

Associations between aggression and loneliness: An examination of the mediating role of social preference

By

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Submitted to the graduate degree program in Clinical Child Psychology and the Graduate Faculty of the University of Kansas in partial fulfillment of the requirements for the degree of Doctor of Philosophy

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preference

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Date Approved: August 13, 2014

## **Abstract**

Accumulating evidence suggests proactive and reactive aggression are uniquely related to a variety of negative outcomes. Children with higher levels of reactive, not proactive, aggression score lower on measures of social preference and score higher on measures of internalizing symptoms (Card & Little, 2006). There is also evidence that aggressive children struggle more with loneliness (Crick & Grotpeter, 1995). The current study sought to examine whether proactive and reactive aggression uniquely predict self-reported loneliness and whether social preference mediates these relations.

A total of 345 children ages 6-10 were recruited from local elementary schools. Data were collected in the Fall and Spring of a single academic year. Structural equation modeling was used to assess the associations between proactive and reactive aggression and loneliness, and bias corrected bootstrapping was used to assess the significance of social preference as a mediator.

Results indicated that models significantly differed by gender and timepoint. Results from a single-time point model indicated that for boys, higher levels of reactive aggression were associated with greater loneliness, and this association was mediated by social preference. For girls, higher levels of reactive aggression were associated with lower social preference and higher loneliness at the trend level. Contrary to predictions, social preference mediated the association between proactive aggression and loneliness, but not reactive aggression. When examining the model across timepoints and controlling for initial levels of social preference and loneliness, few significant paths remained. For boys, neither proactive nor reactive aggression were associated with social preference or loneliness. For girls, reactive aggression was

negatively associated with social preference at the end of the school year. In the multi-time point models, social preference was not a mediator of the aggression-loneliness association.

Thus, results indicate that social preference mediates the association between aggression and loneliness; however, this varies based on type of aggression, gender, and whether associations are examined concurrently versus across time. Future research should further examine the complicated relationships of aggression, social preference, and loneliness.

## Acknowledgements

There are a number of people who have supported my graduate education and completion of this dissertation, and this document would be incomplete (as in, I never would have completed it) without acknowledging their help and sacrifice. First, I would like to thank my dissertation chair and advisor, Dr. Eric Vernberg, for his invaluable expertise and commitment of time to my graduate training. I would also like to thank Dr. Chris Elledge, whose postdoctoral training grant supported the data collection for this project. Chris, I cannot thank you enough for reading drafts and providing ongoing research and statistics consultation even after moving on to your current faculty position. I know that you will be a valued mentor and advisor at the University of Tennessee. I would also like to thank the members of my dissertation committee, Drs. Paula Fite, Ric Steele, Michael Roberts, and Robert Harrington, for your helpful comments and suggestions in the formation of this dissertation project.

In addition to my professional supports, I must thank my family for their incredible support and sacrifice over the last 5 years as I pursued my doctoral degree. To my parents, Cy Wilcox and Billie Blumenthal, and brother, Josh Wilcox, thank you for your years of support, your continued emphasis on the importance of education, and, perhaps most importantly, your love and support over the last few months. To my husband, Mark Swails, I cannot imagine a more supportive and loving spouse, and I truly believe this document is your accomplishment as well as mine. I do not have words enough to express my gratitude to you for your support throughout my graduate training.

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Accumulating evidence suggests that it is important to distinguish between proactive and reactive aggression when examining how aggression may influence social and emotional adjustment. For example, children who exhibit higher levels of reactive aggression score lower than children who primarily exhibit proactive aggression on measures of social preference and peer acceptance, and score higher on measures of internalizing symptoms, peer rejection, and peer victimization (Card & Little, 2006). Thus, although high levels of aggression in general are associated with poorer social and emotional adjustment, these two subtypes of aggressive behavior appear to convey different types of risks to adjustment. The current study examines loneliness, a dimension of adjustment that has been linked to aggression in prior research (Crick & Grotpeter, 1995). However, only a few studies have examined whether proactive and reactive aggression are differentially associated with loneliness in children (e.g., Xu & Zhang, 2008). Furthermore, although some prior studies have found that controlling for social preference may attenuate the association between general aggression and loneliness (Cassidy & Asher, 1992; Coplan, Closson, & Arbeau, 2007), no prior studies have examined social preference as a mediator of the relation between proactive and reactive aggression and loneliness. The current study has three goals: 1) examine whether proactive and reactive aggression uniquely predict self-reported loneliness, 2) examine whether social preference, a measure of peer acceptance, mediates these relations, and 3) determine whether these associations vary by gender.

### **Proactive and Reactive Aggression**

Proactive and reactive aggression are two subtypes of aggression, differentiated based on the function of the aggressive behavior (Dodge & Coie, 1987). Proactive aggression, also sometimes referred to as instrumental aggression, refers to “cold-blooded,” unprovoked

aggression that is carried out in order to achieve specific goals or gain access to resources and is associated with a lack of emotional arousal. By contrast, reactive, or “hot-headed,” aggression occurs in response to perceived threat or aggression from others, and seems to reflect impulsive behavior that is caused in part by emotion dysregulation. For example, a child who callously pushes a peer out of the way in order to use the computer is engaging in proactive aggression. A child who is knocked over during a soccer game and responds by impulsively punching a peer, is engaging in reactive aggression. While causes for proactive aggression are thought to be rooted in Bandura’s social learning theory (1973) and exposure to aggressive models, reactive aggression is thought to be related to Berkowitz’s (1978) frustration-aggression response (Dodge & Coie, 1987).

Measures of proactive and reactive aggression highly correlate with one another, and results of meta-analysis indicate that they correlate at approximately  $r = .68$  (Card & Little, 2006). Despite this consistently high correlation, factor analyses indicate that they represent distinct constructs, and are associated with different outcomes (e.g., Dodge & Coie, 1987, Fite, Colder, & Pelham, 2006; Poulin & Boivin, 2000; Raine et al., 2006).

Additionally, these two subtypes of aggression are found to have different emotional and cognitive correlates. Individuals with higher levels of proactive aggression and relatively low levels of reactive aggression are found to experience low physiological arousal and emotional reactivity, as evidenced by skin conductance and heart rate assessments (Hubbard et al., 2002). Conversely, high levels of reactive aggression are associated with low frustration tolerance and emotional dysregulation (Vitaro, Brendgen, & Tremblay, 2002). Proactive and reactive aggression are also found to be related to distinct cognitive distortions. Individuals with higher



levels of proactive aggression are more likely to select an aggressive behavior in response to a problem, and they are more likely to expect a positive outcome as a result of aggressive behaviors (Crick & Dodge, 1996; Dodge, Lochman, Harnish, Bates, & Pettit, 1997; Marsee & Frick, 2007; Schwartz et al., 1998). Individuals with higher levels of reactive aggression are more likely to interpret ambiguous intentions as hostile, or have a hostile attribution bias (Crick & Dodge, 1996; Day, Bream, & Pal, 1992; Dodge & Coie, 1987; Dodge, Price, Bachorowski, & Newman, 1990; Hubbard, Dodge, Cillessen, Coie, & Schwartz, 2001). These distinct emotional and cognitive correlates of proactive and reactive aggression suggest different mechanisms at play in the expression of these two types of aggressive behaviors.

When examining the distinct behavioral and psychosocial correlates of proactive aggression, proactive aggression may be associated with both potential benefits and negative correlates. Because proactive aggression is associated with gaining control of resources, it may result in individuals having resources that attract peer attention (Card & Little, 2006). In the prior example of proactive aggression, the child who gains control of the computer may attract the attention of other children who would also like to use the computer. In support of this notion, Dodge and Coie (1987) found that proactive aggression is associated with being rated as funnier and a better leader by peers. However, the “charm” associated with proactive aggression may be short lived, and a persistently high level of proactive aggression is associated with peer rejection and poor social relationships in the long term (Card & Little, 2006; Poulin & Bouvin, 1999). Additionally, childhood and adolescent proactive aggression is associated with a variety of concerning characteristics, such as callous-unemotional traits, blunted affect, psychopathy, and delinquent behavior, resulting in a number of negative consequences over time (Fite, Raine,

Stouthamer-Loeber, Loeber, & Pardini, 2009; Fite, Stoppelbein, & Greening, 2009; Frick, Cornell, Barry, Bodin, & Dane 2003; Raine et al., 2006; Vitaro et al., 2002).

Unlike proactive aggression, reactive aggression is exclusively associated with negative psychosocial outcomes, particularly internalizing symptoms and social problems. In comparison to children with predominately proactive aggression, children with higher levels of reactive aggression are more likely to experience concurrent negative affect and internalizing problems, such as depression, anxiety, and suicidal behavior (Dodge et al., 1997; Fite, Stoppelbein, et al., 2009; Raine et al., 2006; Scarpa et al., 2010; White et al., 2013). Furthermore, longitudinal studies have also found that initial levels of reactive aggression are associated with the later development of internalizing symptoms and negative affect over time (Vitaro et al., 2002; Fite, Raine et al., 2010; Fite, Rathert, Stoppelbein, & Greening, 2012).

While the mechanism behind the development of internalizing symptoms is unclear, some have hypothesized that higher levels of emotional dysregulation, social rejection, and isolation may play a role. In contrast to the blunted affect and “cold-blooded” nature of proactive aggression, reactive aggression is associated with anger, impulsivity, and emotional dysregulation (Dodge & Coie, 1987). Children with higher levels of reactive aggression are also less cooperative, engage in fewer prosocial behaviors, and incorrectly understand others’ emotions (Card & Little, 2006; Day et al., 1992; Orobio, Merk, Koops, Veerman, & Bosch, 2005; Poulin & Boivin, 2000; Vitaro, Brendgen, & Tremblay, 2002). These deficits in emotional regulation and social skills are likely negatively perceived by children’s peer groups, and indeed children and adolescents with higher levels of reactive aggression tend to be more socially isolated and rejected, experience greater levels of peer victimization, and are rated lower on

measures of peer acceptance and social preference (Card & Little, 2006; Poulin & Boivin, 2000; Prinstein & Cillessen, 2003; Raine et al., 2006). Some have suggested (Card & Little, 2006; Fite et al., 2012) that peers respond negatively to the emotion dysregulation associated with reactive aggression, which may result in less acceptance and inclusion, if not outright rejection. This diminished acceptance and inclusion by peers over time leads to greater psychological maladjustment, such as negative affect, poor self-esteem, depression, withdrawal, or loneliness, in comparison to proactive aggression. Thus, social problems or social status may play a mediating role between reactive aggression and internalizing symptoms.

Support has been found for this hypothesized model in a study of depression, where the association between reactive aggression and withdrawal/depression symptoms was mediated by reports of social problems (Fite et al., 2012). Similarly, White and colleagues (2013) found that controlling for behavioral regulation eliminated the association between reactive aggression and internalizing and externalizing symptoms. The current study seeks to establish the nature of the relationship between reactive aggression, poorer peer relationships, and loneliness, an internalizing symptom associated with a later risk for depression (Heinrich & Gullone, 2006; Koenig & Abrams, 1999).

### **Loneliness in Childhood**

Loneliness is the subjective experience of dissatisfaction with the quality or quantity of one's social relationships, which tends to be accompanied by negative affect (Asher & Paquette, 2003). It is distinct from simply being alone or having few friends; an individual can feel lonely in a crowd of people, or may not feel lonely despite having few friends or social interactions. While many people may feel temporarily lonely, longer, more chronic, loneliness is associated

with a greater risk of maladjustment, such as depression (Asher & Paquette, 2003; Koenig & Abrams, 1999). Although it was initially thought that children were incapable of experiencing loneliness (e.g., Weiss, 1973), research has established that children as young as 5-6 years old can effectively understand and report on experiences of loneliness (Cassidy & Asher, 1992; Galanaki, 2004).

As one might expect, a variety of symptoms of social maladjustment and impairments are associated with higher levels of loneliness (Heinrich & Gullone, 2006). Children who report more loneliness also endorse signs of greater social isolation, such as withdrawal (Boivin & Hymel, 1997; Hymel, Rubin, Rowden, & LeMare, 1990; Renshaw & Brown, 1993), fewer friends (Nangle, Erdley, Newman, Mason, & Carpenter, 2003; Parker & Asher, 1993; Renshaw & Brown, 1993), and less intimate friendships (Nangle et al., 2003). Moreover, loneliness is associated with higher reported levels of peer victimization, peer rejection, and lower ratings of social preference by peers (Boivin, Hymel, & Bukowski, 1995; Cassidy & Asher, 1992; Crick & Ladd, 1993; Nangle et al., 2003). One proposed pathway of these negative social experiences is that children with greater loneliness engage in fewer prosocial behaviors and exhibit poorer social skills that may alienate peers (Cassidy & Asher, 1992; Schinka, van Dulmen, Mata, Bossarte, & Swahn, 2013). Thus, over time loneliness may increase because of ongoing or increasing social isolation due to declining social preference.

### **Aggression and Loneliness**

Similar to the link between reactive aggression and internalizing symptoms in general, prior research has found that higher levels of aggression are correlated with greater self-reported loneliness (Boivin & Hymel, 1997; Boivin, Poulin, & Vitaro, 1994; Coplan et al., 2007;

Prinstein, Boergers, & Vernberg, 2001; Schinka et al., 2013; Xu & Zhang, 2008). In a study of trajectories of loneliness over time, aggression in middle childhood was associated with consistently higher levels of loneliness and increasing levels of loneliness across childhood into adolescence (Schinka et al., 2013). Schinka and colleagues concluded that this finding may be due to aggressive children being rejected by their peers, resulting in higher levels of loneliness. However, they did not examine this proposed pathway by examining social status or social preference as it relates to aggression and eventual loneliness. The current study will expand upon previous research by assessing this proposed model of aggression leading to poorer ratings of social preference, and eventual greater self-report of loneliness.

A number of studies to date provide further information on the role of social preference in the link between aggression and loneliness. Some studies have relied on categorical groupings of students based on social status and loneliness. In a single time point study of school-aged children, Qualter and Munn (2002) used cluster analysis to identify groups of children based on sociometric ratings and self-reported levels of loneliness. Four groups of students were identified: rejected children, lonely children, rejected and lonely children, and children of average social standing and loneliness. When comparing the groups on symptoms of maladjustment, it was found that children in the rejected and lonely groups had the highest reported level of aggressive behavior. The authors concluded that it is a combination of these factors, poor social status and loneliness, which relates to higher levels of peer aggression (Qualter & Munn, 2002). Similarly, studies have classified children as withdrawn, aggressive, withdrawn-aggressive, and of average social standing. Results of a three year longitudinal study of trajectories of adjustment (Ladd & Burgess, 1999) found that individuals who were both

withdrawn and aggressive had the highest self-reported levels of loneliness, and children who were aggressive received lower scores on a sociometric measure of social preference. The authors concluded that aggression is a precursor to social rejection, withdrawal, and isolation, which then puts children at risk for a negative emotional state, such as loneliness. Although the authors hypothesized that children with higher levels of proactive or reactive aggression may constitute subgroups with different outcomes, these subtypes of aggression were not measured.

Several studies provide further information on peer acceptance and exclusion as a mediator of the link between aggression and loneliness (Boivin & Hymel, 1997; Coplan et al., 2007). In a single time point study of kindergarten students, Coplan and colleagues (Coplan et al., 2007) found a significant association between aggression and loneliness; however, when controlling for peer exclusion the significance of this effect was significantly diminished, suggesting that social relationships play a role in the development of loneliness from aggressive behaviors. In a short-term longitudinal study, Boivin and Hymel (1997) hypothesized that aggressive behaviors lead to lower social preference, which in turn cause poor social self-perceptions and loneliness. Indeed, in their sample of school-aged children, they found that over the course of 6 weeks aggressive behaviors predicted later loneliness and, as expected, social preference completely mediated the correlation of aggression on loneliness. Thus, although aggression and loneliness may be related, these studies suggest that this association may be due to the role of peer rejection and social preference. While these studies provide support for the association between aggression and loneliness, and the potential mediating role of social preference, these prior studies examined aggression as a unidimensional construct, without examining the differential impact of proactive and reactive aggression. Therefore, the current

study will extend these findings by examining the role of proactive and reactive aggression in peer relationships and loneliness.

Although a number of studies have examined the relationship between aggression and loneliness, to our knowledge only Xu and Zhang (2008) have examined this relationship separately for proactive and reactive aggression. This study of Chinese school-aged children found that reactive, not proactive, aggression was uniquely associated with higher levels of loneliness for both boys and girls. Although the authors noted differences in aggression between Western and Eastern cultures they found that this association between reactive aggression and loneliness coincided with previous findings in Western samples that reactive aggression is uniquely associated with internalizing symptoms. However, this study did not examine the role of social preference or use multiple time points to establish a longitudinal relationship. Thus, prior research suggests that the association between aggression and loneliness may be mediated by peer rejection, and that proactive and reactive aggression are differentially related to loneliness. However, no studies to date have integrated these models to examine the relationship between proactive and reactive aggression and loneliness over time, and the possible mediating effect of peer rejection.

### **Role of Child Gender**

Previous research on loneliness and aggression suggests possible subtle differences in how these constructs operate based on gender. First, base rates of aggression have been found to be overall higher in boys than girls, particularly overt or physical aggression (e.g., Achenbach & Rescorla, 2011; Card, Stucky, Sawalani, & Little, 2008). While rates of proactive and reactive aggression have typically been similar between genders, research indicates that these different

types of aggression may have different correlates for boys and girls (e.g., Connor, Steingard, Anderson, & Melloni, 2003). Moreover, gender non-normative aggression, such as relational aggression in boys and overt aggression in girls, is associated with greater social maladjustment (e.g., Crick, 1997).

Research on internalizing symptoms of maladjustment finds gender differences in the experience of internalizing symptoms in childhood (e.g., Chaplin & Aldao, 2013) however, findings related to loneliness have been equivocal, with some studies finding higher levels of loneliness in girls, some finding higher levels of loneliness in boys, and some finding no gender differences at all (see Weeks & Asher, 2011 for a summary). Overall, previous research does not yield a clear picture of whether gender differences exist in mean levels of proactive and reactive aggression and loneliness.

Although research on gender differences in levels of proactive and reactive aggression and loneliness is mixed, evidence from Coplan and colleagues (2007) suggested that gender may play a role in the aggression-loneliness association. As previously noted, findings from their study found that controlling for peer acceptance resulted in a significant reduction in the association between aggression and loneliness; however, after controlling for peer acceptance aggression and loneliness remained significantly correlated for girls, but not boys. They concluded that girls are likely to experience negative interpersonal interactions with adults and peers as a result of gender non-normative aggressive behavior, leading to a greater experience of loneliness. Thus, it appears that the role of peer status, particularly rejection, as a mediator between aggression and loneliness may vary between boys and girls. Therefore, the current



study will examine the proposed mediation model separately in boys and girls, to capture this potentially important facet: the role of gender in loneliness, aggression, and social preference.

### **Study Questions and Aims**

Proactive and reactive aggression are distinct yet overlapping constructs, differentially associated with a variety of outcomes for children (e.g., Raine et al., 2006). Of particular note for the current study, reactive aggression increases risk for symptoms of psychological maladjustment, including internalizing symptoms (Card & Little, 2006) and self-reported loneliness (Xu & Zhang, 2008). Although it has been proposed that the association between reactive aggression and internalizing symptoms operates through peer rejection and social relationships (e.g., Card & Little, 2006), no longitudinal studies have examined this proposed relationship in loneliness. Additionally, while prior research has established an association between aggression and loneliness, only one prior study examined the differential association for proactive and reactive aggression. Thus, the aims of the current study are as follows. We will examine whether reactive aggression, as opposed to proactive, is uniquely associated with loneliness concurrently (Aim 1a) and in a short-term longitudinal design (Aim 1b). Because reactive aggression is more strongly associated with internalizing symptoms, it is hypothesized that the strength of the association between reactive aggression and loneliness will be stronger than the association between proactive aggression and loneliness. Second, we will examine social preference as a potential mediator of the association between proactive and reactive aggression and loneliness (Aim 2). Due to previous research demonstrating a stronger association between reactive aggression and social preference, and the hypothesized path by which reactive aggression leads to internalizing symptoms, we predict that social preference will

be a mediator for reactive aggression, not proactive aggression. Finally, due to research suggesting that there are differences in aggressive behaviors, loneliness, and social relationships in boys and girls, the proposed model will be examined for gender differences (Aim 3).

## **Method**

### **Participants**

Data were collected as part of a randomized controlled trial examining the efficacy of a school-based mentoring program for aggressive children. Students were recruited to participate in the current study if at least one student in their class was eligible and agreed to participate in the mentoring intervention<sup>1</sup> or waitlist control condition. Second, third, and fourth grade students from 25 classrooms across eight different elementary schools participated in the study. Parents of children from eligible classrooms consented to have their children participate in the study, and an average of 68% of students from each eligible class participated in the study. All measures were administered at two time points: early October and May of a single school year. Data collection was approved by both the local university's and public school district's institutional review boards.

A total of 345 children participated in the current study. Of these, 55 were nominated by teachers and parents to participate in the mentoring intervention because of higher scores on aggression questionnaires. Analyses were based on the 28 children in the active mentoring

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<sup>1</sup> Recruitment for the mentoring intervention was based on teacher nomination. Teachers of participating classrooms were asked to nominate at least two boys and at least two girls who engaged in aggressive behaviors at school (e.g., physical aggression, threatens, teases, spreads rumors, or excludes others"). Parents of nominated students were sent a consent form and the Child Behavior Checklist (CBCL; Achenbach & Rescorla, 2001), a broadband measure of childhood externalizing and internalizing behaviors. For students whose parents gave consent and completed the questionnaires, teachers also completed the Teacher Report Form (TRF; Achenbach & Rescorla, 2001) and eligibility for the mentoring intervention was based on scoring at least one standard deviation above the mean ( $T \geq 60$ ) on the Aggression subscales of the CBCL or TRF.

intervention, 28 students in the waitlist control condition, and 289 classroom peers (n=345 total). Participants' ages ranged from 6 to 10 years old, and 43.7% of the sample was male. About 70% of participants' parents identified their child as White Non-Hispanic; the remainder identified as a members of a specific racial or ethnic minority (12.5%) or bi-ethnic or bi-racial (16.5%). Regarding socioeconomic status, 45.5% of families reported receiving free or reduced lunch, and reported annual household incomes are available in Table 1.

Table 1

*Annual Household Income (n=316, 29 missing)*

Income Range	<i>n</i>	%
< \$10,000	35	10.1
\$10,000 - \$25,000	70	20.3
\$25,000 - \$35,000	45	13.0
\$35,000 - \$50,000	52	15.1
\$50,000 - \$100,00	75	21.7
> \$100,000	39	11.3

Measures were administered at children's schools in a large meeting room, one or two classes of participating students (approximately 40 children or fewer) at a time. Non-participating students remained in their classroom during data collection. A post-doctoral fellow or a trained graduate student research assistant reviewed the purpose of the study, rights of participants (e.g., participation is voluntary, may leave items blank), and confidentiality with students and then read instructions, examples, answer choices, and measure items aloud to students. Students were given copies of the measures to read along and circled the appropriate answer on their answer sheet. In order to ensure confidentiality of responses, particularly peer-nomination items, students were spread out and encouraged to cover their answers after each

item. Talking about responses was prohibited during the assessment session and after returning to the classroom. Graduate and undergraduate research assistants aided students in need of additional assistance, as well as helped ensure confidentiality of responses. After students provided their responses, each questionnaire was reviewed by a research assistant to clarify any unclear answers (e.g., circled more than one response) or unintentionally blank items.

## **Measures**

**Loneliness.** Participants completed 6 items from the Loneliness and Social Dissatisfaction Questionnaire (LSDQ; Asher, Hymel, & Renshaw, 1984) to assess for subjective feelings of insufficient social relationships. Individuals indicated to what degree each item described how they feel on a five-point Likert scale (from “always true” to “not true at all”). The full LSDQ consists of 16 content items, including 6 reverse-coded items. In the current study, 6 non-reverse coded items representing loneliness and social dissatisfaction were used due to time constraints. Items at each time point were averaged and used for analysis, and possible scores ranged from 0 to 5, with higher scores indicating greater feelings of loneliness (see Appendix A for specific questions). These 6 LSDQ items were selected due to their higher factor loadings on the construct of loneliness (item-to-total score correlations: 0.63-0.73; Asher et al., 1984).

The LSDQ has been found to have high internal consistency (Cronbach’s alpha = .90) and internal reliability (Spearman-Brown reliability coefficient = .91; Guttman split-half reliability coefficient = .91; Asher et al., 1984). Previous research using this 6 item form of the LSDQ with preadolescents found high internal consistency (Cronbach’s alpha = .87; Wilcox & Vernberg, 2012). Additionally, previous research using this short form of the LSDQ found that preadolescent self-report of loneliness was significantly associated with parental rating of social

withdrawal, anxiety, and depression (Wilcox & Vernberg 2012), providing evidence of convergent validity for this short form of the LSDQ. For the current study, using an alternate calculation for alpha more accurate for ordinal-level data (Gadermann, Guhn, & Zumbo, 2012), internal consistency for the 6 item scale used here was good-to-excellent in the current sample (Time 1 ordinal alpha = .89; Time 2 ordinal alpha .9).

**Proactive and Reactive Aggression.** Participants completed Dodge and Coie's 6-item aggression questionnaire (Dodge & Coie, 1987), with three items assessing proactive aggression and three items assessing reactive aggression. Children indicated to what degree each statement reflected their behavior, on a 5-point Likert scale (from "never" to "almost always"). See Appendix B for specific item content. Possible total scores ranged from 0 to 24, with higher scores indicating greater reports of aggression. Prior research has found good concurrent and predictive validity (Waschbusch & Willoughby, 1998). Poulin and Boivin (2000) found a two-factor model of proactive and reactive aggression fit Dodge and Coie's (1987) measure better than a one factor model, indicating construct validity for this measure of two forms of aggression. Previous research indicates that children as young as 6 can accurately and reliably self-report proactive and reaction aggression on this measure (e.g., Fite, Rathert, Grasseti, Gaertner, Champion, Fite, & Vitulano, 2011; Fite, Stoppelbein, et al., 2009).

Internal consistency for the current study using ordinal alpha (Gadermann, Guhn, & Zumbo, 2012) at the first time point was acceptable for proactive aggression (ordinal alpha = .69); poor for reactive aggression (ordinal alpha = .51), and good for the overall measure (ordinal alpha = .76), in contrast to previous research which has found acceptable alpha levels for school-aged children (e.g., alpha = .68-.80; Fite et al., 2011; Fite, Stoppelbein, et al., 2009). At the

second time point, internal consistency was improved, where ordinal alpha for proactive aggression was good (ordinal alpha = .85); reactive aggression was acceptable (ordinal alpha = .64), and the overall measure was good (ordinal alpha = .84). One possible reason for the initially lower internal consistency compared to previous studies is the age of participants and method of data collection used in the current study; most previous studies including children as young as 6 collected data in either a one-on-one setting or a small group setting with a lower student-to-research assistant ratio (Fite et al., 2011; Fite, Stoppelbein, et al., 2009). By the second time point, students' reading levels likely improved over the academic year and students were more familiar with the study questionnaires. For the current study, items on the proactive and reactive aggression subscales were averaged for use in analyses.

**Social Preference.** Children were provided with a roster of all students in their class who were participating in the study, and nominated up to three children whom they “like most” (LM) and “like least” (LL). Children's LM and LL scores were each summed and standardized within each class. Social preference scores were then calculated by computing the difference between LM and LL, yielding a continuous social preference variable. A positive social preference score indicated high social preference, while a negative social preference score indicated a child was less preferred by their peers. Social preference has been found to be a reliable and valid assessment of children's social relationships (Boivin et al., 1995; Coie & Dodge, 1983). Although researchers, schools, and institutional review boards have often expressed concern about the ethics of peer nomination research, previous research has demonstrated that peer nomination assessments do not negatively impact children's mood or social interactions (Mayeuz, Underwood, & Risser, 2007; Bell-Dolan & Wessler, 1994).

Additional peer nomination items that were collected but not available for use in the current study are included in Appendix C.

## Results

### Descriptive Analyses

Means, standard deviations, and percent of missing data were obtained for all study variables (Table 2), and student t-test of independent sample were conducted to determine mean-level differences by gender (Table 3), with missing data removed pair-wise. Results indicated that, compared to boys, girls had slightly higher social preference scores at the beginning of the year. Girls also reported greater loneliness at both time points, while boys reported more proactive aggression at the beginning and end of the year, and more reactive aggression at the end of the year.

Table 2

#### *Descriptive Statistics for Variables by Timepoint*

Variable	<i>M</i>	<i>SD</i>	Skew	Kurtosis	% Missing
<b>Time 1</b>					
PA	0.31	0.54	2.07	4.10	7.0
RA	1.11	0.82	0.86	0.35	7.0
LSDQ	0.93	0.92	1.37	1.61	8.1
SP	0.00	1.60	-0.38	-0.28	1.7
<b>Time 2</b>					
PA	0.21	0.50	3.71	17.14 <sup>a</sup>	6.4
RA	1.01	0.86	1.06	0.85	6.1
LSDQ	0.93	0.89	1.10	0.75	7.8
SP	0.00	1.65	-0.22	-0.54	0.6

*Note.* PA = Proactive Aggression. RA = Reactive Aggression. LSDQ = Loneliness. SP = Social Preference.

<sup>a</sup> After natural log transformation, Skew = 2.39; Kurtosis = 5.93.

Table 3

*Comparison of Mean Levels of Aggression, Loneliness, and Social Preference between Boys and Girls*

Variable	Boys		Girls		T
	M	SD	M	SD	
Time 1					
PA	0.43	0.59	0.22	0.46	-3.5**
RA	1.16	0.85	1.07	0.80	-1.03
LSDQ	0.82	0.82	1.02	1.00	1.99*
SP	-0.20	1.64	0.16	1.55	2.06*
Time 2					
PA	0.28	0.60	0.15	0.40	-2.39*
RA	1.13	0.93	0.91	0.79	-2.33*
LSDQ	0.79	0.88	1.04	0.90	2.50*
SP	-0.01	1.65	0.00	1.68	0.09

*Note.* PA = Proactive Aggression. RA = Reactive Aggression. LSDQ = Loneliness. SP = Social Preference.

\* $p < .05$ . \*\*  $p < .01$ .

Initial Pearson correlations between study variables were also obtained separated by gender (Table 4), with missing data removed pair-wise. These correlations are provided in order to describe the characteristics of the variables in the study.

Mean levels of proactive aggression, reactive aggression, loneliness, and social preference were fairly stable across the year. For both genders, results indicated a large positive association between initial and final levels of social preference ( $r = .63$  to  $r = .64$ ), and a medium-to-large correlation for initial and final levels of loneliness ( $r = .46$  to  $r = -.54$ ). Similarly, results indicated that for both proactive and reactive aggression, initial and final levels were positively associated with medium-sized correlations for both boys and girls ( $r = .31$  to  $r = .38$ ). Consistent with prior research, proactive and reactive aggression were correlated with each



Table 4  
*Correlations Between Proactive and Reactive Aggression, Loneliness, and Social Preference  
 (Boys Above the Diagonal, Girls Below)*

Variable	1	2	3	4	5	6	7	8
Time 1								
1. PA	-	.48**	.22**	-.09	.31**	.23**	.21*	-.12
2. RA	.46**	-	.32**	-.15	.19*	.38**	.25**	-.19*
3. LSDQ	.40**	.28**	-	-.18*	.11	.33**	.54**	-.25**
4. SP	-.01	-.06	-.16*	-	-.03	-.16	-.13	.63**
Time 2								
5. PA	.31**	.09	.09	-.16*	-	.51**	.34**	-.01
6. RA	.23**	.35**	.23**	-.11	.38**	-	.45**	-.18*
7. LSDQ	.12	.04	.46**	-.18*	.18*	.22**	-	-.23**
8. SP	-.08	-.20*	-.18*	.64**	-.19*	-.18*	-.23**	-

*Note.* PA = Proactive Aggression. RA = Reactive Aggression. LSDQ = Loneliness. SP = Social Preference.

\* $p < .05$ . \*\*  $p < .01$ .

other at each time point, with medium-to-large positive correlations in both genders ( $r = .38$  to  $r = .51$ ). Across time points, proactive aggression at the beginning of the year had a small, positive association with end of the year reactive aggression for both genders ( $r = .23$ ), while reactive aggression at the beginning of the year had a small, positive association with ending levels of proactive aggression for boys ( $r = .19$ ).

Regarding the association between aggression and loneliness, results indicated small to medium-sized positive associations with proactive and reactive aggression and loneliness at the beginning of the year for both boys and girls ( $r = .22$  to  $r = .40$ ). Beginning of the year proactive and reactive aggression also had a small, positive correlation with loneliness at the end of the year ( $r = .21$  to  $r = .25$ ); however, this significant association was only found for boys, not girls. Reactive aggression at the end of the year was significantly associated with both beginning and

end of the year reports of loneliness, and this effect was medium in size for boys ( $r = .33$  to  $r = .45$ ) but small for girls ( $r = .22$  to  $r = .23$ ). End of the year proactive aggression was positively correlated with final levels of loneliness, a medium effect in boys ( $r = .34$ ) and small effect in girls ( $r = .18$ ).

In regards to the correlations between aggression and social preference, at the first time point proactive and reactive aggression did not significantly correlate with social preference. However, at the second time point, reactive aggression had a small, negative correlation with social preference for both boys and girls ( $r = -.18$ ), while proactive aggression only yielded a small, negative correlation for girls ( $r = -.19$ ). Across time points, initial levels of reactive, but not proactive, aggression predicted lower scores of social preference for both boys and girls, although this correlation was small ( $r = -.19$  to  $r = -.20$ ). Finally, initial levels of social preference had a small, negative correlation with later proactive aggression for girls ( $r = -.16$ ), although this association did not hold for boys. Social preference at the first time point did not correlate with reactive aggression at the second time point for either gender.

Social preference and loneliness were general negatively correlated in this sample. Social preference at the first and second time points had a small, negative association with initial reports of loneliness for both boys and girls ( $r = -.16$  to  $r = -.25$ ). End of the year levels of loneliness had small, negative correlations with end of the year social preference scores for both groups ( $r = -.23$ ), and beginning of the year social preference for girls only ( $r = -.18$ ).

### **Data Analytic Strategy**

Study aims were examined using structural equation modeling path analysis using Mplus 7 statistical software (Muthén & Muthén, 2012). Missing data was estimated using Full

Information Maximum Likelihood (FIML), a method for estimating data missing on the dependent variable. FIML has the advantage over other methods of missing data analysis (e.g., multiple imputation, listwise deletion) in that it examines the dataset as a whole, including other variables in the model, and best accounts for both data missing completely at random (MCAR) and data missing at random (MAR; Little, 2013). Two cases were missing information on the independent variable of gender, and those cases were therefore deleted listwise. Information regarding normality of data was calculated, and results indicated that skewness and kurtosis were generally acceptable (i.e., skewness <3, kurtosis <13; see Table 2), with the exception of proactive aggression at the second time point. Consequently, proactive aggression at Time 2 was transformed using a natural log transformation (Kline, 2011) and results yielded acceptable skewness and kurtosis statistics (See Table 2).

Two sets of path models were estimated in the current study: one examining data within a single time point (Aim 1a; Figure 1) and a second model utilizing social preference and loneliness data from multiple time points (Aim 1b; Figure 2). Due to the relatively lower internal consistency for reactive aggression at the first time point, data analyses for the single time point model were conducted using only time two data. In the single time point analyses, an indirect effect model evaluated whether social preference mediates the association between each domain of aggression on loneliness (Aim 2). Paths were created from each domain of aggression predicting social preference at the first time point (path a), in addition to a path from social preference predicting loneliness at the first time point (path b). The mediating effect of social preference (path ab) was evaluated using bias corrected bootstrapping. Bootstrapping was used to test for the significance of the mediation path as this method does not make the assumption

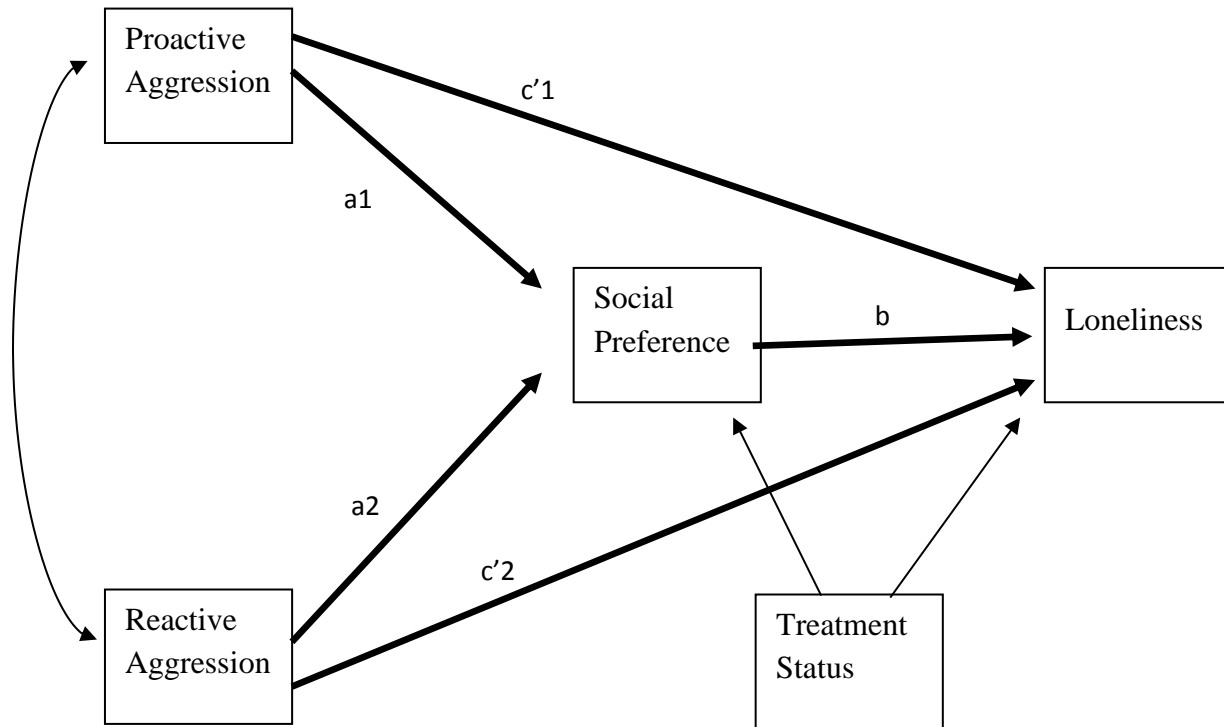


Figure 1. Single time point model.

that the standard error of the  $ab$  path is normally distributed, a faulty assumption in other mediation techniques (Preacher & Hayes, 2008). Bootstrapping involves resampling from the dataset with replacement to create a distribution of the test statistic, and creates a confidence interval of possible statistic values (Preacher & Hayes, 2008). The mediating path was sampled 1000 times and results yielded a 95 percent confidence interval, where a significant mediating path yields a confidence interval that does not include zero.

In the second structural model, a half-longitudinal mediation model (Cole & Maxwell, 2003; Little, 2012) evaluated the mediating role of social preference (T2), controlling for T1 social preference, on the predictive association between each domain of aggression (T1 proactive

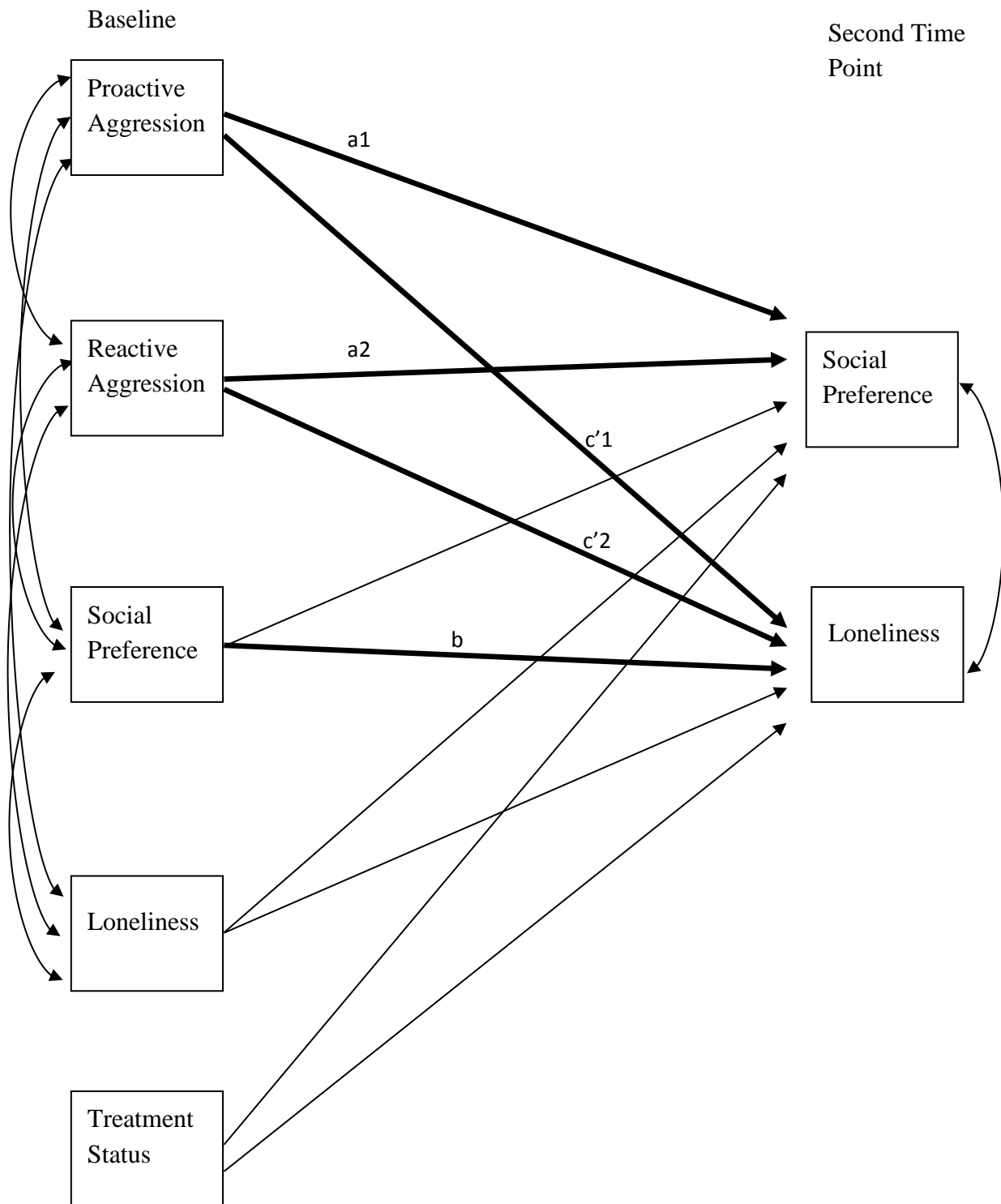


Figure 2. Multi-time point mediation model.

aggression and T1 reactive aggression), and loneliness (T2). As described in Cole and Maxwell (2003) and Little (2012), each domain of aggression was examined for its ability to predict T2 social preference (path a), controlling for T1 social preference (i.e., change in social preference). Simultaneously, social preference at the first time point was used to predict loneliness at the second time point (path b), controlling for T1 loneliness (i.e., change in loneliness). The mediating effect of social preference on the association between aggression domains and loneliness (path ab) was also estimated and the significance of the mediating effect was evaluated using bias corrected bootstrapping, similar to the initial path model. The half-longitudinal mediation design has the advantage over single time point examinations of mediating effects because it accounts for T1 levels of dependent and mediating variables (Cole & Maxwell, 2003; Little, 2012).

Due to the high correlation between proactive and reactive aggression, the effects of these variables were examined simultaneously in order to account for the association between the aggression variables. Age, ethnicity, and treatment status were included as covariates for social preference and loneliness. Age and ethnic status (Caucasian versus minority) were included as covariates because previous research indicates that these variables are associated with peer nomination and loneliness (Bellmore, Nishina, Witkow, Graham, & Juvonen, 2007; Heinrich & Gullone, 2006). Treatment status (active treatment condition versus waitlist or no treatment) was included to ensure that changes in aggression levels over the course of the school-year were not due to treatment effects. For the second, multi-timepoint model, all variables measured within a timepoint were set to covary.

In order to assess for the impact of gender on the proposed models (Aim 3), each path model was initially estimated with gender used as a grouping variable, in order to allow paths to differ between genders. A second path model was then estimated where groups were not allowed to vary based on gender. The Chi square difference tests showed a significant difference in model fit for both the single time point model ( $\Delta\chi^2(8) = 16.747, p < .05$ ) and multi-time point model ( $\Delta\chi^2(16) = 26.461, p < .05$ ), indicating that the estimated structural model was different for boys and girls. Therefore, for each set of path models, results are presented separately for boys and girls. Results of RMSEA power curve power analyses indicated that the sample size was sufficient to detect poor and mediocre model fit in the multi-time point model, and poor model fit in the single time point model (Schoemann, Preacher, & Coffman, 2010).

### **Path Models**

**Model 1: Single time point model, second time point data.** Based on conventions offered by Little (2012), the single time point path model using data from the second time point model fit indices indicated excellent fit ( $\chi^2(4) = 2.353, p = .67, CFI = 1.00; RMSEA = .00$  (90% confidence interval [CI] = .00-.09)). See Table 5 for parameter estimates separated by gender.

**Boys.** For the male model, proactive and reactive aggression significantly covaried ( $B = .512, p < .001$ ). Treatment status was associated with social preference at the second time point at the trend level ( $B = -.12, p = .106$ ), but treatment status was not associated with loneliness. Regarding mediation paths, findings indicated that reactive aggression was significantly associated with social preference (a2 path;  $B = -.228, p = .017$ ) and loneliness (c'2 path;  $B = .363, p < .001$ ), meaning that boys who reported higher levels of reactive aggressive

Table 5

*Unstandardized, Standardized, and Significance Levels for Single Time Point Model, Time 2 Data (Standard Errors in Parentheses; N = 343)*

<i>Parameter Estimate</i>	<i>Unstandardized</i>	<i>Standardized</i>	<i>P</i>
<b>Boys</b>			
PA → SP	.61 (.47)	.12	.192
RA → SP	-.41 (.17)	-.23	.017
PA → LSDQ	.30 (.31)	.11	.347
RA → LSDQ	.34 (.09)	.36	.000
SP → LSDQ	-.09 (.04)	-.17	.027
Covariance PA and RA	.15 (.04)	.51	.000
Treatment Status → SP	-.62 (.39)	-.12	.106
Treatment Status → LSDQ	-.07 (.25)	-.03	.775
<b>Girls</b>			
PA → SP	-.95 (.50)	-.13	.048
RA → SP	-.29 (.19)	-.13	.132
PA → LSDQ	.31 (.35)	.08	.378
RA → LSDQ	.18 (.10)	.16	.077
SP → LSDQ	-.09 (.05)	-.17	.051
Covariance PA and RA	.07 (.02)	.40	.001
Treatment Status → SP	-1.60 (.53)	-.22	.003
Treatment Status → LSDQ	.19 (.38)	.05	.623

*Note.* PA = Proactive Aggression. RA = Reactive Aggression. LSDQ = Loneliness. SP = Social Preference.

were less preferred by their peers and more lonely. Additionally, boys who were less socially preferred rated themselves as more lonely (b path;  $B = -.167, p = .027$ ). In support of initial hypotheses, social preference mediated the path from reactive aggression to loneliness (ab2 path  $B = .036, 95\% \text{ CI } 0.01 - 0.09$ ), but not from proactive aggression to loneliness (ab1 path  $B = -.054, 95\% \text{ CI } -0.16 - 0.01$ ). As predicted, proactive aggression was not found to be significantly associated with social preference or loneliness. See Figure 3 for a depiction of the significant model paths.



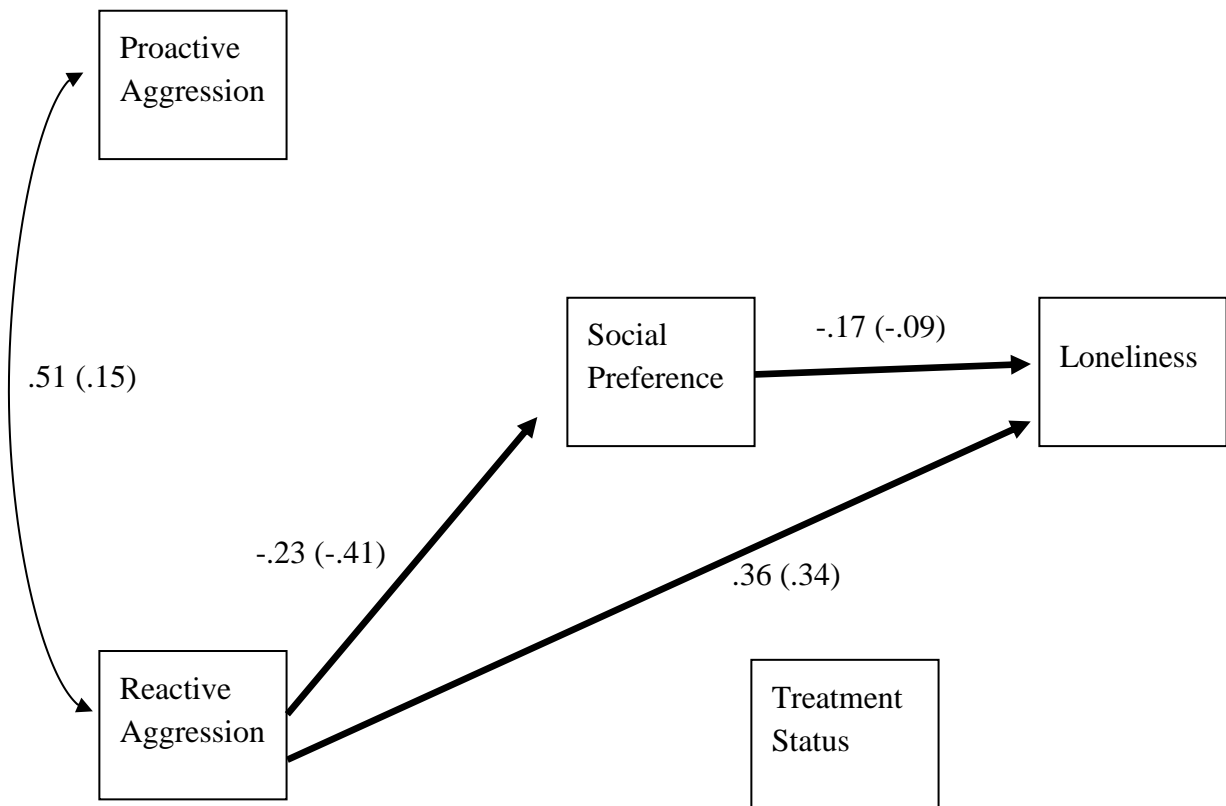


Figure 3. Path analysis model for boys with data from a single time point (Time 2). Standardized parameter estimates are reported outside parentheses and unstandardized parameter estimates are reported inside parentheses. Only significant paths ( $p < .05$ ) depicted for clarity.

**Girls.** For girls, proactive and reactive aggression significantly covaried ( $B = .398, p = .001$ ), and treatment status was significantly associated with social preference ( $B = -.218, p = .003$ ), where those in the treatment group were less preferred by peers. Regarding mediation paths, findings indicated that proactive aggression was associated with social preference at the second time point (a1 path;  $B = -.133, p = .048$ ), where girls with higher reported proactive aggression were less preferred by their peers. Reactive aggression was not associated with social preference (a2 path). Girls who were less preferred by their peers reported greater loneliness (b path;  $B = -.165, p = .051$ ). Reactive aggression and loneliness were associated, but at the trend

level ( $c'2$  path;  $B = .158, p = .077$ ), where girls with higher levels of reactive aggression were also more lonely than their peers. Contrary to predictions, social preference was a significant mediator of the association between proactive aggression and loneliness (ab1 path;  $B = .084, 95\% \text{ CI } 0.01 - 0.22$ ), but this relation was not found for reactive aggression (ab2 path;  $B = .025, 95\% \text{ CI } 0.00 - 0.82$ ). See Figure 4 for a depiction of significant model paths.

**Model 2: Multi-time point mediation model.** In order to address Aim 1b of the current study, a second set of path analyses were conducted using data from both the first and second time point in a half-longitudinal mediation model appropriate for the testing of mediating paths at two timepoints. Model fit for the multi-time point model was adequate ( $\chi^2(10) = 21.736, p = .02$ ) CFI = .957; RMSEA = .08 (90% confidence interval [CI] = .03-.1). See Tables 6-7 for parameter estimates, separated by gender.

**Boys.** As previously described, all variables within each time point were allowed to covary in order to account for within-time-point shared method variance. For boys, the following variables were significantly associated at the first time point. Proactive aggression significantly covaried with reactive aggression ( $B = .478, p < .001$ ) and loneliness ( $B = .227, p = .002$ ). Reactive aggression positively covaried with loneliness as well ( $B = .341, p = .001$ ). Social preference negatively covaried with loneliness ( $B = -.194, p = .008$ ) and covaried with reactive aggression at the trend level ( $B = -.150, p = .070$ ). Social preference was not associated with proactive aggression at the first time point. At the second time point, social preference and loneliness did not covary. Treatment status was not significantly associated with social preference or loneliness at the second time point.

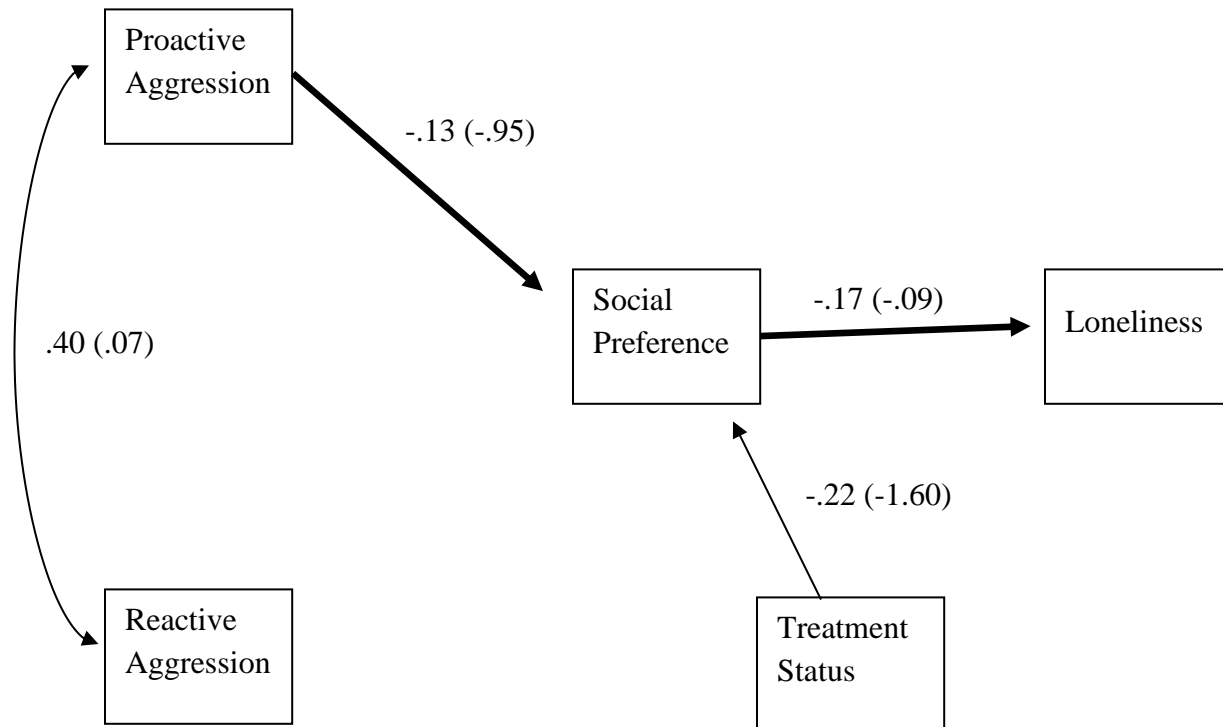


Figure 4. Path analysis model for girls with data from a single time point (Time 2). Standardized parameter estimates are reported outside parentheses and unstandardized parameter estimates are reported inside parentheses. Only significant paths ( $p < .05$ ) depicted for clarity.

Across time points, social preference at the beginning of the year was positively associated with social preference at the second time point ( $B = .620, p < .001$ ), and similarly loneliness at the beginning of the year predicted loneliness at the end of the year ( $B = .526, p < .001$ ).

Regarding mediation paths for boys, results indicated that neither beginning of the year reactive nor proactive aggression were associated with end of the year social preference, after controlling for initial levels of social preference (a paths). Similarly, social preference at the first time point did not significantly predict loneliness at the second time point (b path), and neither

Table 6

*Unstandardized, Standardized, and Significance Levels for Male Multiple Time Point Model (Standard Errors in Parentheses; N = 343)*

<i>Parameter Estimate</i>	<i>Unstandardized</i>	<i>Standardized</i>	<i>p</i>
T1 PA → T2 SP	-.03 (.23)	-.01	.888
T1 RA → T2 SP	-.17 (.15)	-.09	.269
T1 PA → T2 LSDQ	.12 (.13)	.08	.350
T1 RA → T2 LSDQ	.04 (.24)	.04	.361
T1 SP → T2 LSDQ	-.01 (.04)	-.03	.744
T1 SP → T2 SP	.63 (.06)	.62	.000
T1 LSDQ → T2 LSDQ	.55 (.11)	.53	.000
Covariance T1 PA and T1 RA	.24 (.05)	.48	.000
Covariance T1 PA and T1 SP	-.10 (.07)	-.10	.164
Covariance T1 RA and T1 SP	-.21 (.12)	-.15	.070
Covariance T1 PA and T1 LSDQ	.11 (.04)	.23	.002
Covariance T1 RA and T1 LSDQ	.24 (.08)	.34	.001
Covariance T1 SP and T1 LSDQ	-.27 (.10)	-.19	.008
Covariance T2 SP and T2 LSDQ	-.10 (.08)	-.11	.237
Treatment Status → T2 SP	.22 (.36)	.04	.554
Treatment Status → T2 LSDQ	-.22 (.24)	-.08	.361

*Note.* PA = Proactive Aggression. RA = Reactive Aggression. LSDQ = Loneliness. SP = Social Preference. T1 = Time 1. T2 = Time 2.

proactive nor reactive aggression were significantly associated with loneliness at the second time point (c' paths). Results of bootstrapping analyses indicated that social preference was not a significant mediator of the association between proactive aggression and loneliness (ab1 path;  $B = .000$ , 95% CI = -0.01 - 0.02) or reactive aggression and loneliness (ab2 path;  $B = .002$ , 95% CI = -0.01 - 0.28). See Figure 5 for a depiction of significant model paths.

**Girls.** For girls, similar results were found regarding covariances between variables within timepoints. Proactive aggression positively covaried with reactive aggression ( $B = .457$ ,  $p = .002$ ) and loneliness ( $B = .395$ ,  $p = .006$ ). Reactive aggression also positively covaried with loneliness ( $B = .280$ ,  $p = .007$ ). Social preference negatively covaried with loneliness ( $B = -.168$ ,

Table 7

*Unstandardized, Standardized, and Significance Levels for Female Multiple Time Point Model (Standard Errors in Parentheses; N = 343)*

<i>Parameter Estimate</i>	<i>Unstandardized</i>	<i>Standardized</i>	<i>p</i>
T1 PA → T2 SP	.03 (.29)	.01	.916
T1 RA → T2 SP	-.37 (.13)	-.18	.004
T1 PA → T2 LSDQ	-.12 (.16)	-.06	.455
T1 RA → T2 LSDQ	-.08 (.09)	-.07	.342
T1 SP → T2 LSDQ	-.05 (.05)	-.09	.246
T1 SP → T2 SP	.66 (.05)	.62	.000
T1 LSDQ → T2 LSDQ	.45 (.09)	.50	.000
Covariance T1 PA and T1 RA	.17 (.05)	.46	.002
Covariance T1 PA and T1 SP	-.01 (.05)	-.02	.791
Covariance T1 RA and T1 SP	-.08 (.09)	-.06	.413
Covariance T1 SP and T1 LSDQ	-.26 (.11)	-.17	.015
Covariance T1 PA and T1 LSDQ	.18 (.07)	.40	.006
Covariance T1 RA and T1 LSDQ	.22 (.08)	.28	.007
Covariance T2 SP and T2 LSDQ	-.12 (.07)	-.12	.102
Treatment Status → T2 SP	-1.26 (.36)	-.17	.001
Treatment Status → T2 LSDQ	.30 (.40)	.08	.451

*Note.* PA = Proactive Aggression. RA = Reactive Aggression. LSDQ = Loneliness. SP = Social Preference. T1 = Time 1. T2 = Time 2.

$p = .015$ ), and neither proactive nor reactive aggression covaried with social preference. At the second time point, social preference and loneliness covaried at the trend level ( $B = -.120$ ,  $p = .102$ ). Girls in the treatment status condition were less preferred by their peers at the second time point ( $B = -.172$ ,  $p = .001$ ).

Across time points, social preference at the beginning of the year was positively associated with end of the year social preference ( $B = .621$ ,  $p < .001$ ), and initial levels of loneliness were positively associated with loneliness at the end of the year ( $B = .495$ ,  $p = .000$ ).

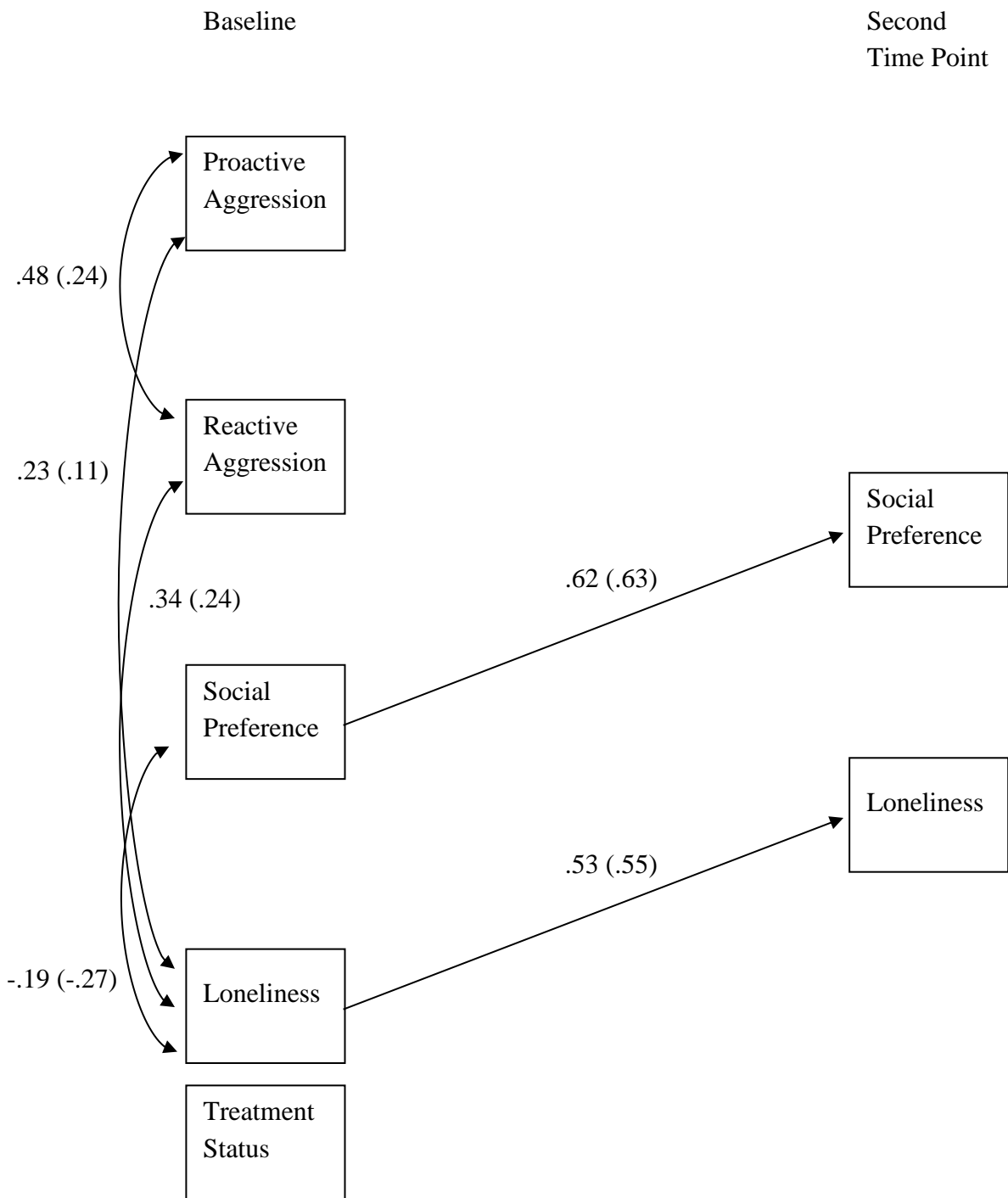


Figure 5. Path analysis model for boys with data from a multiple time points. Standardized parameter estimates are reported outside parentheses and unstandardized parameter estimates are reported inside parentheses. Only significant paths ( $p < .05$ ) depicted for clarity.

Regarding mediation paths, reactive, but not proactive, aggression at Time 1 was negatively associated with end of the year social preference (a path;  $B = -.179, p = .004$ ), indicating that girls with higher initial reports of reactive aggression were less preferred by their peers at the end of the year, after accounting for initial levels of social preference. However, initial levels of social preference were not associated with end of the year loneliness (b path), nor were initial reports of proactive or reactive aggression associated with end of the year loneliness (c' paths). Social preference was not a significant mediator of the association between proactive aggression and loneliness (ab1 path;  $B = -.002, 95\% \text{ CI} = -0.04 - 0.03$ ) or reactive aggression and loneliness (ab2 path;  $B = .020, 95\% \text{ CI} = -0.01 - 0.06$ ). See Figure 6 for a depiction of significant model paths.

### **Post Hoc Analyses**

In order to better understand the differences between the path models for boys and girls, a series of model comparisons were made to determine which direct path(s) in the model accounted for the significant difference in overall model fit between boys and girls. For each significant directional path, a structural model was analyzed where the associated parameter was constrained to be equal across gender groups. The original, unconstrained, model was then compared to the model with the constrained path to determine whether constraining the parameter to be equal for boys and girls resulted in a significant change in model fit (Little, 2012).

Results for the single time point model indicated that the association between proactive aggression and social preference at the second time point was significantly different for boys and girls ( $\Delta\chi^2(1) = 4.611, p < .05$ ). Specifically, girls who reported greater proactive aggression were

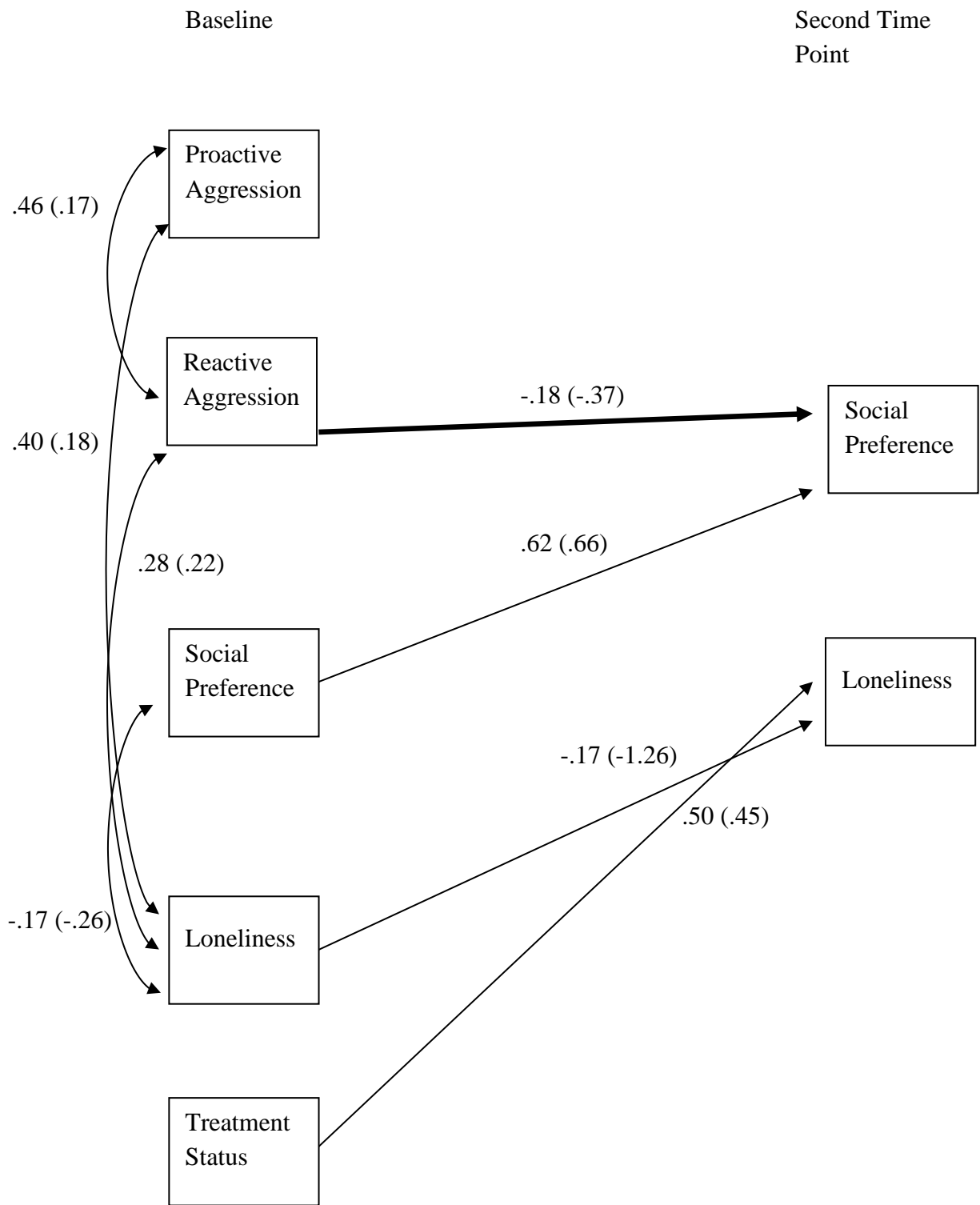


Figure 6. Path analysis model for girls with data from a multiple time points. Standardized parameter estimates are reported outside parentheses and unstandardized parameter estimates are reported inside parentheses. Only significant paths ( $p < .05$ ) depicted for clarity.



less preferred by peers, while this relationship was not found for boys. For the multiple time point model, constraining the association between treatment status and social preference at the end of the year resulted in a significant detriment to model fit ( $\Delta\chi^2(1) = 7.826, p < .05$ ), indicating that girls, but not boys, in the active treatment condition were less socially preferred at the end of the year. No other path was found to be significantly different between groups in the single time point or multiple time point models when paths were constrained to be equal between groups (see Tables 7-8).

Additional analyses were conducted to contrast the mediating effect of social preference for both boys and girls. For each significant mediation path, a variable was created that represented the difference between the mediator for boys and girls, and bootstrapping was conducted to determine the significance of the resulting difference variable (Preacher & Hayes, 2008). Results indicated that social preference was a stronger mediator of the association between proactive aggression and loneliness at the second time point for girls compared to boys ( $B = -.31, 95\% \text{ CI } -0.33 - -0.14$ ), while there were no significant differences for the mediating effect of social preference on reactive aggression and loneliness ( $B = -.04, 95\% \text{ CI } -0.06 - 0.01$ ).

Table 7  
*Single Time Point Model Comparisons of Significant Paths Constrained Across Gender*

Constrained Path	$\chi^2$	Df	$\Delta\chi^2$	$\Delta \text{df}$	p
Proactive Aggression → Social Preference	6.96	5	4.61	1	0.032
Reactive Aggression → Social Preference	2.62	5	0.26	1	0.607
Reactive Aggression → Loneliness	4.08	5	1.73	1	0.188
Treatment Status → Social Preference	4.53	5	1.74	1	0.140

Table 8

*Multiple Time Point Model Comparisons of Significant Paths Constrained Across Gender*

Constrained Path	$\chi^2$	Df	$\Delta\chi^2$	$\Delta$ df	p
Reactive Aggression → Social Preference	22.83	11	1.09	1	0.296
Treatment Status → Social Preference	29.56	11	7.83	1	0.005

**Discussion**

The purpose of the current study was to determine whether two aspects of aggression, proactive and reactive aggression, have differential impacts on psychosocial adjustment, specifically loneliness. Proactive and reactive aggression are known to be highly correlated constructs with distinct impacts on childhood adjustment, and indeed, in the current study proactive and reactive aggression were highly correlated. Reactive aggression in particular is associated with an increased risk for internalizing symptoms, and researchers (Card & Little, 2006; Fite et al., 2012) have proposed that reactive aggression leads to children being less preferred and more rejected by their peers, which contributes to the development of a negative self-concept and eventual internalizing problems. Although prior research has established that aggression is associated with loneliness (Boivin & Hymel, 1997; Boivin, Poulin, & Vitaro, 1994; Coplan et al., 2007; Prinstein, Boergers, & Vernberg, 2001; Schinka et al., 2013; Xu & Zhang, 2008), this is the first study to date examining the differential impact of reactive and proactive aggression on the development of loneliness through social preference. Although loneliness is, to some degree, a normative experience (Heinrich & Gullone, 2003), predictors of loneliness are particularly important to identify in childhood as chronic loneliness is a risk factor for the development of additional psychosocial problems, such as depression and suicidality (e.g.,

Schinka et al., 2013). The current study offers a contribution to the field in better understanding predictors of loneliness and correlates of childhood aggression.

One significant strength of the current study is that analyses were conducted both within a single time point model (Time 2) and across a multi-time point model (Times 1 and 2), a significant advantage over previous research limited to a single time point (Xu & Zhang, 2008). Further, another strength of this study was the use of multiple informants in data collection. Participants represented a wide range of socioeconomic levels and data were collected from a number of different schools, increasing the generalizability of results.

Results of descriptive data analyses indicated that boys and girls differed in their reported mean levels of aggression and loneliness, where boys reported higher levels of proactive and reactive aggression, while girls reported higher levels of loneliness. This is consistent with previous research on aggression showing that boys tend to engage in more aggressive behavior, particularly overt aggression, than girls (e.g., Achenbach & Rescorla, 2011; Card, Stucky, Sawalani, & Little, 2008). Additionally, although research is somewhat divided as to whether there are gender differences in mean levels of loneliness (Weeks & Asher, 2011), some researchers assert that measures which explicitly use the word “lonely” in test items, such as items on the LSDQ, result in higher reported levels of loneliness in girls (Heinrich & Gullone, 2006).

The overall study goal was broken down more specifically into three aims: (1) to determine whether proactive and reactive aggression are differentially associated with loneliness, (2) whether social preference acts as a mediator on that association, and (3) whether the associations between variables vary as a function of gender.

### **Aim 1: Aggression and Loneliness**

Initial hypotheses received partial support from the data analyses; however, results varied based on whether initial reported levels of social preference and loneliness were accounted for and based on gender. As predicted, higher levels of reactive aggression were associated with greater reported loneliness but, contrary to predictions, this association only existed in the single time point model and was significant only at the trend level for girls. Once pre-existing levels of loneliness are accounted for, reactive aggression no longer accounted for a significant portion of the variance in loneliness. This may be due in part to the stability of the loneliness construct in the current sample; after preexisting levels of loneliness were accounted for, little variance remained to be explained.

### **Aim 2: Social Preference as a Mediator**

The second aim of the current study, that social preference mediates the association between reactive aggression and loneliness, again received partial support from analyses. In looking at the component mediation paths (e.g., a, b paths), children with higher levels of reactive aggression were less preferred by their peers. For boys, this association existed only at the second time point while for girls, this association was seen across time points, accounting for initial levels of social preference. Interestingly, this association was not unique to reactive aggression. Girls who reported greater levels of proactive aggression were also less preferred by their peers, although this association no longer existed after accounting for pre-existing levels of social preference. This is contrary to previous research, which indicates that reactive aggression is associated with being less preferred by peers, greater social problems, and greater peer rejection in comparison to proactive aggression (Card & Little, 2006).

When examining the association of social preference and loneliness, similar patterns emerge. As found in previous research (Cassidy & Asher, 1992; Crick & Ladd, 1993; Nangle et al., 2003), children who were more preferred by their peers were less lonely, although again, this relationship did not hold when accounting for initial levels of both social preference and loneliness. This is contrary to previous research demonstrating that children with greater social problems were more likely to develop loneliness over time (e.g., Schinka, 2013).

In support of Aim 2, social preference mediated the association between reactive aggression and loneliness for boys; however, this mediating effect was not found after accounting for initial levels of social preference and loneliness. Surprisingly, social preference was also a mediator of the association of proactive aggression and loneliness for girls, again within the second time point only. These findings are similar to Coplan and colleagues (2007) study, which found that social preference mediated the association between aggression and loneliness, but operated slightly differently for boys versus girls.

### **Aim 3: Role of Child Gender**

Finally, support was found for the third aim of the study: the overall model of aggression, social preference, and loneliness varies as a function of gender. In particular, girls with higher levels of proactive aggression were less preferred by their peers, unlike boys. This may be related to the particular measure used in the current study. The Dodge and Coie (1987) aggression measure taps into differences between proactive and reactive aggression; however, the specific item content is more heavily focused on overt, as opposed to relational aggression. Overt aggression is considered to be a more gender non-normative form of aggression for girls, and has previously been found to be associated with poorer psychosocial outcomes for girls

(Crick, 1997). The focus on gender non-normative overt aggression may explain why proactive aggression related to social preference for girls, and why social preference was a mediator of the association between proactive aggression and loneliness for girls. Future studies should further examine this potential gender difference by using a measure that examines both form (overt vs. relational) and function (proactive vs. reactive) of aggression, such as Little, Heinrich, Jones, and Hawley's (2003) Forms and Functioning of Aggression measure.

Gender differences were also found in the relation of treatment group status on end of the year social preference scores. Treatment status (i.e., whether individuals received a mentoring intervention during the school year) was included in the current study in order to control for the effects of intervention on social preference and loneliness, not to examine the effectiveness of the intervention. Future studies will be conducted to more thoroughly examine why girls who received the treatment were less preferred by their peers over the course of the school year.

### **Limitations and Future Directions**

**Measurement of Aggression.** The current study utilized a short, self-report form for assessing proactive and reactive aggression, which was originally intended to be completed by teachers (Dodge & Coie, 1987). Although previous studies found acceptable internal consistency when children completed this measure (e.g., Fite et al., 2011; Fite, Stoppelbein, et al., 2009), the results from the current study yielded lower estimates of internal reliability, particularly at the initial timepoint. Low internal consistency may have attenuated relations between aggression and other constructs assessed in this study. In particular, this may have impacted the ability to find significant results in the multi-time point model, as this relied on proactive and reactive aggression data from the beginning of the year. Therefore, results from

the current study should be replicated to ensure that the findings truly reflect the associations between proactive and reactive aggression, social preference, and loneliness over time, and are not an artifact of measurement problems.

Additionally, aggression in the current study was infrequently endorsed, which may have led to difficulties determining correlates of proactive versus reactive aggression. It is possible that children preferred to present themselves in a positive manner or were unaware of their aggressive behaviors. Self-report can be particularly useful in studies of proactive and reactive aggression, as outsiders may be unaware of the motivation behind a behavior, and therefore may be unaware of whether aggression is proactive or reactive. However, as aggression was infrequently endorsed, it may be useful to obtain multiple measures of proactive and reactive aggression, such as self and teacher report.

**Timing of Measurement.** Although the current study sought to examine factors that may contribute to a change in social preference and loneliness over time, these variables were fairly stable in the current study. It is possible that the reason few significant findings emerged in the multiple time point model is because after accounting for pre-existing levels of social preference and loneliness, little variance remained to be explained. This may be due, in part, to the relatively short length of time between measurement occasions (6 months). It is possible that the development of internalizing symptoms from aggression occurs over a longer timespan than a single academic year. For example in Schinka and colleagues' (2013) study of trajectories of loneliness over time, initial report of aggression predicted later trajectories of loneliness at ages 9, 11, and 15, 2-8 years after initial assessment of aggression.

Additionally, it would have been ideal to test mediation using data collected at three timepoints, allowing for the assessment of whether proactive or reactive aggression is associated with an increase in social preference over time, and whether social preference then leads to a later increase in loneliness. Although the half-longitudinal model used in the current study approximates this path, it relies on the assumption that the associations observed between variables would continue across time, and are not due to cohort effects. Additional research using three or more time points is needed to determine whether social preference truly mediates the aggression- loneliness association.

## **Conclusion**

Results of the current study found partial support for the central hypothesis: that social preference mediates the associations between reactive and proactive aggression and loneliness. Support was found for examining these models separately for boys and girls, and contrary to predictions, social preference mediated the association with reactive aggression only for boys, while social preference was a mediator for proactive aggression with girls. Furthermore, the majority of the significant associations between aggression, loneliness, and social preference were nonsignificant once pre-existing levels of loneliness and social preference were accounted for. This indicates that while aggression is associated with social preference and loneliness, it may not predict a change in social preference or loneliness over the course of an academic year. Overall, results of the current study support previous research in predictors of loneliness and correlates of proactive and reactive aggression.



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## Appendix A

### Measurement of Loneliness

1. I feel alone.
2. I feel left out of things.
3. I don't have anyone to play with.
4. It's hard to get other kids to like me.
5. I'm lonely.
6. It's hard for me to make friends.

## Appendix B

### Measurement of Proactive Reactive Aggression

1. When I am teased or threatened, I get angry easily and strike back.
2. I feel that other kids are to blame in a fight. I feel they started the trouble.
3. When a kid hurts me on accident (such as bumping into me), I think they meant to do it. I then react with anger or fighting.
4. I get other kids to gang up on somebody that I do not like.
5. I use physical force (or threaten to use physical force) in order to dominate other kids.
6. I threaten or bully other kids to get my way.

## Appendix C

### Other Peer Nomination Items

1. Who in your class bullies other children by hitting, kicking, pushing or shoving?
2. Who in your class bullies other children by gossiping, telling lies, or spreading rumors?
3. Who in your class gets hit, kicked, pushed, or shoved by other children?
4. Who in your class gets gossiped about or has rumors spread about them?
5. Who in your class gets along best with the teacher?
6. Who in your class doesn't get along well with the teacher?
7. Who in your class has few friends?
8. Who in your class looks lonely?

These items were administered during data collection but were not used in the current study.