AN EXAMINATION OF THE RELATIONSHIP BETWEEN THE POSITIVE ILLUSORY BIAS AND THE SUBTYPES OF AGGRESSION ACROSS TIME: A MULTI-METHOD PERSPECTIVE

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ABSTRACT

The goal of the current study was to examine the relationship between the positive illusory bias and the subtypes of aggression in a sample of aggressive children (n = 120) across three time points using multiple informants. In addition, a methodological question was explored by using difference and residual scores of the bias to examine its relationship with proactive and reactive aggression. While difference scores have traditionally been calculated to represent the bias, more recently, residual scores have been used (White & Kistner, 2011). To date, no study has examined whether unique findings emerge if the bias score is represented by a difference versus a residual score. To address these goals, four cross-lagged autoregressive models were estimated, including teacher and peer-informed difference and residual models. Finally, the relationship between the positive illusory bias and specific social cognitive biases related to the subtypes of aggression was examined.

Results from the teacher-informed difference model indicate that the positive illusory bias predicts proactive and reactive aggression across time controlling for within-time associations among constructs. In this sample, the residual scores did not seem to accurately represent the bias, and therefore, there was no support for using a residual score to examine the positive illusory bias. Lastly, the hostile attribution bias, a social cognitive bias associated with reactive aggression, was found to predict the positive illusory bias during elementary school, but not during transition to middle school.

DEDICATION

This thesis is dedicated to my parents. I am eternally grateful for the example that they set for me and the unconditional and endless support they have provided.

LIST OF ABBREVIATIONS AND SYMBOLS

CI	Confidence Interval
CFI	Comparative Fit Index: Relative fit index
RMSEA	Root Mean Square Error of Approximation: Absolute fit index
TLI	Tucker-Lewis Index: Relative fit index
p	Probability associated with the occurrence under the null hypothesis of a value as extreme as or more extreme than the observed value
t	Computed value of *t* test
x^2	Chi-square: statistical fit index
<	Less than
=	Equal to

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Chapter 1: Introduction

Childhood aggression is a serious and widespread problem, accounting for half of all child referrals for mental health services (Nelson & Finch, 2000). It has been associated with a number of negative outcomes including delinquency, substance abuse, conduct problems, academic difficulties, and poor adjustment. Problems associated with aggression in childhood often continue into adulthood, causing this behavioral characteristic to be a major concern for researchers and clinicians (Tremblay, 2000). Furthermore, the negative impact of aggressive behavior affects not only the aggressor but his/her victims along with society as a whole. In the school setting, children who engage in aggressive behavior can be a significant distraction. In addition to disrupting the learning environment, there is a threat of physical and psychological harm (Larson & Lochman, 2011).

Social Information Processing and Aggression

There are a number of factors associated with the development and maintenance of aggression, one of which is a specific pattern of social-cognitive processes. The way in which children evaluate and process social information can influence their behavior. Crick and Dodge (1994) proposed a social information processing (SIP) model comprised of six steps that children follow when faced with a social situation. During the first step, encoding, it is hypothesized that children selectively attend to particular external and internal cues. Based on the encoding of those cues, an interpretation of the event is constructed. Knowledge based on previous experience and causal inferences guide the interpretation and understanding of the social situation. During the remaining four steps, children process the social information that has been

gathered. This includes selecting a desired outcome, accessing from memory or constructing new possible responses, selecting a response, and finally enacting the chosen response. Research suggests that biased and deficient processing leads to an aggressive response (Dodge & Crick, 1990).

In a study conducted by Dodge and Tomlin (1987), children were presented with hypothetical provocation situations along with information about the intent of the peer in each situation. Participants were asked to infer the intent of the provocateur, allowing researchers to assess whether children rely on information presented in the story or information from their own previous experiences (i.e., schemata). Results emerged indicating that aggressive children, compared to their non-aggressive peers, were more likely to rely on their own schemata when formulating an interpretation. Additionally, when interpreting social situations aggressive children have been found to use fewer social cues than their non-aggressive peers (Dodge & Newman, 1981). As a result of these studies, it has been suggested that during the encoding stage, aggressive children selectively attend to particular social cues and rely on a well-developed schemata which prevents them from using immediate social cues (Crick & Dodge, 1994).

In a laboratory-based study, the interpretation step was examined by setting up an ambiguous situation, having it appear that a confederate knocked down blocks that the participant built. Findings from this study suggest that aggressive children attributed hostile intent to the peer more often than their non-aggressive peers. It is believed that aggressive children tend to have a hostile attribution bias, that is, when faced with an ambiguous situation they tend to assume malicious intent. The social information processing literature suggests that

aggressive children perceive and interpret social situations in a way that increases the likelihood of responding aggressively (Crick & Dodge, 1994; 2006).

Biased Self-Perceptions and Aggression

Related to how aggressive children appraise and process a social situation is how they perceive their own social competence. Rejected-aggressive children have been shown to overestimate their own peer acceptance in relation to others' reports of their social status (Hymel et al., 1993; David & Kistner, 2000; Hoza et al., 2010). Although overestimating is most common, rejected children who significantly underestimate their social competence also have been shown to display higher levels of aggression (White & Kistner, 2011). While aggressive children who are overestimators tend to report that they are socially competent and accepted by their peers, their peers often tell a very different story. This discrepancy between the self-view and peer reports has been described as a positive illusory bias, or inflated self-view. Interestingly, aggressive children who are rejected, as compared to aggressive or rejected only children, engage in more severe antisocial behavior (Lochman & Wayland, 1994). Additionally, research has shown that a bi-directional relationship exists between aggression and peer rejection (Coie & Dodge, 1983; Cillessen, 1992). Therefore, aggression can lead to peer rejection, which in turn, can trigger further aggression.

There could be possible benefits and costs to the child who overestimates their status. The relationship between aggression and peer rejection has caused researchers to question whether the positive illusory bias might offset some of the negative consequences of peer rejection. Significant debate has arisen over the utility of an inflated view of oneself. Some researchers posit that the presence of a positive illusory bias is adaptive, allowing for psychological well-being (Taylor, 1989). Proponents of the positive illusory bias as an adaptive

feature argue that if we boost self-concepts then symptoms of depression and levels of aggression can be decreased (Cairns & Cairns, 1988). However, there is no empirical evidence to date that indicates fostering a false sense of competency will contribute to psychological adjustment. On the other side of the debate, researchers argue that there is no adaptive quality associated with an inflated self-view (Ackermann & DeRubeis, 1991). In fact, a number of recent studies have examined whether there are negative consequences associated with maintaining an inflated self-view. This direction of research grew out the threatened egotism literature introduced by Baumeister and colleagues (1996).

Baumeister et al. (1996) argued against the idea that aggression is associated with low self- esteem, proposing instead that people with overly positive self- perceptions were prone to engage in aggressive behavior. However, there are mixed findings regarding whether self-esteem is associated with aggression. Barry and colleagues (2007) found that narcissism, not self- esteem, was related to aggression. Narcissism and high self-esteem seem to be separate constructs, operating differently especially during the preadolescent age period. Still, it is possible that interventions aimed at increasing a child's positive self-view to reduce aggression could potentially have the opposite effect of increasing aggression. The rationale underlying the proposed relationship between highly positive self-perceptions and aggression is that inflated beliefs about one's own competence might be the most prone to challenges by others. When a favorable view of the self is challenged, people might respond against the threat in order to avoid having to change a positive view of oneself.

It is common for young children to hold positively biased self-perceptions, believing that they are good at doing almost everything (David & Kistner, 2000). This view is not considered a distortion of reality; instead it is believed that young children do not have the cognitive abilities

to logically evaluate their abilities (David & Kistner, 2000). However, by eight years old, children's self-perceptions begin to coincide with objective raters (Berndt & Burgy, 1996). Yet, there is a subset of children who maintain an overly positive self-perception. David and Kistner (2000) explored Baumeister's hypothesized link between the inflated self-view and aggression among elementary school children. Perceptual bias was measured by regressing the participants' perceived acceptance onto their actual acceptance. Results indicate perceptual bias significantly predicts peer-nominated aggression, offering support to Baumeister and colleagues' (1996) hypothesis that increases in a positively skewed self-view are associated with greater levels of aggressive behavior.

Further evidence of the negative effects of an inflated self-perception is offered by Hoza and colleagues (2010). In a study examining change in positively biased self-perceptions, findings suggest a cyclical pattern where aggression predicts increases in positively biased self-perceptions and these biased self-perceptions predict increases in aggression over time. In addition, Hoza et al. (2010) examined the relationships between biased self-perceptions and symptoms of depression. The findings of this study did not support the notion that biased self-perceptions are protective against depressive symptoms. Taken together, the results of this study lend further support to the belief that biased self-perceptions are maladaptive.

Biased Self-Perceptions and Subtypes of Aggression

Considering the negative consequences of an inflated self-view, it is important to gain a better understanding of the relationship between the positive illusory bias and aggression. One direction researchers have started to pursue is the relationship between the positive illusory bias and two distinct types of aggression, reactive and proactive aggression. There are inconsistent findings regarding whether the positive illusory bias is uniquely related to reactive versus

proactive aggression. In a sample of eight to twelve-year-old Dutch children, sociometric data on peer perceived social competence and reactive and proactive aggressive behavior were collected (Orobio de Castro, Brendgen, Van Boxtel, Vitaro, & Schaepers, 2007). Self- perceived social competence was measured by the Social Acceptance subscale of the Dutch version of Harter's Self-Perception Profile for Children (Harter, 1985). Standardized residual scores, computed by regressing children's self-perceived social competence on their peer perceived social preference score, were used to operationalize children's overestimation of their social competence. Results emerged supporting a relation between aggressive behavior and overestimation in rejected children. This relation was specific to proactive aggression. An additional study was conducted with Canadian children, this time with the parent as the informant on reactive and proactive aggression. Results from this study, despite a culturally different sample and multiple informants, supported the previous findings. That is, a biased self-perception in rejected children is related to aggressive behaviors, specifically proactive aggression.

In a study conducted by White and Kistner (2011), the findings were contradictory to those of the Orobio de Castro et al. findings. In a sample of children in the fourth through seventh grade, self- perceived social competence was measured by the Self-Perception Profile for Children (SPPC; Harter, 1985). Proactive and reactive aggression along with social acceptance was measured by teacher ratings. Similar to the Orobio de Castro study, residual scores were used to represent the bias of a child's self-perceptions. In line with previous research, findings from this study suggest that rejected children who overestimate their social status engage in higher levels of aggression. However, this relationship was found to be unique to reactive rather than proactive aggression. There are a number of possible explanations for

these incongruent findings. Most notably, in the Orobio de Castro et al. study peer informants were used to report on peer perceived social competence and aggression, whereas, the White and Kistner study relied on teacher reports of the participants' social competence and levels of aggression. It is possible that teachers and peers have different experiences with the aggressive behaviors they witness, therefore contributing to different results. More specifically, there is research to support that teachers can be less aware of proactive aggression such as bullying (Pepler et al., 2006). Additionally, cultural differences could account for the discrepant results.

Proactive and Reactive Aggression

The association between proactive versus reactive aggression and the positive illusory bias could provide information about the cognitive processes related to the bias. A child engaging in proactive aggression could be described as deliberate and purposeful, whereas, a child displaying reactive aggression might seem angry and impulsive. A theoretical distinction has been made between the subtypes of aggression. Proactive aggression is grounded in the social-learning model of aggression, which posits aggressive behavior is learned through observing and imitating an aggressive model. The reliance on aggressive behavior is then strengthened and maintained through experiencing desirable outcomes as a result of the behavior (Bandura & Cervone, 1983). Children engage in proactive aggression in order to achieve a goal. In contrast, reactive aggression is a response to real or perceived provocation. Reactive aggression has its roots in frustration-aggression theory, which suggests that negative experiences lead to aggressive tendencies (Berkowitz, 1989).

Previous research has empirically demonstrated distinct behavioral and social correlates and developmental outcomes of proactive and reactive aggression. While there are distinct correlates of each subtype of aggression, the correlation between reactive aggression and

proactive aggression ranges from .70 to .85. This does not discount the distinction between the subtypes of aggression; instead, it suggests that proactive and reactive aggression often co-occur at varying degrees within the same children. Proactive aggression has been associated with juvenile delinquency, deviant friends, and a family history of substance abuse and violence. Compared to reactive aggression, proactive aggression is associated with higher levels of social skills and peer acceptance. On the other hand, reactive aggression has been associated with anger, peer rejection, poor social skills, hyperactivity, social withdrawal, depression, and harsh parenting (McAuliffe et al., 2007).

Research examining the social-cognitive correlates of proactive and reactive aggression indicates distinct cognitive processes underlying the subtypes of aggression. Proactive aggression is associated with a positive outcome expectation of aggression (Lochman & Dodge, 1994). Children engage in proactive aggression to influence or coerce others, believing they can attain a goal through their behavior. Considering the planning required to successfully engage in proactive aggression, it is not surprising that compared to reactive aggression it is less associated with social cognitive deficits. In fact, a study conducted by Ellis and colleagues (2009) found that specific social information processes and executive functions related to behavior problems are associated specifically with reactive aggression. A hostile attribution bias is specifically linked to reactive aggression.

Purpose and Hypotheses

Research suggests that aggression predicts increases in positively biased self-perceptions and positively biased self-perceptions predict increases in aggression over time (Hoza et al., 2010). The current study seeks to further contribute to the literature on bidirectional influences of aggression and biased self-perceptions by exploring whether the relationship is specific to one

subtype of aggression (reactive vs. proactive). Although previous studies have investigated whether overestimation of social competence predicts the development of a specific subtype of aggression, findings were inconsistent (Orobio de Castro et al., 2007; White & Kistner, 2011). Prior research on the subtypes of aggression may inform our understanding of the behavioral characteristics and cognitive processes of children who display a positive illusory bias. Given the inconsistencies in the literature, the overall goal of the present study is to address limitations of previous research. To date, no previous studies have examined the relationship between positively biased self -perceptions and the subtypes of aggression using multiple informants. Latent constructs will be created to evaluate whether a specific subtype of aggression is uniquely related to the positive illusory bias.

The *first aim* of the present study is to determine whether the positive illusory bias construct in the latent model is adequately formed by the indicators. This will allow for the exploration of whether concordance occurs between peer and teacher reports of children's social status. Studies that examined multiple methodologies for assessing child and adolescent social behavior found peer and teacher reports to be the best sources of information (Bierman, 2004). However, the use of peer versus teacher data is a possible explanation of the inconsistent findings of whether positively biased self-perceptions relate to reactive or proactive aggression.

If adequate concordance, without excessive multicollinearity, between the indicators of the latent positive illusory bias construct is demonstrated, then the second aim of the study will be addressed. The *second aim* of the present study is to assess whether a specific subtype of aggression predicts change in positively biased self-perceptions over time and/or whether positively biased self-perceptions predict change in a specific subtype of aggression through structural equation modeling. Since previous research suggests that the positive illusory bias

occurs to a greater extent in children with ADHD, hyperactivity will be included in the model as a proxy to control for the influence of ADHD (Hoza et al., 2002). It is hypothesized that the positive illusory bias will be uniquely associated with reactive aggression. Characteristics such as poor social skills, peer rejection, and anger, which seem to be associated with children who display the positive illusory bias, are consistent with reactive aggression.

In addition, several research questions will be explored. The *third aim* of the study is to explore gender differences. There is some evidence to suggest that proactive and reactive aggressive patterns can lead to different outcomes for males versus females; with females at increased risk for internalizing and males at an increased risk for externalizing problems (Pulkkinen, 1996). *The fourth aim* of the study is to explore a methodological issue, comparing the validity of using difference versus residual scores as indicators of overestimation. In the previous studies that have explored the relationship between inflated self-views and subtypes of aggression, residual scores were used to represent overestimation. Residual scores are computed by regressing children's self-perceived social competence on their peer or teacher perceived social preference score. Difference scores are calculated by subtracting teacher or peer reports of participants' competence from children's own self-reported competence score. Some researchers argue that residual scores are advantageous over difference scores because residual scores provide a basis for comparing the assessment of other-rated and self-perceived acceptance (Brendgen et al., 2004; Orobio de Castro et al., 2007; White & Kistner, 2011). Proponents of difference scores argue that residual scores are almost completely predicted by the other-rater variable, whereas the difference score is correlated equally with each of the informants' ratings from which is was created (De Los Reyes & Kazdin, 2004). Examining the data using residual

and difference scores may indicate whether different methods of calculating overestimation offer unique information.

A *final aim* will investigate how social cognitions are related to inflated self-views and the positive illusory bias. Consistent with the social information processing model, children who display reactive aggression tend to display a hostile attribution bias and children who display proactive aggression tend to hold positive expectations of aggressive behavior (Lochman & Dodge, 1994). No research has directly investigated the role that the hostile attribution bias and outcome expectations may play in contributing to the positive illusory bias in aggressive youth.

Chapter 2: Methodology

Design

Data come from a longitudinal study, funded by the Centers for Disease Control and Prevention, examining the effectiveness of the abbreviated Coping Power Program (Lochman, Boxmeyer, Powell, Roth, & Windle, 2006). The Coping Power Program is a preventative intervention designed to reduce youth violence and other antisocial outcomes (Lochman & Wells, 2004). The present study utilized data collected annually over four years. The participant and procedural information that follows is based on information as originally reported by Lochman et al. (2006).

Participants

Participants were 240 children in the fourth grade. In the original study, participants were identified on the basis of being rated by teachers and parents as having high levels of aggressive and disruptive behaviors. They were randomly assigned to one of three groups: Coping Power Program (total N = 60), Coping Power plus Booster (total N = 60), or Untreated Comparison (total N = 120).

The present study will only include analyses of the untreated comparison group (N = 120). This will prevent intervention effects from confounding the results of the current study. These children are spread across three cohorts, each assessed at the same grade level. Sixty-nine percent of the participants self-identified as African American, 30 percent as Caucasian, and one percent as other race or ethnicity. Sixty percent of the children were male and 40 percent female.

Procedure

Children were recruited from seven city and county public schools in Tuscaloosa, Alabama. Teachers were asked to rate all of the children in their classroom using the Proactive and Reactive Behaviors Scale (Dodge & Coie, 1987). Based on these ratings, participants were selected who were rated as being the top 30 percent most aggressive children across all classes. Informed consent from the parents and assent from the children were required for participation. Screening occurred during April of Grade 4, and baseline assessments were administered shortly after for each cohort. Time 2 assessments were administered at the end of 5th grade, time 3 during 7th grade, and time 4 during 8th grade. Data were collected from child participants at each time point in the child's home or at the research office by trained research assistants. Similarly, research assistants met with the primary caretaker at the participant's home or at the research office. Peer nominations of children's liking and disliking of each target child were completed during the spring in the school setting. Consent and assent was obtained for participation in the sociometric data collection.

Measures

Child Attribution Measure. The Child Attribution Measure (Dodge, Pettit, McClaskey & Brown, 1986) has been used to assess cue utilization deficiencies (oversensitivity to hostile cues, underawareness of prosocial cues) and attributional biases through children's responses to vignettes of peer provocations and conflicts with authority. This measure is composed of the following scales: Average Attribution, Mad, Blame Self/Other, and Frequency of Happening (for both adult-child and child-child interactions).The measure is comprised of four vignettes, and each vignette is followed by four questions. Each question within the vignette contributes to one of the four scales. The scale most relevant for this study is the attribution scale, in which high

scores indicate angry attribution. The items are scored on a three-point scale, ranging from 0 (the negative event in the scenario was an accident) to 3 (the negative event was perpetrated on purpose).

Perceived Competence Scale for Children (PCSC). The Perceived Competence Scale for Children (PCSC) consists of 36 items assessing children's perceptions of cognitive competence, academic competence, social competence, athletic competence, physical appearance, behavioral competence, and general self-worth (Harter, 1985). The social competence subscale is most relevant to the current study. The social competence subscale, comprised of seven items, is a measure of peer acceptance with questions regarding having friends, being easy to talk to, and doing things with their peers. The items are scored on a four-point scale, ranging from 1 ("Not Very Competent") to 4 ("Very Competent"). Silon and Harter (1985) documented good internal consistency, ranging from .75 to .86, and test – retest reliability, ranging from .78-.87 for nine months.

Outcome Expectation Questionnaire (Perceived Consequences). The Outcome Expectation questionnaire, adapted from the OE (Perry, Perry, & Rasmussen, 1986), consists of 12 vignettes in which participants are asked to imagine that they engage in a behavior toward a peer and then report their level of confidence that a particular consequence (e.g., tangible rewards, reduction of aversive treatment) would follow. Scores on this measure ranged from 1 to 4, with lower scores signifying participants' expectations that a desirable outcome would result from aggressive behavior. Perry et al. (1986) provided evidence of validity for the vignettes used in this study by demonstrating aggressive youth were more likely than their non-aggressive peers to expect that their aggressive behavior would enable them to reduce aversive behavior and obtain tangible rewards.

Peer Nominations. Children are asked to nominate classmates who they 'like most' and 'like least' from a class roster. The children could nominate as many or as few classmates as they felt fit the category. This unlimited nominating procedure allows for a greater range of values to be obtained and measurement error is reduced (Terry & Coie, 1991). Previous research has indicated that in order for peer nomination data to be reliable, at least 40% participation in the classroom is required (Terry, 1987). Therefore, data were only collected from classrooms where the 40% participation rate was achieved. The number of nominations a child receives is standardized within classroom. A social preference score is calculated by subtracting the standardized 'like least' nominations from the standardized 'like most' nominations.

Teacher Observation of Classroom Adaptation-Revised (TOCA-R). The Teacher Observation of Classroom Adaptation- Revised measure consists of 16 behavioral items that teachers complete for the children in their classroom (Schwartz, 1991). The social competence subscale, made up of 3 items, is most relevant to the current study. The items are scored on a six- point scale, ranging from 0 ("Almost Never") to 5 ("Almost Always").

Reactive and Proactive Aggression Teacher Version. The teacher-rating scale has been developed from the parent-rating scale of reactive and proactive aggression (Kempes et al., 2006). The teacher version consists of 22 items measuring proactive and reactive aggression. The items are scored on a 5-point scale, ranging from 1 ("Never True") to 5 ("Almost Always True").

Behavior Assessment System for Children – Teacher Rating Scales (BASC-TRS). The BASC-TRS is a behavior problem checklist completed by children's teachers. The BASC Teacher Rating Scale yields scores on 10 clinical syndromes: aggression, anxiety, attention problems, atypicality, conduct problems, depression, hyperactivity, learning problems,

somatization and withdrawal. The BASC also contains four scales assessing positive traits: adaptability, leadership, social skills, and study skills. The hyperactivity subscale is the most relevant to this study, and is comprised of 13 items. The items are scored on a four-point scale, ranging from 0 ('Never') to 3 ('Almost Always"). Previous research has demonstrated strong construct validity of this measure. It has also been found to correlate strongly with counterpart subscales on the Achenbach Teacher Report Form (Reynolds & Kamphaus, 2002).

Perceptual Bias Difference Score. Two self- perceptual bias difference scores will be calculated, one using peer report of social competence (standardized social preference score) and the other using teacher report of social competence (TOCA-R score). Bias scores relative to teacher reports will be calculated by subtracting teacher reports of participants' social competence from the participants' own self-reported social competence. Bias scores relative to peer reports will be calculated by subtracting peer reports of participants' social competence from the participants' own self-reported social competence.

Perceptual Bias Residual Score. Similar to the difference scores, two residual scores will be calculated utilizing multiple informants. The perceptual bias residual score relative to teacher reports will be calculated by regressing each child's perceived competence score (PCSC score) onto his or her teacher-rated social competence score (TOCA-R score) and separately onto his or her peer-rated social competence score (standardized social preference score). The remaining variance for each score will be saved as a standardized residual score to represent the bias of a child's self-perceptions. Positive residual values will signify an inflated view of social competence relative to either teacher ratings or peer ratings of the child's social competence.

Chapter 3: Results

Preliminary Analyses

Initial analyses of the path model produced unstable estimates, most likely due to small sample size. As a result, all analyses were conducted using time points 1, 2, and 3. For the analyses explained below, Time 1 is the Fall of Grade 5, Time 2 is the Spring of Grade 5, and Time 3 is Grade 7.

Table 1 shows the means, standard deviations, skewness, and kurtosis of the study variables, and Table 3 presents their correlations. An examination of these correlations revealed that teacher report of reactive and proactive aggression was correlated within and between constructs across almost all time points. Proactive and reactive aggression were negatively correlated at all time points with teacher report of child social competence, and within time point with the standardized social preference score. No significant correlations emerged between the subtypes of aggression and self-report of peer competence.

Self-report of peer competence within construct was correlated across all time points. Self-report of peer competence (PC) time 1 was correlated with teacher report of social competence (SC) at times 1 and 2, PC time 2 did not correlate with SC, and PC time 3 correlated with SC at times 1 and 2. Peer competence (PC) time 1 correlated at all time points with the social preference score (SP), and PC time 3 correlated with SP times 1 and 2. Peer reported social preference scores were correlated at the majority of time points with proactive and reactive aggression. Social preference scores and teacher reported social competence scores were correlated across all time points within and between constructs.

Table 1
Study Variable Descriptives

	Mean	Std. Deviation	Skewness	Kurtosis
Peer Comp T1 (PC1)	2.74	.55	-.190	-.190
Peer Comp T2 (PC2)	2.73	.55	-.355	-.355
Peer Comp T3 (PC3)	2.90	.53	-.734	-.734
ProactiveT1 (PA1)	2.08	1.04	.918	.918
Reactive T1 (RA1)	2.53	1.25	.545	.545
Proactive T2 (PA2)	2.22	1.05	.650	.650
Reactive T2 (RA2)	2.63	1.14	.268	.268
Proactive T3 (PA3)	1.93	.88	.930	.930
Reactive T3 (RA3)	2.36	1.00	.551	.551
ZSP T1 (SP1)	-.44	1.07	-.174	-.174
ZSP T2 (SP2)	-.41	.95	-.029	-.029
ZSP T3 (SP3)	-.35	.79	.320	.320
Social Comp T1 (SC1)	-1.82	1.15	-.238	-.238
Social Comp T2 (SC2)	-1.87	1.28	-.233	-.233
Social Comp T3 (SC3)	-1.72	1.11	-.556	-.556

Table 2

Study Variable Correlations

Variable	PC1	PC2	PC3	PA1	RA1	PA2	RA2	PA3	RA3	SP1	SP2	SP3	SC1	SC2	SC3
1.PC1	-----														
2.PC2	.37**	-----													
3.PC3	.37**	.60**	-----												
4.PA1	-.03	.07	.05	-----											
5.RA1	-.09	.07	.01	.90**	-----										
6.PA2	-.07	-.08	-.10	.70**	.63**	-----									
7.RA2	-.14	-.12	-.15	.66**	.69**	.90**	-----								
8.PA3	.01	-.01	-.05	.21*	.16	.29**	.30**	-----							
9.RA3	-.04	-.04	-.14	.27**	.23*	.35**	.37**	.90**	-----						
10.SP1	.22*	.04	.14	-.30**	-.42**	-.26**	-.31**	-.18	-.21*	-----					
11.SP2	.28*	.21	.36*	-.21	-.32**	-.23*	-.33**	-.17	-25*	.74**	-----				
12.SP3	.21	.05	.04	-.12	.17	-.19	-.15	-.28*	-.31*	.47**	.30*	-----			
13.SC1	.22*	.19	.25*	-.50**	-.60**	-.55**	-.57**	-.33**	-.35**	.57**	.52**	.48**	-----		
14.SC2	.30**	.19	.30**	-.39**	-.47**	-.59**	-.65**	-.36**	-.40**	.56**	.52**	.44**	.77**	-----	
15.SC3	.17	.08	.18	-.31**	-.34**	-.42**	-.43	-.59**	.62**	.36**	.39**	.47**	.53**	.58**	-----

Note. ** indicates correlation is significant at the .01 level; * indicates correlation is significant at the .05 level

Finally, males versus females, and African American versus other ethnicity were compared to see if any significant differences emerged. Independent samples t-tests were conducted for each pair of possible covariates across all time points. Only 5 of the 36 t-tests were significantly different: reactive aggression at time1, reactive aggression at time 3, teacher informed residual bias score at time 3, and peer informed residual bias score at time 3 for males versus females, reactive aggression time 1 for African American versus other ethnicity. Due to the relatively few differences and the small sample size of other ethnicity, no further analyses were conducted. Separate models for males and females were estimated.

Bias Score Analyses

Table 3 shows the means, standard deviations, skewness, and kurtosis of the four created bias scores for each time point, and Table 4 presents their correlations, including correlations with reactive and proactive aggression. The subtypes of aggression were positively correlated with the teacher informed difference score at all time points. Proactive and reactive aggression at time 1 were positively correlated with the peer informed difference (PD) score at times 1 and 2, PD time 2 was correlated with proactive aggression at times 1 and 3, and correlated with reactive at all times points. The peer informed difference score at time 3 was not significantly correlated with proactive or reactive aggression. No significant correlations emerged between the subtypes of aggression and the residual bias scores (teacher and peer).

Teacher difference scores and teacher residual scores were correlated at all time points within constructs. The peer difference score time 1 was correlated with times 2 and 3.. The peer residual score time 1 was correlated with time 2 and 3, and time 2 was correlated with time 3. In terms of between construct correlations, teacher difference scores peer difference scores were correlated at all time points. Teacher difference score times 2 and 3 were correlated with peer

difference score times 2 and 3. Teacher difference (TD) scores and teacher residual scores (TR) were correlated within time point and between TD time 3 with TR time 2. Teacher difference scores and peer residual scores were correlated at all time points. Teacher residual scores and peer difference scores (PD) were correlated within time point and between TR time 2 with PD time 1, and TR time 2 with PD time 3. Teacher residual scores and peer residual scores were correlated between and within all time points. Finally, peer residual (PR) time 1 was correlated with peer difference (PD) time 1, PR time 2 was correlated with all time points of PD, and PR time 3 was correlated with PD time 3.

Table 3

Bias Score Descriptives

	Mean	Std. Deviation	Skewness	Kurtosis
TD1	4.55	1.16	.330	.113
TD2	4.53	1.29	.113	-.650
TD3	4.66	1.14	.241	-.246
PD1	3.20	1.09	.221	.338
PD2	3.10	1.01	.178	.193
PD3	3.26	.92	.003	-.061
TR1	.00	.99	-.134	-.651
TR2	.00	.99	-.398	-.175
TR3	.00	.99	-.759	.110
PR1	.00	.99	-.050	-.598
PR2	.00	.99	-.224	-.280
PR3	.00	.99	-.488	-.640

Table 4

Bias Score Correlations

Variable	PA1	RA1	PA2	RA2	PA3	RA3	TD1	TD2	TD3	PD1	PD2	PD3	TR1	TR2	TR3	PR1	PR2	PR3
1. PA1	-----																	
2.RA1	.90**	-----																
3.PA2	.70**	.63**	-----															
4.RA2	.66**	.69**	.90**	-----														
5.PA3	.21*	.16	.29**	.30**	-----													
6.RA3	.27**	.23*	.35**	.37**	.90**	-----												
7.TD1	.48**	.55**	.51**	.51**	.32**	.32**	-----											
8.TD2	.39**	.45**	.56**	.56**	.41**	.41**	.66**	-----										
9.TD3	.27*	.29**	.34**	.34**	.56**	.53**	.37**	.52**	-----									
10.PD1	.30**	.40**	.24*	.24*	.16	.18	.59**	.49**	.29**	-----								
11.PD2	.31**	.39**	.24	.27*	.23*	.28*	.46**	.56**	.34**	.65**	-----							
12.PD3	.10	.10	.15	.06	.13	.15	-.31*	.29*	.47**	.27*	.17	-----						
13.TR1	.09	.05	.05	-.02	.08	.03	.47**	.06	.11	.41**	.11	.13	-----					
14.TR2	.14	.13	.05	.02	.11	.05	.15	.41**	.32**	.24*	.44**	.33*	.36**	-----				
15.TR3	.04	.00	-.05	-.13	.06	-.03	.00	.08	.46**	.10	.05	.59**	.33**	.56**	-----			
16.PR1	.09	.08	.02	-.02	.03	.02	.40**	.05	.09	.49**	.18	.10	.98**	.40**	.31**	-----		
17.PR2	.13	.09	-.01	-.06	.09	.06	.10	.32**	.26*	.24*	.53**	.31*	.38**	.98**	.51**	.39**	-----	
18.PR3	-.04	-.12	-.04	-.12	-.16	-.18	-.04	-.09	.16	-.08	-.12	.54**	.37**	.53**	.98**	.34*	.47**	-----

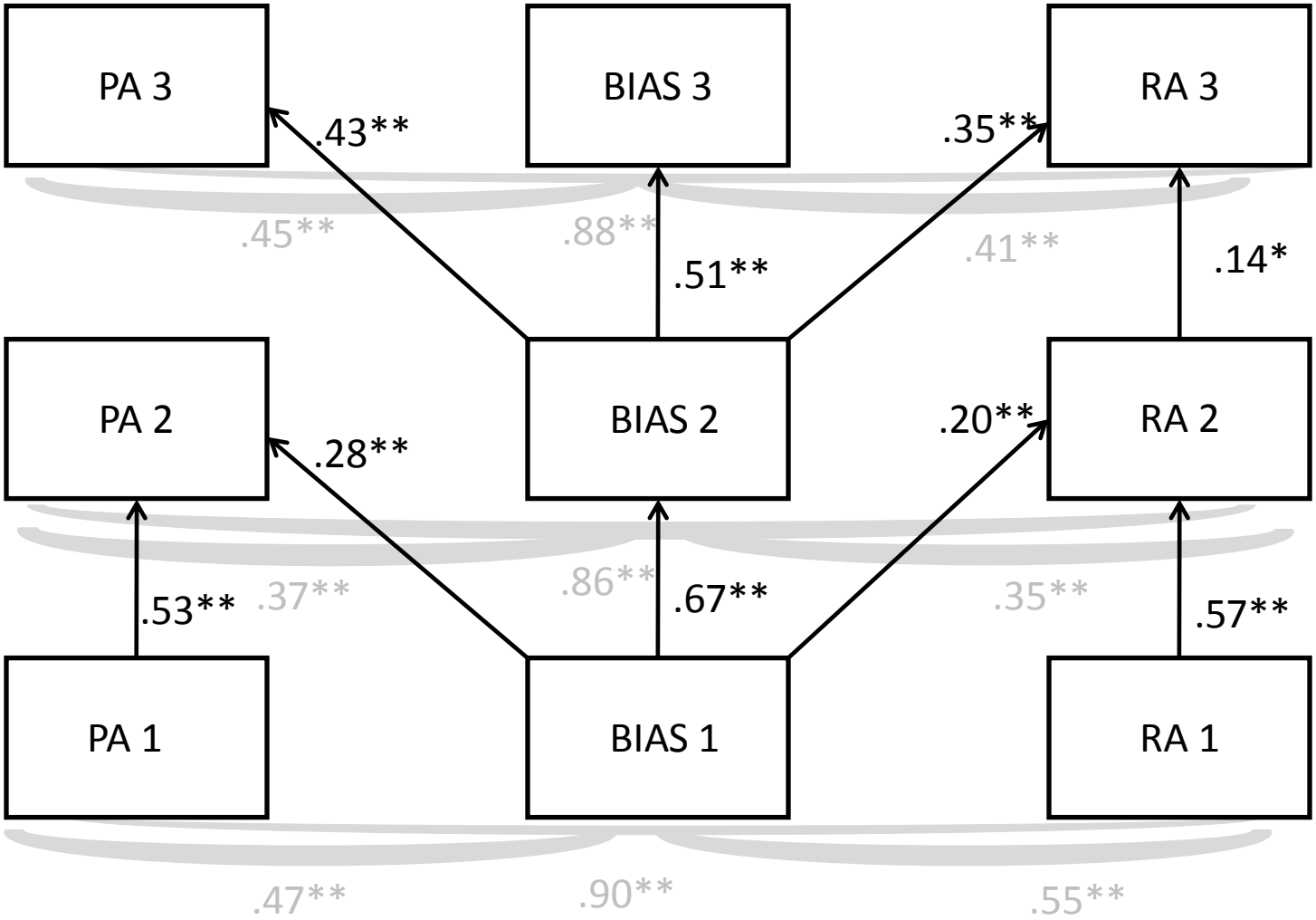
Note. ** indicates correlation is significant at the .01 level; * indicates correlation is significant at the .05 level.

Modeling: Subtypes of Aggression and the Positive Illusory Bias

A cross-lagged autoregressive model was used to examine the temporal ordering and reciprocal relationships of the positive illusory bias, reactive, and proactive aggression. Initially, the proposed latent measurement model was assessed with the intention of examining the latent constructs across all time points. However, the measurement model failed to produce tenable paths and the decision was made to convert the model to a manifest path analysis. Four path models were estimated, each with a unique bias score (teacher difference, peer difference, teacher residual, and peer residual). The models included stability estimates for each construct and within-time associations among constructs. These analyses provided a stringent test of the direction of effects that might account for the longitudinal association between the positive illusory bias and the subtypes of aggression. In each model, non-significant paths were pruned one at a time until the removal of a path resulted in a decrease in model fit. Therefore, non-significant paths were retained in instances where their removal negatively impacted model fit. Although the hypothesized models proposed that the bias would uniquely predict proactive or reactive aggression, the models that best fit the data are presented in Figures 1 to 4.

Teacher Difference Score Model. Model fit was excellent for the teacher difference score model (Figure 1), x^2 (17) = 10.842, p = .864, RMSEA < 0.000, 90% CI = < 0.000 – 0.044, CFI= 1.0, TLI = 1.0. The teacher informed bias score was stable over time, from time 1 to time 2 and time 2 to time 3 (all p's < 0.001). Reactive aggression was stable across time (all p's < 0.01). Proactive aggression was stable from time 1 to time 2 (p < 0.001). The bias at time 1 predicted proactive and reactive aggression at time 2, and the bias at time 2 predicted proactive and reactive aggression at time 3 (all p's < 0.01). Therefore, the bias predicts increases in both subtypes of aggression across time.

Figure 1. *Teacher Difference Model*

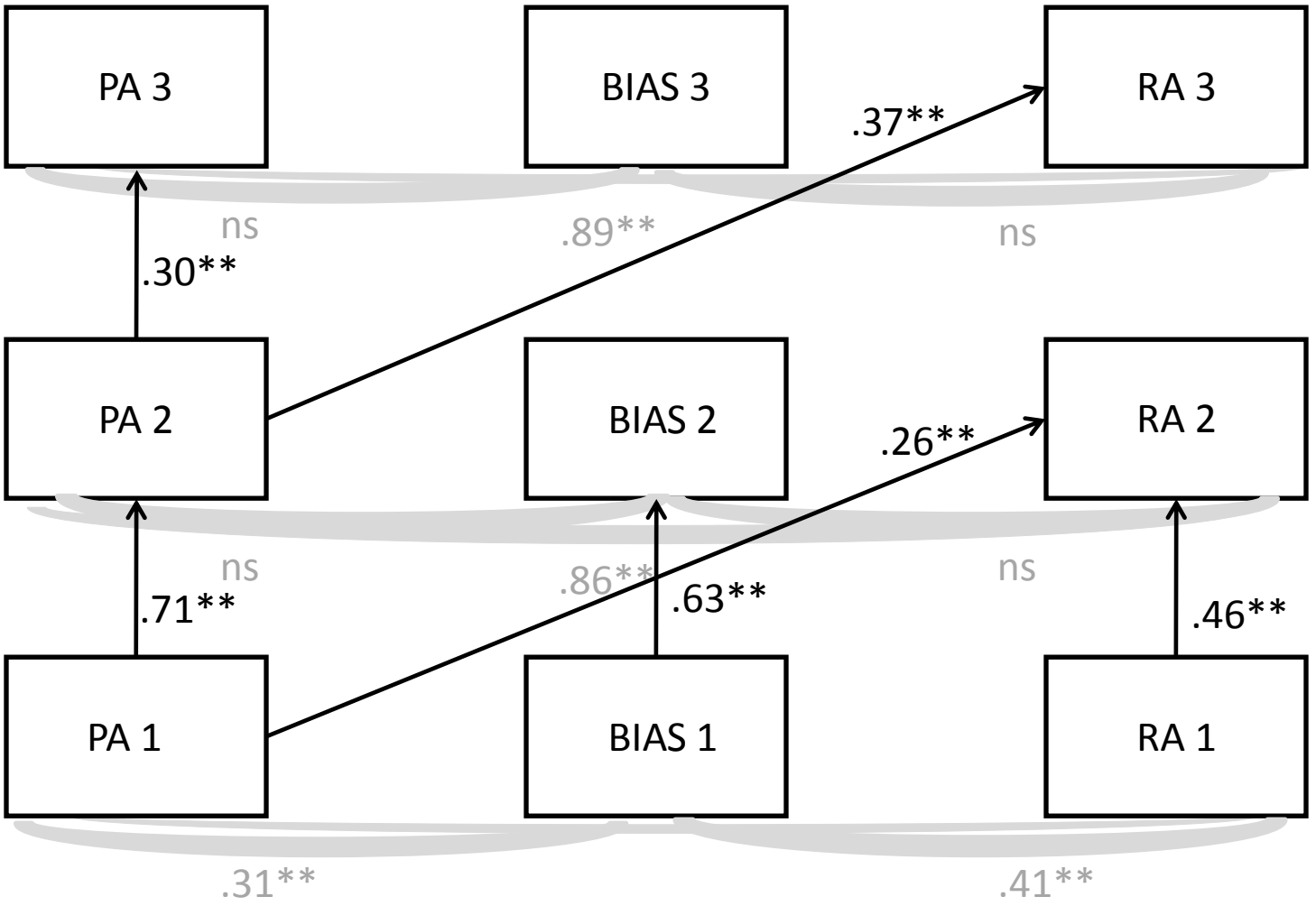


* = p < .05 ** = p < .01

PA = Proactive Aggression
RA = Reactive Aggression
BIAS = Teacher-informed difference score
# following abbreviation = time point (1: grade 4, 2: grade 5, 3: grade 7

Peer Difference Score Model. Model fit was excellent for the peer difference score model (Figure 2), x^2 (16) = 11.263, p = .793, RMSEA < 0.000, 90% CI = < 0.000 – 0.056, CFI= 1.0, TLI = 1.0. However, no significant paths emerged indicating the bias predicted the subtypes of aggression, nor the subtypes of aggression predicting the bias. Reactive aggression at time 1 did significantly predict reactive aggression at time 2 ($p < 0.001$). Proactive aggression at time 1 predicted reactive and proactive aggression at time 2. Proactive aggression at time 2 predicted reactive and proactive aggression at time 3 (all p's < 0.01). Lastly, the bias was stable from time 1 to time 2 ($p < 0.001$).

Figure 2. *Peer Difference Model*

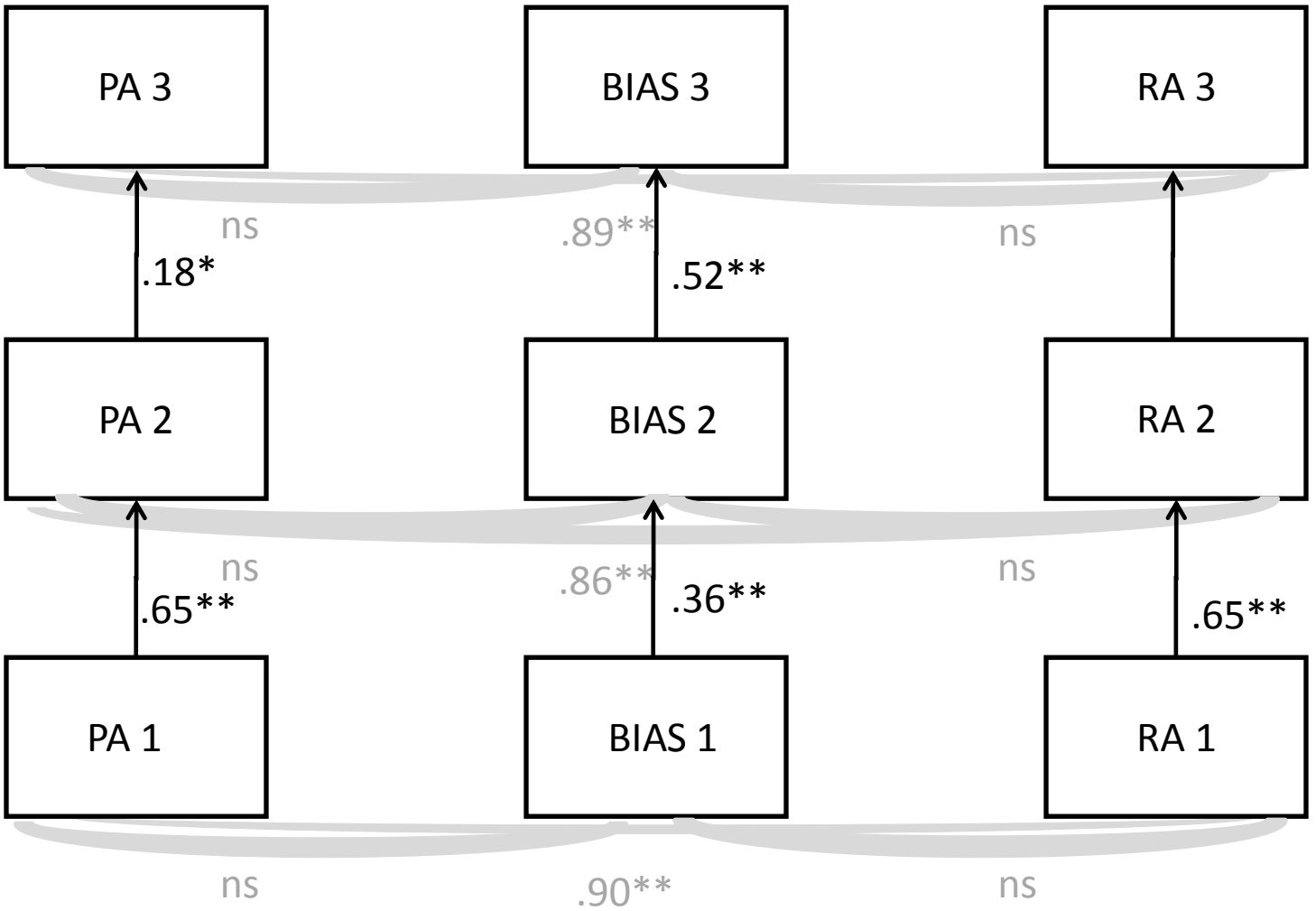


* = p < .05 ** = p < .01

PA = Proactive Aggression
RA = Reactive Aggression
BIAS = Peer-informed difference score
# following abbreviation = time point (1: grade 4, 2: grade 5, 3: grade 7

Teacher Residual Score Model. Model fit was excellent for the teacher residual score model (Figure 3), x^2 (21) = 15.510, p = .797, RMSEA < 0.000, 90% CI = < 0.000 – 0.052, CFI= 1.0, TLI = 1.0. However, no significant paths emerged indicating the bias predicted the subtypes of aggression or the subtypes of aggression predicted the bias. Reactive aggression at time 1 did significantly predict reactive aggression at time 2 ($p < 0.001$). Proactive aggression at time 1 predicted reactive and proactive aggression at time 2. Proactive aggression at time 2 predicted reactive and proactive aggression at time 3 (all p's < 0.01). Lastly, the bias was stable across time (p's < 0.001).

Figure 3. *Teacher Residual Model*

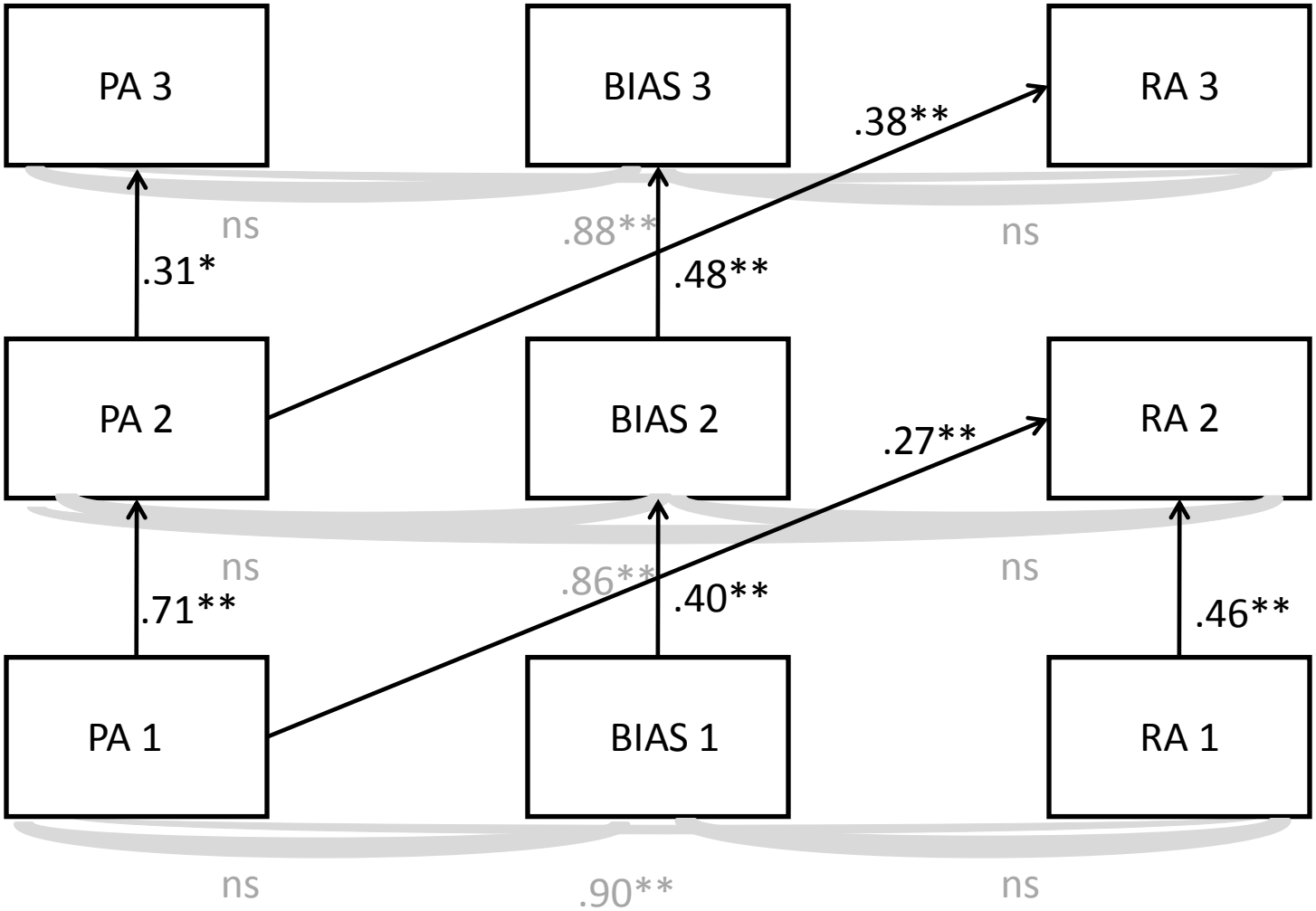


* = p < .05 ** = p < .01

PA = Proactive Aggression
RA = Reactive Aggression
BIAS = Teacher-informed residual score
# following abbreviation = time point (1: grade 4, 2: grade 5, 3: grade 7

Peer Residual Score Model. Model fit was excellent for the peer residual score model (Figure 4), x^2 (21) = 21.103, p = .453, RMSEA < 0.000, 90% CI = < 0.000 – 0.078, CFI= 1.0, TLI = 1.0. However, no significant paths emerged indicating the bias predicted the subtypes of aggression or the subtypes of aggression predicted the bias. The bias and proactive aggression were stable across time points (all p's < 0.05). Reactive aggression at time 1 predicted reactive aggression at time 2 (p < 0.01). Proactive aggression was stable across time and proactive aggression at times 1 and 2 predicted reactive aggression at times 1 and 2 respectively (all p's < 0.05).

Figure 4. *Peer Residual Model*



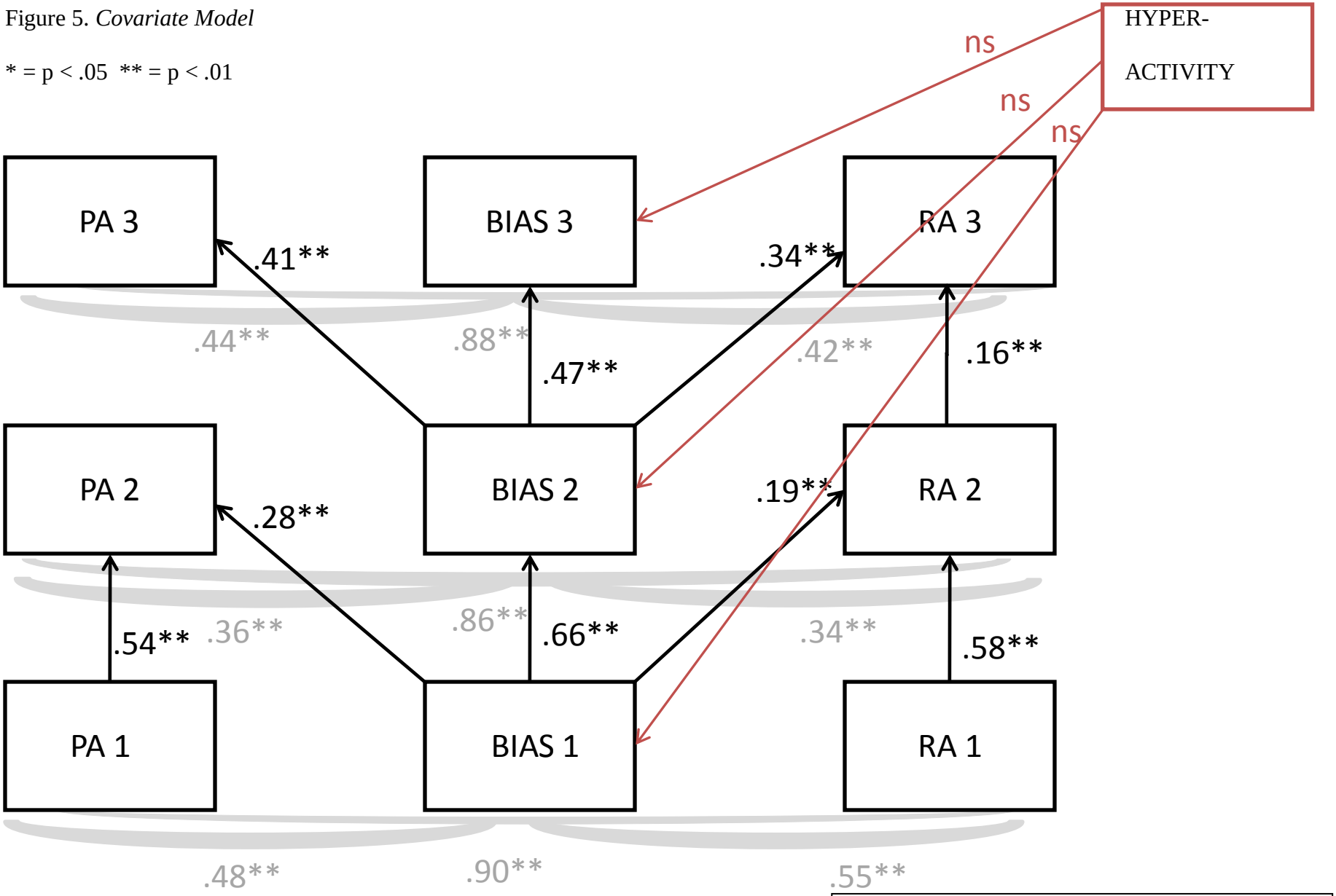
* = p < .05 ** = p < .01

PA = Proactive Aggression
RA = Reactive Aggression
BIAS = Peer-informed residual score
# following abbreviation = time point (1: grade 4, 2: grade 5, 3: grade 7

Covariate Model. Due to the relationship that emerged between the subtypes of aggression and the teacher difference score model, that model was used to explore hyperactivity as a covariate. The fit indices ranged from poor to moderate fit when the covariate was added to the model (Figure 5), x^2 (20) = 21.103, p = .453, RMSEA < 0.000, 90% CI = < 0.000 – 0.078, CFI= 1.0, TLI = 1.0. However, all significant pathways from the teacher difference model without the covariate remained significant. Hyperactivity did not significantly predict the bias score.

Figure 5. *Covariate Model*

* = p < .05 ** = p < .01



PA = Proactive Aggression
RA = Reactive Aggression
BIAS = Teacher-informed difference score
# following abbreviation = time point (1: grade 4, 2: grade 5, 3: grade 7

Gender Analyses

Tables 5 and 6 show the means and standard deviations of the bias scores by gender, and Table 7 shows the correlations. Correlations for the male group were consistent with correlations for the entire sample. Most correlations for females were also consistent with the entire sample, except for: (1) Proactive aggression time 2 and proactive aggression time 3 were positively correlated; (2) Proactive aggression time 2 and reactive aggression time 3 were positively correlated; and (3) The bias time 3 was positively correlated with reactive aggression times 1 and 2, and proactive aggression time 2).

Bias Score Analyses: By Gender

Table 5
Bias Score Means and Standard Deviations:Male

	Mean	Std. Deviation
PA1	2.23	1.11
RA1	2.77	1.30
PA2	2.29	1.05
RA2	2.78	1.14
PA3	2.00	.90
RA3	2.56	1.05
BIAS1	4.60	1.20
BIAS2	4.65	1.26
BIAS3	4.75	1.24

Table 6
Bias Score Means and Standard Deviations: Female

	Mean	Std. Deviation
PA1	1.89	.92
RA1	2.19	1.11
PA2	2.12	1.05
RA2	2.39	1.11
PA3	1.83	.86
RA3	2.10	.87
BIAS1	4.46	1.11
BIAS2	4.37	1.32
BIAS3	4.56	1.02

Table 7
Bias Score Correlations: By Gender

Variable	PA1	RA1	PA2	RA2	PA3	RA3	B1	B2	B3
1. PA1	-----	.92**	.76**	.69**	.17	.22	.47**	.29*	.26
2.RA1	.84**	-----	.70**	.71**	.16	.24	.50**	.34**	.30*
3.PA2	.59**	.51**	-----	.89**	.31*	.38**	.54**	.56**	.40**
4.RA2	.57**	.62**	.93**	-----	.26	.36**	.48**	.59**	.31*
5.PA3	.27	.10	.25	.32**	-----	.91**	.37**	.41**	.52**
6.RA3	.28	.07	.30	.31	.90**	-----	.39**	.42**	.49**
7.BIAS1	.49**	.68**	.45**	.51**	.23	.15	-----	.63**	.39**
8.BIAS2	.53**	.59**	.57**	.55**	.37*	.31	.70**	-----	.54**
9.BIAS3	.28	.25	.24	.27	.64**	.61**	.32*	.48**	-----

Note. Correlations for males are presented above the diagonal and correlations for females are presented below the diagonal.
** indicates correlation is significant at the .01 level; * indicates correlation is significant at the .05 level.

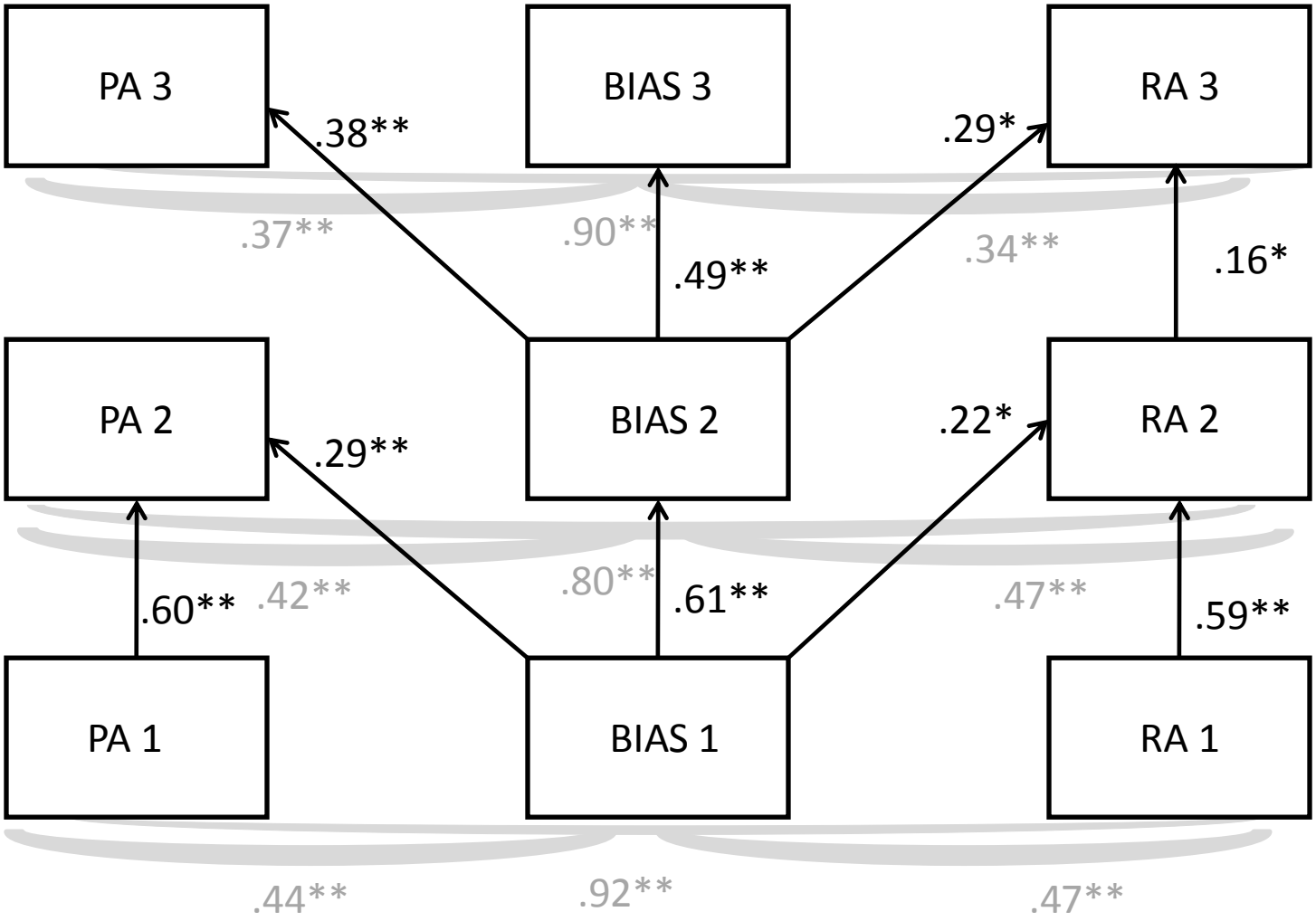
Model by Gender. The teacher difference score model was estimated separately for males and females. Model fit for the male only model was excellent (Figure 6), x^2 (17) = 16.689, p = .338, RMSEA < 0.000, 90% CI = < 0.000 – 0.122, CFI= .995, TLI = .989. Significant paths were consistent with the teacher difference score model that included the entire samples. The teacher informed bias score was stable over time, from time 1 to time 2 and time 2 to time 3 (all p's < 0.001). Reactive aggression was stable across time (all p's < 0.01). Proactive aggression was stable from time 1 to time 2 (p < 0.001). The bias at time 1 predicted proactive and reactive aggression at time 2, and the bias at time 2 predicted proactive and reactive aggression at time 3 (all p's < 0.01). Therefore, the bias predicts increases in both subtypes of aggression across time.

Model fit for the female only model was excellent (Figure 7), x^2 (15) = 11.894, p = .687, RMSEA < 0.000, 90% CI = < 0.000 – 0.108, CFI= 1.0, TLI = 1.0. In this model, there was a different pattern of significant paths that emerged. Consistent with the teacher difference score model, the teacher informed bias score was stable over time, from time 1 to time 2 and time 2 to time 3 (all p's < 0.001). Reactive aggression was stable across time (all p's < 0.01). Proactive aggression was stable from time 1 to time 2 (p < 0.001). The bias at time 1 predicted proactive

aggression at time 2, and the bias at time 2 predicted proactive aggression at time 3 (all p's < 0.05). Additionally, proactive aggression at time 2 predicted reactive aggression at time 3(p < 0.05). However, the bias did not predict reactive aggression.

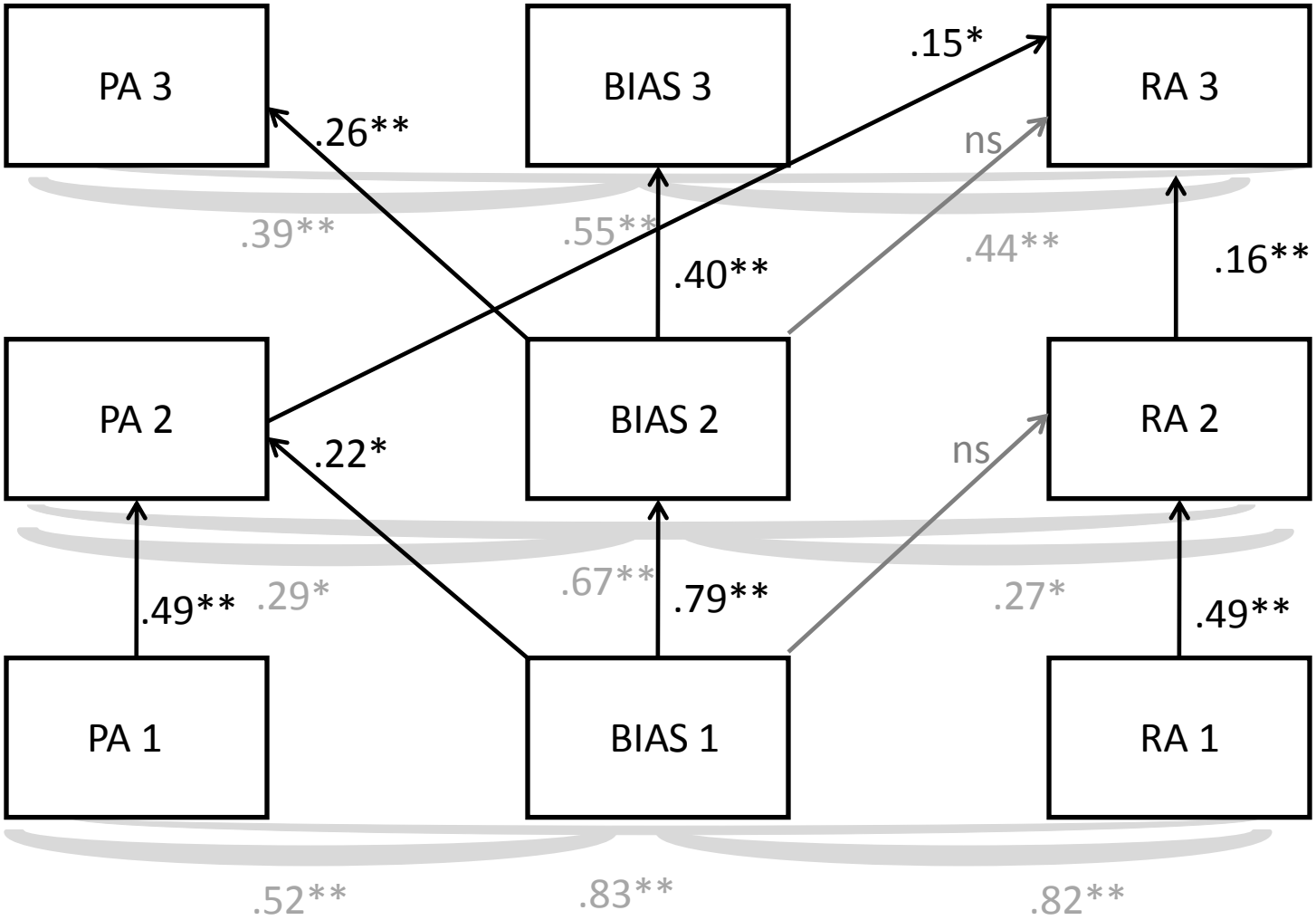
Figure 6. *Teacher Difference Model: Male*

* = p < .05 ** = p < .01



PA = Proactive Aggression
RA = Reactive Aggression
BIAS = Teacher-informed difference score
# following abbreviation = time point (1: grade 4, 2: grade 5, 3: grade 7

Figure 7. *Teacher Difference Model: Female*



* = p < .05 ** = p < .01

PA = Proactive Aggression
RA = Reactive Aggression
BIAS = Teacher-informed difference score
# following abbreviation = time point (1: grade 4, 2: grade 5, 3: grade 7

Cognitive Distortion Analyses

Table 8 shows the means, standard deviations, skewness, and kurtosis of the cognitive distortion constructs (outcome expectation and hostile attribution bias) for each time point, and Table 9 presents their correlations, including correlations with the teacher informed difference score. The Outcome Expectation Questionnaire (OEQ) was correlated across and within time points. The Hostile Attribution Bias measure (HAB) was correlated across and within time points. The OEQ and HAB were correlated at time 2 with times 2 and 3. The OEQ time 1 was correlated with the teacher difference score (TD) at times 2 and 3. OEQ time 2 was correlated with TD at times 1 and 3, and OEQ time 3 was correlated at all time points. The HAB at time 2 was correlated with TD at times 2 and 3.

Table 8

Cognitive Distortion Descriptives

	Mean	Std. Deviation	Skewness	Kurtosis
OEQ1	2.30	.50	.409	.438
OEQ2	2.43	.56	.161	.453
OEQ3	2.46	.60	.321	.467
HAB1	.46	.31	.629	.438
HAB2	.46	.28	.556	.455
HAB3	.40	.29	.253	.467

Table 9

Cognitive Distortion Correlations

Variable	OEQ1	OEQ2	OEQ3	HAB1	HAB2	HAB3	TD1	TD2	TD3
1. OEQ1	-----								
2.OEQ2	.43**	-----							
3.OEQ3	.34**	.54**	-----						
4.HAB1	.06	.05	.04	-----					
5.HAB2	.14	.20*	.22*	.19*	-----				
6.HAB3	.02	.11	.12	.27**	.34**	-----			
7.TD1	-.04	.08	.12	-.06	.15	.08	-----		
8.TD2	.05	.15	.16	.07	.16	.07	.66**	-----	
9.TD3	.21	.11	.14	-.08	.10	-.06	.37**	.52**	-----

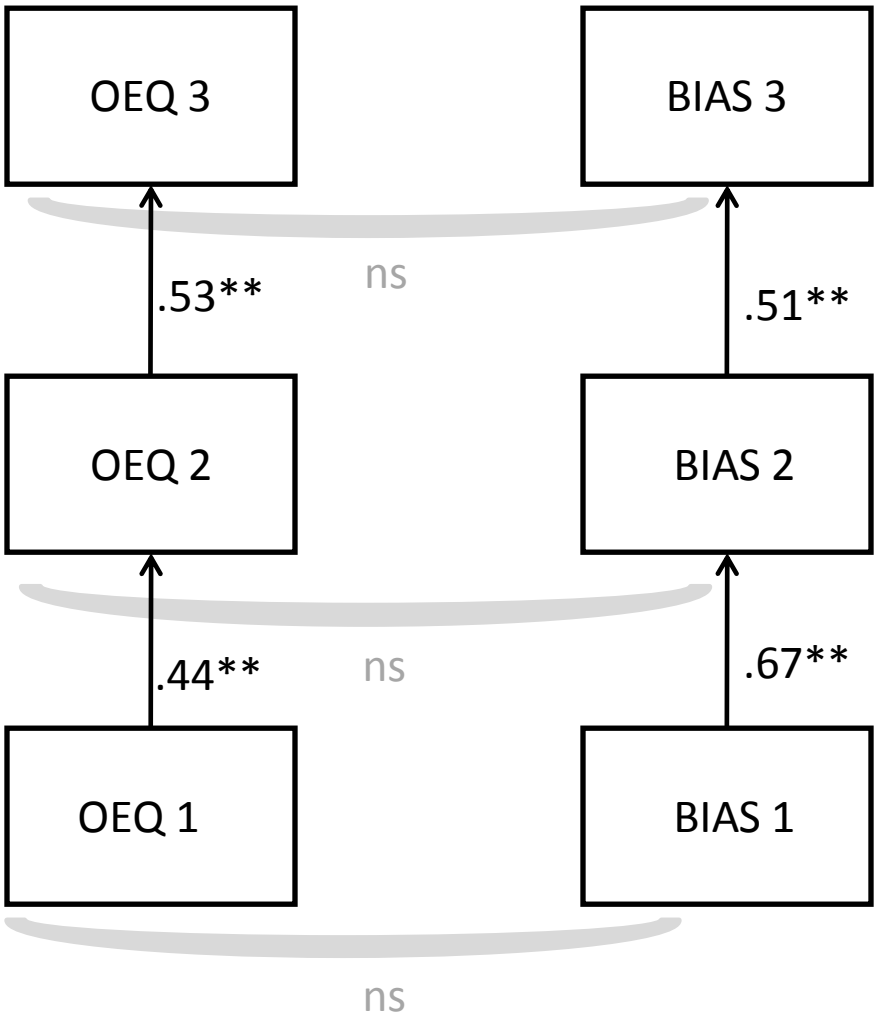
Note. ** indicates correlation is significant at the .01 level; * indicates correlation is significant at the .05 level.

Modeling: Cognitive Distortion and the Positive Illusory Bias

Two cross-lagged autoregressive models were run to examine the temporal ordering and reciprocal relationships of the positive illusory bias and cognitive distortion constructs. The teacher bias score was used to represent the bias since it provided the richest information compared to the other bias scores.

Cognitive Distortion Model: Outcome Expectation. Model fit was excellent for the outcome expectation model (Figure 8), x^2 (8) = 6.494, p = .592, RMSEA < 0.000, 90% CI = < 0.000 – 0.093, CFI= 1.0, TLI = 1.0. The teacher informed bias score was stable over time, from time 1 to time 2 and time 2 to time 3 (all p's < 0.001). The outcome expectation construct was stable across time (all p's < 0.001). However, no significant paths emerged with the outcome expectation construct predicting the bias or the bias predicting the outcome expectation construct.

Figure 8. *Cognitive Distortion Model: Outcome Expectation*

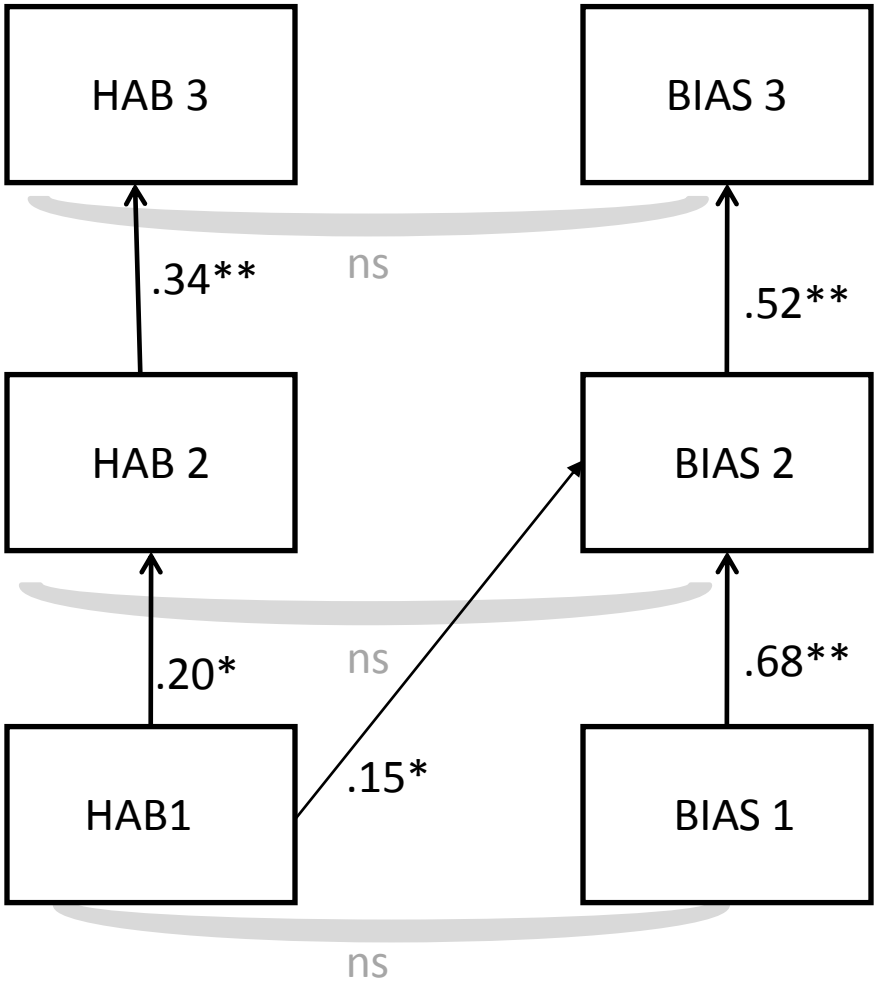


* = p < .05 ** = p < .01

OEQ = Outcome Expectation Questionnaire
BIAS = Teacher-informed difference score
# following abbreviation = time point (1: grade 4, 2: grade 5, 3: grade 7

Cognitive Distortion Model: Hostile Attribution Bias. Model fit was acceptable for the hostile attribution bias model (Figure 9), x^2 (7) = 9.729, p = .205, RMSEA = 0.057, 90% CI = < 0.000 – 0.134, CFI= .97, TLI = .94. The teacher informed bias score was stable over time, from time 1 to time 2 and time 2 to time 3 (all p's < 0.001). The hostile attribution bias and positive illusory bias were stable across time (all p's < 0.05). The hostile attribution construct at time 1 predicted the positive illusory bias at time 2 (p= .03).

Figure 9. *Cognitive Distortion Model: Hostile Attribution Bias*



* = p < .05 ** = p < .01

HAB = Hostile Attribution Bias
BIAS = Teacher-informed difference score
# following abbreviation = time point (1: grade 4, 2: grade 5, 3: grade 7

Chapter 4: Discussion

The current study extended prior research on the positive illusory bias and aggression by examining the unique relationship between the bias and the subtypes of aggression within a bidirectional model with the use of longitudinal data. Inconsistent findings have emerged from previous research, with one study finding a unique relationship between the bias and proactive aggression while another study found a unique relationship between the bias and reactive aggression (Orobio de Castro et al., 2007; White & Kistner, 2011). No previous study has explored the predictive value of the bias with both proactive and reactive aggression in the model as dependent variables. Nor has previous research examined longitudinal relationships among these constructs. Additionally, prior work on this topic has favored the use of residual scores to examine the positive illusory bias over the more traditional difference scores. This study explores bidirectional relationships among proactive aggression, reactive aggression, and the bias over time, and examines the unique information provided by difference versus residual scores within the same sample.

Results of the present study highlight the importance of considering the relationship between the positive illusory bias and both subtypes of aggression. Although it was hypothesized that the bias would predict reactive rather than proactive aggression, the current findings suggest that the teacher-informed positive illusory bias score predicts children's display of both proactive and reactive aggression at later time points. In addition, the bias is moderately correlated with proactive and reactive aggression within time point controlling for the association between the subtypes of aggression. There was no evidence to suggest that proactive or reactive

aggression predicted the bias across time. Even after controlling for the effects of hyperactivity, the teacher-informed positive illusory bias score predicted children's display of both proactive and reactive aggression across time. Similar findings did not emerge when peer-difference, teacher-residual, and peer-residual scores were used to estimate the model. Finally, when the relationship between the bias and cognitive distortions was examined, evidence to suggest that cognitions related to the hostile attribution predicted the bias from time 1 to time 2 emerged.

Subtypes of Aggression and the Bias: Difference Scores

Two difference scores were created to represent the positive illusory bias, one informed by teacher report and the other by peer report. The model estimated using the teacher-informed bias score produced results indicating the bias predicts both proactive and reactive aggression across time. These relationships remain significant even when hyperactivity is controlled for, indicating that the relationship between the bias and increases in aggression is a unique phenomenon and not a product of hyperactivity. Interestingly, although teacher reports are used to indicate the subtypes of aggression and calculate the bias, the teacher and school are different from time 2 to time 3 (i.e. grade 5 to grade 7). Therefore, the stability of the bias, proactive, and reactive aggression and the predictive power of the bias remains constant across multiple reporters and through the transition to middle school. The stable influence and proximal ordering of the bias predicting increases in aggression across time is consistent with Baumeister's theory of threatened egotism; whereby overly positive self- perceptions lead to aggressive behavior (1996). The threatened egotism literature posits that for people who have an overly positive self-perception, they are at increased risk for having this inaccurate view challenged. The increased likelihood of challenges to one's perceptions is believed to provide opportunities to respond aggressively in order to avoid having to adjust the positive self-view.

The findings from this study support the idea that an overly positive self-view leads to increases in aggression over time. In addition, the bias is stable across time which is consistent with the belief that the inflated self-view is not adjusted to a more accurate perception of one's peer relations. These results also support the notion that overestimating one's own peer relations has negative consequences, increased aggression, and is maladaptive.

The model estimated using the peer-informed bias score did not produce similar results to that of the teacher-informed model. In this model, no significant paths emerged between the bias and the subtypes of aggression. The bias score and reactive aggression were stable from time 1 to time 2, and proactive aggression was stable across all time points. Additionally, proactive aggression at time 1 and time 2 predicted reactive aggression at time 2 and time 3 respectively. This model seems to suggest that peers are not in full agreement with teachers regarding other children's peer relations and its relation to the subtypes of aggression. When bivariate correlations between peer and teacher-informed bias scores were examined, statistically significant small to moderate correlations emerged. This indicates that there was some agreement across peers and teachers, however there remains unexplained variance that does not overlap.

Considering the subtypes of aggression are measured via teacher report, it might seem appropriate to point to a source effect when explaining these discrepant results. However, it is important to consider that within the teacher-informed model, the predictive value of the bias holds across different teachers who are not located in the same school. Therefore, it is possible that in general, teachers and peers are making different observations. When considering the discrepancy between observations and therefore the utility of teacher versus peer report of peer relationships, it is important to note potential advantages of the teacher report. Firstly, the

teacher is able to observe each child in the classroom, whereas some students may have very little contact with one another. Therefore, the students may be less reliable reporters on peers with whom they have little interaction. A second advantage is that teachers have a sense of normative behavior through their work with many children. Since teachers are able to observe all of the children in their classroom and are able to take a normative view, the teachers may have particular strengths that the peers are lacking.

While it is plausible that teachers and peers have different experiences leading to inconsistent results, there are other explanations to consider. One issue that should be explored is the construction of the positive illusory bias score for teachers versus peers. The teacher and peer measures include items assessing whether each child is liked or disliked. However, the teacher score is an aggregate of these items, treating them as two separate items contributing equally; whereas the peer measure is a difference score of the items, treating them as two items necessary to create a single construct. Therefore, the process by which the child's peer relations are operationalized may account for differences in the results.

A second consideration is that peers are not asked to report on who is liked and disliked in the classroom, but who they specifically like and dislike. Therefore, without every child participating in the classroom there could be missing data regarding whether a child is liked or disliked. Since there was not full participation in the classrooms in this sample, it is possible that the peer report of children's peer relations do not provide a complete picture[1]. While Terry (1987) found peer nomination data to be reliable when at least 40% of the classroom was participating, more recent research has found that information provided by peer nominations differs even at high levels of participation. Hamilton and colleagues (2000) found differences in

[1]The goal when collecting the peer nominations for this project was 40% consent rate within a classroom. However, after repeated attempts were made to achieve a 40% consent rate, data were collected from approximately ten classrooms that fell below the desired rate.

information collected through peer nominations at 75% participation versus full participation, and the instability of information was greatest for children with adjustment problems. Although having a peer report on their peers' social relationships could be considered the gold standard, taking into account the issue of missing data, it can be argued that the peer report, like teacher report, serves only as a proxy as a measure of peer competence. If the peer and teacher measures of peer relations are comparable, both proxies of the same measure, the data seem to suggest that for this sample the teacher reported peer relations may be a more valid measure as it shows relationships consistent with the hypothesized relationships. That is, the model which includes the teacher report of peer relations indicates significant relationships between the bias and subtypes of aggression in the expected direction.

Subtypes of Aggression and the Bias: Residual Scores

Two residual scores were created to represent the positive illusory bias, one informed by teacher report and the other by peer report. There are few differences between the two residual models. The model estimated with the teacher-informed bias score produced results indicating the bias, proactive aggression, and reactive aggression were all stable across time. There were no significant paths suggesting the bias predicted the subtypes of aggression or that the subtypes of aggression predicted the bias. The model estimated using the peer-informed bias score produced results indicating that the bias and proactive aggression were stable across time and reactive aggression was stable from time 1 to time 2. Additionally, this model produced significant paths suggesting that proactive aggression at time 1 and time 2 predicted reactive aggression at times 1 and 2 respectively.

Considering the method of calculation for the bias scores, it is not surprising that the residual models produced similar results. The residual bias scores are created by regressing the

child's perceived peer relations onto the teacher or peer-rated acceptance score. The remaining variance is then saved as a residual score to represent the bias. When the correlation between the informants' ratings is low (correlation between self-report and teacher/peer), the residual will be almost completely predicted by the dependent variable, in this case the child's self-report (De Los Reyes & Kazdin, 2004). Since there is a low correlation between the self-report and peer/teacher reports of peer relations, both residual models are predominately determined by the child's own self-report of their peer relations. Therefore, these models offer very little insight into the relationship between the positive illusory bias and the subtypes of aggression. In this sample, there was no support for using a residual score to examine the positive illusory bias. It is important to note, this sample was recruited on the basis of being rated as aggressive by teachers. Therefore, it is possible that the restricted range contributed to the lack of support for residual scores.

An interesting finding across the peer models, difference and residual, was that proactive aggression predicted reactive aggression across time points. One possible explanation of this finding is that by engaging in proactive aggression there is an increased opportunity to be met with retaliation. If proactive aggression puts children in a position where their peers may do something to them, then they may face threats and provocation. In this scenario, it logically follows that a pattern of proactive aggression could lead to increased threat and provocation from peers, which in turn leads to increased reactive aggression. A second possible explanation is that deviant peer groups are being formed which provide greater opportunity to engage in aggression. Prior research has shown evidence for an association between engaging in proactive aggression and developing friendships with deviant peers (McAuliffe et al., 2007). Previous work has also shown that within groups of deviant friends, there is a significant amount of fighting and

bullying that occurs within the group (Espelage et al., 2003). Therefore, it may be that engaging in proactive aggression leads to increased associations with deviant peers and consequently greater exposure to fighting and bullying which presents greater opportunities to engage in reactive aggression.

The Positive Illusory Bias and Social Cognitive Distortion

Since the bias predicted both proactive and reactive aggression, two models were estimated examining the relationship between the bias and social cognitive distortions related to each subtype of aggression. The two social cognitive distortions explored were outcome expectation for aggression and the hostile attribution bias. Children who hold a positive outcome expectation of aggression operate based on a belief system that suggests they will reach their goals by acting aggressively. Since this takes skillful planning, a positive outcome expectation of aggression is associated less with social cognitive deficits and has been linked to children who engage in more proactive aggression (Lochman & Dodge, 1994). In the current study, no significant paths emerged between outcome expectation and the bias. These findings suggest, for this sample, the belief that aggression will lead to a positive outcome does not predict the positive illusory bias and the positive illusory bias does not predict a belief that aggression will lead to a positive outcome.

Children who have a hostile attribution bias tend to perceive hostile intent when interpreting ambiguous situations. This social cognitive bias has been linked to reactive aggression, poorer social skills, and peer rejection (Ellis et al., 2009). In the second model, the relationship between the positive illusory bias and hostile attribution bias was estimated. In this model, the positive illusory bias and hostile attribution bias were stable across time, indicating that when these biases are present in elementary school they persist through the transition to

middle school. Additionally, the hostile attribution bias at time 1 predicted the positive illusory bias at time 2. Although the positive illusory bias was found to be predictive of both proactive and reactive aggression, it makes conceptual sense that the bias would be associated with a hostile attributional style rather than a positive outcome expectation of aggression. The hostile attribution bias is an inaccuracy in interpreting social information, and its relationship with the positive illusory bias may reflect a more global misperception problem that these children experience.

When a negative ambiguous event occurs, individuals with a hostile attributional style are putting blame on another person. Children that hold this perception are not well received by others, and tend to be rejected (Dodge & Coie, 1987). The effects of this can be two-fold with children who have a positive illusory bias. These children could be simultaneously maintaining a positive view of themselves and decreasing what others think of them by placing the blame on their peers. While it logically follows that a hostile attribution bias would predict the positive illusory bias, the observed relationship from time 1 to time 2 does not emerge across the middle school transition. One possibility is that the hostile attribution measure is a less developmentally appropriate measure at the middle school time point.

The Bias, Subtypes of Aggression, and Gender

Exploratory analyses were conducted to examine whether there were gender differences across the teacher-informed bias model. When the model was estimated with males, there were no differences from the original model that emerged. However, when the female model was estimated the bias only predicted proactive aggression and not reactive aggression. Additionally, proactive aggression at time 2 predicted reactive aggression at time 3. These findings suggest the bias operates differently in boys and girls, with the bias leading to increased proactive and

reactive aggression in boys but only proactive aggression in girls. The pattern that emerged may be a result of boys and girls displaying aggression in different ways. However, a larger sample size would be necessary to confirm these findings.

Limitations and Future Directions

The present study contributed to the understanding of the relationships between the positive illusory bias and subtypes of aggression, along with the positive illusory bias and social cognitive biases associated with the subtypes of aggression. Although causality cannot be determined with correlational methods, the use of longitudinal data allowed for temporal ordering of constructs to help identify pathways of causal influence. Future studies will hopefully build on these findings to explore whether the causal pathways can be replicated at earlier and later developmental stages.

While the peer and teacher-informed difference score models produced different results, the present study was not able to determine whether those differences were meaningful. Future research should replicate the findings of this study with peer data that is a more complete estimation by obtaining full classroom participation. Additionally, the present study indicated that results may be influenced by how the indicators of the peer relations score are calculated when considering peer versus teacher report. Future studies should examine the relationships between the positive illusory bias, peer and teacher – informed, and the subtypes of aggression when the peer relations score is operationalized uniformly across reporters.

Finally, due to limited sample size, the models were not able to be estimated using latent constructs. Future research could examine the relationship between the bias and subtypes of aggression using peer and teacher report within the same model if there is an adequate sample size.

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