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Functions of aggressive behavior and future functional impairment☆

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ABSTRACT

The present study investigated relations between proactive and reactive functions of physical and relational aggression and functional impairment across early childhood. It was hypothesized that reactive functions of aggression would be associated with functional impairment. Hypotheses with regard to proactive functions of aggression were exploratory. Participants were 36 children (22 girls) from a longitudinal study. At Time 1 (M = 50.31 months old, SD = 10.97), observations of aggressive behavior were collected during preschool free-play. At Time 2 (M = 73.33 months old, SD = 10.88), parent-report of functional impairment was collected. Reactive physical aggression was a significant and unique predictor of future impairment when controlling for gender and all other types of aggression. Implications of these findings are discussed from a developmental perspective.

1. Introduction

In recent years, researchers have paid increasing attention to the multiple ways in which children display aggressive behavior and how it impacts outcomes in early childhood (Nelson, Robinson, & Hart, 2005; Ostrov & Crick, 2007). From a psychological perspective, aggression is defined as behavior with the intent to hurt, harm, or injure another individual (Dodge, Coie, & Lynam, 2006). One way to characterize aggressive behavior is in terms of its form, namely physical aggression or relational aggression. Physical aggression includes harmful behaviors directed toward another person such as punching, kicking, or shoving (Dodge et al., 2006). Relational aggression involves using the relationship as the means of harm, such as social exclusion, spreading rumors and malicious gossip, giving the silent treatment, or threatening to withdraw friendship (Crick & Grotpeter, 1995). In early childhood, relational aggression is typically carried out in a direct fashion and the identity of the perpetrator is known. For example, a child may tell a peer "you're not my friend anymore" or spread rumors about a peer within close proximity (Crick, Ostrov, & Kawabata, 2007; Ostrov, Woods, Jansen, Casas, & Crick, 2004).

The other primary way to characterize aggressive behavior is in terms of its function or underlying motivation, namely proactive or reactive (Dodge, 1991). Proactive or "cold-blooded" aggression is purposeful and goal-directed, and is motivated by the perpetrator's expectation of a positive outcome (Dodge & Coie, 1987). In early childhood, aggression is often used proactively to gain desired objects such as toys (DeHart, Sroufe, & Cooper, 2004). Reactive or "hot-blooded" aggression, conversely, is impulsive, and is typically motivated by an angry emotional response to a perceived offense (Card & Little, 2006). The classification of both form and function are thus important for a comprehensive analysis of aggression (Little, Jones, Henrich, & Hawley, 2003). Moreover, previous literature has supported the utility of distinguishing between types of aggressive behavior during early childhood by revealing differential associations with social outcomes (Crick, Ostrov, Burr, et al., 2006). Identifying and understanding aggression in early childhood is important given that it is related to other externalizing behaviors during this period of development (Ostrov & Godleski, 2009) and is a risk factor for long-term social and psychological difficulties (Huesmann, Dubow, & Boxer, 2009).

1.1. Functions of aggression

Convergent evidence from statistical, biological, and behavioral studies supports the existence of disparate functions of aggression (Hubbard et al., 2004; Lopez-Duran, Olson, Hajal, Felt, & Vazquez, 2009; Poulin & Boivin, 2000). In middle childhood, reactive and proactive aggressors have been distinguished on the basis of social cognitive processes (Crick & Dodge, 1996) as well as levels of anger (Hubbard et al., 2002, 2004). Studies with clinical and high-risk samples in middle childhood and adolescence suggest that reactive aggressors may be sensitive to provocation (Marsee & Frick,

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2007; Waschbusch et al., 2002), indicating that the perception of threat in one's immediate social circumstances may be a process that is central to reactive aggression. Proactive aggression, on the other hand, has shown associations with callous unemotional traits and has predicted later delinquency, conduct problems, and criminal behavior in middle-childhood and adolescence (Frick, Cornell, Barry, Bodin, & Dane, 2003; Pulkkinen, 1996; Vitaro, Gendreau, Tremblay, & Oligny, 1998). Proactive aggression thus appears to be marked by a lack of sensitivity as well as externalizing problems. Given the lack of longitudinal research on younger samples, a goal of the current study was to examine outcomes related to proactive and reactive aggression in early childhood.

1.2. Forms and functions of aggression

In many cases, forms and functions of aggression have been found to be inter-correlated at moderate to high levels (Little et al., 2003). To account for this problem, one approach combines forms and functions to create dimensional subtypes of aggression (Marsee & Frick, 2007; Ostrov & Crick, 2007; Prinstein & Cillessen, 2003). Specifically, an aggressive behavior is categorized as *proactive physical, reactive physical, proactive relational* or *reactive relational aggression.* In using this two-dimensional approach, controlling for other subtypes of aggressive behavior reveals the unique association between a particular subtype of aggression and an outcome of interest. Research using this two-dimensional approach has identified social-psychological risks and consequences uniquely related to different types of aggression (Gentile, Mathieson, & Crick, 2011; Marsee, Weems, & Taylor, 2008). With particular regard to early childhood, an analysis of form and function has predicted how young children function in their relationships with teachers and peers. In a relatively large sample of preschool children, Ostrov and Crick (2007) found that proactive relational aggression accounted for variance in future peer rejection and student–teacher conflict beyond what was accounted for by proactive physical aggression. In another preschool sample, Ostrov, Murray-Close, Godleski, and Hart (in press) showed that proactive relational aggression was related to significant increases in emotion regulation skills and decreases in peer rejection, whereas reactive relational aggression tended to be related to decreases in emotion regulation skills and was related to significant increases in peer rejection. Moreover, Prinstein and Cillessen (2003) showed that function differentially predicted social consequences for adolescents when the form of the aggression remained the same, as instrumental (i.e., proactive) physical aggression was positively correlated with peer-perceived popularity and reactive physical aggression was negatively correlated with peer-perceived popularity and sociometric social preference. Altogether, the results of these studies support the utility of conjoining form and function in the evaluation of aggressive behavior, and the present study adopted this approach. Using multiple methods, associations between these two-dimensional subtypes of aggression and functional impairment were examined.

1.3. Psychosocial consequences of aggression

Physical aggression has shown significant associations with various forms of psychopathology across development, such as personality disorder features (Ostrov & Houston, 2008), depressive symptoms (Morrow, Hubbard, Rubin, & McAuliffe, 2008), and disruptive behavior disorders (Zalecki & Hinshaw, 2004). Results of longitudinal studies suggest that children on stable trajectories of aggressive behavior show more problematic outcomes than non-aggressive children (Campbell, Spieker, Burchinal, & Poe, 2006; Harachi et al., 2006). In both early and middle childhood, physical aggression is associated both concurrently and longitudinally with low sociometric status (Crick, 1996; Crick, Ostrov, Burr, et al., 2006; Nelson et al., 2005; Ostrov et al., 2004; Putallaz et al., 2007; Zimmer-Gembeck, Geiger, & Crick, 2005) and is also associated with difficulties within peer relationships (Ellis & Zarbatany, 2007; Ostrov, 2008; Sebanc, 2003). Relational aggression is also linked to a number of social-psychological adjustment problems in early and middle childhood, including internalizing and externalizing psychopathology (Crick, Ostrov, & Werner, 2006; Murray-Close, Ostrov, & Crick, 2007), personality disturbance (Crick, Murray-Close, & Woods, 2005), and low sociometric status (Crick, Casas, & Mosher, 1997; Crick, Ostrov, Burr, et al., 2006). However, other literature suggests that relational aggression may carry benefits in addition to risks, such as number of mutual friendships, increased friendship intimacy and positive friendship quality (Banny, Heilbron, Ames, & Prinstein, 2011; Burr, Ostrov, Jansen, Cullerton-Sen, & Crick, 2005; Murray-Close et al., 2007; Sebanc, 2003). Based upon these associated social advantages, it is possible that relational aggression requires more advanced social skills than physical aggression, thus accounting for the discrepancy between physical and relational aggression as they pertain to psychosocial outcomes.

With regard to functions of aggression, previous research has indicated that reactive aggression is related to greater deficits in interpersonal relationships than is proactive aggression. A meta-analysis including studies using child and adolescent samples by Card and Little (2006) revealed that reactive aggression was more strongly related to various types of interpersonal maladjustment than was proactive aggression. In a sample of second-graders, Morrow, Hubbard, McAuliffe, Rubin, and Dearing (2006) observed a significant relation between reactive aggression and peer rejection while controlling for proactive aggression, yet did not observe the reverse pattern. Less is known about psychosocial outcomes related to proactive and reactive aggression in early childhood. However, based on previous studies with older youth, it was expected that reactive functions of aggression would be associated with later impairment. Given that proactive aggression (i.e., taking a toy away from a peer) is thought to be relatively normative in early childhood (Ostrov & Crick, 2007), predictions with regard to proactive aggression were exploratory.

Adopting a two-dimensional approach in the present study will thus help to reveal the influence of proactive and reactive aggression in early childhood while further clarifying outcomes related to physical and relational aggression. Based upon prior literature (Campbell et al., 2006; Card & Little, 2006), it was expected that the association between reactive physical aggression and impairment would be robust. Previous literature with regard to the effect of reactive relational aggression is less clear, but based upon a number of studies (Crick et al., 2005; Crick, Ostrov, Burr, et al., 2006; Ellis & Zarbatany, 2007), it was still expected that the association between reactive relational aggression and impairment would be significant.

1.4. Functional impairment

Many studies of psychosocial consequences of aggressive behavior have assessed rates of symptoms, traits, and specific behaviors (Campbell et al., 2006; Crick et al., 2005; Crick, Ostrov, & Werner, 2006), but few have measured level of impairment. Functional impairment specifically refers to the degree to which functioning is affected by certain behaviors or symptoms (Fabiano et al., 2006). For example, a child could show a symptom such as difficulty paying attention, but depending on the nature and severity of the symptom or other relevant contextual factors may or may not be able to complete schoolwork. In this case, failure to complete schoolwork would represent functional impairment. Moreover, functional impairment may reflect difficulties in domains that accord with developmental tasks. For example, in early childhood,

it is expected that children learn self-control and compliance with rules (Gentile & Sesma, 2003), and conflict within the domain of parent–child relationships may ensue when children exhibit delayed achievement of this task. Because individual differences may exist in the levels of such difficulties, a dimensional conceptualization of impairment is warranted in order to sensitively detect them. If impairment is conceptualized dimensionally, then it becomes possible to capture variability even in a typical sample. Aggression in particular may lead to functional impairment based upon its associations with a variety of psychological problems (Campbell et al., 2006). In addition, aggressive behavior may reflect relatively weak attainment of the developmental tasks of self-control and compliance with rules, and thus lead to problems with family members, peers, and teachers. Moreover, identifying links between subtypes of aggressive behavior and difficulties across a variety of developmental domains enhances the utility of these subtypes.

The present study adds to a small existing body of literature assessing the relation between aggressive behavior and functional impairment. In a sample of urban elementary school children, Waschbusch, Willoughby, and Pelham (1998) examined the unique associations between functions of aggression and overall impairment while controlling for variables related to externalizing behavior disorders. Reactive (physical) aggression, but not proactive (physical) aggression, was found to be uniquely associated with overall impairment. In a large sample of clinically referred children and community controls in late middle-childhood and early-adolescence, parent-reported aggression predicted impairment while controlling for group status and primary diagnosis (Bambauer & Connor, 2005). Keenan, Coyne, and Lahey (2008) found that relational aggression predicted a small yet significant amount of impairment above and beyond the effects of sex, age, symptoms of oppositional defiant disorder (ODD), and symptoms of conduct disorder (CD) in a large sample of 9–17-year-olds. Altogether, these studies suggest that aggressive behavior may independently contribute to impairment. To build upon previous research, the present study included an analysis of both forms and functions of aggression, adopted a multi-method and longitudinal approach, and used an early childhood sample.

1.5. Hypothesis and prediction

The present study had one overall hypothesis. Based on theory and past research (Card & Little, 2006), we hypothesized that reactive functions of aggression at Time 1 would be positively associated with future impairment Time 2. In keeping with previous literature (Ostrov & Crick, 2007; Prinstein & Cillessen, 2003; Waschbusch et al., 1998), we predicted that reactive physical aggression and reactive relational aggression would be positively and uniquely associated with future impairment while controlling for the other subtypes of aggression at Time 1. There is not strong previous theoretical and empirical support for associations between proactive functions of aggression and impairment in early childhood, so our hypotheses with regard to proactive physical aggression and proactive relational aggression remained exploratory. To address our overall goals, we conducted a multi-method and multi-informant (i.e., observations, teacher-reports, and parent-reports) longitudinal study.

2. Method

2.1. Participants

Thirty-six children (22 girls) took part in this study. The participants were part of a larger study (Ostrov, Ries, Stauffacher, Godleski, & Mullins, 2008). At the beginning of the longitudinal study, the mean age of the children was approximately 50.31 months-old ($SD = 10.97$). At the second time point of the current study, the mean age of the children was 73.33 months-old ($SD = 10.88$). Children were initially recruited from three early childhood education centers affiliated with a local college and a university in a large Northeastern city. Recruitment from university-affiliated preschools makes the current sample comparable to samples from previous studies of aggressive behavior in early childhood (Crick, Ostrov, Burr, et al., 2006; Nelson et al., 2005). From the original sample of 101 participants, children were invited to participate in a follow-up laboratory visit at Time 2 if parents had initially provided the project staff with personal contact information. The high rate of attrition (64.3%) resulted from many families moving out of the area or not providing valid or current contact information. The sample consisted of 16.7% African Americans, 8.3% Asians or Pacific Islanders, 66.7% Caucasians, 2.8% Hispanics, and 5.5% children of other ethnic backgrounds. The mean level of education completed by parents was at least a four-year college degree. The annual reported family income ranged from $15,000 to over $100,000, with the mean annual family income between $55,000 and $100,000. Relative to the demographics of the regional catchment area, ethnic minorities were overly represented and average income was high in our sample (U.S. Census Bureau, 2010).

2.2. Procedure

The study consisted of two initial cohorts that were recruited from the same or similar classrooms one year apart from each other and then merged together. At the first time point, school-based focal child observations of social behavior and teacher-reports of social behavior were collected. At the second time point, children and their parents were invited to participate in a laboratory session in which child interviews (not part of the current study) and parent-reports were completed. All participants in the present study participated in the second time point. Teachers and parents received gift certificates in the amounts of $25 and $20, respectively, in return for participating in the project.

2.3. Time 1 measures

2.3.1. Naturalistic observations

Using a revised version of the focal child sampling with continuous recording observational approach developed by Ostrov and Keating (2004), naturalistic observations of children's aggressive behavior were made during periods of free play in the classroom and on the school playground (Crick, Ostrov, Burr, et al., 2006) at Time 1. Each focal child was observed for 10 min by a trained research assistant. Over a period of roughly two months, each child was observed eight times, and thus received a total of 80 min of observation per time point. The order by which children were observed in a particular day was randomly determined, and no child was observed more than once per day. Observers spent several days in each classroom before collecting data so that children could adjust to their presence and reduce reactivity. Reactivity was defined as any event in which the focal child looked at the observer, interacted with the observer, or commented about the observer. To fully minimize reactivity, observers adopted a minimally responsive manner (Pellegrini, 2004) in which they controlled their body language and nonverbal behavior. Reactivity occurred at relatively low levels ($M = .25$, $SD = .29$ times per 10-min session during the first time point of the study; see also Atlas & Pepler, 1998; Crick, Ostrov, Burr, et al., 2006).

During each 10-min assessment interval, observers recorded the focal child's engagement in the following behaviors: (a) physical aggression (e.g., pushing, hitting, taking objects); (b) relational

aggression (e.g., threatening friendship withdrawal, excluding someone from an activity); and (c) other social behaviors not part of the current study. Observers described each instance of aggressive behavior as well as the response to each behavior, which was carried out by any individual (e.g., peer, teacher). Each instance of a behavior was separated by a break in time or in its continuity. Total scores for each behavior type were calculated for each child by summing the number of behaviors children engaged in across the eight sessions, thereby yielding frequency counts for each behavior. Past research has supported favorable inter-observer reliability for this approach through the calculation of intra-class correlation coefficients (ICCs), which have been found to be at least .75 for physical aggression and .77 for relational aggression (Crick, Ostrov, Burr, et al., 2006; Ostrov & Keating, 2004). For the present study, ICC's with absolute agreement were calculated using 15% of the observations, and were at least .72 for physical and relational aggression. The use of ICC's as a measure of reliability is appropriate in cases in which Cohen's Kappa is not applicable, such as the assessment of noncategorical data or when absences of behaviors are not recorded (McGraw & Wong, 1996).

Following data collection in the school setting, each behavior that was originally coded as an instance of physical or relational aggression was recoded as either proactive or reactive aggression, to produce four mutually exclusive subtypes of aggression (see Ostrov & Crick, 2007). To classify a behavior as proactive or reactive aggression, the original descriptions of each instance of aggressive behavior were analyzed. For an aggressive behavior to be coded as proactive aggression, reference to a specific object, toy, goal, resource, or social position was needed, and the behavior could not be in response to a threat or in retaliation for being victimized. Coding of an aggressive behavior as reactive aggression required a threat or perceived threat based on the presence of victimization behaviors, a hostile exchange based on behaviors recorded previously, or determination of the presence of hostility or anger. In keeping with past procedures (Ostrov & Crick, 2007), if the coders were unable to code the behavior as proactive or reactive it was assigned to a general (physical or relational) aggression code. Two raters independently coded the same behaviors from a sample of 30% of the observations. Reliability for each behavior was assessed by calculating Kappa coefficients ($\kappa = .61$ for proactive physical aggression, $\kappa = .61$ for reactive physical aggression, $\kappa = .59$ for proactive relational aggression, and $\kappa = .78$ for reactive relational aggression). Three of the four reliability coefficients were found to be above .60 and therefore acceptable (Pellegrini, 2004), but proactive relational aggression was just below this criterion and warrants some caution. These values are comparable to the acceptable Cohen's Kappa coefficients reported for all four subtypes of aggression when using this secondary coding procedure in the past (Ostrov & Crick, 2007).

Validity of the observational approach for studying forms and functions of aggression has been supported by previous research that has correlated behavioral observations with teacher reports (Ostrov & Crick, 2007). In the present study, teacher-ratings of aggressive behavior were also used to validate observations of forms and functions of aggressive behavior.

2.3.2. Teacher-reports of aggressive behavior

To assess forms and functions of aggressive behavior, teachers completed the Preschool Proactive and Reactive Aggression-Teacher Report (PPRA-TR; Ostrov & Crick, 2007) at Time 1. Of the 14 items contained in the PPRA-TR, three items measure *proactive physical aggression* (e.g., "This child often threatens others to get what s/he wants"); three items measure *reactive physical aggression* (e.g., "When this child is hurt by someone, s/he will often fight back"); three items measure *proactive relational aggression* (e.g., "This child often keeps others from being in his/her group of friends to get what s/he wants"); and three items measure *reactive relational aggression* (e.g., "When s/he is angry at others, this child will often tell them that s/he won't be their friend anymore"). There are also two positively toned filler items included in this measure (e.g., "This child will often include others, after they have cooperated with her/him"). All items are rated on a five point scale, from one ("never or almost never true") to five ("always or almost always true"). Previous research has shown adequate internal consistency for each subtype of aggression (Ostrov & Crick, 2007). In the current study, the internal consistency of each aggressive subtype was acceptable: .84 for proactive physical aggression, .90 for reactive physical aggression, .84 for proactive relational aggression, and .85 for reactive relational aggression. Convergent validity for this measure, as assessed by correlations with observations of forms and functions of aggressive behavior, has been strong for proactive and reactive physical forms of aggression, but weaker for proactive and reactive relational aggression (Ostrov & Crick, 2007). This measure was used only for validity purposes (replicating Ostrov & Crick, 2007) and as such we retained the four subscales.

2.4. Time 2 measures

2.4.1. Parent-report of social-psychological adjustment

Parent-report of children's social-psychological adjustment was assessed with the parent form of the Impairment Rating Scale (IRS; Fabiano et al., 2006), obtained from the focal child's parent during Time 2. The IRS is a measure which asks parents to describe their child's primary problems, and then to rate the degree to which the problems affect functioning in seven domains (i.e., relationship with peers, relationship with siblings, relationship with parents, academic progress, self-esteem, family functioning, and overall impairment). For each particular domain, there is space for parents to provide a narrative description of their child's problems and how those problems impact their child's functioning. Below this space, raters are instructed to mark an X on a line that represents where the child lies along a continuum of impairment. For scoring purposes, the line is divided into seven equally spaced segments. The far right of the line is labeled "no problem/definitely does not need treatment or special services" which corresponds to a score of zero. The far left of the line is labeled "extreme problem/definitely needs treatment or special services," which corresponds to a score of six. To obtain impairment scores, items were first summed across domains of functioning, excluding the item pertaining to overall impairment. Items were then averaged depending on the number of items that parents had completed for their child. For children who had siblings, their total raw score was divided by six. For children who did not have siblings, their total raw score was divided by five because the item pertaining to impairment in sibling relationships was not applicable to them. In the current study, the internal consistency (Cronbach's α) of the measure was 0.87.

The IRS has been shown to adequately distinguish clinical samples from matched comparison children (Fabiano et al., 2006). The validity has been supported by correlations with both teacher-reports and observations of social behavior (Fabiano et al., 2006). Responses on parent and teacher versions on the IRS have also been shown to be strongly associated (Fabiano et al., 2006). The IRS was initially validated using early and middle childhood samples (Fabiano et al., 2006), suggesting it is appropriate for use in the current study. The use of parent-report may limit the assessment of the domains of peer relationships and academic progress, due to these domains being largely based within the school and not the home context. However, obtaining teacher-reports at Time 2 was not possible as a result of children attending different schools than at Time 1. In addition, child self-reports of their perceptions of their relationships and academic functioning are suited for older age groups

(e.g., CAIR; Bracken, 2006; Competence Beliefs and Subjective Task Values Questionnaire; Wigfield et al., 1997).

2.4.2. Parent-report of aggression

The Revised Children's Social Behavior – Parent Report (Ostrov & Bishop, 2008) was used to measure physical and relational aggression at Time 2. The measure contains four items that tap physical aggression (e.g., "Hits or kicks other kids"), five items that tap relational aggression (e.g., "Spreads rumors, secrets, or gossips about other kids"), and five items that tap prosocial behavior. All items are rated on a 5-point scale ranging from 1 ("never true") to 5 ("almost always true"). Convergent validity of this measure was supported in a prior study that showed significant correlations between ratings on this measure and teacher reports of physical and relational aggression (Ostrov & Bishop, 2008). The original measure developed by Crick (2006) contained fewer items and also showed significant moderate associations between mother and father report for physical and relational aggression, respectively (Casas et al., 2006). Both physical and relational aggression subscales were reliable in the present study (Cronbach's α's .77 and .72, respectively). This measure was included to support the validity of the IRS and to provide additional relevant covariates in our model.

2.5. Data analytic plan

It was expected that independent variables in this study would be intercorrelated, and therefore a simultaneous multiple regression enabled the examination of unique relations between specific subtypes of aggressive behavior while controlling for relevant covariates (for a similar approach see Bailey & Ostrov, 2008) and reducing the number of tests that were needed to be run (relative to a hierarchical framework when using the two dimensional aggression approach; see Ostrov & Crick, 2007). The hypothesis was tested using one overall model. The model included age, gender, subtypes of aggressive behavior at Time 1, and physical aggression at Time 2 as predictor or control variables. Physical aggression at Time 2 was included as a covariate given possible concerns about the role of concurrent aggression in the prediction of functional impairment at Time 2. Bivariate associations did not suggest that they were significantly associated, but the magnitude of the association was moderate (i.e., .30) justifying the inclusion of this covariate in the overall model. A follow-up model was also run without this covariate to test if the effects would change. Functional impairment served as the outcome variable in this study.

3. Results

A series of independent samples *t*-tests was conducted to compare participants who returned for the last phase of the study with those who did not return for the last phase on key study variables. These *t*-tests revealed no significant differences between these groups of individuals, t's (99) = −1.71 to .523, p's > .05. Descriptive statistics were calculated for key study variables and are presented in Table 1. Tests of skewness and kurtosis showed that observations of proactive physical aggression and observations of reactive relational aggression showed skew and kurtosis problems. A square root transformation was performed on these variables in order to reduce skew and kurtosis scores to acceptable levels (i.e., <3 for skew and <8 for kurtosis; Kline, 2005).

Fabiano et al. (2006) determined that a score of 3 on the IRS constituted an optimal cut-point, by which a child is considered impaired if he or she receives a rating of 3 or greater in one or more domains. Because the IRS is intended to distinguish between clinical and nonclinical levels of impairment, it was important to examine our sample of typically developing children for the presence of clinical levels of impairment. The mean for each domain was below 1. However, scores indicating clinical levels of impairment were reported in all domains. Scores above 4 were not reported for any domain. The following lists the proportion of participants who received scores of 3 or greater per domain: relationships with playmates (11.2%), relationships with siblings (2.8%), relationships with parents (8.3%), academic functioning (13.9%), self-esteem (8.4%), family in general (5.6%), and overall functioning (5.6%). The IRS thus appears to capture some level of impairment even in a non-referred typically developing sample.

To demonstrate the validity of observations at Time 1, correlations between observations and teacher-reports were calculated. Teacher-reports and observations were significantly correlated for proactive physical aggression (r = .42, p < .01), reactive physical aggression (r = .39, p < .05), proactive relational aggression (r = .34, p < .05), but not reactive relational aggression (r = .22, p = .21). Importantly, past research has supported the predictive validity of the reactive relational aggression observational code (Ostrov & Crick, 2007). Bivariate correlations were then performed among key study variables (see Table 1). The association between parent-reported IRS scores and parent-reported physical aggression at Time 2 showed a nonsignificant trend (p = .075), providing modest support for the concurrent validity of the IRS. Parent report of relational aggression at Time 2 was not associated with IRS scores at Time 2 and this aggression variable was dropped from further analyses. Observations of reactive physical aggression at Time 1 were correlated with IRS scores at Time 2, lending preliminary support to the hypothesis. To examine the unique associations between subtypes of aggressive behavior and impairment, a simultaneous linear regression model was run (see Table 2). All independent variables were mean-centered prior to analyses (Aiken & West, 1991). Parent-report of impairment at Time 2 served as the dependent variable. Gender, age, subtypes of aggressive behavior at Time 1, and physical aggression at Time 2 were entered as predictor variables. The overall model was significant. Gender was a significant predictor of impairment, with boys showing greater levels of impairment than girls. Both parent-reported physical aggression at Time 2 and reactive physical aggression at Time 1 were significantly and uniquely associated with impairment at Time 2 while controlling for gender, age, and all other aggression subtypes. A second regression model was run that included the same predictors as the first model but did not include physical aggression at Time 2. The second model yielded similar findings [i.e., reactive physical aggression at Time 1 remained a significant and unique predictor of impairment at Time 2 (β = .356, p = .046)]. For our first model, an effect size was calculated (Cohen's f^2 = .69). A post hoc power analysis (G*Power 3.1.3; Faul, Erdfelder, Buchner, & Lang, 2009) using this effect size (f^2 = .69) and standard alpha and power levels (i.e., α = .05, 1 − β = .80) showed that we were sufficiently powered to run an analysis with seven predictors.

4. Discussion

The primary goal of the current study was to examine whether reactive functions of aggression were uniquely associated with future functional impairment in early childhood. Reactive physical aggression was uniquely associated with functional impairment while controlling for gender and Time 2 physical aggression. Reactive relational aggression was found not to be uniquely associated with impairment while controlling for gender and Time 2 physical aggression. Proactive physical and proactive relational were not uniquely associated with future impairment. Therefore, our hypothesis was supported with regard to reactive physical aggression, but not reactive relational aggression. In addition, boys were

Table 1
Descriptive statistics and bivariate correlations among key study variables.

Study variable	*M*	*SD*	Range	1.	2.	3.	4.	5.	6.	7.
1. Age in months T1	50.31	10.97	22–78	X						
2. OBS proactive PAGG SQRT T1	.96	.84	0–3.32	−.09	X					
3. OBS reactive PAGG T1	.36	.72	0–3	.08	.25	X				
4. OBS proactive RAGG T1	1.41	2.03	0–8	.12	.29	−.07	X			
5. OBS reactive RAGG SQRT T1	.24	.53	0–2	.08	.02	.32	−.12	X		
6. PR PAGG PR T2	5.61	2.19	4–12	−.12	.17	.18	−.05	.36*	X	
7. PR impairment T2	.53	.79	0–3.50	−.19	.26	.37*	−.03	.11	.30	.29

Note: OBS = observations; PR = parent report; SQRT = square root transformation; PAGG = physical aggression; RAGG = relational aggression; T1 = Time 1; T2 = Time 2; response scale for variable 6 was 1–5 and for variable 7 it was 0–6.
* $p < .05$.

found to have a higher level of impairment than were girls, and this finding is consistent with prior literature (Fabiano et al., 2006; Healey, Miller, Castelli, Marks, & Halperin, 2008).

Both reactive physical aggression at Time 1 and physical aggression at Time 2 were significantly and uniquely associated with parent-reported functional impairment at Time 2. Thus, children who showed higher levels of reactive physical aggression at age 4 showed greater impairments in functioning measured at age 6, while accounting for their level of aggression at age 6. These findings suggest that reactive physical aggression in early childhood may lead to difficulties as children approach the transition to middle childhood. One potential explanation for this relation is the weak attainment of developmental tasks, which in early childhood include the development of behavioral and emotional self-control (Gentile & Sesma, 2003). Children who use hostile and impulsive aggressive responses to slights may have not developed appropriate coping strategies or impulse control. In addition, reactive aggression has been shown to be associated with biased social information processing (Crick & Dodge, 1996), anger to provocation (Marsee & Frick, 2007; Waschbusch et al., 2002) and biased attention to cues of rejection, ridicule, and failure in ambiguous hypothetical scenarios (Schippell, Vasey, Cravens-Brown, & Bretveld, 2003). Therefore, reactive aggressors may be overly sensitive to interpersonal slights in their environment, leading them to overreact and experience social difficulties (Dearing et al., 2002). Moreover, problematic social behavior may yield influences beyond the social domain, as recent literature has documented links between social behavior in the classroom and academic development in early childhood (Arnold, Kupersmidt, Voegler-Lee, & Marshall, 2012).

Furthermore, physical aggression may lead to more immediate and hurtful consequences than relational aggression, such as physical injury to victims, leading to stronger negative responses to this behavior by peers, siblings, and adults. Across early childhood, physical aggression is expected to typically decline (Côté, Vaillancourt, Barker, Nagin, & Tremblay, 2007; DeHart et al., 2004; NICHD Early Child Care Research Network, 2004), suggesting that physically aggressive behavior that persists may be viewed as problematic by parents and teachers. In support of this explanation, reactive physical aggression has been viewed more negatively than reactive relational aggression by mothers of young children (Werner, Senich, & Przepyszny, 2006). This finding also suggests that reactive physical aggression may lead to greater parent–child conflict and compromised views of children's social functioning, which could potentially influence the way in which parents report on their children's behaviors and functioning. Both the study by Werner and colleagues (2006) and the present study utilized parent-report as an outcome measure, so the ostensible consistency of these findings could be attributed to methodological artifact. Future research may further clarify these relations through the use of additional informants, such as the other parent or teachers.

That reactive physical aggression was associated with negative psychosocial consequences is also consistent with previous research using older samples. Previous studies of reactive physical aggression have examined other developmental periods, such as middle childhood (Morrow et al., 2006), adolescence (Prinstein & Cillessen, 2003), and emerging adulthood (Ostrov & Houston, 2008). Thus, the current study adds convergent evidence that reactive physical aggression in particular is related to negative outcomes across various developmental periods.

Contrary to our hypotheses, reactive relational aggression was not found to predict future impairment. It was expected that reactive relational aggression would be associated with future impairment given previous literature showing the effects of relational aggression and reactive aggression on social adjustment (Card & Little, 2006; Crick, Ostrov, Burr, et al., 2006). At the same time, it was acknowledged that there was less consistent support for the association between reactive relational aggression and impairment than there would be for the association between reactive physical aggression and impairment. It is important to consider the possible reasons for the absence of a significant association. Although relational aggression is present during the early childhood period, it is typically unconcealed and openly expressed, and becomes more subtle, covert and sophisticated as children age (Crick et al., 2007). Thus, perhaps longer-term psychosocial consequences of relational aggression are more likely to be observed when the behavior is more covert and complex in later stages

Table 2
Linear regression predicting unique associations between observed aggression at Time 1 and impairment at Time 2.

Outcome, predictors	β	F	R^2
PR impairment T2		$(7, 28) = 2.77$, $p = .025$	.41
Age in months	−.213		
Gender	−.448*		
OBS proactive physical aggression SQRT T1	−.014		
OBS reactive physical aggression T1	.346*		
OBS proactive relational aggression T1	.136		
OBS reactive relational aggression SQRT T1	−.130		
PR physical aggression T2	.358*		

Note: OBS = observations; PR = parent report; T1 = Time 1; T2 = Time 2; SQRT = square root transformed; gender (0 = boy; 1 = girl).
* $p < .05$.

of development (Crick, Ostrov, & Werner, 2006; Murray-Close et al., 2007). Alternatively, relational aggression may be seen as developmentally more normative as physical aggression becomes less normative, especially for girls (DeHart et al., 2004). Furthermore, in early childhood, relational aggression has been related to social benefits such as number of mutual friendships (Burr et al., 2005), friendship intimacy (Sebanc, 2003), and the use of prosocial strategies to obtain resources and exercise social influence (Hawley, 2003). Other research has shown that relational aggression is related to controversial social status in preschoolers (Nelson et al., 2005) and decreases in mutual friendships and peer liking in kindergarteners (Johnson & Foster, 2005). Similar mixed findings have been observed later in development. A study of adolescents by Cillessen and Mayeux (2004) suggested that relationally aggressive adolescents who are perceived as popular by their peers are disliked, yet other evidence shows that adolescents with this behavioral profile are protected from internalizing problems (Rose & Swenson, 2009). Identifying conditions under which relational aggression becomes pathological across development remains a question for future research. However, in spite of these unresolved questions, the present study supports the categorization of aggression both by form and by function, as the association between reactive aggression and impairment was limited to physical forms of aggression and did not pertain to relational aggression. Thus, our findings are more specific than they would have been had we analyzed aggressive behavior only in terms of function.

Proactive functions of aggression were not associated with later impairment. During early childhood, proactive aggression is quite normative (Ostrov & Crick, 2007) and thus may not exhibit prospective associations with psychological adjustment problems across early childhood. Research suggests that proactive aggression becomes a more serious risk factor for psychosocial adjustment problems as children age (Fite, Colder, Lochman, & Wells, 2008; Raine et al., 2006). Future research that explores proactive and reactive aggression from a developmental perspective may further clarify risk factors and consequences associated with these behaviors.

In placing our findings within the context of previous literature, it is important to consider that we examined associations between aggressive behavior and impairment, not on ratings of behaviors, symptoms, or peer liking, as has typically been done in previous research (Crick, Ostrov, & Werner, 2006). Our findings add to previous literature demonstrating aggression to be a risk factor for later social adjustment problems in early childhood (Crick, Ostrov, Burr, et al., 2006) and suggest that certain aggressive behaviors may exert a long-term impact on young children's completion of tasks and behaviors that are expected in accordance with their developmental level. Moreover, our results appear to parallel those of Waschbusch et al. (1998), who demonstrated a unique association between reactive physical aggression and impairment after controlling for diagnostically relevant variables (e.g., conduct disorder symptoms) in an older sample. An equivalent comparison between our findings and Keenan et al.'s (2008) findings cannot be made due to different methodologies. Nevertheless, if behaviors such as aggression and symptoms of disruptive behavior disorders or other disorders co-occur, it is clinically useful to determine the degree to which each behavior accounts for impairment. Future research that includes an assessment of both symptoms and functioning is necessary in order to identify what behaviors are more problematic than others, as well as the point at which a behavior warrants intervention.

4.1. Limitations and future directions

The present study has several limitations. First, a two-year span of time occurred between the first and second time points, perhaps preventing us from being able to observe the shorter-term associations between relational aggression and adjustment observed in prior studies of early childhood (Crick, Ostrov, Burr, et al., 2006; Ostrov & Crick, 2007). Second, reactive relational aggression occurred at relatively low levels in our sample (consistent with past studies, Ostrov & Crick, 2007), and thus we may have been unlikely to identify consequences of a low base-rate behavior. Moreover, this potential restricted range may have impacted the validity assessments for this behavioral code. Third, our small sample size limited our power to detect small effects and prevented us from being able to explore whether gender or other variables, such as peer victimization, moderated the relation between aggressive behavior and later impairment. Fourth, because we did not collect parent-reports of impairment at Time 1 in our study, we were not able to observe whether reactive physical aggression predicted increases in impairment. Future research should thus control for initial levels of impairment in order to see whether aggressive behavior accounts for changes in the level of impairment, thereby lending it greater explanatory power in the prediction of adjustment problems. Fifth, our outcome measure was based upon a small number of items. Sixth, our sample may not be adequately representative of the larger population for two reasons. Selection bias may have been present in our sample due to potential differences between families who provided valid contact information and those who did not. In addition, our sample was not particularly diverse with regards to ethnicity or socioeconomic status, and our findings thus lack external validity. Future research should include children from a broader range of backgrounds in order to see whether the relations observed in the present study remain in various populations, as would be expected based on previous findings (Chen & French, 2008). Lastly, the open-ended and individualized nature of the IRS prevented us from imposing experimental control over what types of behaviors or problems parents could endorse. Future research should thus assess behavioral and psychological symptoms as well as impairment and additionally consider a range of outcomes that includes both strengths and weaknesses in order to arrive at a more comprehensive assessment of child functioning.

4.2. Implications for policy and practice

This study identified certain behaviors that may put children on a path toward clinical impairment. Special attention should be paid to these behaviors so as to detect children who may be at risk for future adjustment problems. Because these behaviors were reliably observed in the classroom context, simple training procedures would enable teachers to accurately identify these behaviors. Furthermore, it is important to consider developmentally appropriate and effective methods for intervention. In keeping with the findings of Ostrov et al. (2009), interactive activities may be used to help children develop alternative strategies for coping with peer conflict, thereby reducing aggressive behavior. Policy makers should be encouraged to direct resources to evaluating and treating problematic behavior in early childhood in order to reduce the onset of long-term difficulties.

In conclusion, this is the first study to examine how aggressive behavior influences functioning across early childhood. Our study was enhanced by a multi-informant and multi-method approach as well as a focus on an under-studied period of development, and thus adds to a growing body of literature supporting the utility of obtaining multiple perspectives when assessing children's social behavior (Ostrov & Godleski, 2007; Tackett & Ostrov, 2010). In general, our findings support the use of the IRS in a typically developing sample, the validity of conjoining form and function in the analysis of aggressive behavior, and the union of clinical and developmental perspectives in examining psychosocial correlates of aggression.

Lastly, we intend for our findings to enlighten parents, teachers, and interventionists so that they can identify problematic behavior and implement effective solutions, thus promoting the psychological well-being of young children.

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