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Forms of Aggression and Peer Victimization During Early Childhood: A Short-term Longitudinal Study

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Abstract A multi-informant and multi-measure short-term longitudinal study of the association between subtypes of aggression and peer victimization was conducted in an early childhood sample (M=44.36 months; SD=11.07; *N*=120). Observational and teacher report measures demonstrated appropriate reliability and validity as well as stability across an academic year. Concurrent associations revealed that observed relational aggression was uniquely associated with teacher reported relational victimization and observed physical aggression was uniquely associated with teacher reported physical victimization. Prospective findings indicated that observed relational aggression predicted increases in teacher reported relational victimization for girls only, controlling for the variance associated with physical aggression, prosocial behavior, physical victimization, and gender. Peer rejection partially mediated the association between observed relational aggression at time 1 and teacher reported relational victimization at time 2. Ways in which these and other prospective findings extend the extant literature are discussed.

Keywords Relational aggression · Relational victimization · Physical aggression · Physical victimization · Early childhood

A number of scholars in clinical, school and developmental psychology have called our attention to the study of peer victimization in recent years (Olweus 1995; Juvonen and Graham 2001; Pepler et al. 2004). Given the personal and societal costs associated with peer harassment there has been a call for further research on the development of peer victimization (Troop-Gordon and Ladd 2005), with a particular focus on younger children (Crick et al. 1999). In addition, there is a need for further work to elucidate the predictors of peer victimization across development (Sullivan et al. 2006). Researchers have documented the important link between physical aggression and physical peer victimization (Hodges and Perry 1999; Schwartz et al. 1998). That is, behavioral problems and physical aggression predict increases in physical victimization (Dhami et al. 2005; Schwartz et al. 1999). In addition, there are some children that display high levels of both concurrent physical aggression and physical victimization (i.e., aggressive-victims or provocative victims; Schwartz et al. 2001). The past peer victimization literature has been important in establishing the maladaptive antecedents of the behaviors, which include both internalizing and externalizing problems as well as peer rejection across development (Juvonen and Graham 2001). Despite the importance of studying physical victimization and aggression around the world (Khatri and Kupersmidt 2003), often recent studies have not assessed other subtypes of victimization (e.g., relational victimization) that may help the field better understand the development of psychopathology (Crick et al. 2001). Relational victimization, or the frequent and chronic receipt of relational aggression, typically is defined as using damage, malicious manipulation or threats of damage to relationships as the means of harm (e.g., verbal or nonverbal peer exclusion, friendship withdrawal threats, spreading malicious rumors or secrets; Crick and Grotpeter 1996).

Researchers that have studied both physical and relational forms of peer victimization have demonstrated the utility of this subtype approach in understanding social–

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psychological adjustment problems (Crick and Bigbee 1998). Crick and Grotpeter (1996) revealed that relational victimization was associated with indices of social-psychological adjustment (e.g., loneliness, social anxiety) even when controlling for overt victimization (i.e., physical and verbal). In a second study, Crick and Bigbee (1998) documented that relational victimization was associated with social-psychological adjustment problems controlling for the variance associated with relational aggression. Prinstein and colleagues further documented that relational aggression and victimization are distinct constructs and that the inclusion of the study of relational victimization adds to physical victimization in our understanding of the development of psychopathology (Prinstein et al. 2001). Additional studies have documented the differential associations between relational and physical victimization and social-psychological adjustment indices (e.g., externalizing and internalizing problems, substance use, Cullerton-Sen and Crick 2005; Leadbeater et al. 2006; Sullivan et al. 2006).

Theorists have recognized that aggression and victimization may be linked in fundamental ways. Boivin et al. (2001) present a theoretical social process model or sequential theory of the causes of peer harassment. This theoretical model presents two key hypotheses. First, stable behavioral tendencies such as aggression, which include negative attributions and other social-cognitive processes, may directly lead to peer victimization and ultimately negative social self views (Boivin and Hymel 1997; Boivin et al. 2001). Second, the social process model suggests that an indirect pathway exists from aggression to negative peer status (i.e., peer rejection) and indirectly to future peer harassment. Past research using the Quebec Longitudinal Study of Children and over 1,000 participants in middle childhood found evidence for both these direct and indirect pathways for physical aggression and victimization (Boivin and Hymel 1997). To date, neither pathway has been tested for relational aggression and victimization and thus is the focus of the current study. Concurrent analyses do suggest a possible direct pathway link adding some past empirical support for the model and relational aggression. For example, Dhami et al. (2005) report moderate correlations among self-reported physical aggression and victimization and between relational aggression and victimization for both genders (see also Crick et al. 1999; Sullivan et al. 2006). The indirect pathway has not been explicitly tested with relational victimization, but there are documented links between the various components of this hypothesized model (Buhs and Ladd 2001). For example, relational aggression is associated with peer rejection (Crick et al. 2006) and peer rejection and relational victimization are correlated in early childhood (Crick et al. 1999). Moreover, Ladd (2006) demonstrated that peer rejection uniquely adds in the prediction of psychopathology above and beyond aggressive behavior. Peer rejection increases the probability that aggressive behavior will be stable and lead to social-psychological adjustment problems like victimization (Bierman and Wargo 1995) because rejected children are often viewed by the peer group as easy targets (Bierman 2004). To date, both pathways are unknown for the study of relational forms of aggression and victimization and require further longitudinal study.

In keeping with what might be called a "specificity hypothesis," Crick and colleagues (1999) posited that during early childhood, victim status may be a function of those who receive aggression in retaliation for their own displays of aggression (i.e., physical aggression predicts physical victimization and relational aggression predicts relational victimization). Crick et al. (1999) found limited support for the specificity hypothesis in their concurrent study and called for longitudinal studies to replicate and extend these findings without any concerns for shared method variance (i.e., teachers provided both aggression and victimization data; Crick et al. 1999 see also Sullivan et al. 2006). These researchers attempted to interpret the specificity hypothesis within past gender-segregation theories (Maccoby 1998). To this end, Crick et al. (1999) found evidence for gender differences (i.e., girls were more relationally victimized and boys were more physically victimized). According to Maccoby (1998) and consistent with gender-schema theories (Martin and Halverson 1981), young children are presumably exposed to different gender-specific "social worlds," and girls in turn are socialized by female peers to encode, recall and display relationally aggressive behavior; whereas, boys are socialized by male peers to attend, retain and draw on physical aggression schemas in peer conflict situations. In keeping with this model, young children display physical and relational aggression in gender-linked ways during early childhood (Ostrov and Keating 2004). Thus, relational victimization should follow from relationally aggressive behavior, primarily in young female peer groups; whereas, physical aggression would lead to physical victimization, especially among male peers in early childhood. It is anticipated that these patterns are robust during periods of intense gender segregation such as early childhood.

The past literature has several limitations that the current study was designed to address. First, the past literature exploring the association between aggression subtypes and forms of victimization has been conducted almost exclusively in middle childhood and adolescence. Only a few known studies have assessed relational victimization in children younger than 5, arguably an important developmental period for understanding the on-set and subsequent course of peer victimization (Bonica et al. 2003; Ostrov et al. 2004). For example, Crick et al. (1999) did explore the one month stability of relational and physical victimization and found moderate to high levels of stability for relational and physical

victimization. Dhami et al. (2005) explored critically important empirical questions concerning the role of context in the display of relational victimization over two time points in the early school years, but they did not explore the role of aggressive behavior in the prediction of victimization. Thus, in general, the literature is limited by a lack of longitudinal studies testing prospective associations between relational aggression and victimization constructs. Second, the current literature has been limited to the use of peer, teacher and self-report methods and the association between aggression and victimization subtypes is often conducted with the same measures and informants, raising the possibility of shared method variance concerns. The use of other informants (e.g., observational methods) for aggression and victimization may reduce these concerns and provide a more robust test of theoretical models. Third, the role of gender as a moderating factor in the association between relational aggression and victimization, while explored to some extent (e.g., Crick et al. 1999) often is not systematically tested in models. Finally, sophisticated models controlling for an extensive array of possible confounds are rare in the literature. For example, given past concurrent associations as well as moderate levels of inter-correlation, to test for unique effects of aggression subtypes it is important to statistically control for the role of alternative subtypes of aggression and victimization in the same models (Bonica et al. 2003; Crick et al. 1999; Cullerton-Sen and Crick 2005; Dhami et al. 2005; Prinstein et al. 2001; Sullivan et al. 2006). In addition, because past research has documented a concurrent link between prosocial behavior, relational aggression and relational victimization (e.g., Ostrov et al. 2004) and theoretical models suggest prosocial behavior may be a moderator in the association between aggression and adjustment problems (see Hawley 2003) it is important to control for these influences.

The current study addresses four primary goals and hypotheses. The first main goal of the study is to examine the concurrent unique associations between observed relational and physical aggression and teacher reported relational and physical peer victimization. Based on past studies and in keeping with the specificity hypothesis, it is hypothesized that relational aggression will uniquely be associated with relational victimization controlling for physical aggression; whereas, it is hypothesized that physical aggression will uniquely be associated with physical victimization, controlling for relational aggression. The second main study goal is to test the direct links in the social process model and specifically the unique prospective associations between initial observed relational and physical aggression and teacher reported relational and physical peer victimization, while controlling for initial peer victimization. Based on the specificity hypothesis and the social process model it is predicted that relational aggression will uniquely predict increases in relational victimization; whereas, physical aggression will uniquely predict increases in physical victimization. Given, the "two social world hypothesis" (Maccoby 1998), a related developmental question is whether gender will moderate these concurrent and prospective associations during early childhood. Due to gender segregation in early childhood, we would expect that relational aggression will predict relational victimization particularly for girls; whereas, physical aggression will predict future peer victimization for boys. Moreover, since children that engage in high levels of both aggression and victimization are at greater risk for future victimization (e.g., Kochenderfer-Ladd 2003) the interaction between aggression and victimization was explored in predictive models. The final goal is to test the indirect pathway of the social process model by conducting a test of mediation. Based on past theory and work with physical victimization (Buhs and Ladd 2001) it is hypothesized that peer rejection will mediate the prospective association between observed relational aggression and teacher reported relational victimization.

To test these study goals a multi-method and multi-informant short-term longitudinal study was conducted during early childhood. Teacher and research assistant reports of peer victimization subtypes, peer rejection as well as teacher reports and observations of aggression subtypes were collected at two time points in a large and diverse early childhood sample.

Materials and Method

Participants

Participants include 120 (69 girls) children (M=44.36 months; SD=11.07). The family's ethnic breakdown was 12.5% African American, 15.8% Asian, 57.5% Caucasian/European American, 4.2% Indian, 3.3% Latino, ϕ 0.8% Native American, and 5.9% multi-racial/other. For a subsample of 47 families that participated in a subcomponent of the larger project, parent data was available on family income and other family demographics. Most of the parents reported that they were married (87.2%) with 8.5% single, 2.1% divorced and 2.1% in other situations. Parents reported that 32.6% of families spoke a second language in their home. The mean family income was between $55,000 and $100,000 (ranging from under $15,000 to over $100,000). The mean parental education level was a four-year degree (ranging from some high school to a graduate or professional degree). Based on yearly reported family income and parental education level, children were from primarily middle class families. Available aggregated school data on family income supports these conclusions. This study was conducted at two time points for two cohorts. The cohorts were recruited from the same or

similar schools and classrooms one year apart. Each school (4 schools, 13 classrooms) was accredited by the National Association for the Education of Young Children (NAEYC) and was university-affiliated in an urban or suburban area. Approximately 27% of the head teachers that completed packets for the study had a bachelors degree, 48% had a masters or other advanced degree. Teachers had been employed at the school for an average of 6.45 years (SD= 4.98) and had been the focal child's teacher for 7.16 months (SD=5.83). Children attended the centers for an average of 26.83 h per week (SD=13.91). There were a few differences between the schools. At one school, a university laboratory school, teachers were significantly more likely to have an advanced degree than teachers at other centers. Teachers at this school were earning their Ph.D. in early childhood education, but they also report significantly less time employed at the school than teachers at the other more traditional child care centers. Children also attended the laboratory school significantly less than the other centers. There were no other systematic differences across the schools. Prior data from this project has been published in one manuscript that explored questions related to relational and physical aggression and social cognitive processes (Ostrov 2006), but that data was from only one time and one cohort.

Measures

Observations of aggression and prosocial behavior The observational scheme introduced by Ostrov and Keating (2004) and revised by Crick et al. (2006) was adopted for the present study (for review see Leff and Latkin 2005). Naturalistic focal child sampling with continuous recording of children's relational and physical aggression were conducted during free play at participating child care centers. Each focal child was observed for 10 min per session by a trained undergraduate or graduate student who stayed within earshot but monitored their own nonverbal behavior (i.e., facial expressions, posture, and eye contact) and position in the room to decrease reactivity (Pellegrini 2004). At each of the two time points, every focal child was observed for 8 separate sessions, which took place on different days over an 8–10 week period for 80 min of total observation per child (over 370 h of observation across both time points). The order of children observed in each room was determined randomly with a few caveats (i.e., the number of observations stayed similar across all children and no child was observed more than once per day). This procedure was implemented to reduce independence of observational data, to increase the play contexts in which aggressive behavior was observed, and to gather representative data across a number of peer interactions over several different days. If children went out of range for more than 30 s, the observation was stopped and was restarted later that day or completely redone on the next available day. Observations were collected by 16 trained male and female advanced undergraduate students and 4 female graduate students (primarily used for training and reliability purposes) of diverse ethnicities. The majority of observers rotated through different classrooms throughout the observation period and from time 1 to time 2. All observers were unaware of the goals and hypotheses of the study.

In the present study, training consisted of several steps. First, all research assistants read the methods section of several recent observational manuscripts to become familiar with the observational procedures. Next, the trainer reviewed the observational manual with each observer and discussed videotape sessions demonstrating exemplar behaviors. The third component of the training involved completing six standard observation sessions without pausing or rewinding using videotapes from prior studies and a multiple-choice/matching examination (with discussion for any errors or omissions). Finally live practice reliability observations occurred in the classroom and on the playground with the trainer or an experienced graduate student observer (with discussion for any errors or omissions). Assessments of reliability were conducted throughout the study to avoid observer drift concerns (Pellegrini 2004). Observers spent a minimum of two days in the room prior to conducting observations to allow children a chance to acclimate to their presence and to reduce any reactivity issues. If needed, additional time was spent until children were no longer reactive to the observers. For this study, reactivity was defined as any attempt the focal child made to interact with the observer, comment on the observations or look at the observer. Reactivity, during the 80 min of observation, occurred on average 2.5 times per focal child at time 1 and 1.5 times per focal child at time 2, which are relatively low rates (see also Crick et al. 2006).

For each 10-min session, the observers recorded, in full detail, the focal child's display of the following behaviors: (a) physical aggression (e.g., hitting, kicking, punching, pushing, pinching, and taking things from others), (b) relational aggression (e.g., verbal or nonverbal exclusion from an activity/group or dyadic interaction, using friendship withdrawal as a threat, giving the "silent treatment," spreading malicious rumors, gossip or secrets), (c) prosocial behavior (e.g., sharing, helping and including other children in play). Observers recorded the gender of all the children involved. Separate behaviors were recorded based on temporal breaks in the interactions during the observation. Additional behaviors (e.g., play styles, victimization) were collected. Inter-observer reliability was assessed at each time on 15% of observations across the observation period.

Reliability was acceptable for relational aggression (ICC's from 0.72 to 0.86), physical aggression (ICC's from 0.78 to 0.95). and prosocial behavior (ICC's from 0.77 to 0.88).

Teacher Report of Aggression The Preschool Social Behavior Scale-Teacher Form (PSBS-TF, Crick et al. 1997) was used to assess teacher perceptions of children's physical and relational aggression. This widely used measure consists of 16 items, 6 of which were designed to assess relational aggression (e.g., "This child tried to get others to dislike a peer," "This child tells a peer they won't be invited to their birthday party unless s/he does what the child wants") and 6 of which assess physical aggression (e.g., "This child kicks or hits others"). Teachers rated how often focal children were relationally or physically aggressive on a 5-point scale ranging from 1 (never to almost never true) to 5 (always or almost always true). A number of studies have supported the favorable psychometrics of this measure (e.g., Bonica et al. 2003; Crick et al. 1997, 2006; Hawley 2003; Hart et al. 1998; Ostrov and Keating 2004). In the past, these studies, have demonstrated acceptable reliability for each subscale (i.e., Cronbach's $\alpha>0.70$). Factor analyses have confirmed the existence of distinct factors for relational and physical subtypes of aggression (Crick et al. 1997). In the current study, at each time point, appropriate internal consistency was demonstrated for physical and relational aggression (Cronbach's $\alpha>0.87$). To further validate the measure, research assistants (RA) completed the teacher report measure for each focal child after all observations were completed. RA reports of physical and relational aggression at each time point were all reliable (Cronbach's $\alpha>0.90$). Teacher and RA reports of relational aggression were significantly correlated at time 1 ($r=0.32$, $p=0.001$) and at time 2 ($r=0.48$, $p<0.0001$). Teacher reports of relational aggression at time 1 also correlated with RA reports of relational aggression at time 2 ($r=0.41$, $p<0.001$). RA reports of relational aggression at time 1 correlated with teacher reports of relational aggression at time 2 ($r=0.42$, $p<0.001$). Teacher and RA reports of physical aggression were significantly correlated at time 1 ($r=0.32$, $p=0.001$) and at time 2 ($r=0.21$, $p=0.04$). Teacher reports of physical aggression at time 1 were also correlated with RA reports of physical aggression at time 2 ($r=0.50$, $p<0.0001$). RA reports of physical aggression at time 1 were not significantly associated with teacher reports of physical aggression at time 2 ($r=0.16$, ns).

Teacher Report of Prosocial Behavior The PSBS-TF was also used to assess prosocial behavior (Crick et al. 1997). There were four prosocial behavior items (e.g., "This child is helpful to peers") and the same response scale as note above was used. This subscale had appropriate reliability across the study (Cronbach's $\alpha>0.79$).

Teacher Report of Peer Rejection The PSBS-TF was used to assess peer rejection (Ostrov et al. 2004). Using the same scale as above, to assess peer rejection (2 items), teachers reported how disliked children were by same and opposite-sex peers. This measure was reliable at both time points (Cronbach's $\alpha>0.88$). RA reports of peer rejection were reliable at each time (Cronbach's $\alpha>0.77$). Teacher and RA reports were associated (e.g., $r=0.32$, $p<0.001$).

Teacher Report of Victimization The Preschool Peer Victimization Measure-Teacher Report (PPVM-TR) was developed by Crick and colleagues (Crick et al. 1999) to measure physical and relational victimization and received prosocial behavior. This measure includes seven items, three items assess physical victimization ("This child gets pushed or shoved by peers"), three items assess relational victimization ("This child gets left out of the group when someone is mad at them or wants to get back at them") and 3 items that assess received prosocial behavior ("This child gets cheered up by playmates when he/she is sad or upset about something"). Teachers rated how often focal children were relationally or physically victimized on a 5-point scale ranging from 1 (never to almost never true) to 5 (always or almost always true). Alphas in the past have been acceptable for physical and relational victimization (ranging from 0.77 to 0.88) and factor analyses have indicated that the three hypothesized factors exist (Crick et al. 1999).

In the past, Crick and colleagues have demonstrated that the physical and relational victimization scales have discriminant validity (i.e., intra-item correlations were larger than the inter-item correlations; see also Bonica et al. 2003). In the past, due to cross-loading and conceptual reasons one item was dropped from the relational and physical victimization scales respectively, which yielded two items for each of the factors. Since the structure of this measure has not been replicated, to explore the internal structure, a principal axis factoring with promax rotation was conducted with eight of the original items (i.e., the cross-loaded item hypothesized to be relational victimization was included, but the "mean verbal insults" item that was originally dropped for conceptual reasons was not included). Promax rotation was used given the hypothesized association between physical and relational victimization (Crick et al. 1999). The scree plot suggested that a three component solution would be viable (eigenvalues for the components were 3.23, 2.12, 1.11, 0.47, 0.41, 0.31, 0.20, and 0.15). Factor loadings were all above 0.40 and items loaded on their hypothesized factors. Unlike Crick et al. (1999) there was no cross-loadings on other factors. Thus, the current analyses replicate Crick et al. (1999), but also revealed that the inclusion of the third item for relational victimization (i.e., This child gets told "you are not my friend/buddy" if they do not comply with a

playmate's request) was not problematic. In the current study the alphas were 0.85 for relational victimization at both time points and were 0.90 at both time points for physical victimization. To further validate the measure, research assistants (RA) completed the teacher report measure after all observations were completed. The RA report of relational victimization was reliable at each time point (Cronbach's $\alpha >$ 0.82) and for physical victimization was reliable at time 1 (Cronbach's α=0.80) and time 2 (Cronbach's α=0.81). Teacher and RA reports of relational victimization significantly agreed at time 1 (r=0.31, p=0.001) and time 2 (r= 0.29, p=0.003). Teacher report of relational victimization at time 1 was correlated with RA report of relational victimization at time 2 (r=0.35, p=0.001). RA reports of relational victimization at time 1 was correlated with teacher report of relational victimization at time 2 (r=0.29, p=0.003). Teacher and RA reports of physical victimization significantly agreed at time 1 (r=0.20, p=0.023) but did not agree at time 2 (r=0.13, ns). Teacher report of physical victimization at time 1 was not correlated with RA report of physical victimization at time 2 (r=0.14, ns). RA reports of physical victimization at time 1 significantly correlated with teacher report of physical victimization at time 2 (r=0.22, p=0.02). Thus, there is some additional evidence for the reliability of the PPVM-TR for both physical and relational victimization and in the current study, despite some nonsignificant effects for physical victimization, additional support for the validity of the constructs.

Procedure

The study was reviewed by the local Institutional Review Board and parents provided written consent for their child's participation. Teachers also provided written consent prior to completing report packets. Time 1 observations were always initiated about six weeks after children started school and there was 4 to 5 months between the two time points. Teacher reports were distributed when approximately half of the observational sessions were completed. Research assistant (RA) reports were completed after all observations were finished. Teachers received an honorarium ($25 gift certificate) for the completion of teacher packets at each time point. All families and teachers received a newsletter summarizing the findings of the study.

Results

The project included four key study goals which focused on the unique concurrent and prospective associations between observed relational and physical aggression and teacher reported relational and physical peer victimization; the possible role of gender as a moderator in the association between aggression and victimization subtypes; and peer rejection as a mediator between relational aggression and future relational victimization.

Descriptive statistics for the study variables are reported in Table 1. Skew was not greater than three for any variable suggesting non-normality of the data was not a concern (Kline 2005). Correlations were conducted between observed and teacher reported relational and physical aggression at time 1 and 2 (see Table 1). Correlations and descriptive statistics are also provided separately by gender (see Table 2). The overall pattern was similar for boys and girls and so the total sample was used in subsequent analyses. Consistent with prior observational studies that assessed physical and relational aggression (e.g., Crick et al. 2006; Ostrov and Keating 2004) teacher-reported and observed relational aggression were significantly correlated at time 1 and at time 2. In addition, teacher-reported and observed physical aggression were significantly correlated at time 1 and at time 2. Teacher-reported and observed prosocial behavior were significantly correlated at time 1 (r=0.45, $p<0.001$). In keeping with past findings (Crick et al. 2006), inter-correlations between observed relational and physical aggression were low and non-significant. However, given shared method variance concerns, it is not surprising that teacher reported relational and physical aggression inter-correlations for times 1 and 2 were moderate and significant. Stability correlations revealed that observed relational aggression and observed physical aggression were moderately stable over the 4 to 5-month period. Stability for teacher reported relational and physical aggression and peer rejection was moderate (see Table 1).

Bivariate correlations were conducted between observed physical and relational aggression and teacher reported physical and relational peer victimization at time 1 and 2 (see Table 1). The correlations suggested low to moderate associations between initial observed physical aggression and concurrent and future physical victimization and future relational victimization. The findings for initial observed relational aggression indicated moderate associations with only concurrent and future peer relational victimization. At time 2, observed physical aggression was significantly associated with both prior and concurrent physical victimization and with concurrent relational victimization. At time 2, observed relational aggression was significantly associated with both prior and concurrent relational victimization. Despite the correlations revealing associations between prior victimization and future aggression, since the goal of the study was to test if aggression predicted victimization and to limit the number of models that were run, we did not follow up on these interesting findings in this manuscript. In addition, although observations of relational and physical aggression were always reliable, observations of relational

Table 1 Descriptive statistics and bivariate correlations for key study variables at time 1 and 2

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. PAGG OBS T1	X													
2. RAGG OBS T1	0.15	X												
3. PAGG OBS T2	0.46	0.15	X											
4. RAGG OBS T2	0.06	0.41	0.19	X										
5. PVICT TR T1	0.32	−0.01	0.35	0.01	X									
6. RVICT TR T1	0.13	0.28	0.19	0.24	0.43	X								
7. PVICT TR T2	0.23	0.08	0.40	0.07	0.48	0.33	X							
8. RVICT TR T2	0.27	0.38	0.23	0.42	0.18	0.68	0.33	X						
9. PAGG TR T1	0.36	0.10	0.39	−0.01	0.70	0.63	0.55	0.45	X					
10. RAGG TR T1	0.14	0.28	0.13	0.09	0.18	0.64	0.17	0.51	0.48	X				
11. PAGG TR T2	0.33	0.28	0.37	0.07	0.41	0.53	0.70	0.55	0.74	0.39	X			
12. RAGG TR T2	0.11	0.47	0.11	0.41	0.04	0.55	0.30	0.72	0.41	0.65	0.60	X		
13. Peer Rej TR T1	0.20	0.17	0.28	0.04	0.24	0.54	0.29	0.51	0.54	0.48	0.41	0.47	X	
14. Peer Rej TR T2	0.29	0.16	0.26	0.20	0.27	0.39	0.46	0.58	0.51	0.30	0.65	0.49	0.43	X
M	2.40	1.02	2.02	1.60	3.72	5.85	3.49	5.90	9.56	9.59	9.67	10.65	3.08	3.18
SD	2.49	1.50	2.44	2.42	1.83	2.66	1.56	2.65	4.27	4.88	4.80	5.43	1.51	1.59
Range	0–13	0–7	0–11	0–14	2–10	3–12	2–7	3–13	6–22	6–28	6–26	6–25	2–8	2–10

Pagg Physical aggression; *Ragg* relational aggression; *Pvict* physical victimization; *Rvict* relational victimization; *Rej* rejection; *OBS* observations; *TR* teacher report; *T1* Time 1; *T2* Time 2. Correlations above 0.19 are significant at $p<0.05$; above 0.24 are significant at $p<0.01$ and above 0.32 are significant at $p<0.001$

and physical victimization were not always reliable in this study, which further precluded more sophisticated tests of these questions.

Concurrent regression models were run to test the unique associations between observed relational and physical aggression and teacher reported relational and physical peer victimization at time 1. In each of these models, to explore unique associations, the alternative subtype of victimization relative to the dependent variable was entered at step 1 as a covariate along with gender and observed prosocial behavior. In addition, the two aggression subtypes were entered at step 2 and the respective interaction terms between physical and relational aggression and gender was entered at step 3 (see Table 3). In model one, it was found that observed relational aggression at time 1 was uniquely associated with concurrent teacher reported relational victimization, above and beyond the role of observed physical aggression, teacher reported physical victimization, observed prosocial behavior and gender. Physical aggression was not significantly associated with concurrent teacher reported relational victimization. The second model revealed that boys (M=4.69; SD=1.95) were more physically victimized than girls (M=3.03; SD=1.37), according to teachers. In addition, observed physical aggression was uniquely associated with concurrent teacher reported physical victimization, controlling for the role of observed relational aggression, teacher reported relational victimization, observed prosocial behavior and gender. In sum, and in keeping with predictions, relational aggression was uniquely associated with concurrent teacher reported relational victimization and physical aggression similarly was uniquely associated with teacher reported physical victimization.

Regression models were run to explore the prospective association between observed relational and physical aggression at time 1 and teacher reported relational and physical peer victimization at time 2 (in separate models), controlling for the alternative form of initial observed aggression, observed prosocial behavior, gender and time 1 teacher reported relational and physical victimization (see Table 4). Thus, these models were designed to test if aggression subtypes uniquely predicted increases in teacher reported peer victimization across the study. In each model, the covariates were entered at step 1, the aggression predictors were simultaneously entered at step 2 and the interaction between the aggression predictors and gender was entered at step 3. In addition, the interactions between observed aggression subtypes and corresponding teacher reported victimization subtypes (e.g., relational aggression and relational victimization) were entered at step 4. Finally, at step 5, the three-way interactions between aggression subtypes, corresponding victimization subtypes and gender were entered. In model three, an interaction between relational aggression and gender was found in the prediction of future relational victimization, controlling for initial relational victimization. Thus, the model was run separately for girls and boys and it was revealed that for girls ($\beta=0.24$, $p=0.018$) relational aggression was a significant predictor of increases in teacher reported relational victimization across the year, controlling for physical aggression, ΔF (2,

Table 2 Descriptive statistics and bivariate correlations for key study variables at time 1 and 2 by gender

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	M	SD	Range
1. PAGG OBS T1	X	0.28	0.51	0.06	0.30	0.11	0.24	0.30	0.40	0.21	0.43	0.10	0.10	0.32	3.04	2.86	0–13
2. RAGG OBS T1	0.03	X	−0.002	0.15	0.04	0.30	−0.02	0.31	0.23	0.23	0.17	0.18	0.21	0.11	1.02	1.48	0–7
3. PAGG OBS T2	0.27	0.31	X	0.19	0.43	0.03	0.48	0.18	0.30	−0.14	0.34	−0.10	0.29	0.31	3.07	2.76	0–10
4. RAGG OBS T2	0.13	0.55	0.35	X	0.20	0.34	0.29	0.43	0.09	0.05	0.07	0.07	0.05	0.22	1.19	1.71	0–9
5. PVICT TR T1	0.19	−0.06	−0.06	0.01	X	0.48	0.50	0.33	0.70	0.23	0.43	0.14	0.29	0.39	4.69	1.95	2–10
6. RVICT TR T1	0.12	0.26	0.36	0.22	0.38	X	0.36	0.73	0.65	0.61	0.58	0.61	0.54	0.50	6.20	2.84	3–12
7. PVICT TR T2	0.13	0.15	0.23	0.02	0.37	0.29	X	0.52	0.44	0.09	0.75	0.38	0.25	0.59	3.86	1.66	2–7
8. RVICT TR T2	0.31	0.43	0.36	0.41	0.16	0.68	0.24	X	0.61	0.58	0.74	0.74	0.45	0.62	5.65	2.43	3–11
9. PAGG TR T1	0.25	0.04	0.28	0.05	0.56	0.62	0.59	0.46	X	0.58	0.70	0.53	0.60	0.60	11.56	4.71	6–22
10. RAGG TR T1	0.12	0.32	0.41	0.10	0.23	0.70	0.28	0.47	0.54	X	0.48	0.74	0.40	0.35	9.37	4.16	6–19
11. PAGG TR T2	0.07	0.40	0.25	0.14	0.22	0.48	0.61	0.49	0.74	0.43	X	0.74	0.44	0.79	11.09	5.48	6–26
12. RAGG TR T2	0.20	0.67	0.43	0.54	0.07	0.53	0.31	0.71	0.47	0.61	0.63	X	0.45	0.53	9.79	5.08	6–25
13. Peer Rej TR T1	0.29	0.14	0.28	0.05	0.20	0.54	0.31	0.55	0.56	0.54	0.39	0.50	X	0.46	3.19	1.42	2–7
14. Peer Rej TR T2	0.22	0.19	0.16	0.23	0.10	0.30	0.33	0.59	0.44	0.29	0.53	0.50	0.41	X	3.40	1.60	2–7
M	1.93	1.01	1.28	1.88	3.03	5.56	3.22	6.09	8.16	9.77	8.62	11.27	3.00	3.02	–	–	–
SD	2.08	1.53	1.88	2.79	1.37	2.51	1.45	2.81	3.31	5.43	3.94	5.62	1.57	1.58	–	–	–
Range	0–9	0–7	0–11	0–14	2–6	3–12	2–6	3–13	6–22	6–28	6–22	6–25	2–8	2–10	–	–	–

Pagg Physical aggression; *Ragg* relational aggression; *Pvict* physical victimization; *Rvict* relational victimization; *Rej* rejection; *OBS* observations; *TR* teacher report; *T1* time 1; *T2* time 2. Boys are above the diagonal and girls are below. For boys, correlations above 0.28 are significant at $p<0.05$; above 0.37 are significant at $p<0.01$; and above 0.48 are significant at $p<0.001$. For girls, correlations above 0.245 are significant at $p<0.05$; above 0.32 are significant at $p<0.01$ and above 0.41 are significant at $p<0.001$

47)=7.50, $p=0.001$, $\Delta R^2=0.13$. For boys, the model was not significant. Model 3 also indicated that physical aggression uniquely predicted increases in teacher reported relational victimization across the year, controlling for all of the covariates. Steps 4 and 5 were not significant and for ease of communication are not shown. Model 4 only revealed that physical and relational victimization at time 1 were significant predictors of future teacher reported physical victimization. Steps 4 and 5 were not significant and are not presented for ease of communication.[1]

A test of the second pathway, the indirect or mediated pathway between aggression and victimization, was also conducted. In keeping with Baron and Kenny (1986), a series of regression models were conducted to explore the relation between observed relational aggression at time 1 (IV), teacher reported peer rejection at time 1 (Mediator), and teacher reported relational victimization at time 2 (DV). Peer rejection at time 1 rather than at time 2 was selected as the mediator in order to permit a more conservative prospective analysis and to diminish the likelihood of shared method variance effects. In all models, gender, observed physical aggression at time 1 and teacher reported prosocial behavior at time 1 were treated as covariates. First, relational aggression was significantly associated with future relational victimization, $\Delta F(1, 93)=12.79$, $p=0.001$, $\Delta R^2=0.11$ (see Fig. 1). Second, relational aggression was associated with peer rejection, $\Delta F(1, 105)=3.71$, $p=0.05$, $\Delta R^2=0.03$. Third, peer rejection significantly predicted relational victimization, controlling for relational aggression, $\Delta F(1, 90)=25.50$, $p=0.001$, $\Delta R^2=0.18$. Fourth, there was a drop in the magnitude of the association between relational aggression and relational victimization from 0.34 to 0.25 and the Sobel test revealed that the indirect effect was significant ($z=1.96$, $p=0.05$; MacKinnon et al. 2002). Thus, in keeping with the indirect hypothesis of the social process model, peer rejection partially mediated the association between observed relational aggression and future teacher reported relational victimization.

Discussion

The current study addressed four primary goals. The first main goal of the study was to examine the concurrent unique associations between observed relational and physical aggression and teacher reported relational and physical

[1] Given the age range of the participants, age was included as a covariate in all models and was entered at step 1. All of the effects were similar and thus, the more parsimonious models are presented.

Table 3 Concurrent regression models for unique associations between observed relational and physical aggression and teacher reported relational and physical victimization at time 1

Outcome, Step, Predictors	β	F, ΔF	R^2	ΔR^2
Model 1: Rvict TR T1				
1. Gender	0.06	(3, 105)=9.54, $p<0.001$	0.21	
Prosocial behavior OBS T1	0.14			
Pvict TR T1	0.48**			
2. Ragg OBS T1	0.27**	(2, 103)=5.11, $p=0.008$		0.07
Pagg OBS T1	−0.07			
3. Ragg OBS T1 × Gender	−0.18	(2, 101)=0.78, ns		0.004
Pagg OBS T1 × Gender	0.12			
Model 2: Pvict TR T1				
1. Gender	−0.41**	(3, 105)=19.70, $p<0.001$	0.36	
Prosocial Behavior OBS T1	−0.02			
Rvict TR T1	0.39**			
2. Ragg OBS T1	−0.13	(2, 103)=4.82, $p=0.01$		0.06
Pagg OBS T1	0.23*			
3. Ragg OBS T1 × Gender	0.08	(2, 101)=0.34, ns		0.004
Pagg OBS T1 × Gender	−0.20			

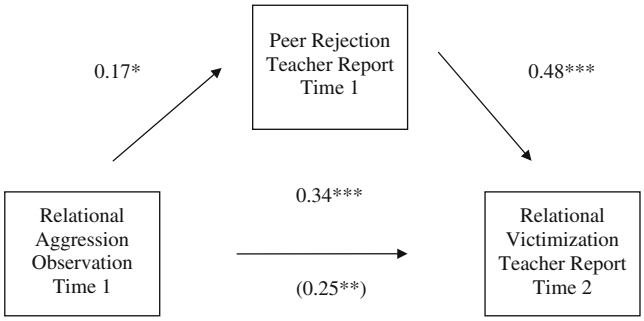
Pagg Physical aggression; *Ragg* relational aggression; *Pvict* physical victimization; *Rvict* relational victimization; *OBS* observations; *TR* teacher report; *T1* time 1; *T2* time 2. Gender was coded 0=male, 1=female.
*$p<0.01$
**$p<0.001$

peer victimization. Observed relational aggression was associated with concurrent teacher reported relational victimization, even when controlling for physical aggression, physical victimization, prosocial behavior and gender. Observed physical aggression was associated with concurrent teacher reported physical victimization, even when controlling for relational aggression, relational victimization, prosocial behavior and gender. Thus, as predicted,

Table 4 Prospective regression models for unique associations between observed relational and physical aggression at time 1 and teacher reported relational or physical victimization at time 2 controlling for relational and physical victimization at time 1

Outcome, step, predictors	β	F, ΔF	R^2	ΔR^2
Model 3: Rvict TR T2				
1. Gender	0.11	(4, 89)=20.81, $p<0.001$	0.48	
Prosocial Behavior OBS T1	0.02			
Pvict TR T1	−0.03			
Rvict TR T1	0.70***			
2. Ragg OBS T1	0.11	(2, 87)=6.56, $p=0.002$		0.07
Pagg OBS T1	0.24**			
3. Ragg OBS T1 × Gender	0.52*	(2, 85)=3.20, $p=0.046$		0.03
Pagg OBS T1 × Gender	0.23			
Model 4: Pvict TR T2				
1. Gender	−0.01	(4, 89)=9.87, $p<0.001$	0.31	
Prosocial Behavior OBS T1	−0.17			
Pvict TR T1	0.41***			
Rvict TR T1	0.20*			
2. Ragg OBS T1	0.01	(2, 87)=0.49, ns		0.008
Pagg OBS T1	0.09			
3. Ragg OBS T1 × Gender	0.59	(2, 85)=1.90, ns		0.029
Pagg OBS T1 × Gender	−0.05			

Pagg Physical aggression; *Ragg* relational aggression; *Pvict* physical victimization; *Rvict* relational victimization; *OBS* observations; *TR* teacher report; *T1* time 1; *T2* time 2. Gender was coded 0=male, 1=female.
*$p<0.05$
**$p<0.01$
***$p<0.001$



Note. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Fig. 1 Peer rejection as a mediator of relational aggression and future relational victimization

aggression subtypes were concurrently associated with the corresponding victimization subtype. The second main study goal was to test the direct pathway hypothesis of the social process model and the specificity hypothesis, which is consistent with Maccoby's (1998) two world hypothesis. Consistent with predictions, observed relational aggression predicted increases in teacher reported relational victimization but only for girls and these effects were present controlling for the variance associated with physical aggression, physical victimization and prosocial behavior. Surprisingly, observed physical aggression also predicted increases in teacher reported relational victimization, controlling for relational aggression, physical victimization, prosocial behavior and gender. The third main goal was to test the indirect pathway of the social process model and specifically to test if peer rejection mediated the prospective link between relational aggression and relational victimization. The indirect hypothesis was supported. Peer rejection partially mediated the association between observed relational aggression and future teacher reported relational victimization.

The current findings suggest that our past understanding of how aggression and victimization is linked across time may need to be revised to address important subtype relations. Concurrent findings suggested that similar subtypes of aggression and victimization were related, but the prospective findings further our understanding by revealing that physical aggression also predicts increases in relational victimization. It is conceivable that young children are using more relational/covert strategies to avoid and exclude physically aggressive children to avoid the costs of physical attacks (Bjorkqvist 1994). It is also important to recall that both boys and girls may be physically aggressive (Crick 1997) so more work is needed to tease apart these effects and continue to explore for possible moderation by gender. Despite some surprising effects, the direct pathway was supported, in part, by the prospective regression models. The indirect pathway also has support. Collectively, these findings support the basic assumptions of the Boivin et al. (2001) direct and indirect path sequential social process model of the causes of peer harassment, but they do suggest that a more refined model may be needed to address the patterns of effects between different subtypes of aggression and victimization. Limited evidence of gender moderation was found and so a more formal future test of Maccoby's (1998) two world hypothesis is needed. In addition, the specificity hypothesis was not supported in prospective models (e.g., physical aggression did not predict increases in physical victimization), which collectively suggests that further study is needed to test this hypothesis. Further study of the role of gender non-normative forms of aggression (Crick 1997) and tests of the two world hypothesis and aggression in early childhood are needed.

The current study had a number of strengths including the use of a multi-method and multi-informant short-term longitudinal study with a relatively large sample size for observational research (e.g., Ostrov and Keating 2004). In addition, this study tested two theoretically driven hypotheses. Despite these strengths and novel substantive developmental questions this study has a number of limitations that must be addressed in future research. First, given the scope of the project only two time points were possible and this restricts the developmental questions we may test. Additional time points would have facilitated an assessment of a theoretical model by Schwartz and colleagues that posits that problems in social skills lead to victimization, which leads to further changes in behavior (Schwartz et al. 1993). That is, with additional time points, it would have been possible to test if aggression predicted victimization, which in turn predicted future aggressive behavior. It is likely than bi-directional effects are present and future studies are needed to explore different direction of effects and other potential mediational processes like self and other perceptions of victimization (Graham and Juvonen 1998). Unfortunately, despite reliable assessments of physical and relational aggression, reliable multiple methods assessing relational and physical victimization were not available for this study, which further precluded the assessment of bi-directional effects. Second, replication of the current effects are needed with children attending diverse community child care centers. Third, it is important to recognize that children were nested within classrooms and the present analytic approach ignored the potential role of classroom norms for aggression and victimization, which may have been different for boys and girls (Chang 2004). Future studies should use multi-level modeling techniques to explore how classroom levels of acceptance impacts the link between aggression and victimization (Chang 2004). Finally, the use of other

informants (e.g., peer report) for assessing peer victimization should be explored in the future along with teacher and parent reports and observations (Kochenderfer and Ladd 1997) to capture both relational and physical victimization and to understand the role of context for the link between aggression and victimization. Multi-informant composite measures of physical and relational victimization may yield better estimates than using single informants (Ladd and Kochenderfer-Ladd 2002).

In conclusion, the current research adds to the literature in several ways. A novel contribution of this study is that relational aggression was found to be uniquely associated with concurrent relational victimization and uniquely predicted increases in relational victimization across the academic year for girls. In addition, peer rejection was found to partially mediate the association between relational aggression and future relational victimization. Future longitudinal research on both relational and physical aggression and victimization is needed to better understand, predict and eventually control these peer interactions during early childhood.

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