

A COGNITIVE APPROACH TO STUDYING THE DEVELOPMENT OF  
PRESCHOOL AGGRESSION

By

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and approved by

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## ABSTRACT OF THE DISSERTATION

A Cognitive Approach to Studying the Development of Preschool Aggression

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The study of aggressive behavior has received a great deal of attention in the development literature. Although it is clear that aggression appears early in development, and childhood aggression is a well-known predictor of future engagement in maladaptive behavior, research on aggressive behavior with preschool-aged children is still limited. Improving our knowledge about what motivates children to engage in aggressive behavior is vital in developing effective strategies and interventions aimed at reducing childhood aggression. In Study 1 we documented the incidence of physical, verbal, and relational acts of aggression in preschool-aged children. The results of Study 1 highlight the surprising complexity and context of aggressive behavior in this young age group. In Study 2, we successfully designed and implemented a new task aimed at assessing patterns of social information processing in preschool-aged children. Results of Study 2 demonstrate that problematic patterns of social information processing in preschoolers are associated with higher teacher ratings of proactive and reactive physical aggression. In Study 3 we examined how children's theory of mind abilities, along with their social information processing, contribute to young children's aggressive behavior. Results from Study 3 demonstrate that the relationship between patterns of social information processing and aggressive behavior differ as a function of children's theory of mind, with theory of mind performance mediating the relationship between children's patterns of

social information processing and their aggressive behavior. More specifically, problematic responding to questions assessing patterns of social information processing, coupled with poor performance on select Theory of Mind items was related to higher levels of *physical* aggression. Likewise, appropriate social information processing patterns, coupled with good performance on select Theory of Mind items was related to higher levels of *relational* aggression.

## Preface

This dissertation is submitted for the degree of Doctor of Philosophy at Rutgers University, Newark. The research described herein was conducted under the supervision of Dr. Vanessa LoBue in the Department of Psychology, Rutgers University, Newark between January 2013 and May 2016.

The work is an original intellectual product of the author, K. Matthews, except where acknowledgements and references are made to previous work. Neither this, nor any substantially similar dissertation has been or is being submitted for any other degree, diploma, or other qualification at any other university.

Part of this work has been presented in the following conference formats and journal publications:

Matthews, K., LoBue, V., & Irving, J. (in prep). Little mean girls (and boys): An observational study of aggressive behavior in preschool.

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### **A Cognitive Approach to Studying the Development of Preschool Aggression**

Aggressive behavior is defined as any behavior carried out with the intention to hurt, harm, or injure another person (Bushman & Anderson, 2001; Berkowitz, 1993).

Aggressive behavior can be displayed in a number of different forms. Physical aggression (e.g., hitting, kicking, pushing) and verbal aggression (e.g., yelling, teasing, name-calling) are commonly referred to as *overt* aggression. Overt aggression is directed at individuals with the intention of causing physical or psychological harm (for review see Coie & Dodge, 1998; Björkqvist, Lagerspetz & Kaukiainen, 1992; Crick & Grotpeter, 1995; Crick, Casa, & Mosher, 1997). Research examining the role of gender in children's engagement in aggressive behavior suggests that males engage in overt aggression more frequently than do females (for review see Archer, 2004; Ostrov & Keating, 2004; Ostrov & Crick, 2007).

In contrast, *relational* aggression can be defined as behaviors that harm others through damage (or the threat of damage) to relationships or feelings of acceptance, friendship, or group exclusion (Crick, 1996; Crick & Grotpeter, 1995). Relational aggression involves behaviors such as threatening friendship withdrawal, secret telling, and social exclusion (Crick, Casa, & Mosher, 1997; Crick et al., 1999). Unlike overt aggression, relationally aggressive behaviors do not pose a direct threat to the physical well being of the victim, but indirectly harm an individual through damage or threat of damage to peer relationships (Crick, 1996; Crick & Grotpeter, 1995; Crick, Casas, & Mosher, 1997). Some researchers have found that during early childhood, girls are more relationally aggressive than boys (Bjorkqvist, et al, 1992; Crick, Casas, & Mosher, 1997; Lagerspetz et al., 1988; Ostrov & Crick, 2007; McNeilly-Choque et al., 1996; Murray-



Close & Ostrov, 2009; Crick, Casas, Mosher, 1997; Crick et al., 2006; Ostrov & Keating, 2004), while others have observed no gender difference in children's use of relationally aggressive behavior (Delveaux & Daniels, 2000). Researchers have also found that as children progress to middle and late childhood, gender plays less of a role in engagement in relationally aggressive behavior (Card et al., 2008).

Relational aggression is similar to, but distinct from other types of aggression such as indirect aggression or social aggression (Crick et al., 1999). Indirect aggression can include relationally aggressive behavior such as ignoring or rumor spreading; however, by definition, indirect aggression involves covert or behind the back behaviors. In contrast to indirect aggression, relational aggression does not require that the behavior be acted out in a covert manner (Crick et al., 1999). Similarly, social aggression, defined as behaviors that damage another's self-esteem or social status, can also include relationally aggressive behaviors such as social exclusion or friendship withdrawal (Cairns et al., 1989). Social aggression, however, is a much broader term than relational aggression and can include both non-verbal behaviors (e.g., negative facial expressions) and verbal behaviors (e.g., name calling) that are also likely to damage a person's self-esteem or social status (Cairns et al., 1989; Crick et al., 1999).

### ***The Development of Relational Aggression in Early Childhood***

Aggression is often viewed as a stable trait, appearing early in development and persisting across the lifespan (Huesmann, Eron, Lefkowitz, & Walder, 1984; Olweus, 1978). Physical aggression is the first type of aggression to appear in a child's behavioral repertoire. By 17 months of age, most children have begun to engage in physically aggressive behaviors (Tremblay et al., 1999). These behaviors are relatively

unsophisticated, which is unsurprising given their appearance early on in development. As children progress to the preschool years (3-5 years), they begin to learn ways to inhibit physical aggression (Tremblay et al., 1999; Tremblay et al., 2004), and other forms of aggressive behaviors begin to emerge. For example, as children's language and social cognitive abilities advance, they begin to use verbal (Coie & Dodge, 1998) and relational forms of aggression (Crick et al., 2006; Crick, Casas, & Mosher, 1997) as well. Research has supported this developmental change, showing that as the frequency of physical aggression decreases, the rate of other forms of aggression (i.e., verbal aggression and relational aggression) increases (Tremblay et al., 1996).

Research on relationally aggressive behavior in preschool-aged children is limited compared to research on overt aggression. Indeed, overt aggression (physical and verbal aggression) is much more common than relational aggression in children of this age (Crick et al., 2006; Crick, Casas, & Mosher, 1997). We do know, however, that relational aggression has been documented in children as young as age 3 (Burr et al., 2005; Crick et al., 2006; Crick, Casas, & Mosher, 1997; Crick & Grotpeter, 1995; Goldstein, Tisak & Boxer, 2002; McNeilly- Choque et al., 1996; Murray-Close & Ostrov, 2009; Ostrov & Crick, 2007; Ostrov & Keating, 2004).

Despite the fact that many studies have documented the existence of relational aggression in preschool-aged children, few report on the complexity of these behaviors. Researchers have theorized that due to cognitive limitations, relationally aggressive behaviors in preschoolers should be relatively simple and direct when compared with those of older children, and that these behaviors are "in the moment," or displayed in response to a current threat (as opposed to a past transgression) (Crick, Werner et al.,

1999; Crick et al., 1999; Crick et al., 2004; Gower et al., 2014; Ostrov & Keating, 2004).

For example, a 4-year-old child might simply use the state of a social relationship to achieve a goal by telling a same-aged peer, “I won’t play with you unless you give me that toy” (Crick, Casas, Mosher, 1997; McNeilly-Choque et al., 1996).

As children’s cognitive abilities become more advanced, so should the complexity of their relationally aggressive behaviors. By middle childhood, complex and indirect forms of relational aggression such as secret telling, deception, social exclusion, and peer group manipulation begin to appear (Crick et al., 1999). It is during this developmental period that children use relational aggression as a retaliatory strategy, or in response to events that have occurred in the past (Crick et al., 1999). Researchers have hypothesized that these more sophisticated behaviors are reflective of the social and cognitive advancements that occur in middle childhood (Crick et al., 1999; Ostrov & Godleski, 2013), and the growing need to be accepted by peers that develops at this age, making relationally aggressive behavior more advantageous for the aggressor and more damaging for the victim (Ostrov & Godleski, 2013).

Although the literature on relational aggression in middle childhood and adolescence is rich, we still know very little about how relational aggression develops in younger children. For example, although researchers have theorized that preschool-aged children’s relationally aggressive behaviors should be simple and “in the moment”, there is little research on the complexity of preschool children’s relationally aggressive behaviors. One of the few studies that does exist on this topic suggests that preschool-aged children might be engaging in relationally aggressive behaviors that are quite complex, such as gossip, rumor spreading, and secret telling (Ostrov et al., 2004). Thus,

preschool children might be recruiting more sophisticated social cognitive abilities to engage in relational aggression than researchers have previously acknowledged.

However, to date there is no work that thoroughly investigates the underlying cognitive components that contribute to preschool children's engagement in relational and other forms of aggression. This is the focus of the current investigation.

### ***Social Information Processing and Aggressive Behavior***

Several cognitive factors might contribute to children's aggressive behavior. A large body of literature explores how different styles or patterns of social information processing may influence children's engagement in aggression. According to the social information processing models put forth by Dodge et al., (1986) (reformulated by Crick and Dodge, 1994), Huesmann (1998), and Lemerise and Arsenio (2000), children's behavioral responses are a function of how they process both internal and external social cues. These models are very similar, all suggesting that individuals faced with a social conflict encode and interpret the social cues around them, they search their memory for potential behavioral responses, they evaluate and decide on which action is best, and they enact a response. These models do differ in that both Huesmann (1998) and Lemerise and Arsenio (2000) include emotion as a key component of each step of social information processing. Here we agree that emotion likely plays an important role in social information processing; however, investigating young children's emotional state as they process social information is extremely challenging and beyond the scope of the current research. Thus for the purposes of the current research, we will focus on the reformulated model developed by Crick and Dodge (1994). This model proposes six steps in children's processing of social information and their subsequent behavioral responses—encoding of

cues, interpretation of cues, clarification of goals, response access or construction, response decision, and behavioral enactment.

Processing of social information begins with a mental representation of the current social situation. These mental representations are formed through the encoding and interpretation of social cues (Crick & Dodge, 1994). Biases that exist during these two important steps of the model may be the result of an attribution style, referred to as a *hostile attribution bias (HAB)*, or the tendency to attribute hostile intent to others (see de Castro et al., 2002, for a review). According to Dodge (1980), children who have a hostile attribution style perceive and interpret the behavior of their peers as intentionally harmful, and as a result, behave aggressively in response to this perceived hostility. Mental representations of social situations can also be greatly influenced by an individual's past experiences (i.e., schemata) and may not necessarily reflect immediate social cues. If children have learned to associate threat with another individual or situation, they may be more likely to interpret similar situations in the future as threatening, and in turn respond aggressively (Dodge & Tomlin, 1987). Further, if a child has experienced physical abuse, he or she might be more likely to interpret the intentions of others as hostile and in turn respond aggressively (Dodge et al., 1995).

After children have formed a mental representation of a social situation by encoding and interpreting social cues, they then formulate a goal. Research suggests that the construction and pursuit of socially inappropriate goals (e.g., getting even with a peer) are positively related to children's social maladjustment (Crick & Dodge, 1989; Dodge, Asher, & Parkhurst, 1989). Further, if a child feels as though the goals he or she has

formed are being blocked, he or she may respond aggressively in response to the blocked goal (Crick & Dodge, 1994).

Once a goal has been formulated and clarified, the model proposes that children either begin accessing potential behavioral responses from long-term memory or they construct new behavioral responses. Research suggests that children who frequently engage in aggressive behavior may access fewer responses to social situations than their peers (Dodge et al., 1986; Slaby & Guerra, 1988), and access more aggressive and fewer prosocial responses to provocation, object acquisition, friendship manipulation, and group entry than their non-aggressive peers (Dodge, 1986; Dodge et al., 1986; Pettit et al., 1988; Richard & Dodge, 1982). An alternative possibility is that aggressive children are able to access appropriate responses but that they do not use these responses to subsequently guide their behavior (Richard & Dodge, 1982).

After responses have been accessed or constructed, children must then decide which response to enact. This step involves evaluating potential responses and outcome expectations, assessing one's own self-efficacy, and ultimately selecting a behavioral response (Crick & Dodge, 1994). It has been hypothesized that socially maladjusted, rejected, and aggressive children more positively evaluate maladaptive response behaviors than do their well-adjusted peers (Crick & Ladd, 1990; Dodge, 1986; Quiggle et al., 1992). Aggressive acts may also occur if a child shows a positive evaluation of aggressive behavior (e.g., if I push him out of the way, I can play with the toy I want). If a child believes that engaging in aggressive behavior will be an effective means of obtaining a positive desired outcome, he or she is more likely to select an aggressive response (Bailey & Ostrov, 2008; Crick & Dodge, 1996; Goldstien & Tisak, 2004;

Renouf et al., 2010). Children who display frequent acts of proactive aggression have been found to give a more positive evaluation of aggressive behavior and its consequences than do nonaggressive children (Crick & Werner, 1998). These children are motivated by their belief that engaging in aggression is a means by which they can attain their goals (Crick & Dodge, 1996; Renouf et al., 2010). Previous studies also indicate that aggressive children have more confidence in their ability to enact an aggressive response than do non-aggressive children (Crick & Dodge, 1989; Perry, Perry, & Rasmussen, 1986; Quiggle et al., 1992).

Differences in outcome expectation, occurring during the response decision step of the model, are also likely to influence children's use of different forms of aggressive behavior (i.e., overt versus relational). Children who choose to use relational aggression may do so because of its covert nature. Relational aggression is much more subtle than overtly aggressive acts such as hitting or yelling at another child. The subtle nature of these behaviors may cause them to go undetected by teachers or parents. Children are far less likely to be reprimanded for an aggressive act if it escapes the attention of their caregivers, and therefore less likely to experience a negative outcome (Crick et al., 1999).

The final step in the model is behavioral enactment. Once a child has decided on a response to take, the child then decides whether or not to engage in that response behavior. Depending on the social situation and how the child processes the social information, he or she may choose to respond in a positive manner (i.e., prosocial behaviors), in a negative manner (i.e., aggressive behaviors), or the child may choose not to respond at all. Children's interpretation of the results of the behavior they select might then in turn inform future information processing.

***Theory of Mind and Aggressive Behavior***

Although different patterns of social information processing may contribute to children's engagement in aggressive behavior, these processing patterns and children's subsequent behavior may also be influenced by differences in other developing cognitive abilities. Theory of Mind (ToM), for example, is a critical skill for all social interactions. A developed ToM affords children the ability to (1) perceive and interpret the mental states (beliefs, desires, and emotions) of others, (2) make the distinction between objective reality (the true state of affairs) and subjective mental representations of reality (that may or may not reflect the true state of affairs) and (3) comprehend that people's behaviors are based on these mental representations (Wellman, Cross, & Watson, 2001). Previous research suggests that important developments in ToM take place when children are between the ages of 3 and 5 (Wellman, Cross, & Watson, 2001).

Theory of mind abilities may influence children's engagement in aggressive behaviors in a variety of ways. First, ToM might show overlap with social information processing, affecting how a child processes and responds to social information. For example, children who lack a developed ToM may be unable to accurately interpret the intentions of others and may display aggression in response to perceived provocation. Behavior motivated by a desire to remove a blocked goal or to respond to a provocation is referred to as *reactive* aggression. These behaviors, typically appearing impulsive and hostile in nature, are seen as defensive acts displayed in response to perceived threat or frustration (Crick & Dodge, 1996; Dodge & Coie, 1987; Little et al., 2003). In contrast, a more advanced ToM may afford children the ability to better anticipate when certain behaviors (e.g., aggression) will lead to positive outcomes or personal gains, and



therefore may motivate children to engage in more complex forms of aggression. This type of aggression is referred to in the literature as *proactive* aggression. These behaviors are more deliberate or premeditated, motivated by a child's desire to achieve a specific outcome or an internally generated goal (e.g., attainment of a toy, resource, or social position) and are controlled by external reinforcements (Crick & Dodge, 1996; Dodge & Coie, 1987; Little et al., 2003). Proactive aggressive behaviors are typically displayed in anticipation of a positive self-serving outcome (Dodge & Coie, 1987; Little et al., 2003). Consistent with this idea, Renouf and colleagues (2010) reported that poor ToM ability at age 5 was related to higher levels of reactive aggression up to 1 year later, while high ToM ability at age 5 was related to higher levels of proactive aggression a year later (Renouf et al., 2010). Further, it is also possible that certain children may attend more to aggressive cues in the environment. This increased attention, coupled with more advanced social cognitive abilities, and the ability to discern when these behaviors lead to a positive or self-serving outcome, may collectively contribute to children's ultimate engagement in aggressive behaviors.

Second, ToM ability may uniquely influence the type of behavioral responses a child is able to generate in a social situation. For example, differences in ToM ability have been hypothesized to differentially contribute to children's use of overt versus relational aggression. Overtly aggressive behaviors may require less social cognition than relationally aggressive behaviors. These behaviors are aimed directly at the victim and do not require manipulation of the victim's mental representations or the inclusion of peers. Thus, the response repertoire of a child who does not have a fully developed ToM may be more limited and therefore comprised of mainly physical or verbal acts of aggression. In

contrast, a more fully developed ToM might be positively related to children's use of relational aggression (Sutton, Smith, & Swettenham, 1999). Relationally aggressive behaviors such as friendship manipulation and social exclusion require a more advanced understanding of the mental states (beliefs, desires, emotions) of others and the influence of mental representations on behavior (Renouf et al., 2009; Renouf et al., 2010; Sutton et al., 1999). A child who is able to engage in relational aggression may choose to do so over physical or verbal aggression because these behaviors are more covert, increasing the chances that they will go unnoticed and therefore unpunished (Crick et al., 1999; Crick, Casas, & Mosher, 1997; Sutton et al., 1999).

Having an underdeveloped theory of mind certainly does not guarantee that a child will engage in physical aggression, in the same way that having an advanced Theory of Mind alone will not ensure a child will engage in relationally aggressive behavior. In other words, ToM simply affords children with the ability to engage in relationally aggressive behaviors. While ToM may play a role in children's engagement in aggressive behavior, it is important to highlight that the development of aggression does not take place inside a vacuum. Children's exposure to parental figures, siblings, peers, the media, and other social influences undoubtedly impacts their engagement in aggressive behaviors.

### ***The Current Research***

In the current research, we presented a thorough investigation of aggressive behavior in preschool children, and examined some of the social cognitive factors that might motivate it. To date, virtually no research has systematically evaluated all the steps in the social information processing model of aggression, or investigated the relation

between these steps and preschool-aged children's rapidly developing ToM skills. Our research was aimed at filling this gap. In Study 1, we conducted an exploratory study to document the incidence of physical, verbal, and relational acts of aggression in preschool-aged children, and attempt to describe the complexity and interpersonal context of their relationally aggressive behaviors. The goal of this study was to confirm the incidence of relationally aggressive behavior in preschool-aged children and to describe its complexity. In Study 2, we designed and implemented a new task that assesses patterns of social information processing in preschool-aged children and its relation to aggressive behavior. Our main objective was to create a new task that is appropriate for preschoolers and to demonstrate that the task produces findings that are consistent with similar tasks in the literature designed for older children. Finally, in Study 3, we examined the complex interrelationship between ToM, social information processing, and aggressive behavior in preschool children, with the ultimate goal of investigating how different social cognitive abilities interact to influence aggressive behavior in preschoolers. Taken together, this work has the potential of providing important insights into the cognitive components underlying the development of different forms of aggressive behavior.

### **Study 1**

In Study 1, we had three main objectives. First, we observed and measured physical, verbal, and relational acts of aggression in preschool-aged children. Second, we attempted to provide a descriptive account of the complexity of the relationally aggressive behaviors being used by this young age group. Third, we sought to examine the interpersonal context surrounding young children's aggressive behavior. This

included any stable patterns of aggression, history of aggression between the aggressor and the victim, as well as history of aggression between the aggressor and other peers in the classroom. Examining these interpersonal relationships might shed new light on what motivates young children to engage in aggression.

### **Method**

Using the Early Childhood Observational System (ECOS) (Ostrov & Keating, 2004), we observed preschool children's behaviors at four time points and coded them for physical, verbal, and relational acts of aggression. Observations took place within two separate classrooms by two independent observers to ensure reliability.

#### ***Participants***

Participants were 26 preschool children (13 female and 13 male) ranging from 30 to 63 months of age ( $M = 42$  months). Children were recruited from a New Jersey childcare center and observations took place in two separate classrooms. The four observations were spaced approximately 3 weeks apart.

#### ***Procedure***

Direct observation was done using an adaption of the Early Childhood Observational System (ECOS), a validated observational coding system for aggressive behavior (Ostrov & Keating, 2004). Two experimenters observed each child individually (the focal child) for 10 minutes at each of the four time points. Observations were made at the same time of the day, during free play in the morning. For each observation, the two experimenters sat in an unobtrusive location inside the classroom close enough to each child to see and hear all of the child's interactions. The children generally paid little or no attention to the experimenters' presence in the classroom, but if approached by a

child, each experimenter responded with “I’m sorry I can’t play right now. I am quietly working. We can play later.”

Each experimenter documented any act of proactive (i.e., seemingly unprovoked) physical aggression (hitting, kicking, pushing, spitting, etc.), verbal aggression (name calling, teasing, taunting, etc.) and relational aggression (social exclusion, rumor spreading, secret telling, etc.) displayed by the focal child during each 10-minute observation period (aggression). In addition, each experimenter also documented any act of physical, verbal, or relational aggression that was directed *toward* the focal child (victimization). Children were observed in a random order chosen prior to observation. Each experimenter was equipped with a stopwatch, and after the 10-minute observation period was complete, the experimenters moved on to the next focal child.

### ***Coding***

Coding was done online during each observation. Each experimenter identified all aggressive acts and acts of victimization based on the ECOS observational coding scheme (Ostrov and Keating, 2004). Each experimenter recorded both the aggressor and the victim of each aggressive act. Acts of aggression and victimization (recipient of aggression) were coded as being physical, verbal, or relational. Any interaction in which a child inflicted harm on another child through blatant physical acts was considered *physical aggression*, which included hitting, kicking, slapping, pushing, pinching, etc. The overall interaction and context of the behavior was assessed to rule out rough and tumble play. Any hostile verbal remarks were coded as acts of *verbal aggression*, which included teasing, taunting, name-calling, etc. In contrast to the standard ECOS method of coding, physical threats were coded as acts of verbal aggression (as opposed to physical

aggression). This was done to differentiate between behaviors that harm others through physical damage (i.e., physical aggression) versus the potential *threat* of physical damage as the vehicle of harm. Any attempt to use the children's relationship as a vehicle of harm was considered *relational aggression*, which included intentional exclusion from a social group, secret telling, and such phrases as "I will not be your friend any more if..." or, "You can't come to my house if..." etc. Both verbal and relational acts of aggression were recorded verbatim. Interrater reliability between the two coders was 100% across the four time points.

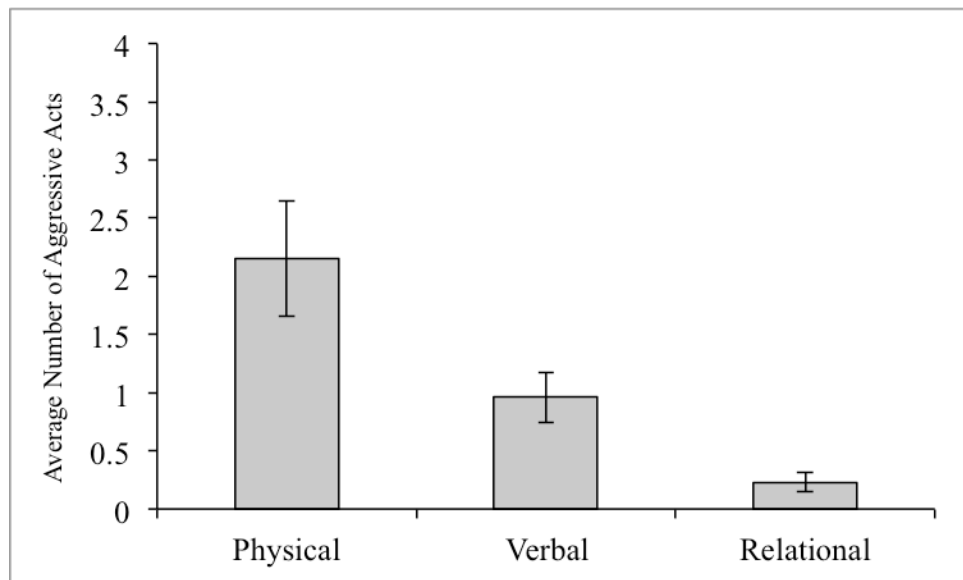
## **Results**

### ***Preschool Aggression***

Our first objective was to assess the prevalence of physical, verbal, and relational aggression within preschool-aged children. Thus, our main analyses focused on the frequency of aggressive acts and the differences among them. Further, previous research has reported gender differences in aggression and victimization. More specifically, girls between the ages of 3.5 and 5.5 years engage in more acts of relational aggression than do boys (Crick, Casas, & Mosher, 1997), whereas boys engage in more acts of physical and verbal aggression than do girls (Crick et al., 2006; Ostrov & Keating, 2004). Thus, gender was also included in all analyses.

The total number of aggressive behaviors did not differ across the time points, so each type of aggressive act was summed across the four observations. First, we examined the type of aggression in which boys and girls engaged over the four time points. In a 3 (type of aggression: physical, verbal, or relational) by 2 (gender) repeated-measures analysis of variance (ANOVA) on the number of aggressive acts observed, with type of

aggression as a within-subjects variable and gender as a between-subjects variable, there was a main effect of type of aggression,  $F(2, 49) = 24.86, p < 0.001$ . A series of follow-up  $t$ -tests indicated that children engaged in significantly more acts of physical aggression ( $M = 2.15$ ) than verbal ( $M = .96$ ) ( $t = 2.79; p = 0.01$ ) or relational aggression ( $M = 0.23$ ) ( $t = 3.95; p < 0.001$ ), and significantly more acts of verbal than relational aggression ( $t = 3.87; p < 0.001$ ) (See Figure 1). The interaction was not significant, indicating that boys and girls did not differ on any of the aggressive acts observed (See Figure 2).



*Figure 1. Average number of aggressive acts in Study 1.*

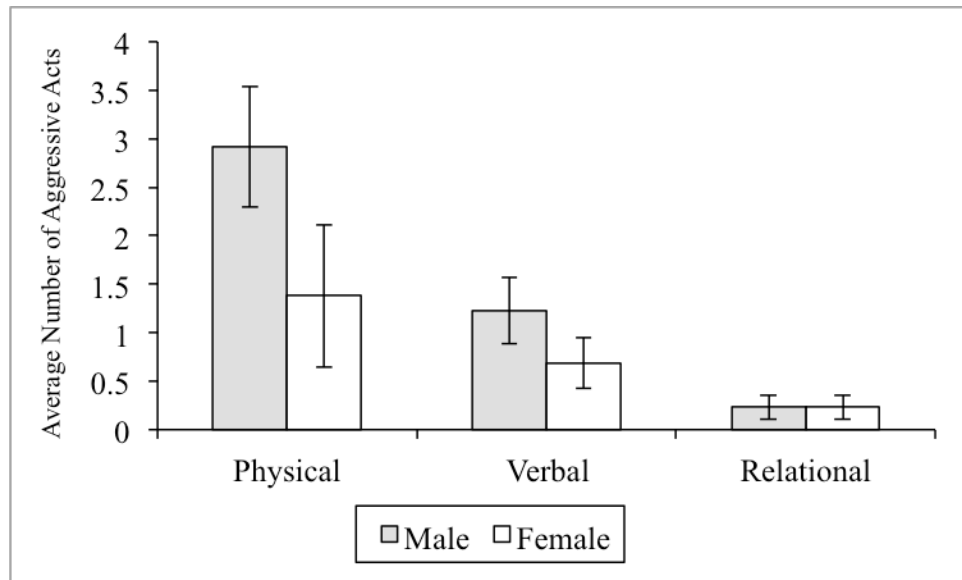


Figure 2. Average number of aggressive acts in Study 1 (by gender).

Although the number of physical, verbal, and relational acts of aggression were equal to physical, verbal, and relational acts of victimization (as we coded for both the aggressor and the victim of each act), it is possible that the gender distribution across types of aggression would vary between aggressors and victims. Thus, we ran a second 3 (type of victimization: physical, or verbal, relational) x 2 (gender) repeated-measures analysis of variance (ANOVA) on the number of acts of victimization observed, with type of victimization as a within-subjects variable and sex of child as a between-subjects variable. There was again a significant main effect of type of victimization,  $F(2,48) = 17.27, p < 0.001$  with physical acts of victimization occurring more often than both verbal and relational, and verbal acts occurring more often than relational (See Figure 3). Importantly, there was also a victimization by sex interaction,  $F(2,48) = 5.28, p = 0.007$ . A series of follow-up t-tests indicated that boys were more often victimized physically ( $M = 3.00$ ) than verbally ( $M = 0.92$ ) ( $t = 4.52; p = 0.001$ ) or relationally ( $M = 0.08$ ) ( $t =$



5.02;  $p < 0.001$ ), and they were more often victimized verbally than relationally ( $t = 2.86$ ;  $p = 0.014$ ). Girls, on the other hand, were more often victimized verbally ( $M = 1.00$ ) than relationally ( $M = .38$ ) ( $t = 2.31$ ;  $p = 0.040$ ); physical victimization did not differ significantly from verbal or relational (see Figure 4).

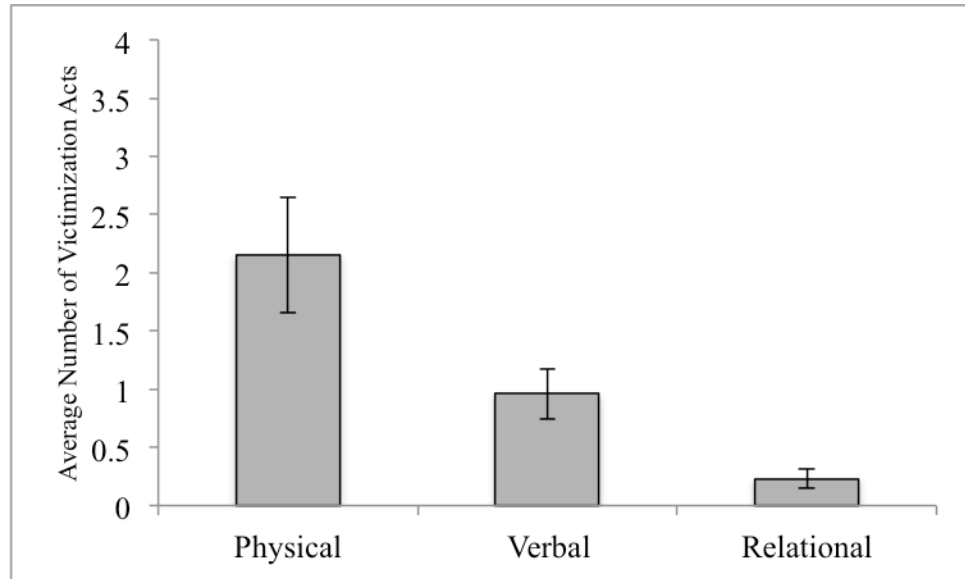
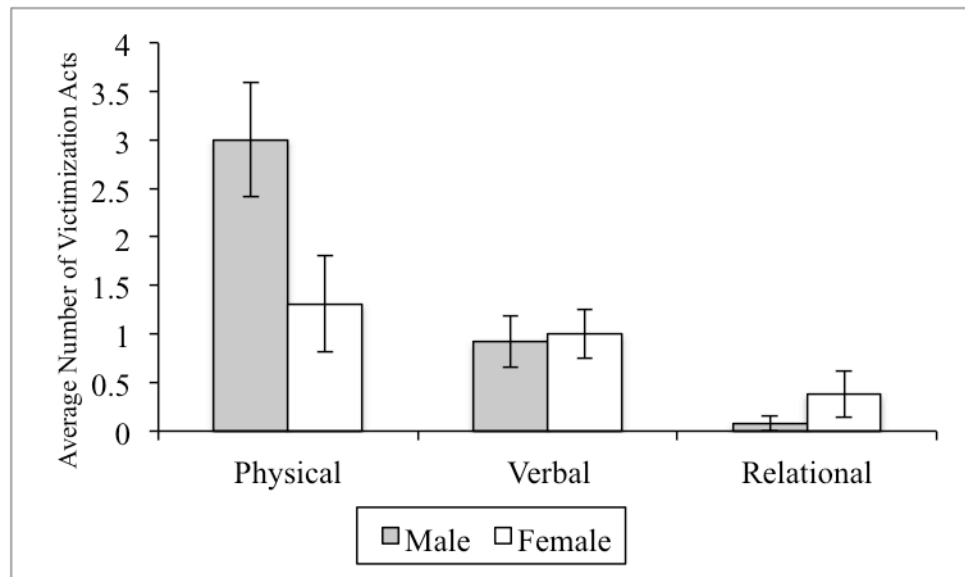


Figure 3. Average number of victimization acts in Study 1.



*Figure 4. Average number of victimization acts in Study 1 (by gender).*

### ***Complexity of Relational Aggression***

Our second objective was to provide a description of the complexity of relationally aggressive behaviors that young children exhibit. In total, we observed six instances of relational aggression (3 female aggressors, 3 male aggressors; ages 3;4 – 4;11). Across these six instances, we observed four different types of relationally aggressive acts—secret telling (child 1 tells a secret to child 2 and child 3, leaving out the focal child; 3 M), deception (“[The teacher] said you can’t play in the block area with us. She said you can’t play here”; F), friendship exclusion (Everybody here can come to my house today but not you, you can’t come”; F), and friendship manipulation (“You can’t be my friend anymore if you don’t let me play with that”; F).

The observed act involving friendship manipulation can be considered a simple form of relationally aggressive behavior—this behavior was directed at a specific victim and did not involve the manipulation of peers groups (Crick et al., 1999). The other five acts of relational aggression are more complex. In four of these cases, children used their peer groups as a means of harming their victim (3 M, 1 F). In one case, a child used deception coupled with the peer’s relationship with the teacher as the vehicle of harm (F). These results challenge the commonly held assumption that relational aggression in early childhood is simple and direct, and that peer group manipulation is not observable until later in development (e.g., Crick et al., 1999; Crick et al., 2004).

*Interpersonal Context*

Since the current study focused on seemingly unprovoked acts of aggression, if children's aggressive behavior was immediate, "in the moment," and did not reflect past transgressions, we expected to see that most aggressive acts were motivated by a child's desire to attain or obtain a specific goal. If young children were using their past experiences with a peer or their knowledge of a peer's past transgressions as motivation for engagement in aggressive behavior, we expected to see aggressive behaviors that were not necessarily accompanied by reference to a specific goal and that were instead retaliatory or reactive in nature.

We found no clear evidence to support either possibility, suggesting that both could potentially motivate preschool children's aggressive behaviors. In 61% of the aggressive behaviors observed, children made reference to a specific toy or object; in the other 39% of cases, they did not. 32% of the aggressive acts observed were directed at children who were highly aggressive towards their peers (i.e., their total number of aggressive acts was one standard deviation above the group mean or higher), and 18% were directed at children who were aggressive towards peers *and* had also been aggressive towards the focal child at a previous time point. Conversely, 50% of the aggressive acts observed were directed at children who were not highly aggressive (6%), or had not aggressed against the focal child in the past (42%).

We were also interested in whether preschoolers engaged in repeated acts of aggression that were directed toward particular targets. To examine this issue, we coded acts of aggression that occurred across multiple time points within specific interpersonal relationships. We found seven relationships in which one child aggressed repeatedly

against another child. Closer examination of these relationships revealed that in five of them, the aggression was reciprocal, with both children aggressing against one another at least once. In the two other relationships the aggression was unidirectional. Boys were the aggressors in 5 out of 7 relationships, with female victims in 2 of these relationships and male victims in the other 3. In the 2 relationships where the aggressor was a girl, 1 of the victims was a boy and the other was a girl. Although too few instances of repeated aggressive acts occurred to run statistical comparisons on these data, physical aggression was the most common method, and sex of the aggressor and victim did not appear to influence the type of aggression used (see Table 1).

Aggressor	Victim	Time 1	Time 2	Time 3	Time 4
4 (M)	8 (M)	PA		PA	
5 (M)	11 (M)	VA	PA		
22 (M)	12 (F)	PA		PA	
14 (M)	22 (M)	PA	PA		
19 (F)	18 (F)		PA, VA	VA	
19 (F)	2 (M)	PA	PA		RA
4 (M)	12 (F)	PA	PA		VA

*Table 1. Repeated acts of physical (PA), verbal (VA) and relational (RA) aggression by gender.*

## Discussion

The results of Study 1 confirm the presence of physical, verbal, and relational acts of aggression in preschool children. Consistent with previous research, the most prevalent form of aggression was physical, followed by verbal, then finally relational. However, previous research reported that girls engage in more acts of relational aggression than do boys (Crick, Casas, & Mosher, 1997), while boys engage in more acts of physical and

verbal aggression than do girls (Crick et al., 2006; Ostrov & Keating, 2004); we found no such gender differences. However, we did find that boys were more likely to be victimized physically than verbally or relationally, consistent with previous data

Importantly, we were indeed able to document complex relational acts of aggression in children as young as three years of age. Further, the specific types of relational aggression we observed in these young children—secret telling, deception, and friendship exclusion—all require a level of cognitive ability typically not attributed to children at this young age. Engaging in deception, for example, requires that a child understands another child's wrong belief in relation to his or her own knowledge *and* that the child thinks simultaneously about appearance and reality (Flavell, Green, & Flavell, 1986; Wimmer & Perner, 1983). Similarly, secret telling requires that the child telling the secret understands that his or her knowledge, beliefs, and desires differ from those of the other child, and that these mental representations do not necessarily reflect the true state of affairs. Finally, friendship exclusion requires children to recruit the help of their peers through the manipulation of their mental representations (rumors and false beliefs) (Renouf et al., 2010). A fully developed theory of mind would clearly support these behaviors, enabling children to engage in such acts of relational aggression. What is significant here is that according to theories of cognitive development, the children we observed engaging in these complex social behaviors may not yet possess a fully developed theory of mind. Thus, these findings are both surprising and noteworthy.

In addition to observing different forms of physical, verbal, and relational aggression in very young children, we were also able to observe acts of aggression that occurred across multiple time points within specific interpersonal relationships. Within

these relationships, one child aggressed against another child repeatedly. This work demonstrates that the complex dyadic relationships (that are characteristic of the bully/victim dynamic) might be beginning to develop at this very early age. Further, we found that there was no one clear reason that children aggressed against other children. In some cases a desired object or toy was mentioned, in other cases it was not. In some cases aggressive behaviors were directed toward aggressive children, in other cases they were not. However, in some cases, the aggression was directed toward a child who had previously victimized the aggressor. While this pattern is not indisputably indicative of retaliatory aggression, it is certainly consistent with the possibility (Crick et al., 1999). This suggests that aggressive behaviors in preschool children might not be either as simple or as “in the moment” as previous research and theory would suggest. In the next two studies, we will empirically evaluate a more in depth investigation of the social cognitive factors that might provide insight into the complexity of aggressive behaviors in preschool children.

### **Study 2**

Previous research has established that the way children process social information can contribute to their engagement in aggressive behavior. In Study 1 we observed a variety of social situations in which children behaved aggressively towards their peers without any apparent provocation. Our results suggest that preschool children are engaging in aggressive acts against their peers and may be doing so for a variety of reasons (i.e., to attain a goal, in response to a perceived threat, as retaliation for a past transgression). How these children are processing the social cues around them may be differentially contributing to their engagement in aggressive behavior.

Previous research suggesting a relationship between patterns of social information processing and children's use of specific types of aggressive behavior is limited in a number of ways. One limitation is that much of the research grounded in Crick and Dodge's (1994) social information-processing model has focused on only one or two steps of the model. No study to date has explored how each step (i.e., encoding and interpreting of social cues, formulation of goals, response access and construction, response decision, and behavioral enactment) relates to children's aggressive behavior. Because each of the steps involved in information processing are related, studying a select few fails to provide a comprehensive view of the mechanisms that might be driving children's aggressive behavior (Crick & Dodge, 1994).

A second limitation is that only a handful of studies examining social information processing and its relation to aggressive behavior have focused on early childhood. It is at this important stage in development that children begin to develop social information processing strategies, along with more advanced forms of aggressive behavior (Crick & Dodge, 1994). By middle childhood, the relationship between social information processing and aggressive behaviors has become more firmly established (Crick & Dodge, 1994; Dodge & Feldman, 1990), so interventions aimed at adjusting information processing patterns that might contribute to children's engagement in maladaptive behaviors would be most effective during the preschool years.

Study 2 had one major objective. We sought to design and implement a new task that assesses Crick and Dodge's social information processing model in preschool-aged children, and to relate children's performance on this new task to teacher-reports of aggression. Due to constraints on time and resources, we could not measure children's

aggressive behavior in real time, and were thus unable to assess the 6<sup>th</sup> and final step (behavioral enactment) of Crick and Dodge's model; however, we were able to successfully design a new social information processing measure that assesses all other steps (1-5) of their model.

## **Method**

### ***Participants***

Participants were 58 preschool children (33 female) ranging from 3.5 to 5 years of age ( $M = 50$  months). Children were recruited from childcare centers in northern New Jersey. The first childcare center had a participation rate of 80% and the second had a participation rate of 50%. All children were given parental consent to participate.

### ***Measures***

Measures of Aggression. Teacher ratings of children's aggression were assessed using the Preschool Proactive and Reactive Aggression Teacher Measure (PPRA-TM) (Ostrov & Crick, 2007). The PPRA-TM assesses children's engagement in different forms (relational and physical) and functions (reactive and proactive) of aggression. It contains 5 subscales that measure proactive relational aggression, reactive relational aggression, proactive physical aggression, and reactive physical aggression. Teachers were asked to respond to 14 questions using a response scale that ranges from 1 (never or almost never true) to 5 (always or almost always true).

Measures of Social Cognition. Children's patterns of social information processing were assessed using a social information-processing task that we designed for use specifically with preschool aged children similar to those used with older children by Dodge, Pettit, Bates, and Valente (1995). Eight vignettes depicted two different



intentions: hostile and ambiguous. For each intention, two vignettes portray male characters and two portray female characters. Each participant was randomly assigned to one gender matched ambiguous vignette and one gender matched hostile vignette. The vignettes were created using images of 3- to 5-year-olds children from the Child Affective Facial Expression (CAFE) set (LoBue & Thrasher, 2015). CAFE faces were joined with clip-art to create images that followed each vignette's story line. Each vignette is stopped at several time points so that the experimenter can ask children questions aimed at evaluating their social information processing patterns.

All vignettes begin with an introduction to two characters. In both conditions, Character 1 is playing with an object when Character 2 enters the scene and destroys the object. During this scene, the conditions vary by intent. In the hostile conditions, when Character 2 destroys the play object, he/she displays a hostile facial expression accompanied by hostile verbalizations. In the ambiguous condition, when Character 2 destroys the play object, he/she displays a neutral facial expression with no verbalizations.

Following this event, participants are asked twenty-two questions. The first three questions measure encoding errors: *1. What happened in the story? 2. What happened to [Character 1]'s [toy]? 3. How did this happen?* The next two questions measure interpretation of cues and emotion attribution. For these two questions, children are given images of Character 1 and Character 2 displaying four emotional facial expressions (happy, neutral, sad, and angry) to use as response options: *4. How do you think [Character 1] feels? (child chooses an image). 5. How do you think [Character 2] feels? (child chooses an image).*

Next, children are asked three questions that measure their ability to evaluate the character's intention: 6. *Did [Character 2] [destroy the play object] of [Character 1] on purpose?* 7. *Did [Character 2] [destroy the play object] of [Character 1] by accident?* 8. *Why did [Character 2] [destroy the play object] of [Character 1]?* The next two questions measure whether or not the children access aggressive responses. For these, the experimenter shows children five images depicting possible behavioral responses (physical aggression, verbal aggression, relational aggression, telling the teacher, and walking away/ignoring), and asks the children to select the image that best answers each question: 9a. *What do you think [Character 1] will do?* 10a. *What do you think [Character 1] should do?* The experimenter also asks the children what they predict the outcome for each of these responses would be: 9b. *What would happen if [Character 1] does this?* 10b. *What should happen if [Character 1] does this?*

After the first series of questions, the experimenter continues to read the vignette. In the next part of each story, [Character 1] engages in 3 different behavioral responses: A physically aggression response in which [Character 1] hits [Character 2], a relationally aggressive response in which [Character 1] threatens to end his/her friendship with [Character 2], and an ambiguous response in which [Character 1] silently walks away from [Character 2]. After each response, the experimenter asks the child two questions to assess whether the child has a positive or negative evaluation of aggression: 11a, 12a, 13a. *Do you think what [Character 1] did was good or bad?* For the second, children are

shown a response scale featuring three different options and are asked to choose one (see Figure 1): *11b, 12b, 13b. How good or bad?*

For the next two questions (14 & 15) the experimenter instructs children to imagine that they are [Character 1] and to imagine that the events in the story actually happened to them. The first question examines children's assessment of aggressive behaviors toward the child him/herself. Children can answer using free response or by selecting a response from the five images described above depicting different behavioral responses (physical aggression, verbal aggression, relational aggression, telling the teacher/parent, and walking away/ignoring): *14. What would you do if you were [Character 1]?* The second question asks the child to evaluate his/her goals: *15. How come you would do this?* Finally, the experimenter asks two questions that examine whether children can access behavioral responses to an aggressive situation from long-term memory. *16a. Has this ever happened to you? 16b. If yes, what did you do?*

### ***Procedure***

Teacher report. Teachers were asked to fill out the PPRA-TM at the beginning of data collection. This measure took approximately 2 minutes per child to complete. Within the PPRA-TM, ratings of proactive physical aggression were correlated with ratings of reactive physical aggression ( $r = .86, p < .001$ ), and proactive relational aggression was correlated with reactive relational aggression ( $r = .86, p < .001$ ).

Social Information-Processing Task. Two vignettes (hostile and ambiguous) were read to each child individually, one story per session over the course of two sessions. Each session lasted approximately 15 minutes and occurred approximately one week apart. Both the experimenter and the child sat at a small table in a quiet room located

within the childcare center. The experimenter read the vignettes slowly to each child. Each vignette was arranged in a storybook that was placed on the table in front of the child to ensure that all images were in full view. Each session was digitally recorded.

### ***Coding***

Children's responses to questions assessing encoding of cues (i.e., "What happened in the story?" and "What happened to [Child 1's] play object?") were coded as fully irrelevant (i.e., the child cited only cues that were not depicted in the story), partially relevant (i.e., the child cited some cues that were depicted in the story and some that were not), relevant (i.e., the child cited cues in the story that were either relevant to the destruction of the play object or included mention of the interpersonal interaction in the story), or fully relevant (i.e., the child cited cues in the story that were both relevant to the destruction of the play object and included mention of the interpersonal interaction in the story).

For questions assessing children's interpretation of cues (i.e., "Why did [Child 2] [destroy the play object] of [Child 1]?"), responses were coded as accidental (i.e., the child states that [Child 2] [destroyed the play object] of [Child 1] by accident), hostile (i.e., the child states that [Child 2] [destroyed the play object] of [Child 1] to harm [Child 1] and/or [Child 1]'s possessions), or other (i.e., the child states that [Child 2] [destroyed the play object] of [Child 1] with a behavior and gives no reference to intent, or the child gives an answer that does not reference either character or the event described in the story). See appendix for full coding manual.

Two researchers independently coded all of the responses. Percent agreement between the researchers was 90.5% (Cohen's  $k = .803$ ), showing substantial agreement. Any disagreements were resolved by the first coder.

### **Results**

We first analyzed differences in children's responding between conditions. Based on previous research, we anticipated that children would show different patterns of responding to questions across the vignette conditions. The literature suggests that when processing ambiguous social cues, children's patterns of social information processing should vary. Thus, we expected to see the most variability in children's responses to the ambiguous vignette condition. In the hostile vignette condition, we expected that most children would be able to accurately report that the behavior of the character was intentionally hostile (e.g., "He knocked down his blocks because he was being mean"); however, we also expected see some variability in children's responses to questions assessing the other information processing variables.

Second, we analyzed the relation between children's responses to the questions in each condition and their aggressive behavior (via teacher report). Based on previous research, children's behavioral responses should be related to how they process social cues; thus, we expected processing patterns at particular steps in the model to be related to children's engagement in different types of aggressive behavior. For example, when encoding and interpreting cues in the ambiguous vignette (steps 1 and 2), we expected that children whose teachers rated them higher in physical aggression to show more encoding errors and to be more likely to attribute hostile intent to the character's behavior than children whose teachers rated them lower in aggression. We also expected children

rated higher in overall aggression to access more aggressive responses (step 4) across both vignette conditions than children rated lower in aggression. Finally, we expected children rated higher in overall aggression to have more positive outcome expectations for aggressive responses and more positive evaluations of aggressive behavior (step 5) than children rated lower in overall aggression.

### *Preliminary Analyses*

Preliminary ANOVAs compared effects of gender and age on ratings of aggression and prosocial behavior on children's responses to the questions in the social information-processing task. We found only a main effect of gender on the PPRA proactive physical aggression subscale,  $F(1,53) = 7.59, p = .008$ , and on the PPRA reactive physical aggression subscale,  $F(1,53) = 4.68, p = .035$ , with boys scoring higher on teacher ratings of proactive physical aggression ( $M = 4.57, SE = .35$ ) than girls ( $M = 3.31, SE = .29$ ), and on teacher ratings of reactive physical aggression ( $M = 6.04, SE = .64$ ) than girls ( $M = 4.29, SE = .54$ ). There were no main effects of age, or any gender- or age-related interactions. We therefore dropped age from all subsequent analyses but retained gender as a covariate.

We also examined children's global responses to each question in the social information-processing task to ensure that children understood the question before including children's responses in our analyses. Two questions assessing attribution of intent, "Do you think [Child 2] [destroyed the play object of] [Child 1] by accident?" and "Do you think [Child 2] [destroyed the play object of] [Child 1] on purpose?" were removed from all subsequent analyses because 55.3% of children in the hostile condition and 60.5% of children in the ambiguous condition answered yes to both questions. This

pattern of responding suggested that children failed to understand that these questions were mutually exclusive. In addition, one question assessing children's response decisions, "What did you do when this happened?" was removed from all subsequent analyses because 60.0% of children in the hostile condition and 76.3% of children in the ambiguous condition reported that the situation described in the vignette had never happened to them.

### ***Data Analysis Plan***

First we ran a series of *t*-tests to evaluate children's responses to the two vignette conditions on the free-response question assessing attribution of intent. This allowed us to explore whether or not children's social information processing in a provoking situation varies as a result of how explicit the intention of the provocation is.

Next we conducted univariate ANCOVAs with gender as a covariate and simple linear regressions to assess the relationship between children's social information processing and teacher ratings of children's total aggression, as well as ratings across each subscale of the PPRA measuring aggressive and prosocial behavior. Children's responses in the hostile condition and the ambiguous condition were examined separately to explore potential differences in the way children process and respond to each type of provocation and how these processing patterns might relate to aggressive and prosocial behavior.

We theorize that the way children process and respond to social information can then lead to engagement in aggressive behavior. Thus, children's responses to the social information processing questions were used as predictor variables and teacher ratings of children's aggressive and prosocial behavior were used as outcome variables for all

analyses. We set our criterion for significant results at  $p < .05$  (see appendix for all results with  $p$ 's = 0.06—.20).

### ***Differences Based on the Condition***

Results revealed that more children attributed hostile intent to the characters in the hostile condition ( $M = .500$ ,  $SE = .066$ ) than to characters in the ambiguous condition ( $M = .313$ ,  $SE = .061$ ),  $t(57) = 2.278$ ,  $p = .026$ . Further, in the hostile condition where the intention of the character is explicitly hostile, significantly more children said that the character's behavior is intentionally hostile ( $M = 0.50$ ,  $SE = .066$ ) than accidental ( $M = 0.12$ ,  $SE = .043$ ) ( $t = 4.14$ ;  $p < 0.001$ ) or that it occurred for some other reason ( $M = 0.37$ ,  $SE = .064$ ) ( $t = .980$ ;  $p = 0.004$ ). In contrast, in the ambiguous condition where the intention of the character is unclear, there was no difference between the number of children who said that the character's behavior was intentional ( $M = 0.31$ ,  $SE = .061$ ), accidental ( $M = 0.31$ ,  $SE = .061$ ), or occurred for some other reason ( $M = 0.37$ ,  $SE = .064$ ) (see Figure 6). Children showed similar patterns of responding across vignette conditions for all other questions ( $p$ 's  $> 0.05$ ).

Together, these results suggest that our new social information processing task is effective in eliciting differences between the hostile and ambiguous conditions, comparable to the differences found in similar tasks used in previous research (e.g., Choe et al., 2013; Dodge et al., 2015; Dodge et al., 1995).



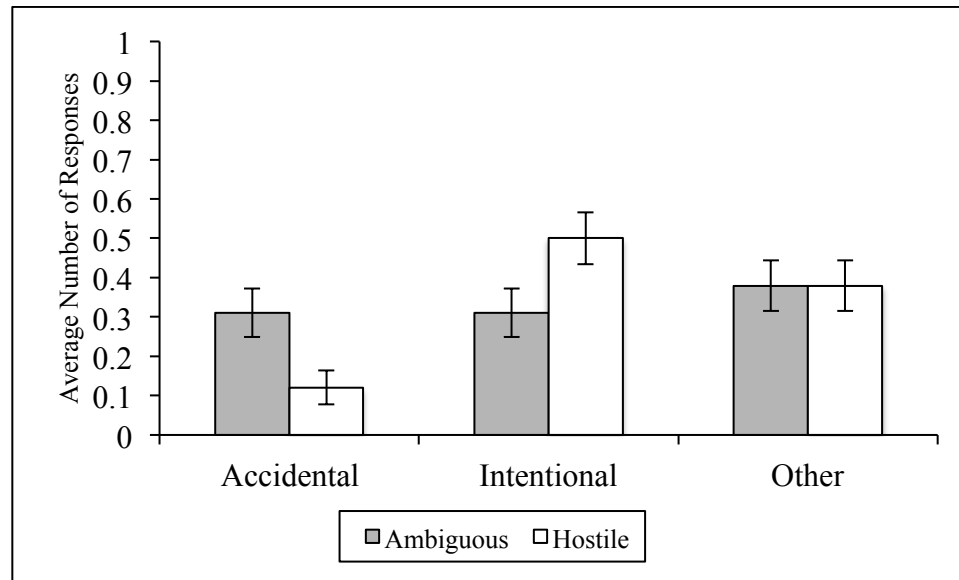


Figure 6. Average number of responses (by vignette condition).

### ***Social Information Processing and Aggressive and Prosocial Behavior***

#### **Hostile Vignette.**

**Encoding of cues.** For total aggression, results revealed a significant effect of children's responses to the questions "What happened in the story?" and "What happened to [Child 1's] play object?" for teacher ratings of total aggression,  $F(3,50) = 5.852, p = .002$ . Children who gave fully irrelevant explanations of what happened in the vignette (e.g., "He doesn't like playing with things") were rated as more aggressive ( $M = 28.31, SE = 4.25$ ) than children who gave relevant (e.g., "He walked over and knocked down his blocks") explanations ( $M = 14.04, SE = 2.59$ ),  $p = .035$ . Further, children who gave only partially relevant explanations of what happened in the vignette (e.g., "She knocked down her blocks because she didn't like what she was building") were rated as more aggressive ( $M = 27.07, SE = 2.31$ ) than children who gave relevant explanations ( $p = .003$ ) (See Figure 7).

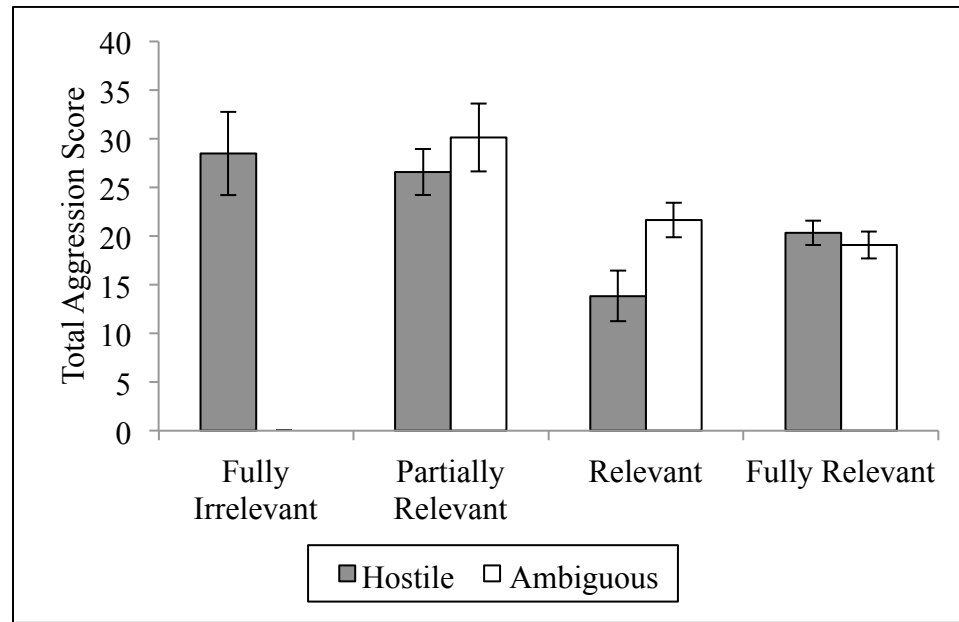


Figure 7. Main effects of encoding of cues on total aggression score (by condition)

For individual subscales of the PPRA, there was a significant effect of children's responses to the questions "What happened in the story?" and "What happened to [Child 1's] play object?" for teacher ratings of proactive physical aggression,  $F(3,50) = 6.05, p = .002$ , and reactive physical aggression,  $F(3,50) = 5.01, p = .004$ . Children who gave fully irrelevant explanations were rated higher on proactive physical aggression ( $M = 6.04, SE = .85$ ) than children who gave relevant ( $M = 2.90, SE = .51, p = .016$ ) or fully relevant explanations ( $M = 3.51, SE = .25, p = .039$ ). Also, children who gave partially relevant explanations were higher on proactive physical aggression ( $M = 5.02, SE = .46$ ) than children who gave relevant,  $p = .023$ , or fully relevant explanations,  $p = .037$ . Similarly, children who gave fully irrelevant explanations were rated higher on reactive physical aggression ( $M = 8.23, SE = 1.61$ ) than children who gave relevant explanations ( $M = 2.98, SE = .98, p = .046$ ). Children who gave partially relevant explanations were rated

higher on reactive physical aggression ( $M = 7.131$ ,  $SE = .881$ ) than children who gave relevant explanations,  $p = .017$  (See Figure 8 and 9).

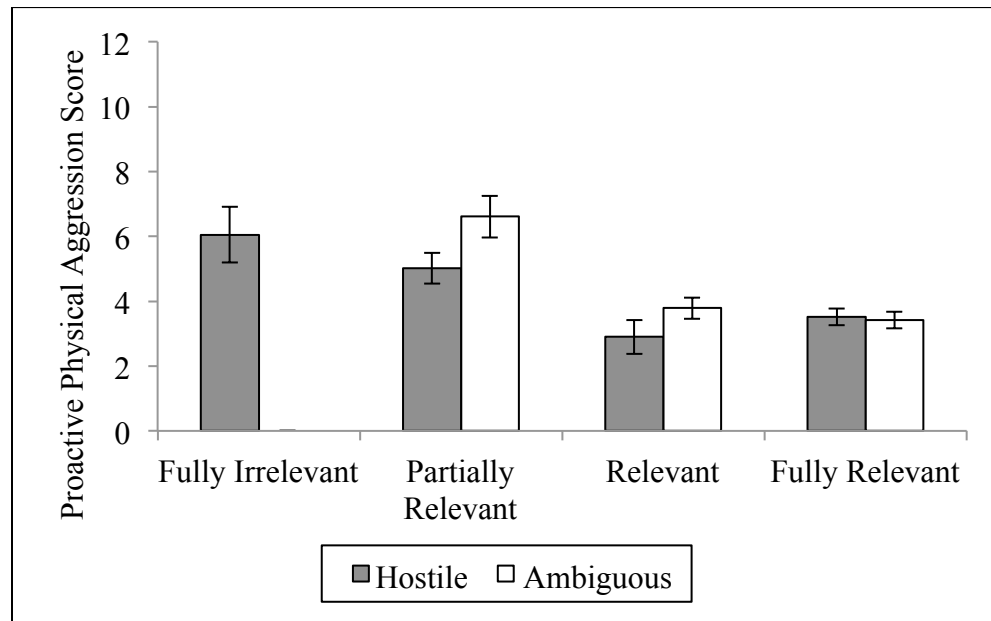
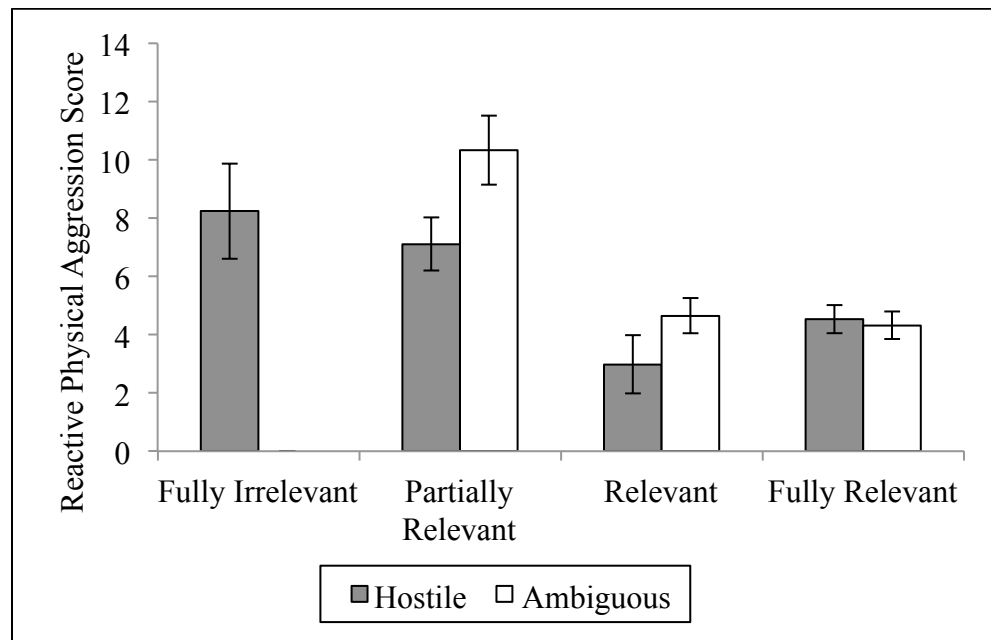


Figure 8. Main effects of encoding of cues on proactive physical aggression



*Figure 9. Main effects of encoding of cues on reactive physical aggression (by condition)*

**Interpretation of cues.** For individual subscales of the PPRA, there was a significant main effect of intent attribution (i.e., “Why did [Child 2] [destroy the play object] of [Child 1]?”) for teacher ratings of reactive relational aggression,  $F(2,50) = 3.60, p = .034$ . Children who correctly attributed hostile intent to Child 2’s behavior were rated higher in reactive relational aggression ( $M = 7.53, SE = .54$ ) than children who did not attribute intent to the behavior ( $M = 5.28, SE = .61, p = .029$ ).

**Response access/Response decision.** For individual subscales of the PPRA, there was a main effect of children’s response evaluation (i.e., “Do you think what [Child 1] did (relational aggression) was good or bad?”) for teacher ratings of proactive physical aggression,  $F(1,52) = 4.940, p = .031$ . Children who positively evaluated a relationally aggressive response were rated higher on proactive physical aggression ( $M = 5.232, SE = .664$ ) than children who negatively evaluated a relationally aggressive response ( $M = 3.665, SE = .230$ ).

**Summary.** In the hostile condition, children who were unable to fully and accurately explain the events in the vignette were rated higher in proactive and reactive physical aggression than children who provided more accurate explanations. Also, children who positively evaluated the relationally aggressive response were rated higher in proactive physical aggression than those who negatively evaluated the relationally aggressive response. In contrast, children who were able to correctly interpret the hostile intention in the story were rated higher in reactive relational aggression than those who

did not correctly interpret the intent. Both patterns of responding, inaccurate and accurate, were positively related to ratings of total aggression. This is likely due to the fact that the total aggression score is comprised of both the physical and relational aggression subscales.

### **Ambiguous Vignette.**

**Encoding of cues.** For total aggression, there was a significant effect of encoding of cues,  $F(3,51) = 4.491, p = .018$ . Children who gave only partially relevant explanations were rated as more aggressive ( $M = 30.224, SE = 3.495$ ) than children who gave fully relevant explanations ( $M = 19.040, SE = 1.401$ ),  $p = .016$ . For individual subscales of the PPRA, there was a main effect of children's responses to the questions, "What happened in the story?" and "What happened to [Child 1's play object?]" on teacher ratings of proactive physical aggression,  $F(2,51) = 10.699, p < .001$ , and reactive physical aggression,  $F(2,51) = 11.546, p < .001$ . Children who gave only partially relevant explanations of what occurred in the vignette were rated higher on proactive physical aggression ( $M = 6.617, SE = .640$ ) than children who gave relevant ( $M = 3.786, SE = .327$ ) ( $p = .001$ ) or fully relevant explanations ( $M = 3.419, SE = .257$ ),  $p < .001$ . Similarly, children who gave only partially relevant explanations were rated higher on reactive physical aggression ( $M = 10.348, SE = 1.174$ ) than children who gave relevant explanations ( $M = 4.660, SE = .600$ ),  $p < .001$ , or fully relevant explanations ( $M = 4.314, SE = .471$ ),  $p < .001$ .

**Response access/Response decision.** For total aggression, there was a significant effect of children's outcome expectation (i.e., "What will happen if [Child 1] does [response chosen]?"),  $F(2,47) = 3.92, p = .027$ . Children who said their response chosen

would result in an unsuccessful outcome were rated higher in total aggression ( $M = 24.70$ ,  $SE = 2.28$ ) than children who said their response chosen would result in some other outcome ( $M = 16.21$ ,  $SE = 2.17$ ),  $p = .027$ . For individual subscales of the PPRA, there was a significant effect of children's outcome expectation (i.e., "What will happen if [Child 1] does [response chosen]?") for teacher ratings of proactive physical aggression,  $F(2,47) = 4.10$ ,  $p = .023$ , and reactive physical aggression,  $F(2,47) = 5.07$ ,  $p = .010$ . Children who said their response chosen would result in an unsuccessful outcome were rated higher in proactive physical aggression ( $M = 4.86$ ,  $SE = .46$ ) and reactive physical aggression ( $M = 6.24$ ,  $SE = .82$ ) than children who said their response chosen would result in some other outcome ( $M = 3.05$ ,  $SE = .44$ ),  $p = .019$ , ( $M = 2.88$ ,  $SE = .791$ ),  $p = .039$ .

**Summary.** Similar to the hostile condition, in the ambiguous condition, children who were unable to fully and accurately explain the events in the vignette were rated higher in proactive physical aggression, reactive physical aggression, and total aggression than children who provided more accurate explanations. Also, children who chose a response they believed would lead to an unsuccessful outcome were rated higher in proactive physical aggression, reactive physical, and total aggression. No relationships were found for children's social information processing and their engagement in relationally aggressive behaviors.

### Discussion

In Study 2 we successfully designed and implemented a new task that assesses patterns of social information processing in preschool-aged children. Unlike previous measures, this new task allowed us to evaluate children's patterns of social information

processing at each step of the social information-processing model (excluding behavioral enactment) proposed by Crick and Dodge (1994). Further, the reduced task demands and language requirements made it appropriate for use with preschool-aged children.

Overall, children's patterns of responding to the social information processing questions differed as a function of the provocation displayed in the vignette. When the vignette displayed an aggressive act that was clearly driven by hostile intent, children showed very similar patterns of responding across social information processing questions. In the ambiguous condition, however, children's responses showed more variability. This pattern was most evident in children's interpretation of cues. In the hostile vignette condition, children attributed hostile intent to a character that destroyed a play object, whereas in the ambiguous vignette condition, children were equally likely to attribute hostile, accidental, or ambiguous intent.

In both the hostile and the ambiguous conditions, patterns of responding were related to teacher ratings of aggression. Children who showed a weaker ability to accurately encode the cues in the vignettes, giving only partially relevant explanations for what happened, were rated higher in proactive physical aggression, reactive physical aggression, and total aggression than children who gave more thorough and accurate explanations.

Further, in the hostile condition, children who positively evaluated the relationally aggressive response of Character 1 were rated higher in both proactive and reactive physical aggression. In contrast, results from the ambiguous condition did not reveal a significant relationship between children's responses to any other social information

processing questions and teacher ratings of aggressive behavior. These results may be due in part to the variability of responding to questions in this condition.

Whereas previous research has shown a relationship between children's interpretation biases or accessing of aggressive behaviors in responses in tasks measuring their social information processing patterns and their reported aggressive behavior, our results did not reveal such a relationship. It is possible that the free-response nature of the intention attribution questions (asking children both if the behavior occurred on purpose, by accident, and why the behavior happened), created demand characteristics that led to unreliable response patterns. Giving the child a forced choice question (i.e., "Did the behavior occur on purpose or by accident?") could potentially lead to more reliable responses. It is also possible that in our task children were showing patterns of responding to questions that are not fully aligned with what that child would do if the situation were to occur in real life. For example, children's responses did not suggest they were accessing or constructing aggressive responses (e.g., "I would hit them" or "I would yell at them"). Instead, children responded with more socially appropriate behavioral responses, such as "tell an adult" or "walk away/ignore", regardless of whether or not they believed the provocation was accidental or explicitly intentional. It is possible in a real life situation where a child is provoked, the child may in fact respond with an aggressive behavior, while in our task, children chose the response they believed was most appropriate.

Contrary to our predictions, we did not see a relationship between children's clarification of goals, or response selection and teachers' ratings of aggression and prosocial behavior. It is clear that children's social information processing patterns do not



fully determine their aggressive behavior, as our results show that children who give similar patterns of responding on the social information-processing task can nonetheless vary greatly on teachers' ratings of aggressive behavior. Thus, it is likely that other cognitive factors, in addition to social information processing patterns, contribute to children's engagement in aggressive behavior.

In the future, developing a total score composite for SIP may be useful for examining the total influence of all SIP steps and their collective contribution to children's behavior. However, creating a total composite score would be challenging due to the difficulty in assigning a meaningful score to children's responses. If developed, the score could reflect the level of problematic responding (i.e., with higher scores reflecting more problematic responding) or the level of competent responding (i.e., with higher scores reflecting more competent responding). Researchers could then examine the relationship between total patterns of SIP and children's aggressive behavior.

### **Study 3**

Study 2 demonstrated that the way children process social information is related to their aggressive behavior. However, other cognitive factors might influence children's engagement in aggressive behavior as well. Several researchers have hypothesized that children's ability to understand the cognitions and emotions of others, referred to as Theory of Mind (ToM), may also influence their use of aggressive behaviors (Renouf et al., 2009; 2010; Sutton, Smith, & Swettenham, 1999). Further, ToM abilities have been shown to play a role in the way children process social information as well. Because major advances in ToM occur between the ages of 3 and 4 (Wellman, Cross, & Watson,

2001), preschool age is an ideal time for exploring the relationship between these advances and the development of aggressive behaviors.

Previous research examining the relationship between children's ToM abilities and aggression has yielded mixed results. Several researchers have failed to find a relationship between ToM and engagement in aggressive behaviors (Buitelaar et al., 1999; Sutton et al., 2000), while others have reported that poor ToM skills are related to higher levels of aggression (Banerjee & Watling, 2005; Capage and Watson, 2001; Renouf et al., 2009). ToM skills have also been credited with providing children with the ability to engage in more complex forms of social aggression (i.e., indirect or relational) (Renouf et al., 2009; Sutton et al., 1999), but findings in this domain have also been mixed. Sutton and colleagues (1999) and Baird and Astington (2004) did not find a relationship between children's ToM abilities and relational aggression. Alternatively, Kaukiainen and colleagues (1999) reported a positive correlation between peer estimates of social intelligence and relational aggression.

Along with their influence on aggressive behavior, children's ToM abilities have also been hypothesized to influence the way they process social information. For example, Choe and colleagues (2013) reported that children with a more advanced ToM made fewer errors when interpreting the intentions of others. Similarly, Capage and Watson (2001) reported a positive correlation between appropriate or relevant patterns of responding and performance on a false-belief task, and a negative correlation between problematic responding (i.e., high generation of aggressive responses) and performance on a false-belief task (Capage & Watson, 2001).

Although research examining the relationship between social information processing and theory of mind is limited, it is likely that the ability to understand another person's cognitions and emotions may also influence a child's social information processing at all steps. A child with a more developed ToM, for example, may be better able to encode social cues, show more accurate interpretation of these cues, engage in more positive goal selection, better predict the consequences of behaving aggressively (e.g., hurt a peer's feelings), evaluate aggressive responses more negatively, and show more appropriate response selection than a child with less developed ToM skills. Thus, differences in children's social information processing, stemming from ToM abilities, may lead to differences in the types of behaviors aggressive children's choose to use.

Although previous research supports a relationship between ToM and aggression, as well as a relationship between ToM and social information processing, the complex interactions between children's ToM abilities, social information processing skills, and aggressive behavior have yet to be systematically evaluated in the context of a single study. Additionally, the piecemeal approach taken in previous research to evaluate Crick and Dodge's social information processing model does not allow us to fully examine the influence of ToM on the mechanisms that might be driving children's aggressive behavior (Crick & Dodge, 1994). Again, because all of the steps of the model are related, collecting data on only a select few renders the development of a comprehensive view of the influence of ToM on the process as a whole virtually impossible. In Study 3, our goal was to explore the relationship between children's ToM abilities, their patterns of social information processing, and their engagement in aggressive behavior. By exploring ToM alongside children's social information processing patterns, we can more closely examine

the cognitive components that may be underlying the development of children's aggressive behavior.

## **Method**

### ***Participants***

Participants included a total of 67 preschool children (34 female) ranging from 36 to 60 months ( $M = 52$  months), along with their parents and teachers. All children were recruited from childcare centers located in northern New Jersey. The first childcare center had a participation rate of 50% and the second center had a participation rate of 90%. Parental consent to participate was obtained for all children, and teacher and parents gave informed consent.

### ***Aggression Measures***

Teacher Report. Teacher ratings of children's aggression were assessed using the Preschool Proactive and Reactive Aggression Teacher Measure (PPRA-TM) (Ostrov & Crick, 2007) that was used in Study 2 to measure children's engagement in different forms (relational and physical) and functions (reactive and proactive) of aggression and also the Preschool Social Behavior Scale—Teacher Form (PSBS—T) (Crick, Casas, & Mosher, 1997). The PSBS—T was used to measure children's use of different forms of aggressive behavior (i.e., relational and overt/physical aggression).

Preschool Social Behavior Scale—Teacher Form (PSBS—T) contains 6 different subscales measuring children's relational aggression, overt/physical aggression, prosocial behavior, depressed affect, acceptance with same sex peers, and acceptance with opposite sex peers. Teachers were asked to respond to 25 questions using a response scale that ranges from 1 (never or almost never true) to 5 (always or almost always true).

Parent Report. Parents reported on their child's aggression using the Child Behavior Checklist (CBCL) (Achenbach & Edelbrock, 1983). The CBCL is comprised of 15 questions aimed at assessing children's aggressive behavior. Examples of questions include, "Demands must be met immediately", "Gets in many fights", and "Hits others". Parents were asked to respond to questions using a response scale that ranges from 0 (not true) to 2 (very true or often true).

Predicted Peer Nominations. Teachers reported on their predicted peer nominations of children's aggressive and prosocial behavior using the Teacher Predictions of Peer Nominations Scale (TPPN) (Huesmann et al., 1994). The TPPN is a 22-item measure comprised of 6 subscales measuring peers' predictions of children's aggression, prosocial behavior, popularity, rejection, victimization, and hyperactivity. For the purposes of this study, only the aggression and prosocial behavior subscales were used.

Relationship Between Measures. The PSBS, PPRA, and TPPN, as well as parent ratings of aggression on the CBCL were correlated on several dimensions. Total prosocial behavior was negatively correlated with total aggressive behavior ( $r = -.524, p < .001$ ). All subscales measuring relational aggression were highly positively correlated, as were all subscales measure physical aggression (all  $p$ 's  $< .000$ ) (see Table 2).

*Bivariate Pearson's Correlations among Measures of Aggression and Prosocial Behavior*

	1	2	3	4	5	6	7	8	9	10	11	12	13
1 PSBS- Relational Aggression		.524***	-.598***	.681***	.637***	.440**	.413**	-0.001	.462***	-.483***	-0.071	.757***	-.539***
2 PSBS- Overt Aggression	.542***		-.405***	.333*	.290*	.640***	.766***	0.073	.538***	-.461***	-0.178	.762***	-.476***
3 PSBS- Prosocial Behavior	-.598***	-.405***		-.502***	-.331*	-.297*	-.296*	-.319*	-.635***	.753***	0.241	-.551***	.768***
4 PPRA- Proactive Relational Aggression	.681***	.333*	-.502***		.886***	.483***	.418**	0.087	.516***	-.368**	0.217	.813***	-.414***
5 PPRA- Reactive Relational Aggression	.637***	.290*	-.311*	.886***		.486***	.441**	0.09	.351**	-0.243	0.14	.775***	-0.259
6 PPRA- Proactive Physical Aggression	.440***	.640***	-.297*	.483***	.486***		.777***	0.061	.352**	-0.24	-0.156	.785***	-0.253
7 PPRA- Reactive Physical Aggression	.413***	.766***	-.296*	.418**	.441**	.777***		0.057	.426**	-.331*	-0.212	.791***	-.304*
8 PPRA- Prosocial Behavior	-0.001	0.073	-.319*	0.087	0.14	0.061	0.057		0.074	-0.237	0.104	0.091	0.251
9 TPPN- Aggressive Behavior	.462***	.538***	-.635***	.516***	.351**	.352**	.426**	0.074		-.606***	-0.106	.691***	-.640***
10 TPPN- Prosocial Behavior	-.483***	-.461***	.753***	-.368**	-0.243	-0.24	-.331*	-0.237	-.606***		0.336	-.508***	.820***
11 CBCL- Aggressive Behavior	-0.071	-0.178	0.241	0.217	0.14	-0.156	-0.212	0.104	-0.106	0.336		-0.059	0.332
12 Total Aggression	.757***	.762***	-.551***	.813***	.775***	.785***	.791***	0.091	.691***	-.508***	-0.059		-.524***
13 Total Prosocial Behavior	-.539***	-.476***	.768***	-.414***	-0.259	-0.253	-.304*	0.251	-.640***	.820***	0.332	-.524***	

Note: \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

Table 2. Bivariate Pearson's Correlations among measures of aggression and prosocial behavior

### ***Social Cognitive Measures***

Social Information-Processing Task. Children's social information-processing patterns were assessed using the Social Information-Processing Task described in Study 2.

Theory of Mind Battery. Children's theory of mind skills were assessed through a Theory of Mind battery created by Wellman and Liu (2004). The Theory of Mind battery is comprised of seven tasks: Diverse Desires, Diverse Beliefs, Knowledge Access, Contents False Belief, Explicit False Belief, Belief Emotion, and Real-Apparent Emotion.

(1) *Diverse Desires.* Each child was seated at a table across from the experimenter. A piece of paper with a picture of a carrot and a picture of a cookie drawn on it was placed in front of the child. The experimenter then showed the child a toy figure of a man and said: "Here's Mr. Jones. It's snack time, so, Mr. Jones wants a snack to eat. Here are two different snacks: a carrot and a cookie. Which snack would you like best? Would you like a carrot or a cookie best?" This question served as a measure of the child's own desire.

After the child chose either the carrot or the cookie the experimenter said: “Well, that’s a good choice, but Mr. Jones really likes (cookies/carrots; the opposite of the child’s own desire). He doesn’t like (cookies/carrots; the child’s own desire). What he likes best are (cookies/carrots; opposite of the child’s own desire).” Then the child was asked the target question: “So, now it’s time to eat. Mr. Jones can only choose one snack, just one. Which snack will Mr. Jones choose? A carrot or a cookie?” To pass this task, the child had to answer all questions correctly.

(2) *Diverse Beliefs*. Each child was seated at a table across from the experimenter. A piece of paper with a picture of bushes and a picture of a garage drawn on it was placed in front of the child. The experimenter showed the child a toy figure of a girl and said: “Here’s Linda. Linda wants to find her cat. Her cat might be hiding in the bushes or it might be hiding in the garage. Where do you think the cat is? In the bushes or in the garage?” This question served as a measure of the child’s own belief.

After the child chose either the bushes or the garage the experimenter said: “Well, that’s a good idea, but Linda thinks her cat is in the (bushes/garage; opposite of child’s own belief). She thinks her cat is in the (bushes/garage; opposite of child’s own belief).” Then the child was asked the target question: “So where will Linda look for her cat? In the bushes or in the garage?” To pass this task, the child had to answer all questions correctly.

(3) *Knowledge Access*. Each child was seated at a table across from the experimenter. In front of the child was a plastic box with a small plastic toy dog inside. The experimenter asked the child, “Here’s a box. What do you think is inside the box?” After the child answered, the experimenter opened the box and showed the child what

was inside, saying, “Let’s see...it’s really a dog inside!” The box was then closed and the experimenter asked, “Okay, what is in the box?” Next the experimenter showed the child a toy figure of a girl and said, “Polly has never ever seen inside this box. Now here comes Polly.” The child was then asked the target question, “So, does Polly know what is in the box?” and the memory question, “Did Polly see inside this box?” To pass, the child must answer all questions correctly.

(4) *Contents False Belief*. Each child was shown a clearly identifiable crayon box with a plastic toy pig inside the closed box. The experimenter asked the child, “Here’s a crayon box. What do you think is inside the crayon box?” Next, the crayon box was opened and the experimenter said, “Let’s see...it’s really a pig inside!” The crayon box was then closed and the experimenter asked, “Okay, what is in the crayon box?” Next, the child was shown a toy figure of a boy and asked the target question, “Peter has never ever seen inside this crayon box. Now here comes Peter. So, what does Peter think is in the box? Crayons or a pig?” The experimenter then asked the memory question, “Did Peter see inside this box?” To pass, the child had to answer all questions correctly.

(5) *Explicit False Belief*. Each child was shown a toy figure of a boy and a sheet of paper with a backpack and a closet drawn on it. Then the experimenter said, “Here’s Scott. Scott wants to find his mittens. His mittens might be in his backpack or they might be in the closet. Really, Scott’s mittens are in his backpack. But Scott thinks his mittens are in the closet.” Next, the child was asked the target question, “So, where will Scott look for his mittens? In his backpack or in the closet?” followed by the reality question, “Where are Scott’s mittens really? In his backpack or in the closet?” To pass, the child had to answer all questions correctly.



(6) *Belief Emotion*. Each child was shown a toy figure of a boy and a clearly identifiable Pop-Tart box with a pack of crayons inside the closed box. The experimenter then asked the child, "Here is a box of Pop-Tarts and here is Teddy. What do you think is inside the Pop-Tart box?" Next the experimenter made Teddy speak: "Teddy says, 'Oh good, because I love Pop-Tarts. Pop-Tarts are my favorite snack. Now I'll go play.'" Teddy was then removed from the child's sight. The experimenter then opened the Pop-Tart box and showed the contents to the child: "Let's see...there are really crayons inside and no Pop-Tarts! There's nothing but crayons." The Pop-Tart box was closed and the child was asked, "Okay, what is Teddy's favorite snack?" Teddy was then brought back and the experimenter asked the child the target question, "Teddy has never ever seen inside this box. Now here comes Teddy. Teddy's back and it's snack time. Let's give Teddy this box. So, how does Teddy feel when he gets this box? Happy or sad?" The experimenter opened the box and let the Teddy figure look inside. The child was then asked the emotion-control question, "How does Teddy feel after he looks inside the box? Happy or sad?" To pass, the child had to answer all questions correctly.

(7) *Real-Apparent Emotion*. Each child was shown a sheet of paper with three faces drawn on it, a happy, a neutral, and a sad face and asked to identify these emotional expressions. The paper was then put aside, and the task began with the child being shown a cardboard cutout figure of a boy drawn from the back so that the boy's facial expression could not be seen. The experimenter said, "This story is about a boy. I'm going to ask you about how the boy really feels inside and how he looks on his face. He might really feel one way inside but look a different way on his face. Or, he might really feel the same way inside as he looks on his face. I want you to tell me how he really feels inside and

how he looks on his face.” The experimenter then told the child the story, “This story is about Matt. Matt’s friends were playing together and telling jokes. One of the older children, Rosie, told a mean joke about Matt and everyone laughed. Everyone thought it was very funny, but not Matt. But, Matt didn’t want the other children to see how he felt about the joke, because they would call him a baby. So, Matt tried to hide how he felt.” The child was then asked two memory questions: “What did the other children do when Rosie told a mean joke about Matt?” and “In the story, what would the other children do if they knew how Matt felt?” Next the experimenter pointed to the three emotion pictures and asked the target-feel question “So, how did Matt really feel, when everyone laughed? Did he feel happy, sad, or okay?” and the target-look question, “How did Matt try to look on his face, when everyone laughed? Did he look happy, sad, or okay?” To pass, the child had to answer all questions correctly, responding that the target-feel question was more negative than the answer to the target-look question (e.g., sad is more negative than happy or okay).

Digit Span. Children’s general cognitive function was measured using the Digit Span Task (DST) (Davis & Pratt, 1996; Fry et al., 2014). The DST is a measure of working memory. The experimenter read children a series of numbers, the easiest level was comprised of two digits and the hardest level was comprised of seven digits. Children were first asked to repeat these numbers forwards. Next, the experimenter read children a new series of numbers, again ranging from strings of 2 to 7, and children were asked to repeat these numbers backwards.

### ***Procedure***

Teacher and Parent Questionnaires. Teachers and parents were asked to fill out the questionnaires once at the beginning of data collection and once at the end of data collection (about 3 months apart) to examine whether social information processing and theory of mind variables account for any changes over time in aggression scores. Each questionnaire took approximately 5 minutes to complete.

Social Information-Processing Task. The two vignettes (hostile, prosocial, and ambiguous) were read to each child individually, one story per session over the course of two sessions. Each session lasted approximately 15 minutes and occurred approximately one week apart. Both the experimenter and the child sat at a small table in a quiet room located within the childcare center. The experimenter read the vignettes slowly to each child. Each vignette was arranged in a storybook that was placed on the table in front of the child to ensure that all images were in full view. Each session was digitally recorded.

Theory of Mind Battery. Children completed the seven tasks, each measuring a unique aspect of children's conceptual understanding. The seven tasks were presented consecutively. The Diverse Desires and Diverse Beliefs tasks were presented first, and the order of the other 5 tasks was counterbalanced. Children were tested in a quiet room located within the childcare center. It took children approximately 20 minutes to complete all 7 tasks. The Theory of Mind battery was given after children had completed the Social Information-Processing Task.

Results examining children's progressive responses on each of the ToM tasks demonstrated that we failed to replicate the developmental progression reported in Wellman and Liu (2004), where most children who passed a later item in the battery passed all earlier items (See Table 3). To account for this difference and to explore the

relationship between performance on each item and children's patterns of social information processing and ratings of aggression and prosocial behavior, all analyses were conducted on total Theory of Mind battery scores, as well as on performance on each of the Theory of Mind items individually. Because each item in the ToM battery taps a unique aspect of Theory of Mind, by examining performance on each individual item, we can explore how each unique aspect of theory of mind may relate to children's social information processing, as well as their aggressive and prosocial behavior.

Pearson correlations examined the relationship between children's total score on the Theory of Mind battery and their performance on each of the seven individual Theory of Mind items. Results revealed significant correlations between children's total score on the Theory of Mind battery and performance on each individual item on the Theory of Mind battery (See Table 4). The Theory of Mind Battery showed moderate internal consistency,  $K-R 20 = .628$ . Inter-item consistency was low, with only a few strong correlations amongst items. The Knowledge Access item (item 3) was correlated with the Contents False-Belief item (item 4),  $r = .478$ , and the Belief-Emotion item (Item 6),  $r = .401$ . The Contents False-Belief item (item 4) was also correlated with the Explicit False-Belief item (item 5),  $r = .346$ . All other inter-item correlations indicated no relationship amongst items (See Table 4).

	Diverse Desires (Item 1)	Diverse Beliefs (Item 2)	Knowledge Access (Item 3)	Contents False-Belief (Item 4)	Explicit False- Belief (Item 5)	Belief-Emotion (Item 6)	Real-Apparent Emotion (Item 7)
Pass	50	48	40	24	22	24	6
Fail	7	9	17	33	35	33	51
% Passed	87.7%	84.2%	70.1%	42.1%	38.5%	42.1%	10.5%
% Passed All Previous	.	91.6%	80.0%	79.1%	59.0%	29.1%	16.6%

*Table 3. Progressive responses on each theory of mind tasks*

*Bivariate Pearson's Correlations among Theory of Mind Items*

	1	2	3	4	5	6	7	8
1 Item 1 (Diverse Desires)		0.278*	0.107	0.211	0.187	0.103	0.128	0.449***
2 Item 2 (Diverse Beliefs)	0.278*		0.033	-0.021	0.146	0.077	0.149	0.362***
3 Item 3 (Knowledge Access)	0.107	0.033		0.478***	0.123	0.401**	0.224	0.583***
4 Item 4 (Contents False Belief)	0.211	-0.021	0.478***		0.346**	0.280*	0.286*	0.688***
5 Item 5 (Explicit False Belief)	0.187	0.146	0.123	0.346**		0.2	0.08	0.602***
6 Item 6 (Belief-Emotion)	0.103	0.077	0.401**	0.280*	0.2		0.171	0.604***
7 Item 7 (Real-Apparent Emotion)	0.128	0.149	0.224	0.286*	0.08	0.171		0.453***
8 Total Theory of Mind Battery Score	0.449***	0.362***	0.583***	0.688***	0.602***	0.604***	0.453***	

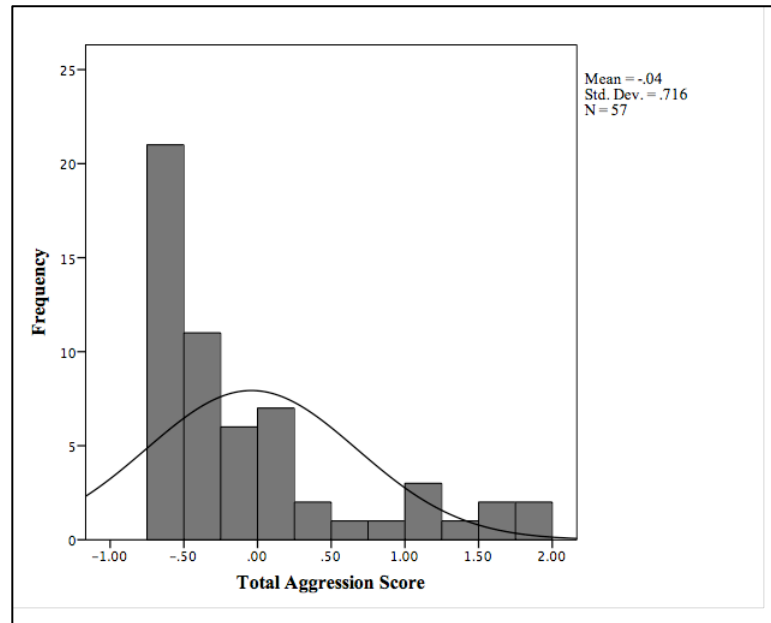
Note: \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

*Table 4. Bivariate Pearson's Correlations among theory of mind items*

## Results

### *Scoring of Measures*

Aggression Measures. Children received a score on 3 subscales of the PSBS teacher form (overt aggression, relational aggression, and prosocial behavior), 5 subscales of the PPRA teacher form (proactive physical aggression, proactive relational aggression, reactive physical aggression, reactive relational aggression, and prosocial behavior subscales), 2 subscales of the TPPN teacher form (aggression and prosocial behavior subscales), and one subscale of the CBCL parent form (aggression subscale) for a total of 10 individual aggression scores. All individual measures were examined individually, and combined to create one total score for aggression (total aggression score) (See Figure 10).



*Figure 10. Frequency of Total Aggression Scores*

Parent data collection at Time 1 yielded only 23 (35%) responses. Due to low rates of return, parent data was not collected at Time 2. Teacher data collection at Time 1 yielded 60 responses (90%) compared with only 56 responses (85 %) at Time 2. T-tests revealed no significant differences between teacher ratings of aggression at time 1 and ratings at time 2, thus, Time 2 data was excluded from all analyses.

Social Information Processing Task. Responses on the social information-processing task were coded the same manner as in Study 2. Coder agreement was above 90% for all questions (all Cohen's  $k > .8$ ). Differences were resolved through discussion.

Theory of Mind Battery. Children received a score of either pass or fail on each of the 7 Theory of Mind items. Additionally, all scores were combined to create one total score of Theory of Mind (total ToM score).

***Predicted Results***

As was the case for Study 2, we anticipated that in Study 3 children would show different patterns of responding to questions across vignette conditions. Further, we expected to find a relationship between children's information processing patterns and their engagement in aggressive behavior.

In line with previous research, we expected to find variability in children's ToM abilities (Wellman & Liu, 2004). Importantly, we anticipated a relationship between children's ToM abilities, their processing of social information, and their aggressive behavior. As is shown in previous work, we predicted that children's ToM abilities would influence their patterns of social information processing, particularly their encoding and interpretation of social cues (steps 1 & 2), with higher ToM abilities predicting fewer encoding errors and interpretation biases.

Additionally, we predicted a relationship between children's ToM abilities and their engagement in different forms of aggressive behavior. Children with high levels of ToM were predicted to engage in more relational forms of aggression, while children with low levels of ToM should engage in more overt forms of aggression. Further, if the relationship between patterns of social information processing and aggressive behavior differs as a function of children's Theory of Mind, we expected to see Theory of Mind performance mediating the relationship between children's patterns of social information processing and their aggressive behavior, as evidenced by significant interactions between the two variables.

*Preliminary Analyses on Gender, Age, and Digit Span*

Preliminary ANOVAs (for categorical predictors) and linear regressions (for continuous predictors) examined effects of gender and age on parent and teacher ratings of aggression and prosocial behavior. ANOVAs examining the effect of gender on measures of aggression revealed a significant main effect of gender on only one measure of aggression, the overt aggression subscale of the PSBS,  $F(1,59) = 5.62, p = .021$ . Boys were rated as more overtly aggressive ( $M = 7.90, SE = .55$ ) than girls ( $M = 6.52, SE = .20$ ). Linear regressions were calculated to examine whether age predicted scores on parent and teacher ratings of aggression and prosocial behavior. Age predicted teachers' predictions of peer nominations of aggression (TPPN aggression subscale),  $\beta = -.492, t(59) = -2.33, p = .023$ , teachers' predictions of peer nominations of prosocial behavior (TPPN prosocial behavior subscale),  $\beta = -.924, t(59) = 2.89, p = .005$ , and total prosocial behavior,  $\beta = .023, t(59) = 2.31, p = .024$ . Older children were rated lower in teacher predicted peer nominations of aggressive behavior, higher in teacher predicted peer nominations of prosocial behavior, and higher in total prosocial behavior.

Additionally, preliminary ANOVAs (for categorical predictors) and linear regressions (for continuous predictors) were conducted to examine interaction effects of gender and age with each predictor variable, children's responses to the questions in the social information-processing task (in both the hostile and ambiguous vignettes,) and children's performance on the Theory of Mind Battery, on our outcome measures (parent and teacher ratings of aggression and prosocial behavior). ANOVAs examining the interaction of gender and our first predictor variable, children's responses to the questions in the social information-processing task, on ratings of aggression and prosocial behavior



revealed several significant interactions. There was a significant interaction between gender and children's intent attribution ("Why did [Child 2] [destroy the play object] of [Child 1]?") in the hostile condition on the proactive physical aggression subscale of the PPRA,  $F(2,49) = 3.33, p = .044$ . Boys who attributed hostile intent to Character 2 were rated higher in proactive physical aggression ( $M = 4.18, SE = .31$ ) than girls who attributed hostile intent to Character 2 ( $M = 3.09, SE = .31, p = .018$ ).

There was also a significant interaction between gender and children's response selection ("What do you think [Child 1] will do now that his/her [play object is destroyed]?" and "What would you do if you were [Child 1] and someone [Destroyed your play object]?") in the hostile condition on the overt aggression subscale of the PSBS,  $F(5,44) = 4.885, p = .001$ . Boys who said that Character 1 would respond with physical aggression were rated higher in overt aggression ( $M = 18.0, SE = 1.93$ ) than girls who said Character 1 would respond with physical aggression ( $M = 6.0, SE = 1.36, p = .000$ ).

There was a significant interaction between gender and children's outcome expectation ("What will happen if [Child 1] does [response chosen]?") in the ambiguous condition on the aggression subscale of the TPPN,  $F(2,52) = 3.397, p = .041$ . Boys who chose an unsuccessful outcome for Character 1 in the ambiguous vignette were rated higher in teachers predicted peer nominations of aggressive behavior ( $M = 22.72, SE = 3.91$ ) than girls who chose an unsuccessful outcome ( $M = 4.81, SE = 4.18, p = .003$ ). Results revealed no significant age-related interactions with our social information processing predictor variable.

ANOVAs (for categorical predictors and continuous outcome measures), linear regressions (for continuous predictors and continuous outcome measures), and logistic regressions (for continuous predictors and binary outcome measures) were also conducted to examine the main effects of gender and age on our second predictor variable, children's performance on the Theory of Mind Battery. ANOVAs examining the effect of gender on children's performance on the Theory of Mind Battery and on children's performance on each battery item revealed no significant main effects. Linear regressions examining the relationships between age and children's performance on the Theory of Mind Battery revealed one significant result; age predicted children's overall performance on the Theory of Mind Battery,  $\beta = .083$ ,  $t(59) = 2.88$ ,  $p = .006$ . Logistic regressions examining the relationships between age and children's performance on each battery item revealed one significant result as well; age predicted children's performance on Theory of Mind Item 3 (i.e., Knowledge Access),  $b = .196$ , Wald  $\chi^2(1) = 7.34$ ,  $p = <.001$ . Results indicate that older children scored higher on the total theory of mind battery and performed better on the Theory of Mind item 3 than did younger children.

Additionally, ANOVAs (for categorical predictors) and linear regressions (for continuous predictors) were conducted to examine the interaction effects of gender and children's performance on the Theory of Mind battery, as well as age and children's performance on the Theory of Mind battery, on ratings of aggression and prosocial behavior. There were no significant effects.

In addition, the association between children's scores on the digit span task and their overall performance on the Theory of Mind battery, along with their performance on each individual battery item, were examined. A linear regression was calculated to

predict children's overall performance on the Theory of Mind battery based on their digit span score. The regression equation was significant,  $F(1,55) = 5.576, p = .022$ , with an  $R^2$  of .092. Children's predicted theory of mind battery score was equal to  $2.039 + .0254$  (digit span score). In other words, children's theory of mind battery score increased .092 points for each 1-point increase in participants' digit span score. Logistic regressions examined the effect of children's digit span score on their performance (pass/fail) on each individual Theory of Mind battery item. There were no significant results.

Liner regressions were also calculated to examine the association between children's score on the digit span task and ratings of aggression. Results indicate that digit span score predicted scores on the proactive relational aggression subscale of the PPRA,  $\beta = .325, t(59) = 2.089, p = .041$ , the reactive relational aggression subscale of the PPRA,  $\beta = .425, t(59) = 2.78, p = .007$ , and the aggression subscale of the CBCL,  $\beta = .446, t(59) = 2.02, p = .033$ . Higher scores on the digit span task predicted higher ratings of proactive relational aggression, reactive relational aggression, and parent ratings of aggression.

### ***Data analysis plan***

Preliminary analyses were conducted to examine differences between teacher ratings on the PSBS, PPRA, or TPPN at time 1 and time 2 and parent ratings of aggression on the CBCL. T-tests revealed no significant differences between teacher ratings of aggression at time 1 and time 2 ( $p$ 's  $> 0.05$ ). Thus, aggression measures taken at time 1 were used as the primary measures of aggression for all further analyses. To account for any influence of gender, age, or digit span on children's Theory of Mind or on teacher or parent ratings of aggression and prosocial behavior, all three were included

as covariates for all analyses. As in Study 2, our criterion for significant findings was  $p < .05$  (all results with  $p$ 's between .06 and .20 are again reported in the Appendix).

To explore whether our results on the social information-processing task replicated those of Study 2, we first we ran a series of  $t$ -tests to confirm that children were showing differential patterns of responding across each vignette condition (i.e., hostile, ambiguous) on the free-response question assessing attribution of intent. Second, we examined the relationship between Theory of Mind performance and ratings of aggression and prosocial behavior by running a series of linear regressions with children's total Theory of Mind battery score predicting scores on each measure of aggression and prosocial behavior. Additional one-way ANCOVAs examined the main effect of children's performance on each Theory of Mind Item (pass/fail) for each measure of aggression and prosocial behavior. Third, we ran a series of ANCOVAs to examine the relationship between social information processing and total Theory of Mind battery score, and logistic regressions to examine the relationship between social information processing and performance on each Theory of Mind item (pass/fail). Finally, we conducted a series of factorial ANCOVAs (categorical predictors) and linear regressions (continuous predictors) to examine the main effects and interaction effects of children's responses to questions assessing their patterns of social information processing and their performance on the Theory of Mind battery for teacher and parent ratings of aggression and prosocial behavior. An additional series of linear regressions were calculated to predict ratings of aggression and prosocial behavior.

***Differences Based on Condition***

In line with the results from Study 2, results in Study 3 revealed that more children attributed hostile intent to the characters in the hostile condition ( $M = .50$ ,  $SE = .06$ ) than to characters in the ambiguous condition ( $M = .28$ ,  $SE = .05$ ),  $t(66) = 2.567$ ,  $p = .013$ . Further, in the hostile condition, more children said that the character's behavior was intentionally hostile ( $M = 0.50$ ,  $SE = .06$ ) than accidental ( $M = 0.14$ ,  $SE = .01$ ) ( $t = 5.71$ ;  $p < 0.001$ ) or that it occurred some other reason ( $M = 0.37$ ,  $SE = .05$ ). In contrast, in the ambiguous condition where the intention of the character was unclear, there was no difference between the number of children who said that the character's behavior was intentional ( $M = 0.28$ ,  $SE = .05$ ), accidental ( $M = 0.17$ ,  $SE = .04$ ), or occurred for some other reason ( $M = 0.41$ ,  $SE = .06$ ). Children showed similar patterns of responding across vignette conditions for all other questions, thus replicating the results of Study 2.

***Social Information Processing, Aggression, and Prosocial Behavior***

In Study 3, we found several of the same main effects of children's social information processing on teacher and parent ratings of aggressive behavior that we found in Study 2. In the hostile vignette condition, first, there was a significant main effect of encoding of cues ("What happened in the story?" and "What happened to [Child 1's play object?]") for children's total aggression score,  $F(3,48) = 4.48$ ,  $p = .007$ . Children who gave fully irrelevant explanations were rated higher in aggression ( $M = 1.97$ ,  $SE = .65$ ) than children who gave relevant ( $M = -.34$ ,  $SE = .17$ ),  $p = .008$ , or fully relevant explanations ( $M = -.02$ ,  $SE = .11$ ),  $p = .025$ .

Second, we found a significant main effect of children's encoding of cues ("What happened in the story?" and "What happened to [Child 1's play object?]") on teacher

ratings of proactive physical aggression,  $F(3,49) = 6.708, p = .001$ , and reactive physical aggression,  $F(3,49) = 11.546, p = .019$ . Children who gave fully irrelevant explanations were rated higher in proactive physical aggression ( $M = 7.21, SE = .97$ ) than children who gave partially relevant ( $M = 4.14, SE = .55, p = .047$ ), relevant ( $M = 2.92, SE = .25, p = .001$ ), or fully relevant explanations ( $M = 3.37, SE = .16, p = .002$ ). Similarly, children who gave only fully irrelevant explanations were rated higher on reactive physical aggression ( $M = 8.33, SE = 1.17$ ) than children who gave relevant explanations ( $M = 3.18, SE = .46, p = .045$ ).

Third, we found a significant main effect of response evaluation (“How good/bad do you think what [Child 1] did (physically aggressive response) was?”) on teacher ratings of reactive physical aggression,  $F(1,51) = 4.29, p = .043$ . Children who positively evaluated a physically aggressive response were rated higher in reactive physical aggression ( $M = 6.64, SE = 1.32$ ) than children who negatively evaluated a physically aggressive response ( $M = 3.84, SE = .24$ ). This is consistent with the non-significant trend found in Study 2.

As in Study 2, for the ambiguous vignette condition we found a main effect for outcome expectation (i.e., “What will happen if [Child 1] does [response chosen]?”) on teacher ratings of reactive physical aggression,  $F(2,49) = 3.21, p = .049$ . Children who said their response would result in an unsuccessful outcome were rated higher in reactive physical aggression ( $M = 4.24, SE = .50$ ) than children who said their chosen response would result in some other outcome ( $M = 3.09, SE = .426, p = .053$ ). A similar effect of children’s outcome expectation was also found for teacher ratings of total aggression, but the results did not reach significance ( $p = .100$ ).

Along with these consistencies between Studies 2 and 3, there were also some discrepancies in our findings. First, some significant effects from Study 2 did not replicate in Study 3. For the hostile vignette condition, we did not find a main effect of children's intent attribution ("Why did [Child 2] [destroy the play object] of [Child 1]?") for children's total aggression score or for teachers' ratings of reactive relational aggression on the PPRA. We also did not find a main effect of response evaluation (i.e., "Do you think what [Child 1] did (relationally aggressive response) was good or bad?") for teacher ratings of proactive physical aggression. For the ambiguous vignette, we did not find a main effect of encoding of cues (i.e., "What happened in the story?" and "What happened to [Child 1's] play object?") for children's total aggression score or for teachers' ratings of proactive physical aggression and reactive physical aggression. We also did not find a main effect of outcome expectation ("What will happen if [Child 1] does [response chosen]?") for children's total aggression score or for teacher's ratings of proactive physical aggression or reactive physical aggression.

Further, Study 3 produced several main effects that were not found in Study 2. In the hostile condition, we found a main effect of response evaluation (i.e., "Do you think what [Child 1] did (physically aggressive response) was good or bad?") for teacher ratings of reactive physical aggression,  $F(1,51) = 4.295, p = .043$ . Children who positively evaluated the physically aggressive response were rated higher in reactive physical aggression ( $M = 6.64, SE = 1.32$ ) than those who negatively evaluated the physically aggressive response ( $M = 3.84, SE = .248$ ). In the ambiguous condition, we found a similar main effect of response evaluation (i.e., "Do you think what [Child 1] did (physically aggressive response) was good or bad?") for teacher ratings of prosocial

behavior on the PSBS,  $F(1,50) = 7.10, p = .010$ . Children who negatively evaluated a physically aggressive response were rated higher in prosocial behavior ( $M = 6.34, SE = .24$ ) than children who positively evaluated a physically aggressive response ( $M = 2.85, SE = 1.28$ ).

Finally, analyses revealed several main effects for measures of aggression and prosocial behavior on outcome measures in Study 3 that were not used in Study 2. In the hostile condition, there was a main effect of outcome expectation (“What will happen if [Child 1] does [response chosen]?”) for parent ratings of aggression on the CBCL,  $F(2,17) = 4.58, p = .026$ . Children who chose a response they said would lead to a successful outcome were rated higher in aggression ( $M = 22.69, SE = 2.92$ ) than children who chose a response they said would lead to an unsuccessful outcome ( $M = 10.54, SE = 2.46$ ),  $p = .028$ . Similarly, in the ambiguous condition, results revealed a main effect of outcome expectation (“What will happen if [Child 1] does [response chosen]?”) for teacher predicted peer nominations of aggression (TPPN),  $F(2,50) = 3.74, p = .031$ , and for teacher ratings of overt aggression on the PSBS,  $F(2,50) = 3.36, p = .043$ . Children who said their response would result in an unsuccessful outcome were rated higher in teacher predicted peer nominations of aggression ( $M = 14.68, SE = 2.7$ ) than children who said their response chosen would result in some other outcome ( $M = 4.84, SE = 2.4$ ),  $p = .029$ . Similarly, children who said their response would result in an unsuccessful outcome were rated higher in overt aggression ( $M = 8.03, SE = .613$ ) than children who said their response chosen would result in some other outcome ( $M = 6.14, SE = .56$ ),  $p = .074$ .



**Summary.** The pattern of results found in Study 3 were similar to those found in Study 2 for the hostile condition with poor encoding of cues and poor response evaluation (i.e., response decision; Step 5 in the model), being associated with higher ratings of aggression.

In the ambiguous condition, results were consistent with those found in Study 2 with poor outcome expectation for chose responses and poor response evaluation (i.e., response decision; Step 5 in the model) being associated with higher ratings of aggression.

### ***Theory of Mind and Social Information Processing***

For children's total Theory of Mind battery score, in the hostile condition, there was a main effect of encoding of cues (i.e., *Intent Attribution*: "Why did [Child 2] [destroy the play object] of [Child 1]?"),  $F(2,51) = 3.82, p = .028$ . Children who correctly attributed hostile intent to Child 2 scored higher on the ToM battery ( $M = 4.34, SE = .32$ ) than children who did not attribute intent to the behavior ( $M = 3.28, SE = .27, p = .052$ ). A significant main effect of encoding of cues (i.e., *Intent Attribution*: "Why did [Child 2] [destroy the play object] of [Child 1]?") was also found in the ambiguous condition,  $F(2,51) = 7.88, p = .001$ . Children who attributed accidental intent to Child 2 scored higher on the ToM battery ( $M = 5.00, SE = .41$ ) than children who did not attribute intent to the behavior ( $M = 3.06, SE = .27, p = .001$ ).

In the hostile condition, children's responses to questions assessing their interpretation of cues (i.e., *Intent Attribution*: "Why did [Child 2] [destroy the play object] of [Child 1]?"), response access and response decision (i.e., *Response Evaluation*: "How good/bad do you think what [Child 1] did (relationally aggressive response) was?"), and clarification of goals (i.e., "Why would you do [response chose]?") predicted

success on ToM Item 3 (Knowledge Access), item 4 (Contents False-Belief), item 5 (Explicit False-Belief), and item 7 (Real-Apparent Emotion). A correct answer to the intent attribution question (i.e., “Why did [Child 2] [destroy the play object] of [Child 1]?”) significantly predicted success on Theory of Mind Item 3 (Knowledge Access),  $b = 1.59$ , Wald  $\chi^2(1) = 4.99$ ,  $p = .025$ , ToM Item 4 (Contents False-Belief),  $b = 1.42$ , Wald  $\chi^2(1) = 6.03$ ,  $p = .014$ , and ToM Item 5 (Explicit False-Belief),  $b = 1.24$ , Wald  $\chi^2(1) = 4.68$ ,  $p = .030$ . A negative evaluation of a relationally aggressive response significantly predicted passing ToM Item 3 (Knowledge Access),  $b = 1.76$ , Wald  $\chi^2(1) = 3.65$ ,  $p = .056$ . A goal of achieving a successful outcome significantly predicted whether a child passed ToM Item 7 (Real-Apparent Emotion),  $b = 8.611$ , Wald  $\chi^2(1) = 3.60$ ,  $p = .058$ .

Similarly, in the ambiguous condition, children’s responses to the question assessing their interpretation of cues (i.e., *Intent Attribution*: “Why did [Child 2] [destroy the play object] of [Child 1]?”) predicted their successful performance on ToM Item 3 (Knowledge Access), Item 4 (Contents False-Belief), and item 6 (Belief-Emotion). A response of “accidental” to the intent attribution question (i.e., “Why did [Child 2] [destroy the play object] of [Child 1]?”) significantly predicted success on ToM Item 3 (Knowledge Access),  $b = 1.39$ , Wald  $\chi^2(1) = 3.56$ ,  $p = .059$ , ToM Item 4 (Contents False-Belief),  $b = 1.47$ , Wald  $\chi^2(1) = 4.48$ ,  $p = .034$ , and ToM Item 6 (Belief-Emotion),  $b = 1.41$ , Wald  $\chi^2(1) = 3.86$ ,  $p = .049$ .

**Summary.** In the hostile condition, children who appropriately attributed hostile intent to the provocation behavior showed better performance on several individual ToM items and on the ToM battery as a whole. In the ambiguous condition, children who attributed accidental intent to the behavior performed better on several ToM items and on

the ToM battery as a whole. These results suggest that the ability to appropriately attribute intent to behaviors is associated with more advanced Theory of Mind skills. Results also suggested that the ability to appropriately evaluate negative response behaviors is associated with more advanced Theory of Mind skills. Taken together, results suggest that appropriate patterns of responding on the social information-processing task are associated with more advanced Theory of Mind skills.

### ***Theory of Mind, Aggression, and Prosocial Behavior***

There was a main effect of ToM Item 2 (Diverse Beliefs) for total aggression,  $F(1,49) = 4.80, p = .033$ , and for teacher ratings of proactive relational aggression,  $F(1,50) = 3.46, p = .059$ . Children who passed ToM Item 2 were rated higher in total aggression ( $M = .04, SE = .10$ ) than children who failed this question ( $M = -.55, SE = .25$ ). Similarly, children who passed ToM Item 2 were rated higher in proactive relational aggression ( $M = 5.07, SE = .32$ ) than children who failed it ( $M = 3.42, SE = .81$ ). There was also a main effect of ToM Item 3 (Knowledge Access) for teacher ratings of prosocial behavior on the PPRA,  $F(1,50) = 4.21, p = .045$ . Children who passed ToM Item 3 were rated as more prosocial ( $M = 6.59, SE = .30$ ) than children who failed it ( $M = 5.38, SE = .47$ ).

***Summary.*** In line with our predictions, children's successful Theory of Mind performance was associated with higher total aggression scores, higher proactive relational aggression, and higher prosocial behavior.

***Theory of Mind, Social Information Processing, and Aggressive and Prosocial Behavior***

We predicted that the way children process and respond to social information, coupled with their Theory of Mind abilities, would contribute to their engagement in aggressive behavior.

**Hostile Vignette**

***Encoding of cues.*** For children's total aggression score, there was a significant main effect of encoding of cues ("What happened in the story?" and "What happened to [Child 1's] play object?"),  $F(3,45) = 4.237, p = .010$ . Children who gave fully irrelevant explanations were rated higher in aggression ( $M = 2.01, SE = .65$ ) than children who gave relevant ( $M = -.253, SE = 1.96, p = .011$ , or fully relevant explanations ( $M = -.252, SE = .20, p = .012$ ).

For the PSBS Teacher Measure (subscales: overt aggression, relational aggression, prosocial behavior), there was a significant interaction effect of encoding of cues (i.e., "What happened in the story?" and "What happened to [Child 1's] play object?") and ToM Item 5 (Explicit False-Belief),  $F(2,46) = 4.107, p = .023$ . Children who gave partially relevant explanations and passed ToM Item 5 were rated higher in overt aggression ( $M = 13.41, SE = 2.25$ ) than children who gave partially relevant explanations and failed this item ( $M = 6.27, SE = 1.61, p = .015$ ).

For the PPRA Teacher Measure (subscales: proactive relational aggression, reactive relational aggression, proactive physical aggression, reactive physical aggression, prosocial behavior), there was a main effect of encoding of cues (i.e., "What happened in the story?" and "What happened to [Child 1's] play object?") for each

individual Theory of Mind item, all  $F$ 's(3,46)  $\geq 5.40$ , all  $p$ 's  $\leq .003$  (see Table 5):

Children who gave fully irrelevant explanations were rated higher in proactive physical aggression ( $M = 7.24$ ,  $SE = 1.00$ ) than children who gave partially relevant ( $M = 4.16$ ,  $SE = .57$ )( $p = .056$ ), relevant ( $M = 2.98$ ,  $SE = .29$ )( $p = .001$ ), or fully relevant explanations ( $M = 3.24$ ,  $SE = .304$ )( $p = .003$ ) (see Table 5) (see Figure 11). There was also an interaction between encoding of cues (i.e., "What happened in the story?" and "What happened to [Child 1's] play object?") and ToM Item 5 (Explicit False-Belief) for proactive physical aggression,  $F(2,45) = 4.156$ ,  $p = .022$ . Children who gave fully relevant explanations and failed ToM Item 5 were rated higher in proactive physical aggression ( $M = 3.60$ ,  $SE = .20$ ) than children who gave fully relevant explanations and passed this item ( $M = 2.98$ ,  $SE = .25$ ),  $p = .064$ .

Proactive physical aggression (PPRA):		Proactive reactive aggression (PPRA):	
ToM Item	Fs and Ps	ToM Item	Fs and Ps
1	$F(3,46) = 6.07, p = .001$	1	$F(3,46) = 3.04, p = .038$
2	$F(3,46) = 6.03, p = .001$	2	$F(3,46) = 2.92, p = .044$
3	$F(3,46) = 6.47, p = .001$	3	$F(3,46) = 3.53, p = .022$
4	$F(3,46) = 5.40, p = .003$	5	$F(3,46) = 5.41, p = .003$
5	$F(3,46) = 7.03, p = .001$	6	$F(3,46) = 3.45, p = .024$
6	$F(3,46) = 6.31, p = .001$	7	$F(3,46) = 3.28, p = .029$
7	$F(3,46) = 6.00, p = .002$		

Table 5. Main effects of children's encoding of cues

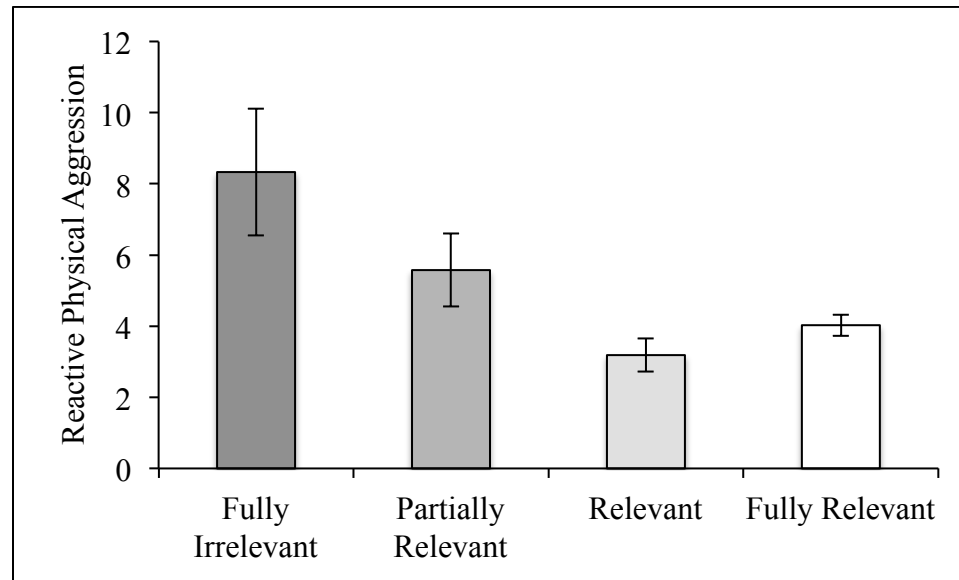


Figure 11. Main effect of encoding of cues on children's reactive physical aggression

For reactive physical aggression, there was a main effect of encoding of cues (i.e., “What happened in the story?” and “What happened to [Child 1’s] play object?”) for each Theory of Mind item (except item 4), all  $F$ ’s (3,46)  $\geq 2.92$ , all  $p$ ’s  $\leq .044$  (see Table 5). Children who gave fully irrelevant explanations were rated higher in reactive physical aggression ( $M = 8.36$ ,  $SE = 1.82$ ) than children who gave relevant ( $M = 3.28$ ,  $SE = .538$ ) ( $p = .062$ ), or fully relevant explanations ( $M = 3.57$ ,  $SE = .475$ ),  $p = .091$ . Results also revealed a significant interaction effect of encoding of cues (i.e., “What happened in the story?” and “What happened to [Child 1’s] play object?”) and ToM Item 5 (Explicit False-Belief),  $F(2,45) = 11.01$ ,  $p < .000$ . Children who gave fully relevant explanations and failed ToM Item 5 were rated higher in reactive physical aggression ( $M = 4.65$ ,  $SE = 2.97$ ) than children who gave fully relevant explanations and passed this item ( $M = 2.97$ ,  $SE = .409$ ),  $p = .003$ .

**Summary.** In the hostile condition, children who were unable to fully and accurately explain the events in the vignette were rated higher in total aggression, proactive physical aggression, and reactive physical aggression. Interestingly, however, children who were able to fully and accurately explain the events in the story were also rated higher in proactive physical and reactive physical aggression, but only if they failed ToM item 5 (Explicit-False Belief). This suggests that being able to fully and accurately encode social cues alone may not prevent children from engaging in physically aggressive behaviors. Children must combine these encoding skills with basic theory of mind comprehension to limit their engagement in physically aggressive behaviors.

**Interpretation of cues.** For total aggression, there was a significant main effect of emotion attribution (i.e., “How do you think [Child 1] feels?”),  $F(2,44) = 3.45, p = .040$ , and a significant interaction effect of emotion attribution (i.e., “How do you think [Child 1] feels?”) and ToM Item 3 (Knowledge Access),  $F(2,44) = 4.29, p = .020$ . Children who said Child 1 (the victim) was happy were rated higher in total aggression ( $M = .97, SE = .44$ ) than those who said Child 1 was sad ( $M = -.11, SE = .10$ ),  $p = .06$ , or angry ( $M = -.30, SE = .19$ ),  $p = .035$ . Also, children who said Child 1 was happy and failed ToM Item 3 were rated higher in aggression ( $M = 2.13, SE = .61$ ) than children who said Child 1 was angry and passed this item ( $M = -.20, SE = .18$ ),  $p = .009$ .

For the PSBS Teacher Measure (Subscales: overt aggression, relational aggression, prosocial behavior), there was a significant interaction effect of intent attribution (i.e., “Why did [Child 2] [destroy the play object] of [Child 1]?”) and ToM Item 4 (Contents False-Belief),  $F(1,48) = 4.69, p = .035$ . Children who correctly attributed hostile intent to character 2 and passed ToM Item 4 were rated higher in overt

aggression ( $M = 8.58$ ,  $SE = .638$ ) than children who attributed hostile intent to character 2 and failed this item ( $M = 6.84$ ,  $SE = .78$ ),  $p = .093$ .

For the PPRA Teacher Measure (subscales: proactive relational aggression, reactive relational aggression, proactive physical aggression, reactive physical aggression, prosocial behavior), there was a main effect of ToM Item 2,  $F(1,47) = 4.00$ ,  $p = .052$ . Children who passed ToM Item 2 (Diverse Beliefs) were rated higher in proactive relational aggression ( $M = 5.69$ ,  $SE = .971$ ) than children who failed this item ( $M = 3.54$ ,  $SE = .97$ ). For teacher ratings of reactive relational aggression, there was a main effect of ToM Item 2,  $F(1,47) = 4.00$ ,  $p = .05$ . Children who passed each ToM Item 2 were rated higher in reactive relational aggression ( $M = 5.69$ ,  $SE = .971$ ) than children who failed this item ( $M = 3.54$ ,  $SE = .97$ ).

For the TPPN Teacher Measure (subscales: aggression and prosocial behavior), there was a significant interaction effect of intent attribution (i.e., “Why did [Child 2] [destroy the play object] of [Child 1]?”) and Theory of Mind Item 4,  $F(1,48) = 4.49$ ,  $p = .039$ . Children who failed to identify the behavior as being intentionally hostile and failed ToM Item 4 were rated higher in teacher predicted peer nominations of aggression ( $M = 10.34$ ,  $SE = 2.39$ ) than children who failed to identify the behavior as hostile and passed this item ( $M = 1.82$ ,  $SE = 3.82$ ),  $p = .080$ .

**Summary.** In line with our predictions, problematic emotion attribution and intention attribution (i.e., interpretation of cues; Step 2 in the model) and poor Theory of Mind performance was associated with higher levels of total aggression and teacher predicted peer nominations of aggression. Also in line with our predictions, and in contrast to problematic social information processing and poor Theory of Mind



performance, appropriate intention attribution and successful Theory of Mind performance was associated with higher levels of overt, proactive relational, and reactive relational aggression.

***Response access/Response decision.*** For total aggression, there was a significant main effect of ToM Item 4 (Contents False-Belief),  $F(1,47) = 4.66, p = .036$ , and a significant interaction effect of children's response evaluation (i.e., "How good/bad do you think what [Child 1] did (physically aggressive response) was?") and ToM Item 4,  $F(1,47) = 6.55, p = .014$ . Children who passed ToM Item 4 were rated higher in aggressive behavior ( $M = .76, SE = -.29$ ) than children who failed it ( $M = -.29, SE = .34$ ),  $p = .036$ . Also, children who gave a positive evaluation of the physically aggressive response and passed ToM Item 4 were rated higher in aggressive behavior ( $M = 1.72, SE = .69$ ) than children who gave a positive evaluation of the physically aggressive response and failed this item ( $M = -.62, SE = .68$ ),  $p = .019$ . There was also a main effect of ToM Item 5 (Explicit False-Belief),  $F(1,47) = 4.82, p = .033$ , and a significant interaction effect of children's response evaluation (i.e., "How good/bad do you think what [Child 1] did (physically aggressive response) was?") and ToM Item 5,  $F(1,47) = 6.17, p = .017$ . Children who passed ToM Item 5 were rated higher in aggressive behavior ( $M = .79, SE = .35$ ) than children who failed it ( $M = -.28, SE = .35$ ),  $p = .033$ . Children who gave a positive evaluation of the physically aggressive response and passed ToM Item 5 were rated higher in aggressive behavior ( $M = 1.75, SE = .69$ ) than children who gave a positive evaluation of the physically aggressive response and failed this item ( $M = -.56, SE = .68$ ),  $p = .021$ .

Additional results for total aggression revealed a significant main effect of ToM Item 6 (Belief-Emotion),  $F(1,47) = 5.11, p = .028$ , and a significant interaction effect of children's response evaluation (i.e., "How good/bad do you think what [Child 1] did (physically aggressive response) was?) and ToM Item 6,  $F(1,47) = 5.75, p = .021$ . Children who passed ToM Item 6 were rated higher in aggressive behavior ( $M = .81, SE = .35$ ) than children who failed it ( $M = -.30, SE = .35$ ),  $p = .028$ . Children who gave a positive evaluation of the physically aggressive response and passed ToM Item 6 were rated higher in aggressive behavior ( $M = 1.74, SE = .70$ ) than children who gave a positive evaluation of the physically aggressive response and failed it ( $M = -.57, SE = .69$ ),  $p = .022$ .

For the PSBS Teacher Measure (Subscales: relational aggression, overt aggression, prosocial behavior), there was a significant main effect of ToM Item 4 (Contents False-Belief),  $F(1,49) = 5.79, p = .020$ , ToM Item 5 (Explicit False-Belief),  $F(1,49) = 7.12, p = .01$ , and ToM Item 6 (Belief-Emotion),  $F(1,49) = 6.90, p = .011$ . Children who passed ToM Items 4, 5, and 6 were rated higher in overt aggression ( $M = 10.27, SE = 1.20$ ) than children who failed these items ( $M = 6.25, SE = 1.17$ ),  $p = .02$ . For relational aggression, there was a significant interaction effect of children's response selection (i.e., "What do you think [Child 1] will do now that his/her [play object is destroyed]?") and ToM Item 5 (Explicit False-Belief),  $F(3,40) = 4.11, p = .012$ . Children who said Child 1 would respond to the provocation by telling an adult and passed ToM Item 5 were rated higher in relational aggression ( $M = 14.06, SE = 1.97$ ) than children who said Child 1 would tell an adult and failed this item ( $M = 7.50, SE = 1.45$ ),  $p = .011$  (See Figure 12).



Figure 12. Interaction effect of response selection (Tell an Adult) and performance on Theory of Mind Item 5 (Explicit False-Belief) on reactive relational aggression.

For the PPRA Teacher Measure (Subscales: proactive relational aggression, reactive relational aggression, proactive physical aggression, reactive physical aggression, prosocial behavior), there was a main effect of ToM Item 7 (Real-Apparent Emotion),  $F(1,40) = 5.02, p = .031$ . Children who passed ToM Item 7 were rated higher in reactive relational aggression ( $M = 7.93, SE = .1.13$ ) than children who failed this item ( $M = 4.98, SE = .59$ ),  $p = .031$ . For proactive physical aggression, there was a significant interaction effect of children's response evaluation (i.e., "Do you think what [Child 1] did (physical aggression) was good or bad") and ToM Item 4 (i.e., Contents False-Belief),  $F(1,48) = 4.45, p = .039$ , ToM Item 5 (Explicit False-Belief),  $F(1,48) = 4.47, p = .040$ , and ToM Item 6 (Belief-Emotion),  $F(1,48) = 5.23, p = .027$ . Children who had a positive

evaluation of physical aggression and passed Items 4, 5, and 6 were rated higher in proactive physical aggression ( $M = 6.011$ ,  $SE = 1.09$ ) than those who had a positive evaluation of physical aggression and failed ToM Items 4, 5, and 6 ( $M = 2.92$ ,  $SE = 1.08$ ),  $p = .049$ ;  $p = .050$ ;  $p = .045$ . For reactive physical aggression, there was a main effect of response evaluation,  $F(1,48) = 5.66$ ,  $p = .021$ . Children who gave a positive evaluation of physical aggression were rated higher in reactive physical aggression ( $M = 6.64$ ,  $SE = 1.34$ ) than children who gave a negative evaluation of physical aggression ( $M = 3.90$ ,  $SE = .276$ ).

**Summary.** Children showing problematic response evaluating (i.e., positively evaluating a physically aggressive response) who were successful on Theory of Mind Item 4 (Content False-Belief), Item 5 (Explicit False-Belief), and Item 6 (Belief-Emotion) had higher total aggression scores than children who gave positive evaluations of physically aggressive behavior and who failed these Theory of Mind items. In addition, children who selected appropriate responses to provocation and passed Theory of Mind item 7 (Real-Apparent Emotion) were rated higher in reactive relational aggression than children who selected an appropriate response and failed Theory of Mind item. These results suggest that a more advanced Theory of Mind may in some cases promote children's engagement in aggressive behavior, as measured by a higher aggression score and higher ratings of reactive relational aggression.

More generally, children's relational aggression ratings appear to be related more to their performance on the Theory of Mind items than to their responses on the social information-processing task. Results are mixed for measures that combine both physical and relational aggression (i.e., total aggression score) or physical and verbal (i.e., overt

aggression) with both appropriate and problematic patterns of responding, and both success and failure on the Theory of Mind items, showing positive relationships with ratings of aggression.

### **Ambiguous Vignette.**

**Encoding of cues.** For total aggression, there was a significant interaction effect of encoding of cues (“What happened in the story?” and “What happened to [Child 1’s] play object?”) and ToM Item 4,  $F(1,45) = 4.19, p = .021$ , and encoding of cues and ToM Item 5,  $F(1,46) = 10.26, p = .002$ . Children who gave relevant explanations and failed ToM Item 4 were rated higher in aggression ( $M = .37, SE = .20$ ) than children who gave relevant explanations and passed this item ( $M = -.40, SE = .25$ ),  $p = .022$ . Similarly, children who gave relevant explanations and failed ToM Item 5 were rated higher in aggression ( $M = .41, SE = .20$ ) than children who gave relevant explanations and passed this item ( $M = -.38, SE = .22$ ),  $p = .013$ .

For the PSBS Teacher Measure (Subscales: overt aggression, relational aggression, prosocial behavior), there was a significant interaction effect of children’s encoding of cues (i.e., “What happened in the story?” and “What happened to [Child 1’s] play object?”) and ToM Item 3,  $F(2,47) = 3.63, p = .034$ . Children who gave fully relevant explanations and passed ToM Item 3 were rated higher in relational aggression ( $M = 9.43, SE = .71$ ) than children who gave fully relevant explanations and failed it ( $M = 6.22, SE = 1.36$ ),  $p = .047$ . (See Figure 13). For overt aggression, there was a significant interaction effect of children’s encoding of cues and ToM Item 4,  $F(2,47) = 3.56, p = .036$ . Children who gave fully relevant explanations and passed ToM Item 4

were rated higher in overt aggression ( $M = 8.47$ ,  $SE = .66$ ) than children who gave fully relevant explanations and failed ToM Item 4 ( $M = 6.41$ ,  $SE = .56$ ),  $p = .027$ .

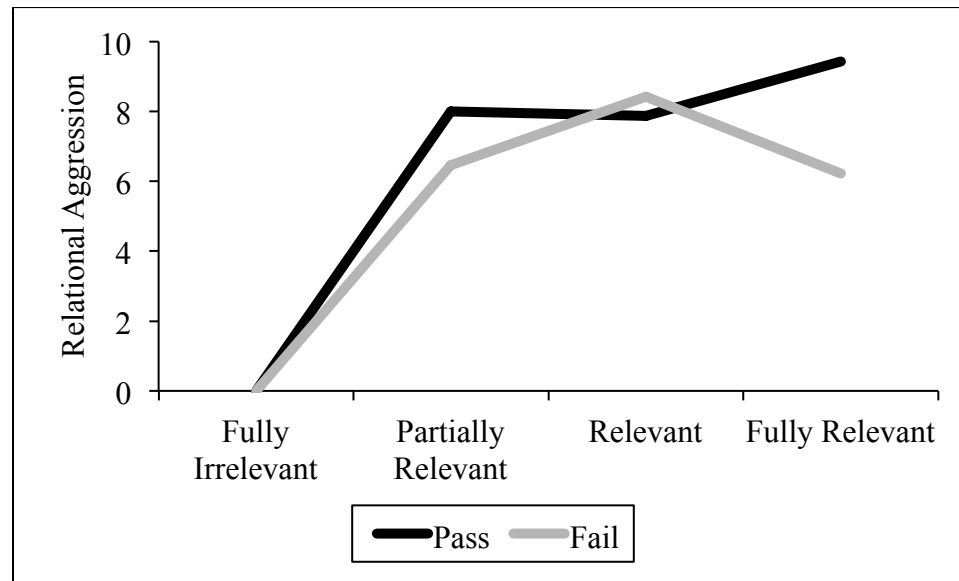


Figure 13. Interaction effect of encoding of cues and performance on Theory of Mind Item 3 on relational aggression

For the PPRA (proactive relational aggression, reactive relational aggression, proactive physical aggression, reactive physical aggression, prosocial behavior), there was a significant interaction effect of children's encoding of cues (i.e., "What happened in the story?" and "What happened to [Child 1's] play object?") and ToM Item 5,  $F(1,47) = 7.10$ ,  $p = .010$ . Children who gave relevant explanations and passed Theory of Mind Item 5 were rated higher in proactive relational aggression ( $M = 5.89$ ,  $SE = .68$ ) than children who gave relevant explanations and failed Theory of Mind Item 5 ( $M = 3.78$ ,  $SE = .75$ ),  $p = .043$ . There was also a significant interaction effect of encoding of cues (i.e., "What happened in the story?" and "What happened to [Child 1's] play object?") and Theory of Mind Item 6,  $F(2,46) = 3.17$ ,  $p = .051$ . Children who gave fully relevant

explanations and passed Theory of Mind Item 6 were rated higher in proactive relational aggression ( $M = 5.66$ ,  $SE = .60$ ) than children who gave fully relevant explanations and failed Theory of Mind Item 6 ( $M = 4.04$ ,  $SE = .53$ ),  $p = .051$ .

For reactive relational aggression, there was a significant interaction effect of encoding of cues (i.e., “What happened in the story?” and “What happened to [Child 1’s] play object?”) and Theory of Mind Item 5,  $F(1,47) = 11.15$ ,  $p = .002$ , and a significant interaction effect of encoding of cues and Theory of Mind Item 7,  $F(1,47) = 3.74$ ,  $p = .051$ . Children who gave fully relevant explanations and passed Theory of Mind Item 5 were rated higher in reactive relational aggression ( $M = 6.30$ ,  $SE = .61$ ) than children who gave fully relevant explanations and failed Theory of Mind Item 5 ( $M = 4.52$ ,  $SE = .49$ ),  $p = .028$ . Likewise, children who gave fully relevant explanations and passed Theory of Mind Item 7 were rated higher in reactive relational aggression ( $M = 8.54$ ,  $SE = 1.32$ ) than children who gave fully relevant explanations and failed Theory of Mind Item 7 ( $M = 4.84$ ,  $SE = .42$ ),  $p = .011$ .

For proactive physical aggression, there was an interaction effect of encoding of cues (i.e., “What happened in the story?” and “What happened to [Child 1’s] play object?”) and Theory of Mind Item 4,  $F(2,46) = 3.00$ ,  $p = .059$ , and an interaction effect of encoding of cues (i.e., “What happened in the story?” and “What happened to [Child 1’s] play object?”) and Theory of Mind Item 5,  $F(1,47) = 6.58$ ,  $p = .014$ . Children who gave relevant explanations and failed Theory of Mind Item 4 were rated higher in proactive physical aggression ( $M = 3.94$ ,  $SE = .32$ ) than children who gave relevant explanations and passed Theory of Mind Item 4 ( $M = 2.91$ ,  $SE = .39$ ),  $p = .055$  (See Figure 14). Likewise, children who gave relevant explanations and failed Theory of Mind

Item 5 were rated higher in proactive physical aggression ( $M = 4.00$ ,  $SE = .31$ ) than children who gave relevant explanations and passed Theory of Mind Item 5 ( $M = 2.92$ ,  $SE = .36$ ),  $p = .031$ .

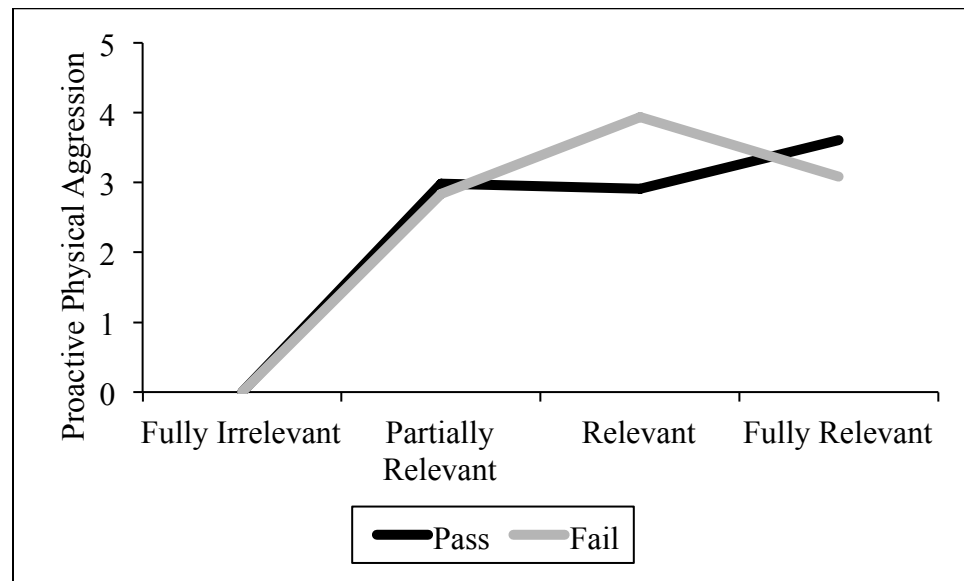


Figure 14. Interaction effect of encoding of cues and performance on Theory of Mind Item 4 on proactive physical aggression

For reactive physical aggression, there was a significant interaction effect of encoding of cues (i.e., “What happened in the story?” and “What happened to [Child 1’s] play object?”) and Theory of Mind Item 4,  $F(2,46) = 3.97$ ,  $p = .025$ , and a significant interaction effect of encoding of cues (i.e., “What happened in the story?” and “What happened to [Child 1’s] play object?”) and Theory of Mind Item 5,  $F(1,47) = 5.35$ ,  $p = .025$ . Children who gave relevant explanations and failed Theory of Mind Item 4 were rated higher in reactive physical aggression ( $M = 5.03$ ,  $SE = .54$ ) than children who gave relevant explanations and passed Theory of Mind Item 4 ( $M = 3.36$ ,  $SE = .66$ ),  $p = .061$ .



Likewise, children who gave relevant explanations and failed Theory of Mind Item 5 were rated higher in reactive physical aggression ( $M = 5.18$ ,  $SE = .56$ ) than children who gave relevant explanations and passed Theory of Mind Item 5 ( $M = 3.33$ ,  $SE = .62$ ),  $p = .031$ .

For the TPPN Teacher Measures (Subscales: aggression and prosocial behavior), there was an interaction effect of encoding of cues (i.e., “What happened in the story?” and “What happened to [Child 1’s] play object?”) and Theory of Mind Item,  $F(1,48) = 3.83$ ,  $p = .056$ . Children who gave relevant explanations and failed Theory of Mind Item 1 were rated higher in aggression ( $M = 24.98$ ,  $SE = 7.97$ ) than children who gave relevant explanations and passed Theory of Mind Item 1 ( $M = 8.94$ ,  $SE = 2.52$ ),  $p = .063$ .

**Summary.** The relationship between children’s encoding of cues and aggressive behavior differed as a function of whether or not children passed certain Theory of Mind items. Children who were able to accurately explain the events in the vignette and who failed Theory of Mind item 1 (Diverse Desires), item 4 (Contents False-Belief), and item 5 (Explicit False-Belief) had higher total aggression scores and were rated higher in proactive physical aggression, reactive physical aggression, and teacher predicted peer nominations of aggression. In contrast, children who were able to fully and accurately explain the events in the vignette and who passed Theory of Mind item 3 (Knowledge Access), item 4 (Contents False-Belief), item 5 (Explicit False-Belief), item 6 (Belief Emotion), and item 7 (Real-Apparent Emotion) were rated higher on overt aggression, proactive relational aggression, and reactive relational aggression than children who showed identical encoding of cues and failed the Theory of Mind tasks. These results suggest that accurate encoding of cues, coupled with poor performance on the Theory of

Mind battery items, is associated with higher ratings of physically aggressive behaviors whereas accurate encoding of cues, coupled with successful performance on the Theory of Mind battery items, is associated with higher ratings of relationally aggressive behaviors.

**Interpretation of cues.** For the PSBS Teacher Measure (Subscales: overt aggression, relational aggression, prosocial behavior), there was a significant interaction effect of intent attribution (i.e., “Why did [Child 2] [destroy the play object] of [Child 1]?”) and Theory of Mind Item 7,  $F(1,48) = 8.85, p = .005$ . Children who attributed accidental intent to the behavior and passed Theory of Mind Item 7 were rated higher in prosocial behavior ( $M = 17.96, SE = 1.20$ ) than children who attributed accidental intent and failed Theory of Mind Item 7 ( $M = 14.23, SE = .84$ ),  $p = .015$  (See Figure 15).

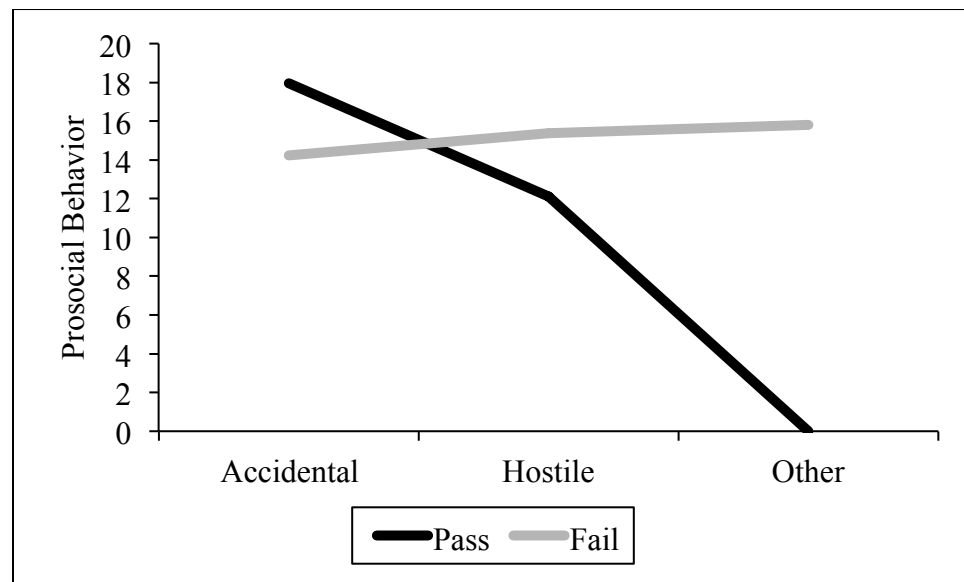


Figure 15. Interaction effect of interpretation of cues and performance on Theory of Mind Item 7 on prosocial behavior.

**Summary.** Children who attributed accidental intent to ambiguous provocation and who passed Theory of Mind item 7 (Real-Apparent Emotion) were rated the highest in prosocial behavior, suggesting that appropriate patterns of social information processing coupled with successful Theory of Mind performance are associated with high prosocial behavior.

**Response access/Response decision.** For total aggression, there was a significant main effect of outcome expectation (i.e., “What will happen if [Child 1] does [response chosen]?”),  $F(2,45) = 7.05, p = .002$ , and a significant interaction of outcome expectation (i.e., “What will happen if [Child 1] does [response chosen]?”) and Theory of Mind Item 3 (Knowledge Access),  $F(2,45) = 7.07, p = .002$ . Children who chose a response that will result in an unsuccessful outcome were rated higher in total aggression ( $M = .75, SE = .24$ ) than children who chose a response that will result in successful outcome ( $M = -.03, SE = .14$ ),  $p = .024$ . Also, children who chose a response that will result in unsuccessful responses and failed Theory of Mind Item 3 were rated higher in total aggression ( $M = 1.56, SE = .44$ ) than children who chose a response that will result in a successful responses and passed Theory of Mind Item 3 ( $M = .21, SE = .16$ ),  $p = .002$ . There was also a significant interaction of response selection (i.e., “What would you do if you were [Child 1] and someone [Destroyed your play object]?”) and Theory of Mind Item 5 (Explicit False-Belief),  $F(1,38) = 2.61, p = .050$ . Children who said they would display negative affect and passed Theory of Mind Item 5 were rated higher in aggression ( $M = 2.06, SE = .69$ ) than children who said they would display negative affect and failed Theory of Mind Item 5 ( $M = -.34, SE = .30$ ),  $p = .003$ .

For the PSBS Teacher Measure (Subscales: overt aggression and relational aggression), there was a significant interaction effect of response selection (i.e., “What would you do if you were [Child 1] and someone [Destroyed your play object]?”) and Theory of Mind Item 4 (Contents False-Belief),  $F(4,40) = 2.82, p = .038$ . Children who said they would display negative affect and passed Theory of Mind Item 4 were rated higher in relational aggression ( $M = 13.98, SE = 1.83$ ) than children who said they would display negative affect and failed Theory of Mind Item 4 ( $M = 5.78, SE = 1.75$ ),  $p = .003$ .

For the PPRA Teacher Measure (Subscales: proactive relational aggression, reactive relational aggression, proactive physical aggression, reactive physical aggression, prosocial behavior), there was a significant interaction of response selection (i.e., “What do you think [Child 1] will do now that his/her [play object is destroyed]?”) and Theory of Mind Item 7 (Real-Apparent Emotion),  $F(1,41) = 3.98, p = .053$ . Children who said Child 1 would not confront Child 2 and passed Theory of Mind Item 7 were rated higher in reactive relational aggression ( $M = 7.25, SE = 1.02$ ) than children who said Child 1 would not confront Child 2 and failed Theory of Mind Item 7 ( $M = 4.94, SE = .47$ ),  $p = .045$  (See Figure 16).

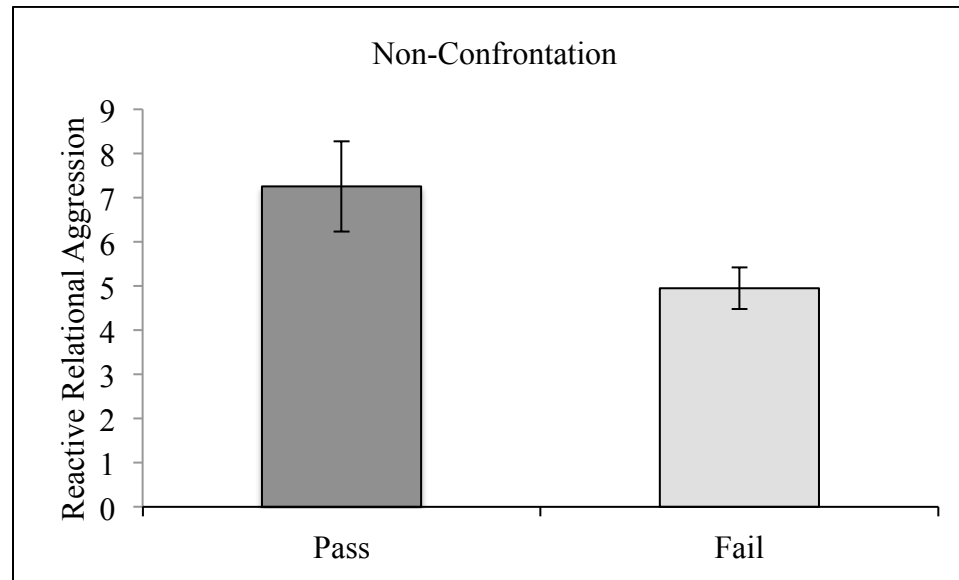


Figure 16. Interaction effect of response selection (Non-Confrontation) and performance on Theory of Mind Item 7 on reactive relational aggression.

For the TPPN Teacher Measure (Subscales: aggression and prosocial behavior), there was a main effect of outcome expectation (i.e., “What will happen if [Child 1] does [response chosen]?”),  $F(2,47) = 7.98, p = .001$ , and a significant interaction effect of outcome expectation (i.e., “What will happen if [Child 1] does [response chosen]?”) and Theory of Mind Item 3 (knowledge Access),  $F(2,47) = 4.51, p = .016$ . Children who chose a response that will result in an unsuccessful response were rated higher in aggression ( $M = 22.13, SE = 2.25$ ) than children who chose a response that will result in a successful outcome ( $M = 6.63, SE = 3.71$ ). Children who chose a response that will result in an unsuccessful outcome and failed Theory of Mind Item 3 were rated higher in aggression ( $M = 32.67, SE = 6.94$ ) than children who chose a response that will result in a successful outcome and passed Theory of Mind Item 3 ( $M = 9.19, SE = 2.44$ ),  $p = .008$ .

*Summary.* Children who chose responses they believed would result in unsuccessful outcomes had high total aggression scores and were rated high in teacher predicted peer nominations of aggression. When these unsuccessful response choices were coupled with poor performance on Theory of Mind Item 3 (Knowledge Access), children's aggression was the greatest. In addition, appropriate response selection coupled with successful performance on Theory of Mind Item 4 (Contents False-Belief) and Item 5 (Explicit False-Belief) was associated with higher ratings of relational aggression and reactive relational aggression. Thus, problematic outcome expectation, coupled with poor performance on the Theory of Mind battery items, is associated with higher total ratings of aggression and teacher predicted peer nominations of aggression; in contrast, appropriate response selection, coupled with successful performance on the Theory of Mind battery items, is associated with higher ratings of relationally aggressive behaviors.

More generally, children's theory of mind competence seems to be driving the relationship between their social information processing and their aggressive behaviors. Children showing similar patterns of responding on the social information processing task vary in ratings of physical and relational aggression as a function of how well they perform on the Theory of Mind items. Children showing problematic response patterns, coupled with poor performance on the Theory of Mind items, were rated higher in physical aggression. In contrast, children showing appropriate response patterns, coupled with good performance on the Theory of Mind items, were rated higher in relational aggression. Again, results are mixed for children's total aggression score, as was the case for the hostile condition.

### Discussion

In Study 3, we examined the interaction between children's social information processing, theory of mind abilities, and engagement in aggressive behavior. Previous research has not produced a thorough examination of the interaction between children's ToM ability, how they process social information at each step in the model, and their engagement in aggressive behavior. By exploring children's ToM abilities alongside their social information processing patterns, we were able to more closely examine the cognitive components that may be underlying children's aggressive behavior.

Across both conditions of the social information-processing task, similar relationships between children's patterns of responding and their engagement in aggressive and prosocial behavior emerged. In the hostile condition, children's responses to questions assessing their encoding of cues (Step 1 in the model), intent attributions (i.e., interpretation of cues; Step 2 in the model), response evaluations (i.e., response decision; Step 5 in the model), and outcome expectations (i.e., response decision; Step 5 in the model) were related to their engagement in aggressive behavior. Children who were unable to fully and accurately explain the events in the vignette were rated higher in proactive physical aggression, reactive physical aggression, and total aggression. Children who showed impaired emotion attribution, attributing happiness to the victim of the provocation, were also rated higher in total aggression. In contrast, children showing accurate intent attribution, attributing hostile intent to the behavior, were rated higher in reactive relational aggression. Further, children who had positively evaluated a physically aggressive response were rated higher in reactive physical aggression, and children who

chose responses they reported would lead to unsuccessful outcomes in response to the provocation were rated higher in parental ratings of aggression.

In the ambiguous condition, children's responses to questions assessing their outcome expectations and response evaluations were related to their engagement in both aggressive behavior and prosocial behavior. Children who chose responses they reported would lead to unsuccessful outcomes in response to provocation were rated higher in reactive physical aggression, overt aggression, and teacher predicted peer nominations of aggression. Children who showed appropriate response evaluation, negatively evaluating a physically aggressive response, were rated higher in prosocial behavior.

Across both conditions, children who showed problematic responding to questions assessing their patterns of social information processing were rated higher on measures of physical aggression and also had higher ratings of total aggression. These results are in line with previous research suggesting that problematic processing patterns at particular steps in the model are associated with children's engagement in aggressive behavior (e.g., Delveaux & Daniels, 2000; Dodge, 1986; Dodge & Frame, 1982; Dodge & Newman, 1981; Dodge et al., 2015; Dodge et al., 1995; Quiggle et al., 1992). In the current study, children's problematic patterns of social information processing and their engagement in relationally aggressive behaviors were not related. These findings are also consistent with previous research (Crain, Finch & Foster, 2005) in which relational aggression was related only to children's appropriate intent attribution.

In this study, our main interest was to examine the role ToM abilities might play in children's engagement in aggressive behaviors. Further, we were interested in how ToM abilities may influence the relationship between social information processing and



children's aggression. We predicted that the way children process social information may interact with their ToM abilities in a way that promotes or hinders their engagement in certain behaviors. Analyses examining the relationship between children's social information processing, Theory of Mind, aggression, and prosocial behavior revealed main effects of theory of mind on all measures of aggression and prosocial behavior. In general, higher scores on the total ToM battery and successful performance on each battery item was positively associated with children's engagement in relational aggression. Children who had a higher ToM battery score were rated higher in reactive relational aggression. Similarly, children who passed ToM Items 2-7 were rated higher on one or more of our measures of relational aggression (i.e., relational aggression subscale of the PSBS and the reactive relational and proactive relational subscales of the PPRA). Success on several items of the ToM battery (i.e., Item 2, 4, 5, and 6) was also related to higher scores on the overt aggression subscale of the PSBS and higher total aggression scores. In contrast, failure on a ToM battery item (i.e., Item 3) was associated with higher scores on teacher predictions of peer nominations of aggression (TPPN) and higher total aggression.

Results also revealed several significant interactions between children's social information processing and Theory of Mind on teacher and parent ratings of aggression and prosocial behavior. Results of our analyses examining the relationship between children's encoding of cues (i.e., Step 1 in the model) and Theory of Mind show different patterns of results across conditions. In the hostile condition, children who were unable to fully and accurately explain the events in the vignette (i.e., encoding of cues; Step 1 in the model) were rated higher in proactive physical aggression, reactive physical

aggression, and overt aggression, regardless of how well they performed on the Theory of Mind battery. In the ambiguous condition, children who were able to more fully and accurately explain the events in the vignette and pass select Theory of Mind Items (i.e., Item 3 (Knowledge Access), item 4 (Contents False-Belief), item 5 (Explicit False-Belief, and item 6 (Belief-Emotion)) were rated higher in relational aggression (both proactive and reactive).

Results of analyses examining children's interpretation of cues (i.e., Step 2 in the model) and theory of mind indicate that, in the hostile condition, children who were able to accurately attribute hostile intent to Child 2 and pass ToM Items 4 (Contents False-Belief) and 7 (Real-Apparent Emotion) were rated higher in overt aggression and reactive relational aggression. In contrast, children who inaccurately attributed accidental intent to Child 2 and failed ToM Item 4 (Content False-Belief) were rated higher in teacher predictions of peer nominations of aggression. Also, children who inappropriately attributed positive emotions to Child 1 (the victim of the provocation) and failed ToM Item 3 (Knowledge Access) were rated higher in total aggression. In the ambiguous condition, children who attributed accidental intent to Child 2 and passed ToM Item 7 (Real-Apparent Emotion) were rated higher in prosocial behavior, whereas children who attributed hostile intent to Child 2 and failed ToM Item 3 (Knowledge Access) were rated higher in proactive physical aggression.

In the hostile condition, interactions between children's clarification of goals (i.e., Step 3 in the model) and Theory of Mind performance were also found for both prosocial behavior and reactive relational aggression. Children who reported having goals of achieving a successful outcome and passed ToM item 4 (Contents False-Belief) were

rated higher in both prosocial behavior and reactive relational aggression; however, these interactions were not significant at  $p$ 's < .05. No interactions were found in the ambiguous condition.

Children's response access and response decision (i.e., Steps 4 and 5 in the model) were comprised of several different processes (i.e., response evaluation, response selection, outcome expectation), each showing a unique relationship with Theory of Mind and children's aggressive and prosocial behavior. In the hostile condition, children who showed inappropriate response evaluation by positively evaluating a physically aggressive response, and who passed Theory of Mind items 4 (Contents False-Belief), 5 (Explicit False-Belief), and 6 (Belief-Emotion), had higher ratings of proactive physical aggression and higher total aggression scores. In contrast, children who showed appropriate response selection, choosing to tell an adult or to not confront their provocateur, and who passed Theory of Mind item 5 (Explicit False-Belief) and item 6 (Belief-Emotion) were rated higher in relational aggression and prosocial behavior. Results showed a similar pattern in the ambiguous condition. Children who reported poor outcome expectations for their chosen response and who failed Theory of Mind item 3 (Knowledge Access) and 6 (Belief-Emotion) were rated higher in teacher predicted peer nominations of aggression and total aggression. In contrast, children who reported successful outcome expectations for their chosen response and who passed Theory of Mind item 7 (Real-Apparent Emotion) were rated higher in reactive relational aggression. Also, children who showed appropriate response selection, choosing to display negative affect or to not confront their provocateur, and who passed select Theory of Mind item 4

(Contents False-Belief), 5 (Explicit False-Belief), and 7 (Real-Apparent Emotion) were rated higher in relational aggression and reactive relational aggression.

Overall, these results suggest that children's problematic responding to questions assessing patterns of social information processing, coupled with poor performance on the select Theory of Mind items, is related to higher levels of *physical* aggression. Importantly, however, results also suggest that appropriate patterns of responding to social information processing, coupled with good performance on select Theory of Mind items, are related to higher levels of *relational* aggression. Children's total aggression score, ratings on the CBBL, and level of teacher predicted peer nominations of aggression were not associated with any consistent pattern of results. This is likely due to the fact that each measure is comprised of questions assessing physical, verbal, and relational aggression.

Taken together, results support the hypothesis that the way children process and respond to the social information around them is related to their engagement in different types of social behavior (i.e., aggressive and prosocial behavior); however, social information processing alone does account for variability in children's behavior. By examining children's Theory of Mind abilities alongside their social information processing we are able to get a clearer picture of how social cognition relates to children's engagement in aggressive behaviors. Taken together, our results support our prediction that children's patterns of social information processing interact with their Theory of Mind abilities in ways that promote engagement in both physically and relationally aggressive behaviors.

### **General Discussion**

The goal of the current research was to describe preschool children's engagement in relational aggression, and to study the cognitive components that may underlie its development. In Study 1 we used observation to examine physical, verbal, and relational acts of aggression in preschool-aged children. In doing so, we were able to describe the surprising complexity of the aggressive behaviors in this young age group, as well as the interpersonal context in which young children's aggressive behavior is embedded. Consistent with previous research, the most prevalent form of aggression in preschool children was physical, followed by verbal, then relational. It has been suggested that young children's relationally aggressive behaviors should be simple and direct, reflecting their relatively unsophisticated cognitive abilities. Contrary to this assumption, however, the specific types of relational aggression that we observed were quite complex, including secret telling, deception, and friendship exclusion. Further, all of the observed acts of aggression were seemingly unprovoked and were not in response to any previous transgression. These findings are consistent with those of Ostrov et al. (2004), suggesting that preschool-aged children may be engaging in relationally aggressive behaviors that are quite complex, requiring social cognitive abilities that are typically not attributed to children of this age.

In Study 2 we developed a new task that allowed us to examine one potential cognitive factor that might be contributing to children's engagement in aggressive behavior—how they process and respond to social information. Unlike other measures of social information processing used in the literature, our new task allowed us to evaluate children's processing at each step of Crick and Dodge's (1994) model. Further, we

greatly reduced task demands and language requirements, thus making our task appropriate for use with preschool-aged children. We found that problematic patterns of social information processing in preschoolers were associated with higher teacher ratings of aggression. Children who showed a weak ability to accurately encode social cues in a vignette or who positively evaluated relationally aggressive responses were rated higher in proactive physical aggression, reactive physical aggression, and total aggression than children who gave more thorough and accurate explanations or who negatively evaluated aggressive responses. Contrary to our predictions, we did not find a relationship between children's clarification of goals or response construction and teachers' ratings of aggression and prosocial behavior. We also did not see a strong relationship between children's patterns of social information processing and their engagement in relationally aggressive behaviors.

Importantly, our results from Study 2 demonstrated that children who produced similar patterns of responding in our social information-processing task also exhibited substantial variability in aggressive behavior. This suggests that other cognitive factors in addition to children's social information processing patterns may be contributing to children's engagement in aggressive behavior. Thus in Study 3 we examined the relationship between children's aggressive behavior, their patterns of social information processing, and their Theory of Mind abilities. We predicted that children's ToM would influence their patterns of social information processing, with higher ToM abilities predicting more appropriate patterns of responding (i.e., fewer encoding errors, non hostile attribution biases, positive outcome expectation, negative evaluation of aggressive behaviors, etc.). Our results partially supported this prediction: Children's ability to

appropriately attribute intent to behaviors and to appropriately evaluate negative response behaviors was associated with more advanced Theory of Mind skills. Additionally, we predicted that children with high levels of ToM would engage in more relational forms of aggression, while children with low levels of ToM would engage in more overt forms of aggression. Consistent with our predictions, children's ToM performance was associated with higher total aggression scores, higher scores on the prosocial behavior subscale of the PPRA, and most importantly, higher scores on *all subscales* of relational aggression.

Results from Study 3 also support our prediction that the relationship between patterns of social information processing and aggressive behavior would differ as a function of children's ToM, with ToM performance mediating the relationship between children's patterns of social information processing and their aggressive behavior. In other words, problematic responding to questions assessing patterns of social information processing, coupled with poor performance on specific Theory of Mind items was related to higher levels of *physical* aggression. Likewise, appropriate social information processing patterns, coupled with good performance on select Theory of Mind items was related to higher levels of *relational* aggression.

These results have important implications for research examining the developmental relationship between social information processing, Theory of Mind, and aggressive behavior. The relationship between children's social information processing, Theory of Mind, and aggressive behavior varied across specific Theory of Mind items and specific aggression measures. This variability likely accounts for the mixed results in the literature regarding the relationship between these variables. Each Theory of Mind item taps into a unique aspect of children's Theory of Mind abilities; our results show

that these can be differentially related to children's social information process as well as their aggressive behavior. Similarly, our results demonstrate that children's specific Theory of Mind skills are differentially associated with specific forms of aggression. Thus it is not surprising that measures that take a more universal approach to aggression, combining physical and relational acts of aggression, show mixed results with regards to their relationship with children's social information processing as well as with Theory of Mind abilities.

These results also have important implications for choosing successful intervention strategies for different types of aggressive behavior. Currently, the Centers for Disease Control and Prevention have outline a set of school-based social-cognitive "best practices" to prevent aggression. These intervention strategies were derived from the cognitive-ecological view of behavior development (Conduct Problems Prevention Research Group, 1999) and aim to modify the social-cognitive components underlying children's management of social conflicts and problems with the goal of preventing aggression in schools (Boxer & Dubow, 2002; Boxer et al., 2005).

Our results suggest that this type of social-cognitive intervention approach would be most effective in reducing children's engagement in aggressive behaviors that stem from problematic patterns of social information processing, such as physical aggression (Boxer & Dubow, 2002). It is unclear, however, how effective this approach would be in reducing children's engagement in relationally aggressive behaviors. Our research demonstrates that children who engage in high levels of relational aggression often showed appropriate responses to questions assessing their patterns of social information processing (i.e., accurately interpreting the behavior of others, reporting non-aggressive



problem solving strategies, and negatively evaluating aggressive responses). These children appear to be responding to the questions in our task with the most socially appropriate and acceptable answers, simultaneously, engaging in more problematic processing strategies.

New intervention strategies specifically targeting relationally aggressive children are important, as relational aggression has been linked to the development of internalizing problems such as anxiety and depression later in development (Card et al., 2008; Cleverley et al., 2012). Further, relational aggression is more difficult to identify than overt forms of aggression and often goes unnoticed in classrooms and in homes. Goldstein and Boxer (2013) reported that when asked about parental strategies for addressing aggression at home, parents report being less likely to discipline their children for engaging in relational aggression than they would if their child engaged in overt aggression. Thus, children might not be receiving negative feedback after engaging in relationally aggressive acts, suggesting an even stronger need for new intervention strategies.

One potential limitation of this study is that the data are correlational, so we cannot conclude that ToM abilities along with social information processing strategies necessarily *cause* aggressive behavior. There are many potential causes for the development of aggression. It is likely that aggression stems from the interaction between biological (e.g., genetic predispositions), cognitive (problematic patterns of information processing, aggressive behavioral scripts, poor emotional control), environmental (e.g., poverty, exposure to violence in the home or community), and situational (e.g., aggressive cues, frustration, substance abuse) (Anderson & Bushman, 2002; Huesmann,

1998) factors. While our results suggest that children's patterns of social information processing and aggressive behavior appear to differ as a function of ToM, the role of external social influences cannot be discounted. Research on early childhood aggression highlights the relationship between children's exposure to aggression at home, in peer groups, and from the media and the development and maintenance of aggressive behaviors. Although we hypothesize that both ToM and social information processing strategies causally influence children's aggressive behaviors, future longitudinal work is needed to fully elucidate how cognitive factors might play a role in the development of different types of aggression.

### ***Conclusion***

The current research presents a detailed account of the complex relationship between aggressive behavior and some of the cognitive components that underlie it, including social information processing patterns and ToM. Together, our results demonstrate that aggressive behavior does not always stem from children's problematic patterns of information processing or social incompetence. In fact, relational aggression in young children appears to stem from *more advanced* social cognitive abilities. This work stresses the importance of studying aggressive behavior in the context of social-cognitive development, as it has implications for the mechanisms that might underlie the development of aggressive behavior from a young age.

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## Appendix A

### Social Information Processing Task Coding Manual

#### 1. What happened in the story?

#### 2. What happened to [Child 1's play object]?

Note: Combine answers to Question 1 and Question 2

<u>Code</u>	<u>Description</u>	<u>Example</u>
0 Fully irrelevant explanation	Child cited cues that were not actually depicted in the story	Ex. "She was mean to her sister", "He doesn't like playing with blocks"
1 Partially relevant explanation	Child cited some cues that were relevant to the story and some cues that were irrelevant to story	Ex. "She knocked over her blocks because she didn't like what she was building". "She knocked over her blocks" is a relevant cue. "Because she didn't like what she was building" is an irrelevant cue.
2 Relevant explanation	Child cited cues in the story that were (a) relevant to the destruction of the play object OR (b) included mention of the interpersonal interaction in the story	Ex. "She knocked over her blocks", "She was playing and her friend came over"
3 Fully relevant explanation	Child cited cues in the story that were (a) relevant to the destruction of the play object and (b) included mention of the interpersonal interaction in the story	Ex. "He colored on his picture", "She stepped on the other girls crayons when she was coloring", "He knocked over his blocks and then said haha"

#### 3. How did this happen?

<u>Code</u>	<u>Description</u>	<u>Example</u>
0 Accidental	Child describes the event as being caused by Child 2 engaging in provoking behaviors for accidental reasons	Ex. "He stepped on the crayons because he wasn't looking where he was going"
1 Hostile Intent	Child describes the event as being caused by Child 2 engaging in provoking behaviors to harm Child 1 and/or Child 1's possessions	Ex. "She colored on her paper because she didn't like her drawing"
2 Ambiguous	Child describes the event as being caused by a behavior with no reference to intent	Ex. "He knocked it over with his feet"
3 Other	Child gives an answer that does not reference either character or the event described in the story	Ex. "I don't know", "Because that wasn't nice"

**4. How do you think [Child 1] feels?**

<u>Code</u>	<u>Description</u>
1 Happy	Child pointed to the face depicting a Happy face
2 Sad	Child pointed to the face depicting a Sad face
3 Neutral	Child pointed to the face depicting a Neutral face
4 Angry	Child pointed to the face depicting a Angry face

**5. How do you think [Child 2] feels?**

<u>Code</u>	<u>Description</u>
1 Happy	Child pointed to the face depicting a Happy face
2 Sad	Child pointed to the face depicting a Sad face
3 Neutral	Child pointed to the face depicting a Neutral face
4 Angry	Child pointed to the face depicting a Angry face

**8. Why did [Child 2] [destroy the play object] of [Child 1]?**

<u>Code</u>	<u>Description</u>	<u>Example</u>
0 Benign Intent	Child states that [Child 2] [destroyed the play object] of [Child 1] by accident	Ex. "He wasn't looking where he was going", "She thought it was her paper"
1 Hostile Intent	Child states that [Child 2] [destroyed the play object] of [Child 1] to harm [Child 1] and/or [Child 1]'s possessions	Ex. "She colored on her paper because she didn't like her drawing"
2 Ambiguous Intent/Other	Child states that [Child 2] [destroyed the play object] of [Child 1] with a behavior. Child gives no reference to intent	Ex. "Because the crayons were on the floor when he stepped there"

**9a. What do you think [Child 1] will do now that his/her [play object is destroyed]?**

<u>Code</u>	<u>Description</u>	<u>Example</u>
1 Tell an adult	Answer indicates involving an adult	Ex. "Tell the teacher", "Tell his mommy"
2 Non-confrontation	Answer indicates a reaction that does not involve a direct confrontation of the provocateur or an adult	Ex. "Go somewhere else to play", "Build it again"
3 Direct confrontation (nonaggressive)	Answer indicates that [Child 1] will confront [Child 2] in a nonaggressive manner	Ex. "Tell her that wasn't very nice"
4 Express forgiveness	Answer indicates that [Child 1] will apologize to [Child 2]	Ex. "Say sorry to him"
5 Aggression- Relational	Answer indicates that [Child 1] will use relational aggression (e.g., threatening friendship withdraw, secret telling, social exclusion, using an individual's social relationships as the vehicle of harm) against [Child 2]	Ex. "He will not be his friend anymore"
6 Aggression- Physical	Answer indicates that [Child 1] will use physical aggression (e.g., hitting, kicking, pushing) against [Child 2]	Ex. "She will hit him"
7 Aggression- Verbal	Answer indicates that [Child 1] will use verbal aggression (e.g., yelling, teasing, name-calling) against [Child 2]	Ex. "He will yell at him"
8 Display negative affect	Answer indicates [Child 1] will be upset, sad, or angry	Ex. "She will be sad"
9 Miscellaneous	Answer does not include any of the above responses	Ex. "I don't know", "Maybe nothing"

**9b. What will happen if [Child 1] does [response to 9a]?**

<u>Code</u>	<u>Description</u>	<u>Example</u>
1 Successful outcome for [Child 1]	Any outcome indicating the provoking behavior of [Child 2] will be stopped. OR any outcome indicating [Child 2] will receive repercussions for his/her actions	Ex. "[Child 2] will get in trouble", "[Child 1] will get a new pack of crayons"
2 Unsuccessful outcome for [Child 1]	Any outcome indicating the provoking behavior of [Child 2] will continue without repercussion. OR any outcome indicating [Child 1] will have a negative emotional reaction	Ex. "[Child 2] will do it again", "[Child 1] won't be able to play ever again"
3 Other	Any response that does not provide an outcome for the response given in Question 9a	Ex. "The blocks will fall", "Then it will be all done"

**10a. What do you think [Child 1] should do now that his/her [play object is destroyed]?**

<u>Code</u>	<u>Description</u>	<u>Example</u>
1 Tell an adult	Answer indicates involving an adult	Ex. "Tell the teacher", "Tell his mommy"
2 Non-confrontation	Answer indicates a reaction that does not involve a direct confrontation of the provocateur or an adult	Ex. "Go somewhere else to play", "Build it again"
3 Direct confrontation (nonaggressive)	Answer indicates that [Child 1] will confront [Child 2] in a nonaggressive manner	Ex. "Tell her that wasn't very nice"
4 Express forgiveness	Answer indicates that [Child 1] will apologize to [Child 2]	Ex. "Say sorry to him"
5 Aggression- Relational	Answer indicates that [Child 1] will use relational aggression (e.g., threatening friendship withdraw, secret telling, social exclusion, using an individual's social relationships as the vehicle of harm) against [Child 2]	Ex. "He will not be his friend anymore"
6 Aggression- Physical	Answer indicates that [Child 1] will use physical aggression (e.g., hitting, kicking, pushing) against [Child 2]	Ex. "She will hit him"
7 Aggression- Verbal	Answer indicates that [Child 1] will use verbal aggression (e.g., yelling, teasing, name-calling) against [Child 2]	Ex. "He will yell at him"
8 Display negative affect	Answer indicates [Child 1] will be upset, sad, or angry	Ex. "She will be sad"
9 Miscellaneous	Answer does not include any of the above responses	Ex. "I don't know", "Maybe nothing"

**10b. What will happen if [Child 1] does [response to 10a]?**

<u>Code</u>	<u>Description</u>	<u>Example</u>
1 Successful outcome for [Child 1]	Any outcome indicating the provoking behavior of [Child 2] will be stopped. OR any outcome indicating [Child 2] will receive repercussions for his/her actions	Ex. "[Child 2] will get in trouble", "[Child 1] will get a new pack of crayons"
2 Unsuccessful outcome for [Child 1]	Any outcome indicating the provoking behavior of [Child 2] will continue without repercussion. OR any outcome indicating [Child 1] will have a negative emotional reaction	Ex. "[Child 2] will do it again", "[Child 1] won't be able to play ever again"
3 Other	Any response that does not provide an outcome for the response given in Question 9a	Ex. "The blocks will fall", "Then it will be all done"

**11a. Do you think what [Child 1] did was good or bad?**

<u>Code</u>	<u>Description</u>
0 Bad	Child verbally responded with "bad"
1 Good	Child verbally responded with "good"

**11b. How good/bad?**

<u>Code</u>	<u>Description</u>
1 Very bad	Child (a) verbally stated it was "very bad" or "Biggest bad", or, (b) pointed to the large sad face labeled "very bad"
2 Kind of bad	Child (a) verbally stated it was "kind of bad" or "Medium bad", or, (b) pointed to the large sad face labeled "kind of bad"
3 Only a little bit bad	Child (a) verbally stated it was "only a little bit bad" or "tiny bad", or, (b) pointed to the large sad face labeled "A little bit bad"
4 Only a little bit good	Child (a) verbally stated it was "only a little bit good" or "tiny good", (b) pointed to the large happy face labeled "A little bit good"
5 Kind of good	Child (a) verbally stated it was "kind of good" or "medium good", or, (b) pointed to the large happy face labeled "kind of good"
6 Very good	Child (a) verbally stated it was "very good" or "Big good", or, (b) pointed to the large happy face labeled "very good"

**12a. Do you think what [Child 1] did was good or bad?**

<u>Code</u>	<u>Description</u>
0 Bad	Child verbally responded with "bad"
1 Good	Child verbally responded with "good"

**12b. How good/bad?**

<u>Code</u>	<u>Description</u>
1 Very bad	Child (a) verbally stated it was "very bad" or "Biggest bad", or, (b) pointed to the large sad face labeled "very bad"
2 Kind of bad	Child (a) verbally stated it was "kind of bad" or "Medium bad", or, (b) pointed to the large sad face labeled "kind of bad"
3 Only a little bit bad	Child (a) verbally stated it was "only a little bit bad" or "tiny bad", or, (b) pointed to the large sad face labeled "A little bit bad"
4 Only a little bit good	Child (a) verbally stated it was "only a little bit good" or "tiny good", (b) pointed to the large happy face labeled "A little bit good"
5 Kind of good	Child (a) verbally stated it was "kind of good" or "medium good", or, (b) pointed to the large happy face labeled "kind of good"
6 Very good	Child (a) verbally stated it was "very good" or "Big good", or, (b) pointed to the large happy face labeled "very good"



**13a. Do you think what [Child 1] did was good or bad?**

<u>Code</u>	<u>Description</u>
0 Bad	Child verbally responded with "bad"
1 Good	Child verbally responded with "good"

**13b. How good/bad?**

<u>Code</u>	<u>Description</u>
1 Very bad	Child (a) verbally stated it was "very bad" or "Biggest bad", or, (b) pointed to the large sad face labeled "very bad"
2 Kind of bad	Child (a) verbally stated it was "kind of bad" or "Medium bad", or, (b) pointed to the large sad face labeled "kind of bad"
3 Only a little bit bad	Child (a) verbally stated it was "only a little bit bad" or "tiny bad", or, (b) pointed to the large sad face labeled "A little bit bad"
4 Only a little bit good	Child (a) verbally stated it was "only a little bit good" or "tiny good", (b) pointed to the large happy face labeled "A little bit good"
5 Kind of good	Child (a) verbally stated it was "kind of good" or "medium good", or, (b) pointed to the large happy face labeled "kind of good"
6 Very good	Child (a) verbally stated it was "very good" or "Big good", or, (b) pointed to the large happy face labeled "very good"

**14. What would you do if you were [Child 1] and someone [destroyed your play object]?**

<u>Code</u>	<u>Description</u>	<u>Example</u>
1 Tell an adult	Answer indicates involving an adult	Ex. "Tell the teacher", "Tell my mommy"
2 Non-confrontation	Answer indicates a reaction that does not involve a direct confrontation of the provocateur or an adult	Ex. "Go somewhere else to play", "Build it again"
3 Direct confrontation (nonaggressive)	Answer indicates that the child would confront [Child 2] in a nonaggressive manner	Ex. "Tell her that wasn't very nice"
4 Express forgiveness	Answer indicates that the child would apologize to [Child 2]	Ex. "Say sorry to him"
5 Aggression- Relational	Answer indicates that the child would use relational aggression (e.g., threatening friendship withdraw, secret telling, social exclusion, using an individual's social relationships as the vehicle of harm) against [Child 2]	Ex. "Not be his friend anymore"
6 Aggression- Physical	Answer indicates that the child would use physical aggression (e.g., hitting, kicking, pushing) against [Child 2]	Ex. "hit him"
7 Aggression- Verbal	Answer indicates that the child would use verbal aggression (e.g., yelling, teasing, name-calling) against [Child 2]	Ex. "yell at him"
8 Display negative affect	Answer indicates that the child would be upset, sad, or angry	Ex. "be sad"
9 Miscellaneous	Answer does not include any of the above responses	Ex. "I don't know", "Maybe nothing"

## 15. How come you would do this?

<u>Code</u>	<u>Description</u>	<u>Example</u>
1 To achieve a successful outcome	Response is motivated by a desire to stop the behavior of [Child 2], OR to seek help in stopping [Child 2]'s behavior, OR to achieve a positive affect	Ex. "Because what she did was mean", "Because that's not nice to do that"
2 For revenge	Response is motivated by a desire to get revenge for the behavior of [Child 2] (to get back at Child 2), OR make [Child 2] sad, OR injure [Child 2] or his/her possessions	Ex. "So I could make them so sad", "So they would be hurt"
3 Other	Answer does not provide motivation for the response	Ex. "Because I wanted to", "Because that is what I would do"

## 16a. Has [play object being destroyed] ever happened to you?

<u>Code</u>
0 No
1 Yes

## 16b. If yes, what did you do?

<u>Code</u>	<u>Description</u>	<u>Example</u>
1 Tell an adult	Answer indicates involving an adult	Ex. "Tell the teacher", "Tell his mommy"
2 Non-confrontation	Answer indicates a reaction that does not involve a direct confrontation of the provocateur or an adult	Ex. "Go somewhere else to play", "Build it again"
3 Direct confrontation (nonaggressive)	Answer indicates that [Child 1] will confront [Child 2] in a nonaggressive manner	Ex. "Tell her that wasn't very nice"
4 Express forgiveness	Answer indicates that [Child 1] will apologize to [Child 2]	Ex. "Say sorry to him"
5 Aggression- Relational	Answer indicates that [Child 1] will use relational aggression (e.g., threatening friendship withdraw, secret telling, social exclusion, using an individual's social relationships as the vehicle of harm) against [Child 2]	Ex. "He will not be his friend anymore"
6 Aggression- Physical	Answer indicates that [Child 1] will use physical aggression (e.g., hitting, kicking, pushing) against [Child 2]	Ex. "She will hit him"
7 Aggression- Verbal	Answer indicates that [Child 1] will use verbal aggression (e.g., yelling, teasing, name-calling) against [Child 2]	Ex. "He will yell at him"
8 Display negative affect	Answer indicates [Child 1] will be upset, sad, or angry	Ex. "She will be sad"
9 Miscellaneous	Answer does not include any of the above responses	Ex. "I don't know", "Maybe nothing"

## Appendix B

### Study 2- Results for $p$ 's = 0.06—.20

#### *Social Information Processing and Aggressive and Prosocial Behavior*

##### **Hostile Vignette.**

*Interpretation of cues.* For total aggression, there was an effect of children's intent attribution (i.e., "Why did [Child 2] [destroy the play object] of [Child 1]?"),  $F(1,49) = 2.525, p = .068$ . Children who correctly attributed hostile intent to Child 2's behavior were rated higher in total aggression ( $M = 23.41, SE = 1.57$ ) than children who did not attribute intent to the behavior ( $M = 17.31, S = 1.76$ ),  $p = .046$ .

There was also an effect of children's intent attribution (i.e., "Why did [Child 2] [destroy the play object] of [Child 1]?") for teacher ratings of proactive relational aggression,  $F(2,50) = 1.99, p = .146$ , proactive physical aggression,  $F(2,50) = 2.160, p = .126$ , and reactive physical aggression,  $F(2,50) = 2.19, p = .122$ . Children who correctly attributed hostile intent to Child 2's behavior were rated higher in proactive relational aggression ( $M = 6.34, SE = .50$ ) than children who did not attribute intent to the behavior ( $M = 4.83, S = .56$ ),  $p = .169$ . Children who incorrectly attributed accidental intent to Child 2's behavior were rated higher in proactive physical aggression ( $M = 4.65, SE = .64$ ) than children who correctly attributed hostile intent ( $M = 4.10, SE = .32$ ),  $p = .302$ , or children who did not attribute intent to the behavior ( $M = 3.26, S = .36$ ),  $p = .221$ . Similarly, children who incorrectly attributed accidental intent to Child 2's behavior were rated higher in reactive physical aggression ( $M = 6.61, SE = 1.18$ ) than children who correctly attributed hostile intent ( $M = 5.42, SE = .60$ ),  $p = .349$ , or children who did not attribute intent to the behavior ( $M = 3.93, S = .68$ ),  $p = .187$ .



***Response access/Response decision.*** For total aggression, there was a main effect of children's response selection (i.e., "What do you think [Child 1] will do now that his/her [play object is destroyed]?"),  $F(7,55) = 1.85, p = .100$ . Children who said Child 1 would respond to the provocation with physical aggression were rated higher in total aggression ( $M = 32.45, SE = 4.19$ ) than children who said that Child 1 would respond with a non-aggressive direct confrontation ( $M = 13.06, SE = 4.54$ ),  $p = .072$ .

Additionally, there was a main effect of children's response selection (i.e., "What would you do if you were [Child 1] and someone [Destroyed your play object]?") for teacher ratings of proactive physical aggression,  $F(1,44) = 1.85, p = .100$ . Children who said they would respond to the provocation with verbal aggression were rated higher in proactive physical aggression ( $M = 8.58, SE = 1.63$ ) than children who said they would respond by non-confrontational behavior (e.g., walking away) ( $M = 3.58, SE = .36$ ),  $p = .129$ .

There was a main effect of response evaluation of relational aggression for reactive physical aggression that was approaching significance,  $F(1,52) = 3.245, p = .077$ . Children who positively evaluated a relationally aggressive response were rated higher on reactive physical aggression ( $M = 7.113, SE = 1.251$ ) than children who negatively evaluated a relationally aggressive response ( $M = 4.721, SE = .432$ ). There was also a main effect of response evaluation of physical aggression for proactive physical aggression,  $F(1,51) = 1.85, p = .179$ , and for reactive physical aggression,  $F(1,51) = 2.14, p = .149$ . Children who positively evaluated a physically aggressive response were rated higher in proactive physical aggression ( $M = 4.93, SE = .83$ ) and reactive physical

aggression ( $M = 7.15$ ,  $SE = 1.54$ ) than children who negatively evaluated a physically aggressive response (proactive:  $M = 3.75$ ,  $SE = .233$ ; reactive:  $M = 4.81$ ,  $SE = .43$ ).

**Ambiguous Vignette.**

**Clarification of goals.** There was a main effect of children's clarification of goals for teacher ratings of reactive relational aggression,  $F(1,45) = 3.49$ ,  $p = .068$ . Children who said they would respond to provocation with the goal of achieving a successful outcome (e.g., stopping the behavior of the provocateur) were rated higher in reactive relational aggression ( $M = 7.05$ ,  $SE = .56$ ) than children who said they would respond with a goal other than that of achieving a successful outcome (e.g., to get revenge) ( $M = 5.50$ ,  $SE = .60$ ),  $p = .068$ .

**Response access/Response decision.** There were two main effects of children's response selection (i.e., "What do you think [Child 1] will do now that his/her [play object is destroyed]?") for teacher ratings of proactive relational aggression,  $F(7,44) = 1.92$ ,  $p = .088$ , and for teacher ratings of reactive relational aggression,  $F(7,44) = 2.011$ ,  $p = .075$ . Children who chose a verbally aggressive response for Child 1 were rated higher in proactive relational aggression ( $M = 10.00$ ,  $SE = 2.82$ ) than children who chose a relationally aggressive response ( $M = 3.00$ ,  $SE = .00$ ),  $p = .093$ . Similarly, children who chose a verbally aggressive response for Child 1 were rated higher in reactive relational aggression ( $M = 9.46$ ,  $SE = 1.97$ ) than children who chose a relationally aggressive response ( $M = 2.70$ ,  $SE = 1.56$ ),  $p = .194$ .

There was also a main effect of children's outcome expectation (i.e., "What will happen if [Child 1] does [response chosen]?") for teacher ratings of reactive relational aggression,  $F(2,47) = 2.72$ ,  $p = .076$ . Children who said their response chosen would

result in a successful outcome were rated higher in reactive relational aggression ( $M = 7.50$ ,  $SE = 2.19$ ) than children who said their response chosen would result in some other outcome ( $M = 5.29$ ,  $SE = 3.07$ ),  $p = .099$ .

## Appendix C

### Study 3- Results for $p$ 's = 0.06—.20

#### ***Theory of Mind and Aggressive and Prosocial Behavior***

In the ambiguous condition, there was a main effect of response evaluation (*Response Evaluation*: “How good/bad do you think what [Child 1] did (relationally aggressive response) was?”),  $F(1,52) = 3.15, p = .081$ . Children who negatively evaluated the relationally aggressive response scored higher on the Theory of Mind battery ( $M = 3.86, SE = .21$ ) than children who positively evaluated the relationally aggressive response ( $M = 2.32, SE = .83, p = .081$ ).

#### ***Social Information Processing and Aggressive and Prosocial Behavior***

##### **Hostile Vignette.**

***Encoding of cues.*** For teacher ratings of overt aggression, there was a main effect of encoding of cues (i.e., “What happened in the story?” and “What happened to [Child 1’s] [play object]?”),  $F(3,50) = 1.963, p = .132$ . Children who gave fully irrelevant explanations about what happened in the vignette were rated higher in overt aggression ( $M = 11.80, SE = 2.36$ ) than children who gave relevant ( $M = 6.56, SE = .61, p = .223$ ), or fully relevant explanations ( $M = 7.30, SE = .39, p = .396$ ).

***Clarification of Goals.*** For teacher ratings of reactive physical aggression, there was a main effect of children’s clarification of goals (i.e., “How come you would do this [response chosen]?”),  $F(2,50) = 2.26, p = .114$ . Children who said they would choose a response with the goal of getting revenge were rated higher in reactive physical aggression ( $M = 6.72, SE = 1.34$ ) than children who said they would choose a response with the goal of achieving a successful outcome ( $M = 3.93, SE = .38$ ).

***Response Access/Response Decision.*** For teacher ratings of proactive physical aggression, there was a main effect of response evaluation (i.e., “Do you think what [Child 1] did (physically aggressive response) was good or bad?”),  $F(1,51) = 2.13, p = .150$ . Children who positively evaluated the physically aggressive response were rated higher in proactive physical aggression ( $M = 4.49, SE = .78$ ) than children who negatively evaluated the response ( $M = 3.31, SE = .14$ ).

#### **Ambiguous Vignette.**

***Response Access/Response Decision.*** For teacher predicted peer nominations of aggression, there was a main effect of response evaluation (i.e., “Do you think what [Child 1] did (relationally aggressive response) was good or bad?”),  $F(1,51) = 2.58, p = .114$ . Children who positively evaluated the relationally aggressive response were rated higher in aggression ( $M = 18.87, SE = 6.6$ ) than children who negatively evaluated the response ( $M = 7.90, SE = .14$ ).

### ***Theory of Mind, Social Information Processing, and Aggressive and Prosocial Behavior***

#### **Hostile Vignette.**

***Encoding of cues.*** A regression equation that was approaching significance was found for the effect of children’s Theory of Mind score on teacher ratings on the reactive relational aggression subscale of the PPRA,  $F(1,53) = 2.877, p = .096$ , with an  $R^2$  of .051. Children’s predicted rating of reactive relational aggression is equal to  $4.140 + 0.320$  (theory of mind). In other words, teacher ratings of reactive relational aggression increased .320 points for each 1-point increase in children’s Theory of Mind score.

There was a main effect of ToM Item 5 (i.e., Explicit False Belief) for teacher ratings of overt aggression,  $F(1,46) = 2.183, p = .146$ . Children who passed ToM Item 5 were rated higher in overt aggression ( $M = 9.40, SE = .846$ ) than children who failed ToM Item 5 ( $M = 7.07, SE = .846$ ) ( $p = .029$ ). There was also an interaction effect of ToM Item 5 (i.e., Explicit False-Belief) and encoding of cues on teacher ratings of relational aggression,  $F(2,46) = 2.034, p = .142$ . Children who gave partially relevant explanations to “What happened in the story?” and “What happened to [Child 1’s] play object?” and passed ToM Item 5 were rated higher in relational aggression ( $M = 13.91, SE = 3.50$ ) than children who gave partially relevant explanations and failed ToM item 5 ( $M = 7.46, SE = 2.49$ ) ( $p = .178$ ).

There was an interaction effect of ToM Item 1 (i.e., Diverse Desires) and encoding of cues,  $F(1,46) = 2.332, p = .134$ . Children who gave fully relevant explanations to “What happened in the story?” and “What happened to [Child 1’s] play object?” and passed ToM Item 1 were rated higher in proactive relational aggression ( $M = 5.19, SE = .414$ ) than children who gave fully relevant explanations and failed ToM Item 1 ( $M = 2.96, SE = 1.35$ ) ( $p = .123$ ).

There was an interaction effect of ToM Item 1 (i.e., Diverse Desires) and encoding of cues for teacher ratings of reactive relational aggression,  $F(1,46) = 1.760, p = .141$ . Children who gave fully relevant explanations to “What happened in the story?” and “What happened to [Child 1’s] play object?” and passed ToM Item 1 were rated higher in reactive relational aggression ( $M = 5.64, SE = .407$ ) than children who gave fully relevant explanations and failed ToM Item 1 ( $M = 3.32, SE = 1.33$ ) ( $p = .104$ ). There was also a main effect of ToM Item 2 (i.e., Diverse Beliefs),  $F(1,46) = 1.82, p = .183$ .

Children who passed ToM Item 2 were rated higher in reactive relational aggression ( $M = 6.61$ ,  $SE = .69$ ) than children who failed ToM Item 2 ( $M = 4.01$ ,  $SE = .82$ ).

For teacher predictions of peer nominations of prosocial behavior, there was a main effect of ToM Item 6 (i.e., Belief-Emotion),  $F(1,47) = 1.86$ ,  $p = .179$ , and an interaction effect of ToM Item 6 and encoding of cues,  $F(1,47) = 1.91$ ,  $p = .174$ . Children who passed ToM Item 6 were rated higher in prosocial behavior ( $M = 62.87$ ,  $SE = 4.59$ ) than children who failed ToM Item 6 ( $M = 51.14$ ,  $SE = 6.37$ ),  $p = .137$ . Children who gave relevant explanations to “What happened in the story?” and “What happened to [Child 1’s] play object?” and passed ToM Item 6 were rated higher in prosocial behavior ( $M = 76.50$ ,  $SE = 8.04$ ) than children who gave relevant explanations and failed ToM Item 6 ( $M = 60.79$ ,  $SE = 5.61$ ),  $p = .110$ .

**Interpretation of cues.** For total aggression, there was a main effect of Theory of Mind Item 3 (i.e., Knowledge Access) approaching significance,  $F(1,44) = 3.63$ ,  $p = .063$ . Children who failed ToM Item 3 were rated higher in aggression ( $M = .49$ ,  $SE = .24$ ) than children who passed Theory of Mind Item 3 ( $M = -.12$ ,  $SE = .22$ ),  $p = .063$ .

There was a main effect of ToM Item 1 (i.e., Diverse Desires),  $F(1,47) = 2.04$ ,  $p = .159$ , and ToM Item 4 (i.e., Contents False-Belief),  $F(1,47) = 2.02$ ,  $p = .161$ , for teacher ratings of proactive relational aggression. Children who passed ToM items 1 and 4 were rated higher in proactive relational aggression ( $M = 5.69$ ,  $SE = .971$ ) than children who failed each ToM items 1 and 4 ( $M = 3.54$ ,  $SE = .97$ ). There was also an interaction effect of ToM Item 1 and interpretation of cues (i.e., *Intent Attribution*: “Why did [Child 2] [destroy the play object] of [Child 1]?”),  $F(1,47) = 2.378$ ,  $p = .130$ . Children who attributed hostile intent to child 2 and passed ToM Item 1 were rated higher in proactive

relational aggression ( $M = 5.6$ ,  $SE = .53$ ) than children who attributed hostile intent and failed ToM Item 1 ( $M = 2.5$ ,  $SE = 1.62$ ),  $p = .08$ .

There was a main effect of ToM Item 1 (i.e., Diverse Desires),  $F(1,47) = 2.04$ ,  $p = .159$ , and ToM Item 7,  $F(1,47) = 2.02$ ,  $p = .161$ , for teacher ratings of reactive relational aggression. Children who passed each ToM item were rated higher in reactive relational aggression ( $M = 5.69$ ,  $SE = .971$ ) than children who failed each ToM item ( $M = 3.54$ ,  $SE = .97$ ).

**Clarification of goals.** For teacher ratings of reactive relational aggression, there was an interaction effect of ToM Item 7 (i.e., Real-Apparent Emotion) and clarification of goals,  $F(1,47) = 2.75$ ,  $p = .103$ . Children who selected a successful goal for their behavior and passed ToM Item 7 were rated higher in reactive relational aggression ( $M = 7.65$ ,  $SE = 1.07$ ) than children who selected a successful goal and failed ToM Item 7 ( $M = 4.80$ ,  $SE = .55$ ),  $p = .024$ .

**Response Access/Response Decision.** There was an interaction effect of ToM Item 6 (i.e., Belief-Emotion) and response selection (i.e., “What do you think [Child 1] will do now that his/her [play object is destroyed]?”),  $F(5,38) = 1.79$ ,  $p = .136$ . Children who said character 1 would respond to the provocation by telling an adult and pass ToM Item 6 were rated higher in relational aggression ( $M = 11.11$ ,  $SE = 1.57$ ) than children who said character 1 would tell an adult and fail ToM item 6 ( $M = 7.64$ ,  $SE = 1.98$ ),  $p = .179$ .

Additionally, for teacher ratings of relational aggression, there was a main effect of ToM Item 4 (i.e., Contents False-Belief),  $F(1,49) = 2.44$ ,  $p = .125$ , ToM Item 5 (i.e., Explicit False-Belief),  $F(1,49) = 2.50$ ,  $p = .120$ , and ToM Item 6,  $F(1,49) = 2.28$ ,  $p =$



.137. Children who passed ToM Items 4, 5, and 6 were rated higher in relational aggression ( $M = 11.44$ ,  $SE = 1.86$ ) than children who failed ToM Items 4, 5, and 6 ( $M = 7.41$ ,  $SE = 1.87$ ),  $p$ 's  $< .125$ .

There was an interaction effect of ToM Item 6 (i.e., Belief-Emotion) and children's outcome expectation (i.e., "What will happen if [Child 1] does [will do response chosen]?"),  $F(2,47) = 1.88$ ,  $p = .163$ . Children who chose successful outcomes and passed ToM Item 6 were rated higher in relational aggression ( $M = 10.51$ ,  $SE = 1.29$ ) than children who chose successful outcomes and failed ToM Item 6 ( $M = 7.71$ ,  $SE = 1.08$ ),  $p = .111$ . There was also an interaction effect of Theory of Mind Item 3 (i.e., Knowledge Access) and children's outcome expectation (i.e., "What will happen if [Child 1] does [will do response chosen]?"),  $F(2,46) = 2.11$ ,  $p = .124$ . Children who chose successful outcomes and passed ToM Item 3 were rated higher in reactive relational aggression ( $M = 6.32$ ,  $SE = .65$ ) than children who chose successful outcomes and failed ToM Item 3 ( $M = 4.01$ ,  $SE = 1.07$ ),  $p = .082$ .

### **Ambiguous Vignette.**

**Encoding of cues.** For teacher predicted peer nominations of aggression, there was an interaction of ToM Item 5 (i.e., Explicit False-Belief) and encoding of cues,  $F(1,48) = 3.72$ ,  $p = .060$ . Children who gave relevant explanations and failed ToM Item 5 were rated higher in aggression (TPPN) ( $M = 15.28$ ,  $SE = 3.11$ ) than children who gave relevant explanations and passed ToM Item 5 ( $M = 4.22$ ,  $SE = 3.55$ ),  $p = .023$ .

**Interpretation of cues.** For total aggression, there was an interaction of ToM Item 3 (i.e., Knowledge Access) and intent attribution (i.e., "Why did [Child 2] [destroy the play object] of [Child 1]?"),  $F(2,45) = 2.25$ ,  $p = .117$ . Children who attributed hostile

intent and failed ToM Item 3 were rated higher in aggression ( $M = .53$ ,  $SE = .41$ ) than children who attributed hostile intent and passed ToM Item 3 ( $M = -.22$ ,  $SE = .20$ ),  $p = .106$ .

There was an interaction effect of ToM Item 3 (i.e., Knowledge Access) and intent attribution (i.e., “Why did [Child 2] [destroy the play object] of [Child 1]?”) for teacher ratings of reactive physical aggression,  $F(2,46) = 2.15$ ,  $p = .127$ . Children who attributed hostile intent to the provocation and failed ToM Item 3 were rated higher in reactive physical aggression ( $M = 5.18$ ,  $SE = 1.08$ ) than children who attributed hostile intent and passed ToM Item 3 ( $M = 3.16$ ,  $SE = .54$ ),  $p = .103$ .

**Clarification of Goals.** For teacher ratings of relational aggression, there was a main effect of ToM Item 2 (i.e., Diverse Beliefs),  $F(1,49) = 2.82$ ,  $p = .099$ . Children who passed ToM Item 2 were rated higher in relational aggression ( $M = 9.09$ ,  $SE = .51$ ) than children who failed ToM Item 2 ( $M = 6.74$ ,  $SE = 1.28$ ),  $p = .099$ . Also, for teacher ratings of proactive relational aggression, there was an interaction of ToM Item 3 and clarification of goals,  $F(1,48) = 2.04$ ,  $p = .159$ . Children who reported a goal of achieving a successful outcome and passed ToM Item 3 were rated higher in proactive relational aggression ( $M = 5.50$ ,  $SE = .53$ ) than children who reported goals of a successful outcome and failed ToM Item 3 ( $M = 3.50$ ,  $SE = 1.09$ ),  $p = .122$ .

**Response access/Response decision.** There was an interaction of ToM Item 6 (i.e., Belief-Emotion) and outcome expectation (i.e., “What will happen if [Child 1] does [response chosen]?”),  $F(2,45) = 2.96$ ,  $p = .062$ . Children who chose unsuccessful responses and failed ToM Item 6 were rated higher in aggression ( $M = .61$ ,  $SE = .27$ ) than

children who chose successful responses and passed ToM Item 6 ( $M = .27$ ,  $SE = .22$ ),  $p = .046$ .

For teacher ratings of reactive relational aggression, there was a main effect of ToM Item 7 (i.e., Real-Apparent Emotion),  $F(1,46) = 3.12$ ,  $p = .084$ , and an interaction effect of ToM Item 7 and outcome expectation,  $F(2,46) = 2.45$ ,  $p = .097$ . Children who passed ToM Item 7 were rated higher in reactive relational aggression ( $M = 6.91$ ,  $SE = .92$ ) than children who failed ToM Item 7 ( $M = 5.18$ ,  $SE = .32$ ). Children who chose a successful outcome and passed ToM Item 7 were rated higher in reactive relational aggression ( $M = 10.11$ ,  $SE = 1.60$ ) than those who chose an unsuccessful outcome and failed ToM Item 7 ( $M = 5.55$ ,  $SE = .665$ ),  $p = .007$ .

For teacher predictions of peer nominations of aggression, there was a main effect of ToM Item 3 (i.e., Knowledge Access). Children who failed Theory of Mind Item 3 were rated higher in aggression ( $M = 14.73$ ,  $SE = 3.02$ ) than children who passed Theory of Mind Item 3 ( $M = 8.13$ ,  $SE = 1.59$ ).