regulation frameworks (e.g., Bates & Rothbart, 2006; Rothbart, Posner, & Hershey, 1995; Thompson, 1994) have posited that social cognition and temperament may interact in the prediction of young children's social behavior.

The body of research examining social cognitive correlates of young children's social behavior primarily has been inspired by social-information-processing models (Crick & Dodge, 1994; Dodge, 1986) and models from the social-learning perspective (e.g., Ladd & Mize, 1983), both of which describe sequences of cognitive events thought to guide behavior in a particular social exchange. One aspect of social cognition that has proved particularly useful in predicting children's aggressive behavior involves individual differences in children's tendencies to attribute hostile intentions to others in ambiguous situations. Children's attributions are assessed by asking children to explain why a peer behaved in a certain way. This is often accomplished by

asking children if a character presented in the hypothetical story was being mean or not being mean, or by coding children's descriptions of a social event for spontaneously occurring hostile attributions.

Although a bias among aggressive children towards attributing hostile intentions to others in ambiguous situations has been well documented among second- though eighth-grade children (e.g., Dodge, 1980; Dodge & Frame, 1982; Feldman & Dodge, 1987; Gouze, 1987; Steinberg & Dodge, 1983), findings have been mixed among preschool, kindergarten and first-grade samples (Meece & Mize, 2011; Meece & Mize, 2010; Meece & Mize, 2009; Meece, Colwell & Mize, 2007). Pettit, Dodge, and Brown (1988) report that almost all of the children in their sample of economically disadvantaged four-and five-year-olds were biased towards attributing hostile intentions to others. These authors note anecdotally that many of the preschoolers appeared to focus solely on the outcome of hypothetical situations, in this case peer provocations, and that the children seemed to assume that intentions were necessarily hostile since outcomes were negative. However, other studies (Dodge, Bates, & Pettit, 1990; Katsurada & Sugawara, 1998; Weiss, Dodge, Bates, & Pettit,1992) report positive and significant associations between preschoolers' observed aggressive behavior and the tendency to attribute more hostile intentions to hypothetical provocateurs. In a meta-analysis conducted by de Castro, Veerman, Koops, Bosch, & Monshouwer (2002) a robust significant association between hostile attributions and aggressive behavior was found among 41 studies. Larger effect sizes were found for studies that examined more severe aggressive behavior,

studies that included peer rejection as a selection criteria, studies that included 8- to 12-year olds (two studies in the meta-analysis included 4- to 6-year-olds), and studies that did not control for intelligence.

The second burgeoning line of research on characteristics associated with variations in young children's social functioning points to temperamental aspects of children's self-regulation as a predictor of individual differences in social behavior (Calkins, 1994; Dunn & Brown, 1991; McDonald & Parke, 1986; Thompson, 1994). Temperamental constructs such as self-regulation and negative emotional reactivity (sometimes called difficult temperament) often overlap depending on how they are measured in a given study (Bates & Rothbart, 2006). Self-regulation has often been discussed by temperament theorists who define regulation in terms of modulating internal reactivity (e.g., Ahadi & Rothbart, 1994). Reactivity describes individual differences in threshold and intensity of emotional experience. Regulation refers to mechanisms that operate to control or modulate reactivity, and includes such processes as the ability to shift and focus attention as needed (i.e., to decrease arousal, by shifting attention from a distressing stimulus or by sustaining attention on a non-arousing stimulus, or to increase arousal by focusing attention on an arousing stimulus), behavioral approach or avoidance, and attempts at self-soothing (Eisenberg et al., 1997; Rubin, Coplan, Fox, & Calkins, 1995). Studies that examine patterns of association between temperamental aspects such as self-regulation and negative emotional reactivity – often called difficult temperament – often overlap (Rothbart & Bates, 2006).

Researchers working within this framework most often employ parent and/or teacher ratings to assess aspects of self-regulation. For example, Rubin and colleagues (1995) used a composite of two scales, five items assessing emotionality (“child often fusses and cries”) and five items assessing soothability (“when upset, child quickly calms down”) from maternal reports to assess the self-regulation of ninety-six 4-year-olds. Their analyses revealed that children who were high in social interaction, but were poor self-regulators, scored higher on observed disruptiveness and maternal ratings of externalizing problems than did children in other groups. Children who were low in social interactions who were poor regulators displayed more wary and anxious behaviors than did other children. These findings implicate poor self-regulation skills with behaviors that characterize both aggressive and withdrawn children.

In a series of studies, Eisenberg and her colleagues have used mother-, father-, and teacher- ratings to assess temperamental aspects of children’s self-regulation. Of most interest to this research group have been measures of children’s negative emotionality (“child often worries”) and emotional intensity (“child responds very emotionally to things around her”) as well as measures of regulatory mechanisms, particularly coping (“child cries to elicit assistance from others”) and attentional control (“if child doesn’t want to deal with a problem, she can easily shift attention away”). These researchers have linked preschool boys’ attentional control and coping to their constructive anger reactions (Eisenberg, Fabes, Minore, &Mathy, 1994), and have also found links between self-regulation and social behavior in older children.

Although researchers have documented linkages between aggressive behavior and both hostile attributions and self-regulation, there is currently little empirical data available in which the two constructs have been assessed in the same investigation. In their model of children's social information processing, Crick and Dodge (1994) suggest that children's emotional state may reciprocally influence how social cues are interpreted. Similarly, Thompson (1994) suggests that social cognitive processing may be influenced by children's regulation. Huesmann's (1998) model of social information processing posits that negative affect may predispose a child to attend to and misinterpret hostile cues. Rothbart and colleagues (1996) suggest that temperament may bias the way in which information about the self and others is processed. Specifically, these authors speculate that negative affectivity may predict negatively biased social information processing, which in turn predicts aggression. Mize, Pettit, and Meece (2000) suggest that aspects of social cognition, such as hostile attributions, may not be strongly associated with measures of aggressive behavior for children who are very skilled at soothing themselves, or who don't get very upset in the first place. On the other hand, for children who are less skilled at soothing themselves, hostile attributions might have a greater impact on their behavior with peers. For example, when faced with a provocation from a peer that is interpreted as hostile, children who are more likely to "fly off the handle" may be more likely to respond aggressively than are children more skilled at calming themselves down, or who do not become upset by such provocation.

Although there is a growing body of research that documents interactions between temperamental aspects of self-regulation and environmental influences in predicting children's adjustment (see Bates & Rothbart, 2006 for a review), there is a dearth of studies that have investigated interactions between temperament and other qualities internal to the child. Thus, currently there is only indirect evidence that temperamental aspects of regulation influences social information processing. For example, Dodge and Somberg (1987) report that aggressive children were more likely to interpret peers' intentions as hostile when under stress of perceived threat than when they were not. In a study conducted by de Castro, Bosch, Veerman, and Kopps (2003), highly aggressive 7- to 12-year-old boys who paused to monitor and regulate their own emotions before generating a strategy response to a hypothetical provocation suggested less aggressive strategies. Finally, in a separate study of 9- to 13-year-old boys, negative feelings that were induced by a loss at a manipulated video game during a laboratory session increased hostile attributions of intent made by highly aggressive boys (de Castro, Slot, Bosch, Koops, & Veerman, 2003).

In the current work we examine the hypothesis that aspects of self-regulation may moderate the association between young children's tendency to attribute hostile intentions to others and children's aggressive behavior with peers. We speculate that for young children who are more skilled at self-regulation, a tendancy to report hostile attributions will not predict aggressive behavior. However, for young children who are less skilled at self-regulation, we expect a significant association between hostile attributions and aggression. We

examined this hypothesis in three distinct samples. The first was a sample of preschool-age children in a small southern town. The longitudinal Child Development Project and the NICHD Study of Early Child Care provided two additional, larger samples to investigate possible replication of findings. Additionally, the larger sizes of these two additional samples allowed for a preliminary investigation of possible gender differences in the pattern of associations.

STUDY 1

Method

Participants. Data were available for 61 preschoolers attending one of two child care centers. The first center was a university-sponsored preschool serving mainly middle-income, professional families (n = 47), and the second was a day care center serving mainly lower-income families (n = 14). A series of t-tests revealed no differences between the children of the two samples on any variable of interest in this study. The children ranged in age from 36 to 73 months (M = 57.4 months; SD = 8.3 months); 29 were boys, and 32 were girls. Of the 61 children, 38 (62.3%) were European-American, 13 (9%) were African-American, and 10 (16.4%) were members of other minority groups, predominantly Asian-American (13.1%).

Maternal ratings of temperament. Mothers of participants were asked to complete the Preschool Characteristics Questionnaire (PCQ) (Finegan, Niccols, Zacher, & Hood, 1989). The PCQ is a normed questionnaire for parents of toddlers and preschoolers designed to assess children's temperamental

characteristics. Validity and reliability information for the PCQ can be found in Finegan et al. (1989), who report that temperament ratings made when children were 7-months old were moderately correlated with the scores from the difficult scale of the PCQ made when the children were 4-years-old. Of the infants classified as difficult at age 7 months, 46% continued to be perceived as difficult at age 4 years. The PCQ consists of 32 items that assess children's adaptability, emotional intensity levels, mood changes, and consistency in routines. For each item, mothers indicated the extent to which the description is accurate for their child on a scale of 1 to 7.

Exploratory factor analysis of the 32 items revealed nine factors with an eigenvalue greater than 1. Results revealed that items loading on the first factor (eigenvalue = 7.2) were consistent with the factor loadings reported by Finegan et al. (1989) for the construct labeled "difficult." Based on the results from the exploratory factor analysis and the results reported by Finegan et al. (1989), eight items were selected for further analyses. Each of these eight items was reported to load (or cross-load) on a factor labeled "difficult" by Finegan et al. (1989), with the exception of one item ("Goes when asked to 'stop,' or 'come'"). Two additional items ("negative response to new food" and "negative reaction to getting dressed") that were included in the "difficult" factor by Finegan et al. (1989) were not included on this scale because of low factor loadings in the current data set and low item-total correlations between these items and the other items in the scale. *Mother-rated temperament* (alpha = .88) was computed as the mean of the remaining 8 items (high scores reflect poorer regulation).

Appendix A lists the 8 items that were used to construct the regulation composite.

Hostile attributions videotape-based interview. The procedure used to assess hostile attributions was derived from procedures used in numerous studies conducted by Dodge and his colleagues, including Dodge et al. (1990) and Weiss et al. (1994). The video-tape based interview was conducted by the first author. During the videotape-based interview, children watched 10 vignettes in which child actors (ages 3 - 7) depicted an ambiguous peer provocation occurring during social interaction scenarios (such as a peer who refuses to share, a child who is rejected by peers, a child who enters a new classroom) The development of the video-taped vignettes is more fully described in Mize & Pettit (1997). Following the presentation of each of the 10 stories, interviewers asked the participant if the child depicted in the story was being mean or not being mean, and noted the children's answers. Children's responses were recorded with paper and pencil, and also audio-recorded (the experimenter repeated each child's verbal answers to help ensure the clarity of the audio-taped backup). The proportion of stories for which the child indicated the provocateur was being mean formed a measure of children's tendency to make *hostile attributions* (α = . 82).

Teacher ratings of aggression To assess children's aggressive behavior with peers, the head teachers in each classroom were asked to complete the Teacher's Checklist of Peer Relations (TCPR; Dodge & Somberg, 1987) and the short form of the Preschool Socio-affective Profile (PSP; La Freniere, Dumas,

Capuano, & Dubeau, 1992). The TCPR consists of 17 items rated on 5-point Likert-type scales, 5 of which pertain to the children's aggression (e.g., "starts fights with other children"). The scales from the TCPR have shown adequate reliability in past research (see Dodge & Coie, 1987; Dodge & Somberg, 1987). The five aggression items were averaged to form a composite of teacher-rated *TCPR aggression* (α = .90).

The short form of the PSP contains 30 items rated on 6-point Likert-type scales designed to tap three areas of children's emotional and behavioral competence: (a) positive qualities of child's adaptation (e.g., negotiates solutions to conflicts with other children, cooperates with other children); (b) angry, aggressive, and oppositional behaviors (e.g., irritable, gets mad easily, gets into conflicts with other children); and (c) anxious, isolated, and withdrawn behaviors (e.g., remains apart, inactive, watches others play). Previous research (La Freniere et al., 1992) has shown the three factors of the PSP to be internally consistent (α s = .92, .90, and .85 for positive, aggressive, and withdrawn scales, respectively) and to demonstrate adequate 2-week test re-test reliability (r s = . 86, .82, and .78 for positive, aggressive and withdrawn, respectively). In the current work, the 10 items that pertained to children's angry and aggressive behavior were averaged to form a composite of teacher-rated *PSP aggression* (α = .89).

Results

Descriptive statistics for both boys and girls are presented in Table 1. A series of t-tests revealed that boys were rated as significantly more aggressive

by teachers on both instruments than were girls, and that boys were rated significantly poorer in self-regulation by mothers. Because of these sex differences, the zero-order correlations presented in Table 2 are reported separately for boys and girls. For both boys and girls, there were no significant zero-order correlations between hostile attributions and the ratings of aggression or the rating of self-regulation. Also, for both boys and girls, no significant association was obtained between the rating of self-regulation and either rating of aggression.

In order to test the hypothesis that self-regulation moderates associations between aggressive strategies and aggressive behavior, regression equations predicting teacher-rated aggressive behavior were computed for each of the ratings of aggression. The variables were first centered. On the first step of each regression mother-rated emotion regulation and hostile attributions were entered. On the second step, the multiplicative interaction term between mother-rated self-regulation and hostile attributions was entered. As shown in Table 3, there was a significant interaction term between mother-rated self-regulation and hostile attributions in the prediction of both of the teacher ratings of aggression.

Analyses guided by the recommendations of Aiken and West (1991) were then conducted to clarify the nature of the interaction between mother-rated self-regulation and hostile attributions. Aggressive behavior was predicted from hostile attributions with the value of self-regulation fixed at low, medium, and high. The standard deviation of the moderator is often used as cut-off points for these analyses, although other cut-off points can be used. Only seven of the

children in this sample were rated one standard deviation below the mean on emotion regulation, and ten of the children were rated as one standard deviation above the mean. Therefore, due to the small cell sizes, we adopted the strategy of calculating the three groups based upon quartiles, with the 15 children (13 boys, 2 girls) who were rated poorest in self-regulation comprising the poor regulators group, the 15 children (8 boys, 7 girls) who were rated as most skilled in self-regulation comprising the skilled regulators group, and the remaining 31 children (8 boys, 23 girls) comprising the medium group.

For PSP-rated aggressive behavior the slope of the relationship between hostile attributions and aggressive behavior varied from 1.93 ($t = 2.82$, $p < .05$) for low self-regulation to 0.55 ($t = 1.38$, ns) for medium self-regulation to -0.53 (t = -.75, ns) for high self-regulation (see Figure 1). The slope of the relationship between hostile attributions and TCPR-rated aggressive behavior varied from 1.49 ($t = 2.26$, $p < .05$) for low self-regulation to 0.12 ($t = .31$, ns) for medium self-regulation to -0.86 ($t =-1.26$, ns) for high self-regulation (see Figure 2). Analogous analyses conducted using one standard deviation above and below the mean of self-regulation as cut-points yielded the same pattern of results.

To further clarify the nature of this interaction, correlations between hostile attributions and each of the ratings of aggression were calculated for each of the three levels of self-regulation. For the group rated most skilled in self-regulation by mothers, there was a negative, but non-significant association between hostile attributions and teacher-rated aggressive behavior (r s = -.15 and -.24 for PSP and TCPR ratings, respectively, both ns). For the group rated as moderate in

self-regulation by mothers, the association between hostile attributions and teacher-rated aggressive behavior was non-significant (r s = .17 and .01 for PSP and TCPR ratings, respectively, both ns). For the group rated lowest in self-regulation by mothers (i.e., poor emotion regulators), the association between hostile attributions and teacher-rated aggressive behavior was significant and positive (r s = .57 and .45 for PSP and TCPR ratings, respectively, both $p < .05$). Thus, there was no association between hostile attributions and aggressive behavior for children rated as highly or moderately skilled regulators, whereas the hostile attributions measure was significantly associated with aggressive behavior for children rated as poor regulators.

STUDY 2

Method

Participants included 585 five-year-old children from the longitudinal Child Development Project (see Bates et al., 1994; Pettit et al., 1997). Families were recruited for participation from each of three sites (Nashville and Knoxville, Tennessee, and Bloomington, Indiana). Schools considered generally representative of each of the three communities were selected in consultation with local school personnel. At the time of kindergarten pre-registration (during the Spring preceding the September of matriculation), parents were approached by research staff and asked to participate in a longitudinal study of child development. Of the families approached, about 75% of the parents agreed to take part in the study, resulting in 585 families. The sample was quite diverse in terms of child sex (52% male), ethnicity (81% European-American, 17%

African-American, and 2% other ethnic groups), and family composition (26% of the children lived in single parent homes). The average family score on the Hollingshead (1975) four-factor index of social status (computed from demographic information provided by the parents) was 40.4 indicating a predominantly middle-class sample. However, a wide range of statuses was represented, with 9%, 17%, 25%, 33%, and 16% of the families being classified into the five possible classes (from lowest to the highest) recommended by Hollingshead (1975).

Maternal Rating of temperament. In the summer before children entered kindergarten, or within the first weeks of school, parents were separately given questionnaires and were interviewed at home by a graduate student or post-graduate research assistant (See Bates et al., 1994). Measures from the 1.5-hr. Developmental History Interview included caregiving arrangements, family stress and social support, parent discipline practices, child exposure to violence, child conduct, and peer relations. The measure of young children's *temperament* ($\alpha = .86$) was comprised of the maternal ratings on 9-items from the difficultness subscale of the Retrospective Infant Characteristics Questionnaire (Bates, Freeland & Lounsbury, 1979).

Hostile Attributions During the home visits conducted the summer preceding kindergarten, children were separately interviewed in order to assess their social information processing. Following procedures outlined in Harrist, Zaia, Bates, Dodge, and Pettit (1997), children were presented with several hypothetical social dilemmas depicting either a peer-group entry situation (in

which the child is asked to imagine being rebuffed or ignored when attempting to join an on-going social activity) or a peer-based provocation (in which the child was asked to imagine being provoked by another child). Following the presentation of each of the hypothetical vignettes, children were asked a series of questions designed to tap social information-processing steps (Dodge, 1986). rained research assistants, who were blind to the hypothesis of the current study, presented each child with three sets of hypothetical social vignettes using multiple methods. The vignettes were always presented in the following order: (1) an eight-item oral set with accompanying cartoon drawings to assess response generation; (2) an eight-item oral set with accompanying cartoon drawings used to assess attributions; and (3) a 24-item videotaped set featuring 6- to 11-year-old actors to asses encoding, attributions, and response decision. The videotape-based set depicted three types of group entry and peer provocation stories (eight stories of each type), in which the intention of the provocateur in the story was deliberately varied as either clearly hostile, ambiguous, or clearly accidental. Children's tendency to attribute hostile intent to the actions of others was assessed through children's responses during the 24 videotaped stories, and the second set of eight stories read aloud. Following each of the vignettes, children were asked "Was the other kid being mean or not being mean?" Answers were scored immediately by the interviewer as being either benign intent (scored 0) or hostile intent (scored 1). The proportion of hostile responses within each format (read story or videotape) was computed and converted to a *z* score. The two standardized scores where then summed to form a single

composite of *hostile attributions.*

Teacher ratings of aggression. In the spring of the kindergarten year, teachers were asked to complete the Teacher Report Form Ages 2 to 5 Years of the Child Behavior Checklist (Achenback & Edelbrock, 1986). The TRF lists 100 problem behaviors reflecting both internalizing problems (e.g., "too fearful and anxious") and externalizing problems (e.g., "hits others,""disobedient at school,""argues a lot"). Achenbach reports a test–retest reliability of .89, an interparent agreement of .70, and a stability of .71 over 2 years. Raw scores were converted into standard T scores, based on normative data for children of the same age. The t-score of the aggression scale was used as the measure of *aggression*.

Results

Descriptive statistics for both boys and girls are presented in Table 1. The larger sample size of the Child Development Project allowed for the examination of potential sex differences through investigating potential three-way interactions between sex, hostile attributions, and emotion regulation in predicting young children’s aggressive behavior. A regression equation predicting aggression from sex, hostile attributions, self-regulation, the multiplicative interaction terms of sex X hostile attributions, sex X self-regulation, attributions X self-regulation, and sex X hostile attributions X self-regulation was computed (Table 4). The procedures of the regression analysis described in study 1 were followed. All of the entered variables contributed significantly to the prediction of aggression, with the

exception of the sex X hostile attributions interaction term (p = .06). It is important to point out that the main effect of hostile attributions in predicting teacher-rated aggression remained significant even when sex, self-regulation, and the interaction terms were entered (β = .93, p = .05).

To further examine the nature of the interactions, the slopes of the association between hostile attributions and aggression at multiple levels of difficultness were computed separately for boys and girls (Figure 2). For boys, the slope of the relationship between hostile attributions and aggression varied from 7.21 (t = 3.22, p < .05) for low (-1 SD) self-regulation to 4.46 (t = 2.62, p < .05) for mean self-regulation to 1.72 (t = 0.75, ns) for high (+1 SD) self-regulation. Thus, the association between attributions and aggression was significant for boys rated as less skilled in self-regulation, but not for boys rated as more skilled in self-regulation. For girls, the slope of the relationship between hostile attributions and aggression varied from -2.38 (t = 1.17, ns) for low (-1 SD) self-regulation to 0.43 (t = 0.28, ns) for mean self-regulation to 3.24 (t = 1.51, ns) for high (+1 SD) self-regulation. Thus, for girls, there was no association between hostile attributions and aggression at any level of the moderator.

STUDY 3

Method

The NICHD-SECC included 1,364 families recruited in 10 US locations shortly after the child's birth. Families were recruited in 1991 from hospitals located in 10 locations in the USA. During selected 24-hour sampling periods, all 8,986 women who gave birth were screened and 5,416 met the eligibility criteria

for the study. From that group, 1,364 families became study participants upon completing a home interview when their infants were one month old. Additional details about recruitment and selection procedures are available in prior publications from the study (see NICHD ECCRN, 1997). At 54 months, 854 children (435 girls; 419 boys) were observed in childcare; 368 were not in regular care and 142 were not observed. In general, children observed in childcare came from more educated, economically advantaged, and stable two-parent families than did children not in childcare and than children in childcare who were not observed. Data used in the current investigation, collected at the 54-month follow-up, were available for 720 children (374 girls; 84.7% European-American, 9.3% African-American; 5.6% Hispanic).

Measures of Temperament At the 54-mounth laboratory visit, each child was administered a children's versin of a Stroop Test (Gerstadt, Hong, & Diamond, 1994). During this test, children are presented with a deck of 18 cards. Nine of the cards depict a yellow moon and several stars against a black background, and nine of the cards depict a bright sun against a white background. The first two cards are used as practice as the children are instructed to say "day" upon seeing a black card with the moon and stars, and to say "night" upon seeing the white card with the sun. The measure of *impulsivity* was the proportion of incorrect responses obtained through this children's Stroop Test.

Mothers completed the Children's Behavior Questionnaire (Rothbart, Ahadi, & Hershey, 1994) when the children were 54 months old. This widely used

measure of parental report of child temperament is appropriate for children ages 3–8. The average maternal ratings on the 10-items from the inhibitory control scale (α = .75) of the Children's Behavior Questionnaire comprised the measure of *inhibitory control.*

Hostile attributions. During the 54-month laboratory visit, children were presented with four gender-tailored hypothetical scenarios in which a negative outcome happened to the focus child due to the actions of another child. The four scenarios were (a) being hit in the back by a ball while playing catch, (b) having a favorite toy taken (while the child was not watching) by another child, (c) having juice spilled on the child, and (d) tripping over another child's leg while playing. Children were asked whether they thought the action was intentional or accidental (e.g., "Did she hit you in the back by accident or "did did she want to hit you in the back?"). The measure of *hostile attributions* was the number of negative attributions children made in response to the four ambiguous peer provocation situations (alpha = .65)

Teacher ratings of aggression were assessed via caregiver report on Achenbach's Teacher Report Form of the Child Behavior Checklist. These subscales have shown good test-retest and inter-rater (teacher and aide) reliability (see Achenback & Edelbrock, 1986). The t-score of the aggression scale was used as the measure of *aggression*.

Results

Two regression equations predicting aggression were computed. In the first, inhibitory control, hostile attributions and the multiplicative interaction term

were entered (Table 5). The main effects of both inhibitory control and hostile attributions, as well as the interaction term, were significant. The slope of the relationship between hostile attributions and aggression varied from 1.02 (t = 3.70, $p < .05$) for low (-1 SD) inhibitory control to 0.52 (t = 2.76, $p < .05$) for mean inhibitory control to 0.03 (t =-0.12, ns) for high (+1 SD) inhibitory control (Figure 3). In analyses conducted separately for boys and girls, both hostile attributions and inhibitory control main effects, but not the interaction term, were significant for girls, whereas the inhibitory control main effect and the interaction term, but not the hostile attributions main effect, was significant for boys.

The second regression equation predicted aggression from impulsivity, hostile attributions and the multiplicative interaction term. The impulsivity and hostile attribution main effects, as well as the interaction term, were significant (Table 5). The slope of the relationship between hostile attributions and aggression varied from -0.28 (t = 0.97, ns) for low (-1 SD) impulsivity to 0.46 (t = 2.28, $p < .05$) for mean impulsivity to 1.20 (t = 4.13, $p < .05$) for high (+1 SD) impulsivity (Figure 3). When examined separately, the hostile attributions main effect and the interaction term, but not the impulsivity main effect, were significant for girls, whereas for boys the impulsivity main effect and the interaction term, but not the hostile attributions main effect, were significant.

Discussion

Results from the current study suggest that whether or not hostile attributions lead to aggressive behavior depends on young children's temperament. Hostile attributions were not associated with aggressive behavior

for young children in this study who were described as being skilled in self-regulatin. In contrast, for children who were rated as poorly skilled in self-regulation, hostile attributions was significantly associated with aggressiveness. This finding may shed some light on the contradictory findings in the literature concerning associations between young children's hostile attributions and aggressive behavior. As mentioned previously, some studies (Dodge et al., 1990; Katsurada & Sugawara, 1998; Weiss et al., 1992) have found significant associations between young children's hostile attributions and aggressive behavior, whereas others have not (Pettit et al., 1988). Some authors (e.g., Pettit et al., 1988) have suggested that ecological characteristics may play a role in explaining non-significant associations between hostile attributions and aggressive behavior, and it is possible that ecological characteristics may interact with children's temperament in explaining links between hostile attributions and aggressive behavior. For instance, children from disadvantaged households who have been exposed to violence and abuse (such as those in the Pettit et al. 1988 sample) may have particular difficulties with regulating their anger, and may have chronically accessible hostile attributions (Graham & Hudley, 1994). Such children may be particularly at risk for aggressive behavior due to the combination of poor self-regulation skill and hostile attribution biases.

The finding that associations between young children's hostile attributions and aggressive behavior is moderated by children's temperament suggests that self-regulation may be a protective factor for children who are at increased risk for exhibiting aggressive behavior due to a heightened tendency to make hostile

attributions. That is, current research has demonstrated that an increased tendency to make hostile attributions concerning ambiguous provocations is a risk factor for aggressive behavior (Dodge et al., 1990; Weiss et al., 1992), particularly among older children (see de Corso et al. 2002 for a meta-analysis). However, skill at self-regulation may buffer some children from this increased risk of aggressive behavior, in that children better able to calm themselves down may be able to preempt aggressive responses following hostile attributions. Further research examining self-regulation as a potential protective factor for children at risk for aggressive behavior due to chronically accessible hostile attributions may be warranted.

It is important to note the sex differences in the pattern of findings. In the first sample, sex differences existed in the teacher ratings of aggressive behavior and the maternal ratings of difficult temperament. This raises the potential concern that the interaction between hostile attributions and aggressive behavior may be confounded by sex, because boys were rated as both more aggressive and more difficult. However, there were no instances in which a zero-order correlation was significant for boys but not girls, or for girls and not boys. Also, both comparison groups of children (those who scored high self- regulation and those who scored low in self-regulation) contained both boys and girls. The limited sample size of the first study did not allow for follow-up analysis of sex differences. The second study employed the larger Child Development Project sample to examine the potential three-way interactions between sex, hostile attributions, and emotion regulation in predicting young children’s aggressive

behavior. In this sample, significant interactions were obtained between sex, temperament, and aggression. Among the CDP sample, hostile attributions did not significantly predict aggression at any level of temperament for girls. However, for boys, the association between hostile attributions and aggression was significant for those rated as more difficult, but not significant, though still positive, for boys with less difficult temperament.

In the third study, of the NICHD SECC sample, an additional measure of self-regulation was available. In all three studies, separate informants were used to rate temperament and aggressive behavior in order to reduce method variance. Mother-ratings of temperament were selected because mothers are with children in a variety of situations and may have better insight to temperament qualities (Rothbart & Bates, 1986). Preschool teacher ratings of aggression were selected because teachers are more likely to be present when children are interacting with same-age peers. In the NICHD SECC sample, a measure of impulsivity from a laboratory session was also included as a measure of self-regulation. In this sample, when maternal ratings of temperament were used as the moderator, a significant interaction term was obtained for boys but not for girls. These findings replicate the findings of the first two studies. Additionally, when the laboratory-based measure of impulsivity was used as the moderator, significant interaction terms were obtained for both boys and girls.

These findings lend strong support to the hypothesis that temperament moderates associations between hostile attributions and aggressive behavior, at least for boys. One reason that evidence supporting the moderational hypothesis

for girls may be less compelling is that the measures of aggression used in these analysis were measures of general aggression. It has been documented that girls are more likely than boys to engage in relational aggression during the early childhood years (e.g., Crick, Casas, & Mosher, 1997). Future researchers may wish to include both measures of hostile attributions and aggressive behavior that focus on aspects of relational aggression for studies of associations between girls' temperament, hostile attributions, and aggressive behavior.

It is also possible that environmental factors, such as aspects of parenting and community contexts, impact the associations between young children's hostile attributions and aggressive behavior. Findings from the current work suggest that links between temperament, discrete social cognition, and social behavior may be complex and interacting, and so future researchers may wish to design studies that incorporate measures of temperament as a moderator of links between social cognition and social behavior. It is also likely that emotional expression and experiences may impact associations between temperament, discrete cognition, and social behavior. Models of young children's affect and emotion regulation (for example, Halberstadt, Denham, & Dunsmore, 2007; Hubbard & Dearing, 2005).may prove useful for guiding further research that includes measures of other aspects of children's emotionally experiences and regulation.

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Appendix A:

Mother-rated items used to compute emotion regulation composite:

How many times per day, on the average, does your child get cranky and irritable for either short or long periods of time?

How much does your child cry, fuss or whine in general?

How easily does your child get upset?

When your child gets upset, how vigorously or loudly does he/she cry and whine?

How changeable is your child's mood?

Does your child continue to go someplace even when told something like "stop," "come here," or "please don't"?

When removed from something he/she is interested in but should not be getting into, does your child get upset?

Please rate the overall degree of difficulty your child would present for the average mother.

Table 1

Descriptive statistics for all variables, and t tests by sex

	Boys			Girls			
STUDY 1	M	range	SD	M	range	SD	t
Hostile attributions	.74	.10-1.00	.23	.71	.00-1.00	.27	.28
Temperament	3.17	1.13-5.00	1.11	3.74	2.00-5.13	.67	-2.45*
TCPR Aggression	2.07	1.00-4.60	.88	1.64	1.00-3.20	.66	2.24*
PSP Aggression	2.13	1.20-4.50	.90	1.68	1.00-3.10	.67	2.25*
STUDY 2							
Hostile Attributions	.67	.00-1.00	.29	.64	.00-1.00	.26	1.18
Temperament	3.31	1.11-6.22	.96	3.28	1.11-6.38	.94	.43
Aggression	53.9	50-84	6.14	54.16	50-82	6.42	.49
STUDY 3							
Hostile Attributions	1.82	0-4	1.32	1.63	0-4	1.34	2.23*
Inhibitory Control	4.54	2.00-6.70	.78	4.78	2.20-6.70	.76	-5.32**
Impulsivity	26.67	.00-87.5	21.67	24.08	.00-87.50	19.32	1.82
Aggression	54.08	50-90	6.22	53.82	50-97	6.03	.59

Note: * = $p < .05$

Table 2

	1	2	3	4
1 Hostile Attributions	1.00	.24	-.08	.26
2 Emotion Regulation	-.04	1.00	-.09	-.05
3 TCPR Aggression	.24	-.29	1.00	.75**
4 PSP Aggression	.20	-.29	.75**	1.00

notes: associations for girls are presented above the diagonal, associations for boys are presented below the diagonal; ** = $p < .01$, one-tailed.

Table 3

Predicting aggressive behavior from hostile attributions, emotion regulation and the interaction between hostile attributions and self-regulation

DV	Variables entered on step	R^2	β[a]	p
PSP Aggression	Hostile attributions		.20	.10
	Self-regulation		.26	.03
	Interaction term	.19**	.25	.04
TCPR Aggression	Hostile Attributions		.07	.58
	Self-Regulation		.27	.03
	Interaction term	.16**	.26	.04

Note: [a] Standardized betas are reported, ** = $p < .01$

Figure 1

Association between hostile attributions and aggression at high, medium, and low values of self-regulation

Table 4

Predicting aggressive behavior from sex, hostile attributions, difficult temperament and the interactions between sex, hostile attributions and difficult temperament Study 2 (CDP sample)

Variables entered	R^2	β^a	p
Sex		.77	.04
Hostile Attributions		.93	.05
Difficultness		.70	.03
Attributions X Difficultness		-1.32	.02
Sex X Difficultness		-1.09	.03
Sex X Attributions		-1.15	.06
Sex X Attributions X Difficultness	.05**	1.7	.01

Note: ** = $p < .01$

Figure 2

Association between hostile attributions and aggression at high, medium, and low values of difficult temperament for boys and girls, Study 2 (CDP Sample)

Table 5

Predicting aggressive behavior from hostile attributions, temperamental characteristics and the interaction between hostile attributions and temperamental characteristics, Study 3 (NICHD SECC)

Variables entered	R^2	β[a]	p
Hostile attributions		.10	< .01
Inhibitory Control		-.26	< .01
Interaction term	.10**	-.10	< .01
Girls			
Hostile attributions		.13	.01
Inhibitory Control		-.21	< .01
Interaction term	.06**	-.06	.27
Boys			
Hostile attributions		.05	.29
Inhibitory Control		-.34	< .01
Interaction term	.15**	-.13	.01
Hostile attributions		.09	.03
Impulsivity		.11	.01
Interaction term	.05**	.15	< .01
Girls			
Hostile attributions		.15	< .01
Impulsivity		.07	.22
Interaction term	.05**	.15	< .01
Boys			
Hostile attributions		.02	.74
Impulsivity		.15	.02
Interaction term	.05**	.14	.03

Note: [a] Standardized betas are reported, ** = p < .01

Figure 3

Association between hostile attributions and aggression at high, medium, and low values of temperament variables, Study 3 (NICHD SECC)