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Prospective associations between forms and functions of aggression and social and affective processes during early childhood

Jamie M. Ostrov [a,*], Dianna Murray-Close [b], Stephanie A. Godleski [a], Emily J. Hart [a]

[a] Department of Psychology, University at Buffalo, The State University of New York, Buffalo, NY 14260, USA
[b] Department of Psychology, University of Vermont, Burlington, VT 05405, USA

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ABSTRACT

The central goal of this study was to examine the prospective associations between forms (i.e., physical and relational) and functions (i.e., proactive and reactive) of aggressive behavior with social (i.e., peer rejection) and affective (i.e., anger, emotion regulation skills) processes during early childhood ($N = 96$, mean age = 42.80 months, $SD = 7.57$). A cross-lagged path analysis revealed that proactive relational aggression was uniquely associated with decreases in peer rejection, whereas reactive relational aggression was associated with increases in peer rejection over time. Proactive relational aggression predicted decreases in anger, whereas reactive relational aggression tended to be associated with increases in anger. Proactive relational aggression uniquely predicted increases in emotion regulation skills, whereas reactive relational aggression tended to be associated with decreases in emotion regulation skills over time. Finally, anger was significantly associated with increases in several subtypes of aggressive behavior. In sum, the findings provide further support for the distinction between subtypes of aggressive behavior in young children.

Introduction

Aggression is a major risk factor for psychopathology and a symptom of several disorders among children and adolescents (American Psychiatric Association, 2000; Dodge, Coie, & Lynam, 2006). It

* Corresponding author.
E-mail address: jostrov@buffalo.edu (J.M. Ostrov).

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is important to understand the social and emotional factors associated with the onset and course of aggression in order to develop effective prevention and intervention programs to address these behaviors (Leff, Power, Manz, Costigan, & Nabors, 2001). Moreover, research regarding developmental processes associated with aggression during early childhood may help to inform efforts to help at-risk children avoid maladaptive developmental trajectories (Sroufe, 1997). To best capture the developmental manifestations of aggression and associated outcomes, it is important to consider both the forms (i.e., relational and physical) and functions (i.e., proactive and reactive) of aggression (Little, Jones, Henrich, & Hawley, 2003).

Forms of aggression

Researchers define aggression as actions intended to hurt or harm another person (Crick & Grotpeter, 1995; Dodge et al., 2006; Harré & Lamb, 1983). Physical aggression, which harms another person via physical force or the threat of physical force, consists of behaviors such as hitting, kicking, pinching, punching, and taking objects (Crick & Grotpeter, 1995; Dodge et al., 2006). Relational aggression is defined as behaviors that damage or threaten to damage relationships in order to hurt, harm, or injure another person (Crick & Grotpeter, 1995). During early childhood, relationally aggressive behaviors are typically direct overt tactics such as placing one's hands on a chair so that a child cannot sit at a table or telling another child that "you can't be my friend" (Ostrov, Woods, Jansen, Casas, & Crick, 2004). Relational aggression has been found to be associated with a range of adjustment problems and psychopathology such as attention deficit/hyperactivity disorder (ADHD), borderline personality disorder features, internalizing problems, eating disorders, oppositional defiant symptoms, and conduct problems (Crick, Murray-Close, & Woods, 2005; Crick, Ostrov, & Werner, 2006; Keenan, Coyne, & Lahey, 2008; Werner & Crick, 1999; Zalecki & Hinshaw, 2004). In addition, when aggressive, girls tend to engage in relational rather than physical forms of aggression (Card, Stucky, Sawalani, & Little, 2008; Putallaz et al., 2007). Thus, it is essential to investigate the developmental processes associated with both physical and relational forms of aggression to better understand the associated risk in both male and female populations.

Functions of aggression

Psychologists have distinguished aggressive behaviors that are displayed to obtain resources or instrumental goals (i.e., proactive aggression) and those that are displayed in response to a perceived threat and motivated by hostility or anger (i.e., reactive aggression) (Dodge, 1991; Vitaro, Gendreau, Tremblay, & Oligny, 1998). Theoretically, although there is overlap between these constructs (see Bushman & Anderson, 2001), these functions of aggression have distinct underpinnings. Different developmental precursors are also hypothesized to predict distinct functions of aggression; for example, a history of maltreatment is theorized to be a risk factor for the development of reactive aggression, whereas behavioral contingencies in the social context coupled with social models that reinforce aggressive behavior serve as a developmental risk factor for proactive aggression (see Dodge, 1991; Dodge, Lochman, Harnish, Bates, & Pettit, 1997). Furthermore, from a social information processing perspective (Crick & Dodge, 1994), proactive functions of aggression are theorized to be associated with positive outcome expectancies and reactive functions of aggression are theorized to be associated with hostile attribution biases (Crick & Dodge, 1994, 1996). Thus, developmental theory supports distinct developmental origins, pathways, and outcomes associated with the functions of aggression.

Past studies have provided support for the distinction of proactive and reactive functions of aggression; for example, studies have reported discrete factor loadings (Dodge & Coie, 1987; Poulin & Boivin, 2000) and discriminant validity (Crick & Dodge, 1996; Dodge et al., 1997; Hubbard, Dodge, Cillessen, Coie, & Schwartz, 2001; Hubbard et al., 2002; Price & Dodge, 1989; Vitaro et al., 1998; Waschbusch, Willoughby, & Pelham, 1998) of functional subtypes of aggression. In fact, a twin study of young children revealed that different genes are associated with proactive and reactive aggression (Brendgen, Vitaro, Boivin, Dionne, & Perusse, 2006).

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Forms and functions

It is important for researchers to take into account both the forms and the functions of aggression (Fite, Stauffacher, Ostrov, & Colder, 2008; Fite, Stoppelbein, & Greening, 2009; Little et al., 2003; Marsee & Frick, 2007; Marsee, Weems, & Taylor, 2008; Murray-Close & Ostrov, 2009; Ostrov & Crick, 2007; Prinstein & Cillessen, 2003; Sijtsema et al., 2010). The current study used a two-dimensional combination approach (i.e., forms and functions are crossed, yielding four subtypes of aggression: proactive physical, reactive physical, proactive relational, and reactive relational; Prinstein & Cillessen, 2003) to maximize ecological validity (Underwood, 2003). That is, there is no form without function in the real world; thus, although "pure" assessments provide a useful statistical approach for testing theoretically informed questions that may maximize internal validity, these strategies might not reflect the actual developmental manifestation of behaviors (Underwood, 2003). Past work that has used this two-dimensional conceptualization of aggression subtypes has documented theoretically meaningful distinctions between aggression constructs and outcome variables. For example, Prinstein and Cillessen (2003) demonstrated that proactive, but not reactive, functions of physical and relational aggression were associated with bullying behavior.

Forms and functions and social and affective processes

Previous empirical research has identified numerous potential contributors and outcomes associated with the onset and course of aggressive behavior (Dodge et al., 2006). In the current study, we adopt a developmental psychopathology perspective and focus on multiple levels of influence (i.e., individual and peer group; Cicchetti, 2006) and multiple domains (e.g., social and affective) of functioning believed to underlie various manifestations of aggressive behavior. This theoretical orientation suggests that behavior is due to the constant interaction among a child's social context, cognitive processing, and physiological systems (e.g., Susman et al., 2007). More specifically, scholars have identified several factors, including emotion regulation (e.g., anger and emotion regulation skills), in the development of antisocial and aggressive behavior among peers (see Deater-Deckard, 2001). We focus on peer rejection and emotion regulation because they are believed to be differentially associated with proactive and reactive functions and physical and relational forms of aggression.

Peer rejection

One of the most robust correlates of physical aggression is peer rejection (Bierman, 2004), which is often associated with other forms of psychopathology among children (Deater-Deckard, 2001). Peer rejection is a major developmental concern, especially as negotiating peer relationships becomes an important stage-salient developmental task during early childhood (Sroufe, Egeland, & Carlson, 1999). In fact, rejection uniquely adds in the prediction of psychopathology above and beyond aggressive behavior (Ladd, 2006).

Theoretically, aggression (i.e., physical) is often conceptualized as a precursor to peer rejection, but the behaviors may co-occur (Bierman, 2004; Coie, Terry, Lenox, Lochman, & Hyman, 1995). There are available prospective longitudinal studies testing and supporting the association between relational aggression and peer rejection in young children (e.g., Crick, Ostrov, Burr et al., 2006; Johnson & Foster, 2005) and during later developmental periods (e.g., Zimmer-Gembeck, Geiger, & Crick, 2005). To date, no known research has explored the prospective link between peer rejection and proactive and reactive relational aggression during early childhood.

We hypothesized that reactive, but not proactive, functions of physical and relational aggression would be associated with increases in peer rejection over time. Numerous studies have found that reactive physical aggression rather than proactive aggression is associated with peer rejection during middle childhood and adolescence (for a review, see Dodge et al., 2006). In a meta-analysis, Card and Little (2006) noted that only reactive physical aggression was uniquely related to peer rejection and, in general, was more strongly related to maladjustment than proactive aggression. In contrast, proactive physical aggression has been associated with peer acceptance in young children (e.g., Price & Dodge, 1989), highlighting the possibility that some proactively aggressive children may actually exhibit improvements in social status over time. Thus, we hypothesized that proactive functions of aggression

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would be associated with decreases in rejection over time. We also expected that peer rejection would be associated with increases in reactive functions of physical and relational aggression because rejection may elicit aggressive responses (see Bierman, 2004; Crick & Dodge, 1994; Murray-Close, Ostrov, Nelson, Crick, & Coccaro, 2010).

Emotion regulation

Emotion regulation deficits and emotion-related processes have often been associated with aggressive behavior in children (e.g., Cicchetti, Ackerman, & Izard, 1995; Cole, Zahn-Waxler, & Smith, 1994; Lemerise & Arsenio, 2000). Although substantial debates exist regarding the core features of emotion regulation skills, most approaches highlight the ability to modulate emotional responses (Thompson, Lewis, & Calkins, 2008). Shields and Cicchetti (1997) identified two distinct constructs in their measure of emotion regulation: lability/negativity (reflecting dysregulated negative affect) and emotion regulation skills (reflecting positive aspects of emotion regulation, including the expression of empathy).

Emotional negativity: Anger

Although Shields and Cicchetti (1997) included several emotions in their emotional lability/negativity scale (e.g., anxious, excited, angry, frustrated), inability to regulate anger and frustration may be particularly relevant to the development of aggressive conduct (Lemerise & Dodge, 2000). Theoretically, children who have problems in managing their anger would be more prone to have retaliatory responses to real or perceived peer provocation (Izard, Youngstrom, Fine, Mostow, & Trentacosta, 2006). In particular, anger has been explored as a major component of reactive physical aggression in children. To date, several studies have been conducted supporting the notion that nonverbal, physiological, and behavioral displays of anger are associated with reactive, but not proactive, physical aggression (Hubbard et al., 2002, 2004; Marsee & Frick, 2007; Orobio de Castro, Merk, Koops, Veerman, & Bosch, 2005). Researchers have also demonstrated, in a sample of detained adolescent girls, that anger to provocation is associated with reactive, but not proactive, relational aggression (Marsee & Frick, 2007). Thus, based on the extant literature, we hypothesized that anger would be associated with increases in reactive, but not proactive, functions of physical and relational aggression over time.

Emotion regulation skills: Empathy, appropriate affective displays, and affective awareness

A number of studies have documented that positive emotion regulation skills, including emotion knowledge and empathy, are associated with relatively low levels of aggression. Theoretically, emotion regulation skills such as the experience of empathy may serve to inhibit aggressive conduct (Jolliffe & Farrington, 2004). In fact, recent research suggests that children in kindergarten and first grade who exhibited high levels of empathy tended to engage in less aggression than their low-empathy peers (Findlay, Girardi, & Coplan, 2006). In addition, Lemerise and Dodge (2000) demonstrated that emotion knowledge was associated with lower levels of aggression (physical and verbal), even when controlling for affective dispositions. However, findings have been mixed, particularly during early childhood (Lovett & Sheffield, 2007); for example, one study found a positive association between empathy and aggression (Gill & Calkins, 2003), and a second study did not find any relation among these variables (e.g., Zahn-Waxler, Cole, Welsh, & Fox, 1995).

These mixed findings may in part reflect a failure to consider the association between emotion regulation skills and distinct forms and functions of aggressive conduct. For example, Sutton and colleagues (1999) suggested that proactive aggressors may be skilled at emotion understanding and perspective taking (Sutton, Smith, & Swettenham, 1999). In addition, findings from several studies have highlighted the potential role of social understanding and social skills in the development of relational aggression (Carpenter & Nangle, 2006; Hawley, 2003), suggesting that preschoolers may use advanced knowledge of emotions and experiences of empathy to proactively and relationally harm others. Based on this previous theory and research, we expected that high levels of emotion regulation skills would be positively associated with the development of proactive functions and relational forms of aggression and negatively associated with reactive functions and physical forms of aggression. Moreover, we expected that these relations would be bidirectional across time; for example, engaging

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in relational forms and proactive functions of aggression may also be associated with increases in emotion regulation abilities. In effect, the frequent use of relational and proactive aggression may train children to focus on emotion understanding and empathy so that such knowledge could be used to effectively aggress against peers in the future.

Developmental considerations: Early childhood

The majority of research on both forms and functions of aggression has been conducted with children during middle childhood, adolescence, and emerging adulthood (e.g., Bailey & Ostrov, 2008; Fite et al., 2008; Little et al., 2003; Marsee & Frick, 2007; Marsee et al., 2008; Ostrov & Houston, 2008; Prinstein & Cillessen, 2003; Sijtsema et al., 2010); however, there is increasing attention to the importance of studies examining the onset and development of relational aggression during early childhood (e.g., Brown, Arnold, Dobbs, & Doctoroff, 2007; Nelson, Robinson, & Hart, 2005) and the utility of studying both forms and functions of aggression during early childhood (Ostrov & Crick, 2007). The goal of the current study was to extend this research in order to examine social and affective factors associated with the development of forms and functions of aggression during this developmental period.

Summary of hypotheses

The central goal of this study was to examine the prospective associations between forms (i.e., physical and relational) and functions (i.e., proactive and reactive) of aggressive behavior with social (i.e., peer rejection) and affective (i.e., anger, emotion regulation skills) processes during early childhood. We conducted a multi-method, multi-informant, short-term longitudinal study in order to test these novel study hypotheses. Specifically, we hypothesized that proactive physical and relational aggression would be associated with decreases in peer rejection, whereas reactive physical and relational aggression would predict increases in peer rejection over time. We also expected that peer rejection would be uniquely associated with increases in both reactive physical and reactive relational aggression. Furthermore, we hypothesized that anger would predict increases in reactive functions of physical and relational aggression. We also anticipated that emotion regulation skills would predict increases in proactive functions and relational forms of aggression and decreases in reactive functions and physical forms of aggression. Finally, we hypothesized that proactive functions and relational forms of aggression would be associated with increases in emotion regulation skills.

Method

Participants

In total, 96 children (51 girls and 45 boys) participated in the study at Time 1 and were on average 42.80 months old (SD = 7.57, range = 30–58) at the beginning of data collection. The study was conducted in a large northeastern city of the United States across two time points. Children were recruited from five schools and nine participating mixed-age classrooms within those schools. All children in the classrooms were invited to participate, and those with signed informed consent documents were included in the study (consent rate of 90.6%). Of the participating schools, two were university/college affiliated and three were community-based schools. Each of the schools had a similar educational philosophy and was either currently NAEYC (National Association for the Education of Young Children) accredited or working on re-accreditation. Within the nine classrooms, the teachers participating had been employed at their current school on average for 4.65 years (SD = 3.16) and had known the participating children for 9.79 months at Time 1 (SD = 9.90). Approximately 10% of the teachers had a high school diploma, 6% had an associate's degree, 19% had a bachelor's degree, 42% had a master's degree, and 23% had an additional graduate degree or certificate.

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Across the two time points, attrition was low (7%, 3 girls and 4 boys) and was due to children changing schools or families moving out of the area. The ethnic composition of the participating sample was 4.2% African American, 4.2% Asian, 3.1% Hispanic/Latino, 1% Native American, 80.2% Caucasian, 2.1% multiracial, and 5.2% unknown. Parental occupational information was obtained from parents at the time of enrollment in the study. Using Hollingshead's (1975) four-factor index 9-point scoring system (i.e., 9 = executives and professionals, 1 = service workers), each parent's reported occupation was given a corresponding value (range = 2–9). If information was available for more than one parent, the highest score was assigned to that family. Parent educational information was not collected, and thus the total factor scores are not available. However, according to Hollingshead's occupational codes, the median occupation score was 7.00, suggesting that a typical family in our sample may be classified in the third highest occupation group (i.e., 7 = small business owners, farm owners, managers, minor professionals), suggesting that the sample was primarily middle class.

Measures

Observer ratings of forms and functions of aggression

Observer ratings using the Preschool Proactive and Reactive Aggression–Observer Report (PPRA–OR; Murray-Close & Ostrov, 2009) were used to assess children's proactive and reactive physical and relational aggressive behavior. This 14-item measure is based on a reliable and valid teacher report instrument (Ostrov & Crick, 2007) and assesses proactive physical aggression (3 items; e.g., "This child often hits, kicks, or pushes to get what s/he wants"), reactive physical aggression (3 items; e.g., "If other children anger this child, s/he will often hit, kick, or punch them"), proactive relational aggression (3 items; e.g., "To get what s/he wants, this child often tells others that s/he won't be their friend anymore"), reactive relational aggression (3 items; e.g., "When this child is upset with others, s/he will often ignore or stop talking to them"), and prosocial behavior (2 positively toned filler items). Observers responded on a 5-point scale from 1 (*never or almost never true*) to 5 (*always or almost always true*). Scores are summed within subscale.

Observation ratings were completed by 12 observers (i.e., 9 advanced undergraduate students and 3 graduate students/professional staff members, 10 female and 2 male). Observers spent a minimum of 2 days in the classrooms prior to conducting behavioral observations to reduce reactivity, a threat to the validity of the measure. Reactivity (i.e., looks to the observer, talking to the observer, or talking about the observer) was recorded every time an independent event was observed and was on average generally low across the 80 min per focal child at Time 1 ($M = 3.12$, $SD = 2.55$) and Time 2 ($M = 2.75$, $SD = 2.32$), which are similar rates to those in past studies using the same observational methodology (e.g., Crick, Ostrov, Burr, et al., 2006; Ostrov, 2008). Observers were unaware of the key study hypotheses. Over 2 months, the observers spent more than 100 h in the classrooms conducting observations of participating children (8 separate 10-min observations per focal child with no more than one observation per child per day) at each of the time points. Observers were specifically trained to recognize children's engagement in physical aggression and relational aggression. Observations were typically randomly sampled (i.e., observers selected the first child they saw engaged in child-directed play), although observers attempted to keep the total number of sessions equivalent across the focal children throughout the study. Following these classroom observations for the first or second time period, respectively, one randomly selected observer (who had observed the focal child) completed the PPRA–OR for that focal child. The PPRA–OR, therefore, was completed for each of the participating children. Adequate internal consistency ($\alpha > .80$) and moderate associations with both teacher report and naturalistic observations have been demonstrated for this measure (Murray-Close & Ostrov, 2009; Ostrov & Crick, 2007). In the current study, each PPRA–OR subscale was internally consistent at both Time 1 and Time 2: proactive relational aggression (αs = .86 and .85); reactive relational aggression (αs = .82 and .81); proactive physical aggression (αs = .86 and .88); reactive physical aggression (αs = .89 and .89). Furthermore, proactive physical aggression ($r = .51$, $p < .001$), proactive relational aggression ($r = .56$, $p < .001$), reactive physical aggression ($r = .37$, $p < .001$), and reactive relational aggression ($r = .44$, $p < .001$) were all stable over the course of the study. Finally, in the current study, naturalistic observations of physical and relational aggression were reliable based on 15% of the total observational sessions (intraclass correlation coefficients [*ICC*s] > .70) and correlations were run between

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the naturalistic observations of physical and relational aggression and the four PPRA–OR constructs at both time points. Importantly, given that the observer ratings were completed by an observer who did not complete all of the eight focal child observation sessions for the child, we anticipated only moderate associations, which were found across the study. Specifically, proactive physical aggression (PPRA–OR) was significantly associated with observations of physical aggression at Time 1 and 2 ($rs = .42$, $ps < .001$). Reactive physical aggression (PPRA–OR) was significantly associated with observations of physical aggression at Time 1 ($r = .47$, $p < .001$) and Time 2 ($r = .45$, $p < .001$). Proactive relational aggression (PPRA–OR) was significantly associated with observations of relational aggression at Time 1 ($r = .38$, $p < .001$) and Time 2 ($r = .42$, $p < .001$). Reactive relational aggression (PPRA–OR) was significantly associated with observations of relational aggression at Time 1 ($r = .27$, $p = .008$) and Time 2 ($r = .41$, $p < .001$).

Teacher reports

Teacher report of peer rejection. Two items from the Preschool Social Behavior Scale–Teacher Form (PSBS–TF; Crick, Casas, & Mosher, 1997) assessed dislike by same and opposite sex peers. These items are measured on a 5-point scale from 1 (*never or almost never true*) to 5 (*always or almost always true*). Prior research has demonstrated favorable psychometric properties of the PSBS–TF (Crick et al., 1997; Ostrov et al., 2004). In support of validity, teacher and observer reports of the peer rejection measure have been significantly correlated in past research (Ostrov, 2008). In the current study, internal consistency of this measure was acceptable at Time 1 ($\alpha = .95$) and Time 2 ($\alpha = .91$). The measure also showed adequate stability in the current study across Time 1 and Time 2 ($r = .31$, $p = .003$).

Teacher report of anger. Based on an observational method developed by Hubbard and colleagues (2004), 4 items were used to measure anger and frustration: "expresses anger with peers," "gets angry during play," "uses toys or classroom materials roughly (e.g., throwing toys or slamming toys down when frustrated)," and "displays frustration (e.g., swinging fist, hitting objects, hitting one's own head with the palm of the hand)." These items were measured on a 4-point scale from 1 (*never*) to 4 (*almost always*). Internal consistency of the measure was acceptable at Time 1 ($\alpha = .87$) and Time 2 ($\alpha = .86$). Stability was shown from Time 1 to Time 2 ($r = .61$, $p < .001$).

Teacher report of emotion regulation. The Emotion Regulation subscale from the Emotion Regulation Checklist (Shields & Cicchetti, 1997) was used to assess participants' emotion regulation skills. This measure consists of 8 items (e.g., "is empathic towards others; shows concern when others are upset or distressed," "can say when s/he is feeling sad, angry or mad, fearful or afraid," "displays appropriate negative emotions (anger, fear, frustration, distress) in response to hostile, aggressive, or intrusive acts by peers"). Two items are reverse coded. Items are measured on a 4-point scale from 1 (*never*) to 4 (*almost always*). This measure has shown acceptable psychometric properties in previous studies of early childhood (Flanders et al., 2010; Miller et al., 2006). Internal consistency was acceptable at both time points ($\alpha = .80$ at Time 1 and $\alpha = .85$ at Time 2), and stability of the measure was evident from Time 1 to Time 2 ($r = .64$, $p < .001$).

Procedures

All study procedures were approved by the local social and behavioral sciences institutional review board or ethics review board. Written consent was received from parents for all children participating in the study. Written consent was also obtained from all teachers before they served as informants. The study began approximately 6 weeks after the children began school so that they would know each other and teachers would be adequate reporters on their behavior. Observer ratings were collected directly after classroom observation sessions were completed at each time point and approximately at the same time as the teacher reports. Approximately 4 months after ending data collection for the first time point (Time 1), assessments were initiated for the second time point (Time 2). Teachers received an honorarium ($10) at the conclusion of data collection for both the first and second time points. Newsletters were distributed to all families and participating school staff members to convey the findings of the project.

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Results

Descriptive statistics

Means and standard deviations of study variables at Time 1 and Time 2 are presented in Table 1. Measures of skew (−.15 to 3.35) and kurtosis (−2.03 to 13.45) indicated that some study variables exhibited substantial departures from normality (Kline, 2005); thus, a robust weighted least squares estimator (MLR) was used to accommodate non-normally distributed variables (see Muthén & Muthén, 1998–2007, chap. 15). Intercorrelations among study variables (see Table 1) indicated that subtypes of aggression, rejection, emotion regulation, and anger exhibited moderate stability over the course of the study. Consistent with previous research (e.g., Ostrov & Crick, 2007), proactive and reactive functions of physical and relational aggression, respectively, were highly correlated. Age was positively associated with Time 1 emotion regulation skills and negatively associated with Time 1 reactive physical aggression. In addition, girls engaged in higher levels of proactive and reactive relational aggression at Time 1 and lower levels of reactive physical aggression at Time 2.

Missing data

Of the 96 participants in the sample, 89 (93%) from Time 1 also participated at Time 2. We examined whether there were differences between participants who remained in the study compared with participants who were lost to attrition at Time 2 on study variables at Time 1. Results indicated that attrition was not associated with Time 1 proactive physical aggression, $F(1,93) = .95$, $p = .33$, Time 1 reactive physical aggression, $F(1,93) = .02$, $p = .88$, Time 1 proactive relational aggression, $F(1,93) = .01$, $p = .92$, Time 1 reactive relational aggression, $F(1,93) = .01$, $p = .94$, Time 1 peer rejection, $F(1,94) = .50$, $p = .48$, or Time 1 anger, $F(1,93) = .02$, $p = .88$. However, attrition was marginally associated with Time 1 emotion regulation, $F(1,91) = 3.53$, $p = .06$, with participants with lower levels of Time 1 emotion regulation ($M = 21.86$, $SD = 5.05$) tending to be less likely to participate at Time 2 than their peers with higher emotion regulation skills ($M = 24.93$, $SD = 4.09$). Maximum likelihood estimation procedures were used to accommodate missing data; thus, all participants with data at Time 1 were included in the final models.

Separation of constructs

Given the relatively high correlation between proactive and reactive functions of both physical and relational forms of aggression, a series of analyses were conducted to examine whether these were empirically distinct constructs using Mplus Version 6 (Muthén & Muthén, 1998–2010). Relative fit for models was compared using a chi-square difference test for non-normally distributed data (Satorra, 2000). The first analysis examined whether constraining the association between Time 1 proactive and reactive physical aggression to 1.0 resulted in a significant reduction in model fit compared with a model where the association between these constructs was freely estimated. Models controlled for age and gender. Results indicated that this constraint resulted in a significant reduction in model fit, scaled $\Delta\chi^2(1) = 384.96$, $p < .0001$. Similarly, constraining the association between proactive and reactive relational aggression to 1.0 at Time 1 resulted in a significant decrease in model fit, scaled $\Delta\chi^2(1) = 26.62$, $p < .0001$. These findings indicate that although proactive and reactive functions of physical and relational aggression were highly associated, they were empirically distinct constructs.

Cross-lagged path analysis

A cross-lagged path analysis was run to examine the longitudinal associations between forms/functions of aggression and social (i.e., peer rejection) and affective (i.e., anger and emotion regulation skills) functioning. The standardized root mean square residual (*SRMR*), the Tucker–Lewis index (*TLI*), and the comparative fit index (*CFI*) were used to evaluate model fit (Hu & Benter, 1999). In general, a cutoff value of .08 or lower for the *SRMR* and a cutoff value of .95 or higher for the *CFI* and *TLI*

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Table 1
Descriptive statistics and correlations among study variables.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. T1 ProPhy	1.0														
2. T1 RePhy	.82***	1.0													
3. T1 ProRel	.53***	.44***	1.0												
4. T1 ReRel	.56***	.47***	.85***	1.0											
5. T1 Rejection	.13	.08	−.08	.04	1.0										
6. T1 ER	−.23*	−.12	.05	.00	−.03	1.0									
7. T1 Anger	.37***	.37***	.14	.32**	.55***	−.11	1.0								
8. T2 ProPhy	.51***	.44***	.25*	.23*	.13	−.01	.40***	1.0							
9. T2 RePhy	.37***	.37***	.10	.14	.31**	.00	.45***	.81***	1.0						
10. T2 ProRel	.53***	.45***	.56***	.49***	.11	.02	.32*	.61***	.47***	1.0					
11. T2 ReRel	.50***	.44***	.45***	.44***	.22*	.02	.31*	.52***	.48***	.88***	1.0				
12. T2 Rejection	.14	.17	−.01	.17	.31*	−.23*	.42***	.05	.04	.16	.20	1.0			
13. T2 ER	−.16	−.13	.14	−.02	−.05	.64***	−.23*	.03	−.03	.10	.05	−.53***	1.0		
14. T2 Anger	.34**	.38***	.13	.31**	.36**	−.14	.61***	.20	.24*	.37***	.42***	.71***	−.36***	1.0	
15. Age	−.18	−.21*	.06	.04	.10	.36***	−.05	−.21*	−.05	−.17	−.06	.06	.20	.07	1.0
16. Gender	−.12	−.14	.24*	.27*	−.04	.04	−.04	−.17	−.32**	.10	.02	.00	.07	−.15	−.09
Mean	4.73	5.68	5.24	6.07	3.24	24.70	6.68	3.88	4.71	4.70	5.31	2.96	25.03	6.58	42.80
SD	2.44	2.54	2.29	2.51	1.85	4.22	2.08	1.99	2.42	2.35	2.36	1.53	4.98	1.80	7.57

Note. T1, Time 1; ProPhy, proactive physical aggression; RePhy, reactive physical aggression; ProRel, proactive relational aggression; ReRel, reactive relational aggression; ER, emotion regulation; T2, Time 2. Gender: 1 = male; 2 = female.

* $p < .05$.
** $p < .01$.
*** $p < .001$.

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suggest good fit with the observed data (Hu & Benter, 1999), although lower thresholds are generally adopted for acceptable fit (e.g., *CFI* = .90; Little et al., 2003; see also Hu & Benter, 1999). In the first model, within-time correlations among study variables and stability of each variable over time were estimated (Model 1; see Fig. 1, dashed paths). Then, we estimated a second model in which the cross-lagged associations between each adjustment variable and each form/function of aggression were estimated (Model 2; see Fig. 1, bolded paths), allowing for a test of whether cross-lagged paths should be included in our final model. Nested model comparisons were used to investigate whether the addition of cross-lagged paths resulted in a significant improvement in model fit. Inspection of individual pathways in Model 2 allowed us to examine whether each form/function predicted increases in social and affective processes or vice versa. Gender and age were controlled in all analyses.

Model 1 estimated within-time correlations and stability estimates of study variables. This model provided marginal fit with the data (*CFI* = .93, *TLI* = .86, *SRMR* = .11). The addition of the cross-lagged paths in Model 2 resulted in a significant improvement in model fit, $\Delta\chi^2(24) = 48.35$, $p < .01$. Moreover, the longitudinal model generally fit the data well (*CFI* = .98, *TLI* = .89, *SRMR* = .06; although the *TLI* indicated marginal fit, this index tends to be overly conservative with small sample sizes; see Hu & Benter, 1999). The results of Model 2, presented in Fig. 2, indicated that all model variables were stable over time (although the stability of reactive physical aggression only approached conventional levels of statistical significance, $p = .09$). Anger was significantly associated with increases in proactive and reactive physical aggression as well as proactive relational aggression. Interestingly, emotion regulation skills were marginally but not significantly associated with increases in proactive physical aggression over the course of the study ($p = .09$). Aggressive behavior was also associated with change in emotional and social adjustment in several instances. Specifically, reactive relational aggression was related to increases in peer rejection and was marginally associated with increases in anger and decreases in emotion regulation skills ($p = .05$). In contrast, proactive relational aggression was associated with decreases in peer rejection and with increases in emotion regulation skills.

Given the high correlation among proactive and reactive functions of physical and relational aggression, follow-up regression analyses were conducted to examine whether multicollinearity was a concern in the current findings. A series of regression analyses were conducted in which all of the Time 1 variables and covariates were entered as simultaneous predictors of each Time 2 outcome variable. Results of the variance inflation factor (*VIF*) estimates for each predictor suggested that multicollinearity was not a concern (*VIF* values in the current analyses ranged from 1.23 to 4.14, well below the established threshold of 10).

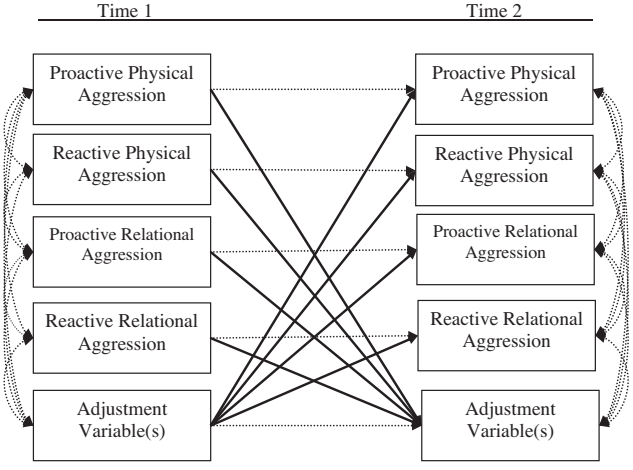

Fig. 1. Illustration of cross-lagged longitudinal model.

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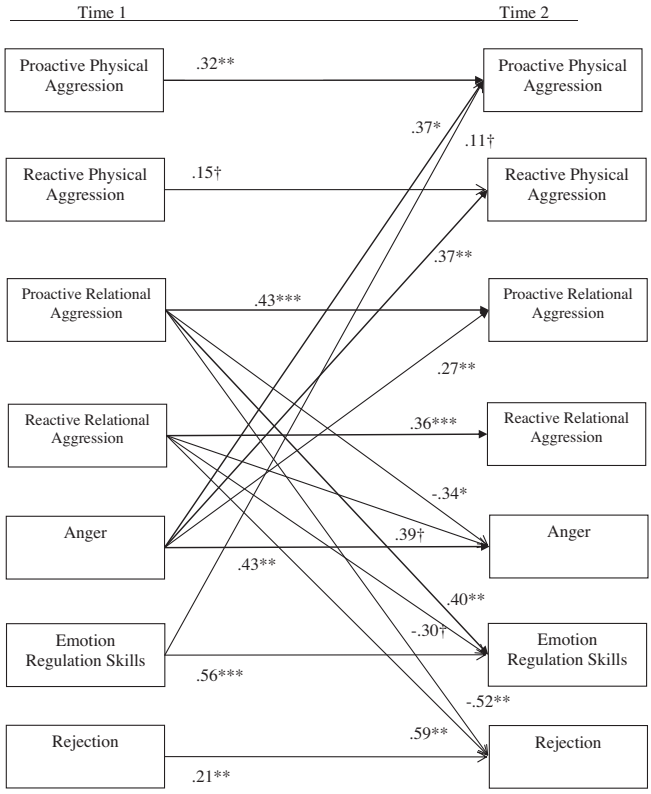

Fig. 2. Cross-lagged model examining the association between forms and functions of aggression and adjustment. Model $\chi^2(19) = 29.53$, $p = .06$. Only significant stability and cross-lagged paths are presented in the figure for clarity; however, all cross-lagged paths depicted in Fig. 1 were included in the final model. Although not shown, all variables were correlated with gender and age to control for these variables. Within-time correlations among variables at both Time 1 and Time 2 were also estimated. $^{\dagger}p < .10$; $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$.

Discussion

The central goal of this study was to examine the prospective associations between forms (i.e., physical and relational) and functions (i.e., proactive and reactive) of aggressive behavior with social (i.e., peer rejection) and affective (i.e., anger, emotion regulation skills) processes during early childhood. We anticipated differential associations between proactive and reactive functions of physical and relational aggression with these constructs that represent theoretically meaningful contributors and outcomes associated with the development of aggression in young children. Findings indicated that distinct social and affective risk factors were involved in the development of subtypes of aggression over time.

Notably, the lack of stability for reactive physical aggression that we found from Time 1 to Time 2 when anger was in the model could have been because anger may be accounting for so much of the variance associated with reactive physical aggression. This is supported by theory and research indicating that anger is a hallmark feature of reactive physical aggression (Dodge, 1991; Hubbard et al., 2002, 2004; Marsee & Frick, 2007; Orobio de Castro et al., 2005; Vitaro et al., 1998).

Overall, reactive relational aggression was associated with the development of problems with peers and tended to be associated with problems in affective functioning. Specifically, reactive relational aggression predicted increases in peer rejection and tended to be associated with increases in anger

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and decreases in emotion regulation skills across the course of the study. It appears that reactive functions of relational aggression tended to be associated with negative social and affective processes during early childhood, which is in keeping with theory (see Dodge, 1991) and findings from a recent meta-analysis (Card & Little, 2006). In contrast, in our study, children who engaged in proactive relational aggression exhibited relatively positive developmental outcomes. Specifically, proactive relational aggression predicted decreases in peer rejection over time. Proactive aggression may be more highly associated with social dominance and leadership qualities during early childhood (see Hawley, 1999) and may predict children's social–psychological adjustment only later in development when these behaviors fail to co-occur with prosocial strategies (Hawley, 2003). In addition, proactive relational aggression was associated with decreases in anger and increases in emotion regulation over time. These findings are consistent with the idea that children who frequently engage in controlled and calculated aggression may have the opportunity to practice emotion regulation skills in the service of their desired instrumental gain. The findings are also some of the first to highlight social status benefits of proactive relational aggression during early childhood, although literature has emerged documenting these associations during adolescence (e.g., Rose, Swenson, & Waller, 2004). Importantly, although proactive relational aggression may buffer a child from some impulse control problems, these behaviors may be used for adaptive or maladaptive purposes (see also Garner, Dunsmore, & Southam-Gerrow, 2008). In fact, past work has shown that proactive aggressive behaviors are associated with other indexes of social–psychological maladjustment during this developmental period (e.g., student–teacher conflict: Ostrov & Crick, 2007) and during later years (e.g., delinquency and substance use: Fite, Colder, Lochman, & Wells, 2008a, 2008b; psychopathy and callous–unemotional traits: Marsee & Frick, 2007; Miller & Lynam, 2003). Moreover, it may be that a combination of proactive and reactive aggression elevates a child's risk for pathways to more severe problems later in development (Muñoz, Frick, Kimonis, & Aucoin, 2008). The current study was limited in the types of social and affective processes that we considered, and arguably they were more appropriate for understanding the development of reactive functions of aggression. Thus, it is conceivable that a different pattern of findings (i.e., one indicative of problematic adjustment for children using proactive aggression) may have been found if we had included those domains of functioning (e.g., deception, oppositional/conduct problems). These possible interpretations set the stage for future research focusing on developmental processes specifically involved in proactive functions of physical and relational aggression during early childhood. Specifically, additional constructs that represent a broader range of domains (e.g., social–cognitive) and levels of analysis (e.g., physiological) should be included in future work on the development of forms and functions of aggression.

Despite the confirmation of most of our theoretically driven hypotheses, some findings were unexpected. First, given theory and the extant developmental literature, we had anticipated that poor emotion regulation skills would predict increases in reactive and physically aggressive behavior. However, in general, the current results did not support this hypothesis. Instead, our findings suggest that it may be dysregulated negative affect, rather than positive emotion regulation skills, that contributes to the development of aggressive behavior during early childhood. Consistent with this perspective, Shields and Cicchetti (1998) reported that emotional lability, but not emotion regulation skills, predicted aggressive conduct. These findings highlight the possibility that distinct developmental processes may underlie the association between aggression and emotion regulation (e.g., emotion knowledge, empathy) versus emotion dysregulation (e.g., expressions of anger). The findings are also consistent with previous research documenting that positive emotion regulation skills, such as empathy, are stronger predictors of aggression later in development (Lovett & Sheffield, 2007).

Second, contrary to expectations, anger was associated with several subtypes of aggressive behavior rather than only reactive functions of aggression. Moreover, anger was surprisingly not associated with reactive relational aggression within the full model despite the significant bivariate associations. It is likely that the moderate to high overlap between peer rejection and anger attenuated the associations between anger and reactive relational aggression in the final conservative model. Importantly, theory and past research have demonstrated that anger and hostility are implicated in the development of both physical and relational forms of aggression (Crick, 1997; Crick, Bigbee, & Howes, 1996; Zahn-Waxler, Park, Essex, Slattery, & Cole, 2005), but available theory suggests that anger should be associated with changes in only reactive, and not proactive, functions of aggression (Hub-

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bard et al., 2002, 2004; McAuliffe, Hubbard, Rubin, Morrow, & Dearing, 2006). Future research is needed to examine the possible role that anger has in the development of proactive functions of aggression. It may be that comorbidity between proactive and reactive aggression helps to explain these associations; in fact, recent work has demonstrated that groups of children elevated on both proactive and reactive aggression show problems with anger dysregulation (Crapanzano, Frick, & Terranova, 2010). Future research will also be needed to replicate and extend these findings, and the use of psychophysiological methods that measure both sympathetic and parasympathetic arousal may help to delineate possible unique effects (e.g., Hubbard et al., 2002; Murray-Close & Crick, 2007).

Third, we had predicted that peer rejection would be associated with increases in both reactive physical and reactive relational aggression. We did not document these effects in our conservative model that controlled for emotion regulation and anger. The overlap between these social and affective processes may have attenuated these effects. However, it may be that the direction of effect is from aggressive behavior to peer rejection during early childhood, as our findings seem to suggest. That is, we demonstrated that proactive relational aggression negatively predicted peer rejection and reactive relational aggression positively predicted peer rejection. Despite the current findings, a growing literature suggests that negative social experiences may also contribute to the development of behavior problems in older children (e.g., Murray-Close, Hoza, et al., 2010), and so future research is needed to replicate these findings during early childhood.

Fourth, there were several cases in which findings emerged in the multivariate analyses when bivariate correlations were not present. Specifically, Time 1 proactive relational aggression and reactive relational aggression were not associated with Time 2 rejection in the bivariate analyses. In addition, proactive relational aggression was not associated with emotion regulation at Time 2 in the bivariate analyses. In each of these instances, these paths were significant in the multivariate analyses. It is important to note that in both of these cases, the multivariate associations between proactive and reactive relational aggression were in opposite directions (i.e., proactive relational aggression was associated with increases in emotion regulation and decreases in peer rejection, whereas reactive relational aggression tended to be associated with increases in anger and decreases in emotion regulation and was significantly associated with increases in peer rejection). This suggests that it was the unique variance of proactive and reactive relational aggression that was associated with changes in these adjustment variables. In other words, relational forms of aggression did not predict changes in emotion regulation or rejection; however, the distinct functions of relational aggression were associated with distinct developmental outcomes. Given that our measures of proactive and reactive relational aggression have overlapping variance associated with relational forms of aggression, the multivariate analyses allow us to tease apart how the unique variance of proactive and reactive functions of relational aggression related to our adjustment variables. These findings are consistent with previous research on proactive and reactive functions of aggression documenting distinct patterns of findings when bivariate correlations are compared with multivariate effects (e.g., Bailey & Ostrov, 2008). Although many of these findings suggest attenuated effects once the other function of aggression is controlled, some research has documented increases in effects in multivariate analyses (e.g., the association between hostile attributions and reactive aggression; Ellis, Weiss, & Lochman, 2009), suggesting that distinct functions of aggression can serve as suppressor variables. Our findings suggest that it is the unique variance associated with each function of aggression that is associated with the development of emotion regulation capabilities and rejection.

Taken together, the novel findings of the current study lend preliminary support to the distinctions between proactive and reactive functions of aggression during early childhood. Moreover, these theoretically driven findings were obtained using multiple informants and methods, a short-term longitudinal design, and a sophisticated cross-lagged path analysis model that controlled for the influence of all other variables in the model (as well as gender and age). Despite these many strengths, several limitations should be addressed in future research.

First, given the multi-method nature of the study, we had a relatively small sample size for the complexity of the path analysis models that we tested. It is possible that some of our null findings may reflect a lack of statistical power. Moreover, we were unable to explore moderation by gender analyses because we were underpowered for testing these effects; as a result, future work should examine similar prospective models for both boys and girls. In addition, despite some diversity in eth-

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nicity and socioeconomic status, our sample was relatively homogeneous, with the majority of our families coming from Caucasian middle-class backgrounds. Thus, further work is needed to replicate and extend our findings in a larger and more diverse sample.

Furthermore, given the restricted range of our secondary codes of forms and functions of aggression in the current study (see Ostrov & Crick, 2007), we were not able to use the detailed naturalistic observations of forms and functions of aggression and instead relied on a global rating of aggressive behavior that was completed after the observations were completed. This approach has been used before (e.g., Murray-Close & Ostrov, 2009) and appears to be valid, but the current findings may have been influenced by overall perceptions of the behavior or by particular events rather than the detailed and relatively objective behavioral record. In addition, the use of observer ratings may have artificially inflated the levels of aggressive behavior in the study, and caution should be exercised until replication with direct naturalistic observation procedures is conducted. Finally, a variety of methodology and data analytic approaches should be examined in the future. For example, a person-centered data analytic approach is particularly compelling as a means of examining the clusters of aggressive behaviors that co-occur in the natural world, and future research should recruit larger samples to conduct this important work. Despite these methodological limitations and our failure to examine gender effects (see Card et al., 2008, for a recent meta-analysis suggesting that gender might not always moderate associations between aggression and adjustment variables), we believe that our novel findings extend the developmental literature in significant ways by testing theoretically driven hypotheses concerning prospective associations between social and affective processes with both forms and functions of aggression in an early childhood sample.

The current findings have several implications for future intervention and prevention efforts. The findings suggest that interventions targeted at reducing anger expressions during peer-based play in the classroom and on the playground may be fruitful in diminishing the likelihood of future aggressive behavior during early childhood. Thus, developmentally appropriate early prevention would likely focus on social, behavioral, and affective domains and might work to facilitate prosocial and friendship formation skills while also reducing words and actions that cause harm (see Ostrov et al., 2009). These early childhood programs should provide children with ways not only to control their behavior and affect but also to build positive social relationships with others. Moreover, current empirically supported approaches with children during middle childhood have incorporated social–cognitive skill training so that children who display high levels of aggression may be able to properly encode and interpret ambiguous physical and relational provocation situations as well as select and implement appropriate nonaggressive behaviors (see Leff et al., 2009). Importantly, given findings that proactive relational aggression was associated with social status benefits during early childhood (i.e., decreases in peer rejection), interventions may also benefit from highlighting alternative avenues to attain positive regard from peers (e.g., prosocial behavior). Future efforts are needed to adapt and test these approaches with younger children.

Conclusions

The current study builds on prior theory and empirical work to test novel hypotheses concerning the prospective associations between forms and functions of aggression and social and affective processes during early childhood. Peer rejection, emotion regulation skills, and anger were found to be prospectively associated with the forms and functions of aggression subtypes in theoretically meaningful ways. Our sophisticated cross-lagged path analysis provided a conservative test of these hypotheses and overall supports the two-dimensional conceptualization of forms and functions of aggression approach during early childhood.

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