Theory-of-Mind Development as an Antecedent and a Consequence of
Social-Behavioral Development in Children

by

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DEDICATION

To my parents

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ABSTRACT

Social and cognitive competencies develop hand-in-hand during the early years of life. Despite the interdependence of the two areas of development, few studies attempt to capture the bidirectional and interactive nature of the relations between the two. This dissertation provides evidence from three longitudinal studies supporting the close, yet intricate, associations between children's behavioral and relational characteristics, and Theory-of-Mind (ToM) development.

The goal of the first study was to test a developmental cascade model of firstborn children's aggression, ToM development, and antagonistic sibling interaction during the transition to siblinghood. Findings revealed that firstborn children's aggression before the birth predicted higher sibling antagonism and poorer ToM understanding at 4 months post-partum. ToM, in turn, predicted lower sibling antagonism at 12 months, supporting the cascade effects across multiple domains of development over time.

The aim of the second study was to further understand the associations among early sibling interactions and parenting styles, and ToM development. Results showed that firstborns children's ToM before the birth of a sibling predicted more positive sibling engagement at 4 months after the birth. Parents' directive parenting moderated the negative link between sibling antagonism and ToM, emphasizing the importance of parental guidance for children's interaction with a baby sibling for their social cognitive growth.

The objective of the third study was to examine the interactive associations between callous-unemotional (CU) behavior, ToM, and anxious temperament at age 3 in predicting externalizing problems across childhood. A significant interaction between CU behavior and

ToM was found, where CU behavior at age 3 predicted externalizing problems at school at age 6 and 10 only when combined with low levels of ToM. This result suggests that advanced ToM understanding may play a protective role for children with high levels of CU behavior, who have a greater risk for persistent and severe externalizing problems across childhood.

To summarize, this dissertation shows multiple ways in which social-cognitive development and behavioral development interact in children's social lives. Findings from the three studies suggest that starting from early childhood, individual differences in children's ToM understanding can be a predictor, an outcome, and a moderator of social-behavioral development.

CHAPTER 1

General Introduction

Theory-of-Mind (ToM) is an understanding that mental states underlie human behaviors and also awareness that others' mental states—desires, beliefs, and intentions—can be different from one's own (Wellman, 2014). Most children develop ToM understanding during the preschool years following a sequence from simple understanding that others have different desires to more complicated understanding that underlying emotion might not always match expressed emotion. Coming to ToM understanding transforms how children experience their social lives, as they understand others in terms of psychological states (Hughes & Cutting, 1999). Although it is a universal cognitive developmental milestone for most typically developing children, there is a range of individual differences in the timetable of ToM development during the preschool years, which has led researchers to study various correlates of those individual differences (Wellman, 2014).

Having enhanced ToM understanding can benefit positive social outcomes because ToM helps children reason about others' behavior in more sophisticated ways, which allows them to become more skillful in their interaction with others (Laible, Thompson, & Froimson, 2015). Empirical evidence suggests that advanced ToM in the preschool years is associated with prosocial behavior (Eggum, Eisenberg, et al., 2011), positive sibling interaction (Dunn, Brown, Slomkowski, Tesla, & Youngblade, 1991), popularity among peers (Astington & Jenkins, 1995), teacher-reported social skills (Razza & Blair, 2009), and lower externalizing behaviors (Hughes & Ensor, 2006; Lemerise & Arsenio, 2000). Moreover, ToM provides a foundation for more

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complex and deeper cognition about themselves and others (Wellman, 2014). As children

develop self-awareness and expand their self-understanding, they become increasingly aware of

their own and others' emotions and can communicate feelings and desires in social relationships

more effectively (Bennett, Bendersky, & Lewis, 2005; Morgan, Izard, & King, 2010). These

individual differences in social cognitive skills continue to contribute to emotional and relational

competence beyond childhood, both independently and interactively with interpersonal (e.g.,

sibling interaction, parenting) and other intrapersonal factors (e.g., aggression, anxiety; Denham,

Bassett, & Wyatt, 2015). Thus, there is a good amount of evidence supporting the idea that

individual differences in ToM predict social developmental outcomes.

Is ToM only an antecedent of social adjustment? Social cognitive development itself is

also a socially constituted process. Children take an active role in gaining social cognitive skills

such as perspective-taking, attributions of intention, or comprehending the self and others as

psychological beings by adapting and rejecting the information presented by the social world

(Gauvain & Perez, 2015). In doing so, the quality and quantity of social experiences matter for

when children come to ToM understanding. Research suggests that children actively engage in

social exchanges from an early age. For example, infants experience differing desires and points

of view with their siblings and parents (Dunn, 1988; Reddy, 2008), which provide formative

experiences for children to develop awareness of differing psychological states across people

(Wellman, 2014). During the preschool years, pretend or fantasy co-play with siblings and peers

contribute to enhanced ToM (Perner et al., 1994; Youngblade & Dunn, 1995). In addition,

conversations about the causes and consequences of behaviors and emotions with caregivers also

facilitate ToM development (Lagattuta & Wellman, 2002; Peterson & Slaughter, 2003; Ruffman,

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Slade, & Crowe, 2002). Therefore, ToM development seems to be not only an antecedent, but also an outcome of social experiences.

Despite the well-accepted notion that social cognition cannot be separated from one's social life, few studies have carefully examined the association between ToM and social-behavioral characteristics by examining longitudinal dynamics between them, which likely are bidirectional and potentially interactive. To address this gap, the overall goal of the present dissertation was to examine how individual differences in children's ToM development around the early preschool years were related to their relational and social-behavioral characteristics. Specifically, these relations were examined in short- and long-term longitudinal studies to test the directionality of the influences and the interactions among the variables. Two broad theoretical frameworks were used: the social cognitive development approach (Olson & Dweck, 2008) and the transactional model (Sameroff, 1975).

Social Cognitive Development (SCD) Approach

Social cognitive development (SCD) has been proposed as an emerging interdisciplinary effort within and outside the field of developmental psychology (Olson & Dweck, 2008). As an approach investigating social antecedents (e.g., sibling interactions, parenting, behavioral characteristics), mental representations (e.g., ToM), and outcomes (e.g., externalizing problems), SCD can benefit both social development and cognitive development areas. For social development researchers, studying social cognitive processes can improve the understanding of "how" certain social and emotional experiences influence children's developmental competencies. On the other hand, cognitive development researchers can benefit from the SCD approach by investigating the individual differences in cognitive development, why children differ from each other, and how these differences might affect children's well-being.

The SCD approach also addresses an important point that many studies fail to acknowledge. To address ToM as both an antecedent and an outcome of individual differences in social antecedents, the relations between ToM and social development need to be examined in both directions (i.e., ToM → social development, social development → ToM). The transactional model allows for this bidirectional examination.

The Transactional Model

The transactional model is a dialectical model, which views children and their environment as interdependent (Sameroff, 1975). Parents and children are active, interacting causal components in a larger system, or *agents*, that consist of cognitive, behavioral, and motivational dimensions (Bandura, 2006; Kuczynski, Parkin, & Pitman, 2015). Children's development occurs within this system of relationships with multiple agents including parents, siblings, peers, and teachers (Reis, Collins, & Berscheid, 2000). The key proposition of the transactional model is that a person and their social environment (e.g., parents) are parts of a system and that they consistently change one another through bidirectional interactions. For example, a child who has advanced ToM understanding may induce more mentalistic conversation from caregivers, which, in turn, advances the child's social cognitive skills even further.

The transactional model can also inform our understanding of relations between *intrapersonal* factors, such as cognitive development (e.g., ToM) and behavior development (e.g., antisocial behavior). For instance, a child who has poor ToM understanding may be more likely to have difficulties associating others' distress with their own aggressive behaviors, which then leads to the continuation or exacerbation of antisocial behavior. Thus, one's cognitive (or social) development consistently influences and interacts with social (or cognitive) development.

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Therefore, the transactional model is not only applicable for understanding person-environment interaction, but could also be effective for capturing cognitive-social interplay.

The Present Studies

This dissertation aimed to capture the complex, transactional nature of the association between ToM and social, behavioral development. This goal is in line with Sameroff (2010)'s call for a unified theory of child development: "Although we all have a strong desire for straightforward explanations of life, development is complicated and models for explaining it need to be complicated enough to usefully inform our understanding (p. 20)." The findings are expected to contribute to understanding the intricate nature of the relations among cognitive, behavioral, and relational domains of child development. This dissertation consists of three studies using two separate samples; the first and second study utilize data from a longitudinal investigation of changes in family relationship functioning and firstborn children's adjustment after the birth of a second child, and the third study uses data from a prospective longitudinal study on young children at risk for school-age externalizing problems.

The aim of Study 1 in chapter 2 was to explore the longitudinal associations among firstborn children's aggression, ToM development, and sibling antagonism in the first year of siblinghood. Expanding the bidirectionality of the transactional model, I used a developmental cascade model (Masten & Cicchetti, 2010) to explore how effects of one domain spread to other domains of development over time. I hypothesized that children's aggression before the birth of a sibling would predict more sibling antagonism and lower ToM during the one year following the birth, which then would predict increases in sibling antagonism at the end of the year. The results from this study were expected to contribute to understanding the cascade effects across

children's cognitive, behavioral, and relational domains of development around the preschool years.

The goal of Study 2 in chapter 3 was to examine the directionality of the influences between ToM and early sibling interaction, and the role of parental discipline for ToM development during the first year of siblinghood. I expected that children's ToM would contribute to more positive sibling interaction, but sibling interaction quality would not predict ToM directly given the limited mutuality in the interaction between young siblings. Parents' use of directive parenting regarding sibling interaction, however, was expected to moderate the link between sibling antagonism and ToM. This study will contribute to our understanding of children's ToM development within a family context by examining the unique roles of mothers, fathers, and siblings.

The purpose of Study 3 in chapter 4 was to test the moderating effects of ToM and anxious temperament in the relation between early callous-unemotional (CU) behavior and later externalizing problems. My hypotheses were that children with higher CU behavior would display more externalizing problems across childhood over and above the effect of externalizing problems in the preschool years. High levels of ToM and anxious temperament, however, were expected to reduce this risk of children with high CU behavior. This study can further understanding of the buffering effect of ToM for temperamental risks and contribute to early preventive intervention for children who are prone to developing antisocial behaviors.

Findings from these studies are expected to contribute to the understanding of individual differences in ToM development during the preschool years as an outcome, as a predictor, and as a moderator. This dissertation aims to demonstrate the benefits of using SCD and the transactional model in understanding child development, and contribute to preventative

intervention for children who have behavioral risks for maladjustment by facilitating social-cognitive growth.

References

Astington, J. W., & Jenkins, J. M. (1995). Theory of mind development and social understanding. *Cognition And Emotion*, *9*, 151-165. doi:10.1080/02699939508409006

Bandura, A. (2006). Toward a psychology of human agency. *Perspectives on Psychological Science*, *1*, 164-180. doi:10.1111/j.1745-6916.2006.00011.x

Bennett, D. S., Bendersky, M., & Lewis, M. (2005). Antecedents of emotion knowledge: Predictors of individual differences in young children. *Cognition and Emotion*, *19*, 375-396. doi:10.1080/02699930441000201

Denham, S. A., Bassett, H. H., & Wyatt, T. (2015). The socialization of emotional competence. In J. E. Grusec, P. D. Hastings, J. E. (Eds.), *Handbook of socialization: Theory and research (2nd ed.)* (pp. 590-613). New York, NY, US: Guilford Press.

Dunn, J. (1988). *The beginnings of social understanding*. Cambridge, MA, US: Harvard University Press.

Dunn, J., Brown, J., Slomkowski, C., Tesla, C., & Youngblade, L. (1991). Young children's understanding of other people's feelings and beliefs: Individual differences and their antecedents. *Child Development*, *62*, 1352-1366. doi:10.2307/1130811

Eggum, N. D., Eisenberg, N., Kao, K., Spinrad, T. L., Bolnick, R., Hofer, C., Kupfer, A. S., & Fabricius, W. V. (2011). Emotion understanding, theory of mind, and prosocial orientation: Relations over time in early childhood. *The Journal of Positive Psychology*, *6*, 4-16. doi:10.1080/17439760.2010.536776

Gauvain, M., & Perez, S. M. (2015). The socialization of cognition. In J. E. Grusec, P. D. Hastings, J. E. Grusec, P. D. Hastings (Eds.), *Handbook of socialization: Theory and research (2nd ed.)* (pp. 566-589). New York, NY, US: Guilford Press.

Hughes, C., & Cutting, A. L. (1999). Nature, nurture, and individual differences in early

    understanding of mind. *Psychological Science*, *10*, 429-432. doi:10.1111/1467-

    9280.00181

Hughes, C., & Ensor, R. (2006). Behavioural problems in 2-year-olds: Links with individual

    differences in theory of mind, executive function and harsh parenting. *Journal of Child*

    Psychology And Psychiatry, *47*, 488-497. doi:10.1111/j.1469-7610.2005.01519.x

Kuczynski, L., Parkin, C. M., & Pitman, R. (2015). Socialization as dynamic process: A

    dialectical, transactional perspective. In J. E. Grusec, P. D. Hastings (Eds.), *Handbook of*

    socialization: Theory and research (2nd ed.) (pp. 135-157). New York, NY, US:

    Guilford Press.

Lagattuta, K. H., & Wellman, H. M. (2002). Differences in early parent-child conversations

    about negative versus positive emotions: Implications for the development of

    psychological understanding. *Developmental Psychology*, *38*, 564-580.

    doi:10.1037/0012-1649.38.4.564

Laible, D., Thompson, R. A., & Froimson, J. (2015). Early socialization: The influence of close

    relationships. In J. E. Grusec, P. D. Hastings (Eds.), *Handbook of socialization: Theory*

    and research (2nd ed.) (pp. 35-59). New York, NY, US: Guilford Press.

Lemerise, E. A., & Arsenio, W. F. (2000). An integrated model of emotion processes and

    cognition in social information processing. *Child Development*, *71*, 107-118.

    doi:10.1111/1467-8624.00124

Masten, A. S., & Cicchetti, D. (2010). Developmental cascades. *Development and*

    Psychopathology, *22*, 491-495. doi:10.1017/S0954579410000222

Morgan, J. K., Izard, C. E., & King, K. A. (2010). Construct validity of the Emotion Matching

    Task: Preliminary evidence for convergent and criterion validity of a new emotion

    knowledge measure for young children. *Social Development*, *19*, 52-70.

    doi:10.1111/j.1467-9507.2008.00529.x

Olson, K. R., & Dweck, C. S. (2008). A blueprint for social cognitive development. *Perspectives*

    on Psychological Science, *3*, 193-202. doi:10.1111/j.1745-6924.2008.00074.x

Perner, J., Ruffman, T., & Leekam, S. R. (1994). Theory of mind is contagious: You catch it

    from your sibs. *Child Development*, *65*, 1228-1238. doi:10.2307/1131316

Peterson, C., & Slaughter, V. (2003). Opening windows into the mind: Mothers' preferences for

    mental state explanations and children's theory of mind. *Cognitive Development*, *18*, 399-

    429. doi:10.1016/S0885-2014(03)00041-8

Razza, R. A., & Blair, C. (2009). Associations among false-belief understanding, executive

    function, and social competence: A longitudinal analysis. *Journal Of Applied*

    Developmental Psychology,*30*(3), 332-343. doi:10.1016/j.appdev.2008.12.020

Reddy, V. (2008). *How infants know minds*. Cambridge, MA, US: Harvard University Press.

Reis, H. T., Collins, W. A., & Berscheid, E. (2000). The relationship context of human behavior

    and development. *Psychological Bulletin*, *126*, 844-872. doi:10.1037/0033-

    2909.126.6.844

Ruffman, T., Slade, L., & Crowe, E. (2002). The relation between children's and mothers' mental

    state language and theory-of-mind understanding. *Child Development*, *73*, 734-751.

    doi:10.1111/1467-8624.00435

Sameroff, A. (1975). Transactional models in early social relations. *Human Development*, *18*,

    65-79. doi:10.1159/000271476

Sameroff, A. (2010). A unified theory of development: A dialectic integration of nature and nurture. *Child Development*, *81*, 6-22. doi:10.1111/j.1467-8624.2009.01378.x

Wellman, H. M. (2014). *Making minds: How theory of mind develops*. New York, NY, US: Oxford University Press.

Youngblade, L. M., & Dunn, J. (1995). Individual differences in young children's pretend play with mother and sibling: Links to relationships and understanding of other people's feelings and beliefs. *Child Development*, *66*, 1472-1492. doi:10.2307/1131658

CHAPTER 2 (Study 1)

Aggression, Sibling Antagonism, and Theory-of-Mind During

the First Year of Siblinghood: A Developmental Cascade Model

Childhood aggression peaks during toddlerhood, followed by a decline around age 3 (Alink et al., 2006; Tremblay et al., 2005). Despite the general decrease in early aggressive behavior, some children continue to show a high stable pattern of aggression into school age, which is associated with a range of poor social and academic outcomes (Caspi & Moffitt, 1995). Because early-onset conduct problems can be identified as early as at age 3 (Shaw & Gross, 2008), research on the correlates of early aggression can help inform preventative interventions that seek to target at-risk young children (e.g., Hyde, Shaw, Gardner, Cheong, Dishion, & Wilson 2013; Olson et al., 2013).

There are multiple family- and child-level factors that are associated with the development of young children's aggression. Siblings, in particular, are influential social agents for developing aggression during toddlerhood and the early preschool years. Destructive and coercive sibling interactions can serve as a training ground for aggressive children, providing opportunities to practice and learn a wide range of antisocial behaviors (Patterson, 1986). In addition to social influences, child characteristics are also relevant for understanding the progression of aggression, with recent research finding relations between aggression and children's Theory-of-Mind (ToM), suggesting that aggressive children have poorer ToM development (Hughes & Ensor, 2006; Lane, Wellman, Olson, Miller, Wang, & Tardif, 2013; Wellman, Lane, LaBounty, & Olson, 2011). Furthermore, a number of studies have found a

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significant positive association between children's advanced ToM development and cooperative and affectionate sibling interactions (Dunn, 1988; Dunn, Brown, Slomkowski, Tesla, & Youngblade, 1991; Hughes & Ensor, 2006). However, the longitudinal cross-domain influences, or *cascade effects*, among childhood aggression, sibling antagonism, and ToM development have not received sufficient attention. Developmental cascade effects refer to the cumulative developmental consequences that spread across multiple domains of development and across time (Masten & Cicchetti, 2010). Most children become older siblings between the ages of 2 and 3 (Baydar, Greek, & Brooks-Gunn, 1997); thus, the transition to older sibling overlaps with a period of dramatic changes in children's abilities to regulate emotions and behavior, and to understand social rules and others' minds (Volling, 2012). Thus, the main goal of the current investigation was to test a developmental cascade model integrating firstborn children's aggressive behavior, their ToM, and early antagonistic sibling interaction in the year following the birth of an infant sibling. Findings from the current study will advance our understanding of the earliest origins of aggression in the family and the cascade effects across social and cognitive domains of development that are closely linked to aggression. Throughout the paper, we refer to the firstborns as the children and the infants as the siblings.

Aggression and Early Sibling Antagonism

Sibling relationships begin within the first months following the birth of a sibling. Children's initial attitude toward the baby sibling is an important predictor of later sibling relationship quality. For example, children's early interest and affection toward the newborn sibling predicted friendly sibling relations approximately a year later (Dunn & Kendrick, 1982), which was then related to less antagonism toward the younger siblings when they were 6 years old (Stillwell & Dunn, 1985). Also, Song and Volling (2015) found that children's early

cooperation in the care of their 1-month-old infant sibling predicted more positive sibling engagement and less antagonism and rivalry toward the sibling 8 months after the birth. Identifying factors associated with individual differences in young children's interactions with their infant sibling shortly after birth takes on particular importance if we are to understand which children engage in antagonistic and potentially harmful interactions later on.

Sibling interaction may serve as a social arena in which aggressive children can engage in disruptive conflict and further exacerbate aggressive behavior (Oh, Volling, & Gonzalez, 2015; Patterson, 1986). In fact, a longitudinal study, which used a person-centered approach, found that having a sibling was the strongest predictor of children placed in a high aggression trajectory group from 17- to 42 months of age (Tremblay et al., 2005). In the current sample, Oh and colleagues (2015) found that 42% of children showed an escalating pattern of antagonistic behavior toward the sibling starting 4 months after the birth, and this pattern was positively predicted by children's dysregulated temperament before the birth. Because conflict is common during sibling interactions in the toddler and preschool years, occurring approximately 6.3 times per hour (Perlman & Ross, 1997; Stewart, 1990), aggression-prone firstborn children typically have ample experience engaging in aggressive exchanges. Others have found that destructive sibling conflict involving physical aggression and intense negative affect at 5 years predicted boys' externalizing behaviors at age 6 (Garcia, Shaw, Winslow, & Yaggi, 2000). Moreover, sustained and increasing antisocial behavior toward siblings from ages 3 to 6 positively predicted antisocial behaviors toward unfamiliar peers at age 6 (Ensor, Marks, Jacobs, & Hughes, 2010). These findings suggest possible escalating, reciprocal influences between children's aggression and sibling conflict over time, yet there is a lack of research examining longitudinal, bidirectional influences between the two factors in the first years of the sibling relationship.

Links between aggression and sibling interaction may be absent shortly after birth, but become stronger over the course of the year as infant siblings mature and become more social and intrusive.

Theory-of-Mind and Sibling Antagonism

During the preschool period, children show a dramatic improvement in their ToM by learning that others have desires and beliefs that are different from their own, and learning how thoughts and feelings influence behavior (Harris, 2006; Wellman, 2014). Children with an advanced ToM may have an advantage when building a positive sibling relationship because ToM can assist children in reading and responding to social cues effectively (Astington, 2001). For example, Hughes and Ensor (2005) found that 2-year-old children with an advanced ToM were more likely to have an affectionate sibling relationship, whereas children with delayed ToM development had poorer sibling relationships marked by higher conflict.

Interactions with others, especially siblings, can provide a rich social environment for young children to learn about others' desires and beliefs (Hughes & Leekam, 2004). For example, sibling cooperation at 33 months predicted children's various socio-cognitive abilities (e.g., ToM, emotion understanding) 7 months later (Dunn et al., 1991). Sibling conflict may also provide a rich opportunity for children to be exposed to opposing ideas and to learn to build an argument about their position, such that children grasp how to negotiate, persuade, and reconcile differing points of view through sibling disputes (Herrera & Dunn, 1997; Katz, Kramer, & Gottman, 1992). Foote and Holmes-Lonergan (2003) found that preschool children who used more other-oriented arguments—arguments taking into account the interests and perspectives of others—during sibling conflict also had better false-belief understanding. On the other hand, simply engaging in conflict charged with negative emotion without the use of other- or self-

oriented arguments was negatively related to social-cognitive understanding. Because it seems likely that the relation between children's ToM development and sibling conflict may be reciprocal, it should be examined longitudinally over time.

Aggression and Theory-of Mind

Recent evidence points to the importance of children's behavioral characteristics (i.e., temperament) in facilitating ToM development (Lane et al., 2013; Suway, Degnan, Sussman, & Fox, 2012; Wellman et al., 2011). Children's behavioral characteristics shape their social experiences by influencing children's attention to and participation in social situations (Rothbart & Bates, 2006), which can affect when and how they learn about others' minds (Wellman & Miller, 2008). Cross-sectional studies have found that disruptive behaviors (e.g., aggression) were associated with delays in affective perspective-taking (Minde, 1992) and false-belief performance in preschoolers (Hughes, Dunn, & While, 1998). In a study of preschoolers in the US and China, Lane and colleagues (2013) found that children's false belief understanding was negatively related to aggression and reactive social withdrawal. Wellman and colleagues (2011) also found that false-belief understanding at 5 years was negatively predicted by children's aggression at 3.

These findings suggest that children's aggressive tendencies in social situations may serve as an obstacle for attending to and learning about others' minds. It is also possible that aggressive children may be deprived of opportunities to learn about other's minds in both peer and family contexts because they are more likely to be rejected from social situations (McElwain, Olson, & Volling, 2002; Wood, Cowan, & Baker, 2002). During the first months after the birth of a sibling, parents are also likely to intervene and prohibit aggressive preschoolers from further interactions with their infant siblings (Dunn & Kendrick, 1982; Oh et

al., 2015), reducing opportunities for these children to learn about siblings' minds with the assistance of caregivers. These may be valuable scaffolding opportunities for children to miss. Indeed, Dunn (1988) found that when mothers talked to their children about the infant sibling as a person and underscored the infant's feelings and needs in the first weeks after the birth, children were more likely to show better emotion understanding.

Despite these intriguing associations, no study has examined aggression and ToM longitudinally in the year following the birth of a sibling. During this transition, aggressive children may be especially likely to develop poorer ToM, and poorer ToM may lead to increased inconsiderate and aggressive behavior toward others, particularly the infant sibling (Dodge & Coie, 1987). Therefore, it is essential to understand how children's aggression, sibling interaction and ToM are interrelated in the first year after an infant sibling's birth

Current study

In short, research suggests that aggression, sibling antagonism, and ToM are closely related, but no study has examined these relations in the year following the birth of an infant sibling even though early aggressive behavior and ToM may be particularly important for the development of antagonistic sibling relationships in the first year. Further, there is a dearth of research on the reciprocal relations between aggression, ToM, and sibling conflict over multiple time points. In the current study, we examined children's ToM and aggressive behavior before the sibling's birth (prenatal) to predict antagonism toward their infant sibling and subsequent ToM at 4 and 12 months after the birth. We used a developmental cascade framework to model the spreading effects among these factors over time. Developmental cascades can be defined as the cumulative consequences of transactional relations occurring across different domains of development and across time (Masten & Cicchetti, 2010). Finally, previous studies have

typically measured ToM using false-belief tasks only, and have not considered how more fundamental or advanced components of a ToM play a role in the link between aggression and sibling antagonism. The current investigation used a ToM scale that captures a wider range of social-cognitive abilities (Wellman & Liu, 2004). Thus, the main goal of the current study was to examine a developmental cascade model describing accumulating effects across children's aggression, antagonistic sibling interaction, and ToM development across the year following the birth of an infant sibling. We hypothesized that children's aggression before the birth would predict their delayed ToM development and more antagonism toward the sibling in the year following the birth. We also expected that poorer ToM understanding and higher levels of antagonism would predict children's aggression. Finally, we hypothesized a negative association between sibling antagonism and children's more advanced ToM.

Method

Participants

Participants were part of a longitudinal study designed to investigate changes in family dynamics and firstborn children's adjustment after the birth of a second child. Initially, 241 families were recruited through obstetric clinics, local hospitals, childcare centers, pediatricians' offices, childbirth education classes, and through local printed media. Families had to meet the following criteria: mothers were pregnant with a second child, the biological father of the infant was resident, firstborn children were between 1 and 5 years of age at the time of the birth, and both children had no mental or physical developmental delays. Parents were mainly European American (83.8% of mothers; 85.1% of fathers), and 16.2% of mothers and 14.9% of fathers represented other racial and ethnic minorities. Most parents had a Bachelor's degree or higher (83.9% of mothers; 79.2% of fathers), and the majority of families (70.6%) earned $60,000 -

$99,999 per year. Roughly half (46%) of the firstborn children and half (55%) of the infant siblings were boys. Participating families were a low risk, community sample with children showing relatively low scores on the CBCL aggression scale across all time points (Ms = 8.52 - 9.22; SDs = 5.12 - 5.99; possible maximum score = 38).

Because children's ages ranged widely from 10 months to 5 years old at the first prenatal time point, and ToM is highly age-sensitive, we restricted the sample for analysis to the 208 firstborn children who were 18 months to 3.5 years old at the prenatal time point (M_{age} at prenatal = 29.74 months; M_{age} at 4 months = 35.36 months; M_{age} at 12 months = 43.49 months; SD = 7.69 months; 117 girls). This age range was chosen because early signs of understanding others' mental states are apparent by 18 months (Meltzoff, 1995) and dramatic growth in ToM is salient during the preschool years, although there are individual differences in the pace at which children progress through ToM development (Wellman, 2014). The 208 families included in analyses did not differ significantly from the recruited sample of 241 on most of the demographic information (i.e., family income, parents' race/ethnicity, age, years of marriage, or siblings' gender) except that mothers were more educated, χ^2 (2) = 8.43, $p < .05$. Missing data were handled with full information maximum likelihood (FIML) estimation in structural equation modeling.

Procedures

The longitudinal study included five time points based on the infant's age: prenatal (last trimester of the mother's pregnancy with the second child), 1, 4, 8, and 12-months. Observations, interviews, and questionnaires were used to assess children's adjustment and family functioning. Children's ToM was assessed at their siblings' ages of prenatal, 4months, and 12months during home visits. This allowed sufficient time for changes to take place between assessments, but also

maintained relatively equivalent lengths between assessments (i.e., 8 months). Mothers' and fathers' reports of children's aggression and antagonistic sibling interaction as collected at the same time points were used in analyses to coincide with the timing of ToM assessments.

Measures

Aggression. Both mothers and fathers completed the aggression subscale of the Child Behavior Checklist (CBCL/1½-5; Achenbach & Rescorla, 2000) at each time point. The CBCL is a widely used measure for identifying children's problem behaviors. Parents rated how well each of 19 items (e.g., hits others, demands must be met immediately; αs = .86 - .89) characterized their firstborn child's aggression, using a 3-point scale (0 = "not true"; 1 = "somewhat true"; 2 = "very true"). Given their high inter-correlations (rs = .37 - 48, ps < .001) items were summed and mothers' and fathers' reports were averaged to create a single score at each time point. Aggression as measured by the CBCL is often thought of as indexing not only aggressive behavior, but also some of the dispositional characteristics of aggression. To distinguish this general measure of aggression from aggressive acts that are specifically directed toward children's sibling in everyday social interactions, antagonistic behaviors directed toward the sibling were reported with a separate sibling antagonism measure.

Sibling antagonism. Both mothers and fathers completed the conflict scale of the *Sibling Relationships in Early Childhood questionnaire* (Volling & Elins, 1998) to assess children's antagonistic behaviors directed toward their infant sibling. Five items (αs = .72 - .79) were rated on a 5-point Likert scale (1 = *almost never*; 3 = *sometimes*; 5 = a*lmost always*), to form a composite of *sibling antagonism* (e.g., is physically aggressive with baby, teases or annoys baby). Due to significant correlations between mothers' and fathers' reports at each time point (rs = .41 - .47, ps < .001), scores were averaged across parents.

Theory-of-Mind (ToM). Children's social cognition was assessed using six ToM tasks (with two false belief tasks) that most children pass in sequential order during the course of early childhood (Wellman & Liu, 2004). Children were shown vignettes using drawings and figures, and asked questions to ascertain their understanding of others' desires, knowledge, beliefs, and emotion. In the *Not-Own Desire* task, children judged whether two persons (the child vs. someone else) could have different desires about the same objects. During the *Not-Own Belief* task, children judged whether people (the child vs. someone else) could have different beliefs about the same object, when children were unaware of which belief was true. In the *Knowledge Access* task, children saw the contents of a nondescript box and judged whether another person, who had not seen inside the box, would know the box's contents. In the *Explicit False-Belief* task, children judged where someone would search for a missing object given the person's mistaken belief about the object's location, and in the *Contents False-Belief* task, children judged whether someone would hold a true or false belief about the contents of a distinctive container when children knew that it contained something unexpected. Finally, the *Hidden Emotion* task examined whether children understood that a person could feel one thing but display a different emotion. A total score summed the number of the tasks for which children provided the correct answer. These sequential ToM tasks have been widely used across different countries (e.g., U.S. and China) and sub-populations (e.g., typically developing children, children with deafness) to capture variations in the progression of children's ToM development (Peterson, Wellman, & Slaughter, 2012; Wellman, Fang, Liu, Zhu, & Liu, 2006).

ToM measures are highly age-sensitive, which creates a challenge in the longitudinal assessment of ToM using the same measure, thus some studies used different age-appropriate ToM measures at different time points (e.g., Adrián, Clemente, & Villanueva, 2007; Fink,

Begeer, Hunt, & de Rosnay, 2014). In line with this idea, the current study calculated ToM

scores while taking into account the age range of children at each time point. The first three

tasks—*not-own desire, not-own belief, and knowledge access*—were used for prenatal- and 4-

month time points when 75% of children (prenatal) and over 50% (4 months) of children were

under age 3; thus most children were still too young to pass explicit false-belief and hidden

emotion tasks (Wellman & Liu, 2004). ToM composites at prenatal- and 4 months ranged from

0-3 tasks passed. At 12 months, 80% of children were between 36 months and 59 months; we

used all six ToM tasks, including the false-belief and hidden emotion tasks, so the ToM

composite ranged from 0-6.

Verbal IQ. Children's Verbal IQ at the prenatal time point was measured using the

receptive vocabulary subscale of the Wechsler Preschool and Primary Scale of Intelligence,

Third Edition (WPPSI-III; Wechsler, 2002), and used as a covariate in analyses.

Data Analysis Plan

Multiple path models using structural equation modeling (SEM) examined the different

paths between aggression and ToM at prenatal, 4, and 12 months, and sibling antagonism at 4

and 12 months (see Figure 1.1). A series of nested models were conducted to test whether a

cascade model fit the data better than simpler longitudinal models without diagonal (i.e., cross-

lag) paths across variables and time. All subsequent models contained paths included in the

previous model. Model 1 was a stability model, which included stability paths (autoregressive

paths) between repeated measures (e.g., aggression at prenatal time point to aggression at 4

months). This model only assumes within-variable stability over time, but no relations across

variables, either concurrently or longitudinally. In Model 2, a covariance model, correlation

estimates were added within each time point (e.g., ToM at 4 months with sibling antagonism at 4

months). This model assumes within-variable stability over time, and also potential relations among variables, but only concurrently. Model 3 was a cascade model, which included diagonal paths between constructs at adjacent time points (e.g., aggression at prenatal time point to ToM at 4 months). This model assumes within-variable stability and potential relations among variables both concurrently and longitudinally between adjacent time points. Model fit was assessed with the comparative fit index (CFI) and the root mean square of approximation (RMSEA). CFI greater than .95 indicates good fit and RMSEA between .06 and .08 with upper bounds not exceeding .10 indicates an adequate model fit (Hu & Bentler, 1999). The χ^2 test of significance is reported, but not used as a measure of model fit in the current study, because it has been shown to be highly sensitive to sample size (Kline, 2005). AMOS Version 22 was used for testing all models (Arbuckle, 2013). As follow-up analyses, indirect effects within the final model were tested for statistical significance.

Results

Preliminary Analyses

Means, standard deviations, and correlations among the focal variables are presented in Table 1.1. Significant positive correlations across time points were found for aggression, sibling antagonism, and ToM, indicating intra-individual stability over time. Aggression at all time points was positively correlated with sibling antagonism at 4 and 12 months. Among demographic variables and covariates, child age (r = .55 - .64, ps < .001) and verbal IQ (r = .43 - .58, ps < .001) were positively correlated with ToM at all time points. Children's gender and family income were not related with any of the focal variables. In the main analyses, children's age, verbal IQ, and mother's education were included as covariates for ToM scores, but they are not included in the figures for the ease of presentation.

Nested Model Comparisons

Fit indices and model comparison tests are shown in Table 1.2 and the models are represented graphically in Figure 1.1. Model 1 (stability), which included stability paths within each construct over time, had poor fit to the data (CFI = .89, RMSEA = .10). Model 2 (stability + covariance), in which within time covariance estimates were added, had poor fit to the data (CFI = .93, RMSEA = .09) even though fit significantly improved from Model 1, $\Delta\chi^2(7) = 36.48$, $p < .001$. Model 3 (cascade), including diagonal paths in addition to stability paths and covariance terms, had good fit (CFI = .98, RMSEA = .06), which was significantly better than Model 2, $\Delta\chi^2(10) = 45.49$, $p < .001$. Therefore, Model 3 was chosen as the final model.

The Cascade Model

The estimates based on the final model (Model 3) are shown in Figure 1.2. According to the autoregressive path coefficients, all three focal variables showed significant stability across time points except from prenatal ToM to 4-month ToM. As shown in Figure 1.2, results supported the significant longitudinal cross-lag relations from aggression to sibling antagonism at all time points, but the cross-lag path from 4-month sibling antagonism to 12-month aggression was not significant. Prenatal aggression also predicted poor ToM at 4 months, but 4-month aggression did not predict 12-month ToM. None of the cross-lag paths from ToM to aggression were significant, but poor ToM at 4 months did predict increased sibling antagonism at 12 months. Finally, sibling antagonism at 4 months did not predict ToM or aggression at 12 months, even though sibling antagonism and aggression were positively correlated at 12 months.

As a final step, the statistical significance of indirect paths in the final cascade model (Figure 2.2) were tested using Sobel's (1982) test, as recommended by MacKinnon, Lockwood, Hoffman, West, and Sheets (2002). Two indirect paths were statistically significant: (a) prenatal

aggression predicted aggression at 4 months, which, in turn, predicted sibling antagonism at 12 months ($z = 3.95$, $p < .001$) and (b) prenatal aggression predicted sibling antagonism at 4 months, which, in turn, predicted sibling antagonism at 12 months ($z = 2.69$, $p < .01$). The path from prenatal aggression to 12-month ToM through 4-month ToM ($p = .09$) did not reach conventional levels of statistical significance.

Discussion

The present study examined longitudinal associations among children's aggression, ToM development, and antagonistic sibling interaction in the first year of siblinghood in a developmental cascade model. The findings provide support for cascade effects of children's aggression, which spread over both social-cognitive and relational domains of development during a short period of time, even in the first year of the developing sibling relationship. Specifically, we found that children's aggression consistently predicted antagonism toward their infant sibling over the first year of siblinghood, whereas sibling antagonism did not predict subsequent aggression. Higher levels of aggression, specifically at the prenatal time point, predicted poorer ToM at 4 months controlling for children's age, verbal IQ, and mother's education level. Poorer ToM did not predict increased aggression, although poorer ToM at 4 months did predict later sibling antagonism. Thus, the results revealed cascade effects from children's aggression before the birth of a sibling on antagonistic sibling interaction as well as on ToM development at the end of the first year of siblinghood, through both direct and indirect pathways. These findings help us understand the significance of children's aggression for their early social-cognitive development and adjustment to the transition to siblinghood.

Supporting the hypothesis that children's aggression before the birth of the sibling would predict more antagonism toward the sibling in the year following the birth, we found direct

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effects of aggression on later sibling antagonism. Aggression at both the prenatal and 4-month time points positively predicted higher levels of sibling antagonism at 4 and 12 months, respectively. Notably, these paths were significant while taking into account the stability of sibling antagonism; aggression at 4 months continued to predict 12-month sibling antagonism even after taking into account the variance explained by 4-month sibling antagonism. The association between aggression and sibling antagonism, however, was not bidirectional: high sibling antagonism at 4 months did not predict increased aggression at 12 months. The unidirectional effect might be due to the short lag (i.e., 8 months) between time points and the fact that we only examined the children's behavior toward the infant sibling and not the dyadic nature of early sibling interactions. Consistent with prior research, we found that aggression was highly stable, perhaps reflective of temperamental characteristics such as negative reactivity and poorer self-regulation (Rothbart & Bates, 2006). Given that aggression can be considered a dispositional characteristic that does not fluctuate much over a short period of time, it is not surprising that aggression predicted children's interactions with their sibling, but not vice a versa. Further, the first year of the sibling relationship may be too early to serve as a training ground for children's aggressive behavior, given the inability of the young infant to reciprocate. Patterson's (1984) sibling coercion model proposed that siblings could train one another to act more aggressively by modeling and reinforcing disruptive behaviors. Although the infant sibling may have been a target for children's aggression in the current study, the infant sibling was much too young to reciprocate aggressive behaviors with the older child. Still, if this association were assessed across a longer period of time, reciprocated sibling antagonism may become a training arena that has long-term consequences for children's increased aggression.

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If aggression is significantly dispositional at these ages, what causes it to specifically result in heightened sibling antagonism? Here, the current study revealed an indirect pathway from aggression to sibling antagonism through poorer ToM. Specifically, aggressive children before the birth of a sibling performed poorer on ToM tasks at 4 months, which then predicted higher levels of antagonism toward the sibling at 12 months. This is consistent with earlier literature showing that children's social-cognitive abilities are closely related to sibling relationship quality (Hughes & Ensor, 2005). For example, Dunn and Kendrick (1982) demonstrated that children who showed better understanding of the needs and wants of the infant during the first weeks after the birth of a sibling developed friendly interactions with the infant 14 months later.

Our findings did not support reciprocal relations between ToM development and sibling antagonism at this young age. Children's enhanced ToM at 4 months predicted less sibling antagonism toward the infant at 12 months, but sibling antagonism at 4 months did not predict firstborn children's ToM at 12 months. Previous studies have found social-cognitive benefits of mental state conversation among siblings (Brown, Donelan-McCall, & Dunn, 1996; Foote & Holmes-Lonergan, 2003; Katz et al., 1992), but again, 4-month-old infants in the current study are too young to react to antagonism in a way that facilitates children's mental state talk or other-oriented argument strategies. Still, it should be noted that the presence of an infant sibling could be beneficial for older siblings' ToM, perhaps indirectly through mental conversation with the caregivers about the sibling's desires (Peterson, 2000). Indeed, Dunn and Kendrick (1982) reported that mothers' discussions about the newborn baby as a person who had distinct intentions and wants positively predicted children's verbal reference to the infant's intention and needs in the following year. Also, the association between sibling antagonism and ToM may

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eventually depend on the quality (e.g., constructive versus destructive) of sibling conflict and how parents manage the conflict (Foote & Holmes-Lonergan, 2003; Slomkowski & Dunn, 1992); future longitudinal research is needed to explore this association.

Finally, we found partial support for our hypothesis regarding the relation between aggression and ToM development. More aggressive children at the prenatal time point had poorer ToM at 4 months, while taking into account the effect of ToM at the prenatal time point. Our results also confirm that relations between aggression and ToM are not limited to false-belief understanding. Here, we found that children's aggression predicted poorer understanding of more fundamental and earlier developing ToM components (i.e., understanding diverse desires, diverse beliefs, and knowledge access). Presumably, aggressive children might be at dual-risk because of dispositional characteristics (e.g., less careful, less observant) that are not conducive to developing ToM, as well as involvement in negative social interactions (e.g., having conflicts with parents and siblings, being excluded from sibling interaction by parents due to their aggressive behavior), which might lead to social rejection and more limited opportunities to engage in rich social experiences (Lane et al., 2013; Wellman et al., 2011). This result fits well with the social information processing model that stresses the importance of synergy between emotion and cognition underlying the progression of aggressive behaviors (Arsenio & Lemerise, 2004; Crick & Dodge, 1994). That is, poor regulatory skills of aggressive children and their delayed ToM development may build an affective-cognitive feedback structure that maintains or exacerbates aggression in social settings (Choe, Lane, Grabell, & Olson, 2013; Izard, Fine, Mostow, Trentacosta, & Campbell, 2002). Given the short lag between the prenatal time point and 4-month time point, our findings suggest that certain behavioral characteristics (i.e., aggression) can facilitate or hinder ToM development even in a relatively brief developmental

period, particularly one involving the intense emotional experiences following the birth of an infant sibling. Children engage in social interactions differently depending on their behavioral tendencies and have different opportunities to learn about others' minds as a result (Rothbart & Bates, 2006; Wellman & Miller, 2008).

Aggression at 4 months, however, did not directly predict ToM at 12 months, although the indirect effect of prenatal aggression on 12-month ToM through 4-month ToM was marginally significant. Other family experiences surrounding the arrival of an infant sibling (e.g., interactions between caregivers and the baby) may have provided various opportunities for aggressive children's social-cognitive development by observing others. Indeed, some research has demonstrated that preschool children with siblings have more advanced social-cognition, compared to only children (Jenkins & Astington, 1996; Peterson, 2000). Future research is needed to replicate these findings.

Strengths and limitations

One of the strengths of the current study is its longitudinal design: we used a developmental cascade model to overcome limitations of earlier cross-sectional studies. Developmental cascade models can assess the cumulative consequences of different developmental factors spreading across time and multiple domains (Masten & Cicchetti, 2010). Another methodological strength was the assessment of ToM. Most studies have only used false-belief tasks to measure children's social cognition. We utilized false-belief tasks, as well as several other ToM tasks (Wellman & Liu, 2004), which allowed us to more sensitively capture growth in ToM among children across the broad age range of firstborn children included in this study.

Despite these strengths, there are also several limitations. Although we used multiple informants, including mother- and father-reports, to remedy single-reporter bias, parent-reports of children's aggression and sibling antagonism are not free from biased interpretation. Direct observations of actual sibling interaction and children's aggression would be useful in future investigations although it is often difficult to observe low frequency events such as aggression in short observation sessions, which is why we relied on parents' reports. Another limitation of the present study is that participating families were mostly white and middle-class, which may limit the generalizability of the findings to children from different socio-economic and cultural backgrounds. Finally, due to the unique characteristics of the current investigation following firstborn children's adjustment during the transition to siblinghood, the time points were established based on the age of the second-born children, making it difficult to recruit firstborn children within tight age-ranges. We attempted to compensate for the wide age-range in the original sample by restricting the age-range of children included in the analysis and statistically controlling for age and verbal IQ. The alternative would be to tightly control the age of the children, but allow the ages of their younger siblings to vary widely. Future research could use both research strategies to examine longitudinal relations between sibling interaction and ToM in children's family-based social interactions.

Conclusions

The arrival of a sibling dramatically expands social horizons for young firstborn children. How children socially and cognitively benefit from sibling interaction may depend on individual characteristics of children. The current study found that more highly aggressive children before the birth of their sibling were at a greater risk for engaging in more antagonistic sibling interactions after the sibling's birth. These children were also more likely to experience delayed

social-cognitive understanding, which, in turn, led to increased sibling antagonism. The findings underscore how behavioral, social-cognitive, and social-relational factors are inter-related in the development of young children during the first year of siblinghood. Uncovering these longitudinal relations across behavioral, cognitive and social domains reminds us that there may be many different options for preventative intervention for aggressive children undergoing stressful circumstances.

Table 1.1.

Descriptive Statistics and Correlations for Aggression, Theory-of-Mind, and Sibling Antagonism

Variable	1	2	3	4	5	6	7	8
1. Aggression (P)	-							
2. ToM (P)	.004	-						
3. Aggression (4)	.72**	.02	-					
4. ToM (4)	-.06	.42**	-.05	-				
5. Sib Antagonism (4)	.28**	.07	.27**	.03	-			
6. Aggression (12)	.67**	-.05	.76**	-.10	.27**	-		
7. ToM (12)	.05	.53**	.06	.49**	.10	.04	-	
8. Sib Antagonism (12)	.34**	-.12	.38**	-.15	.36**	.54**	-.04	-
M	8.6	.93	9.01	1.31	1.64	8.75	2.46	2.40
SD	4.5	.93	4.71	.97	.50	4.98	1.44	.53

*p < .05. **p < .01. *Note*. P = prenatal; 4 = 4 months; 12 = 12 months time point

Table 1.2.

Model Fit Statistics and Comparisons

	df	χ^2	CFI	RMSEA	90% CI	Model Comparison	$\Delta\chi^2$	Δdf	p
Model1: Stability	39	121.76	.89	.10	08 - .12				
Model2: Covariate	32	85.28	.93	.09	.07 - .11	2 vs. 1	36.48	7	$p < .001$
Model3: Cascade	22	39.79	.98	.06	.03 - .09	3 vs 2.	45.49	10	$p < .001$

CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation; 90% = CI 90% confidence interval for RMSEA
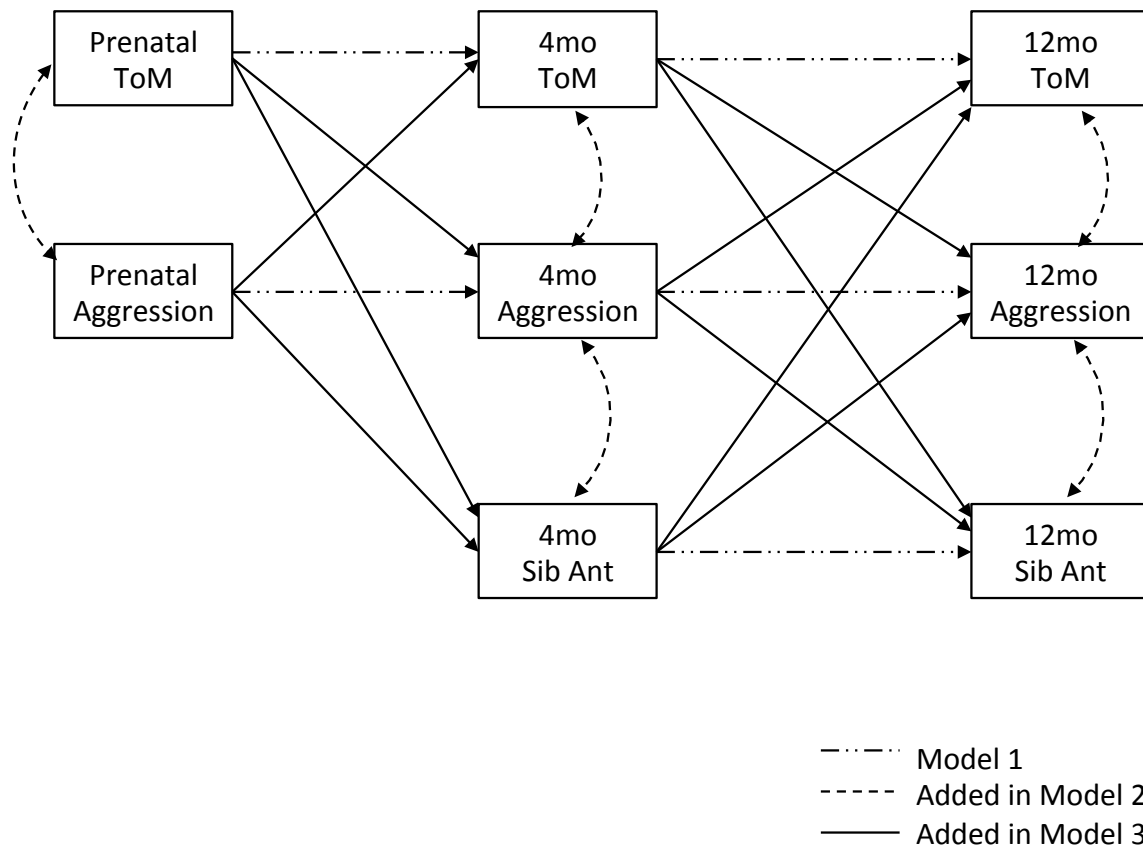
Figure 1.1. Hypothesized models of associations among Theory-of-Mind, aggression, and sibling antagonism. Model 1 (Stability) only assumes individual stabilities of the variables. Model 2 (Covariance) assumes individual stabilities and concurrent correlations among the variables within each time point. Model 3 (Cascade) assumes stabilities, concurrent correlations, and developmental links across domains over time.
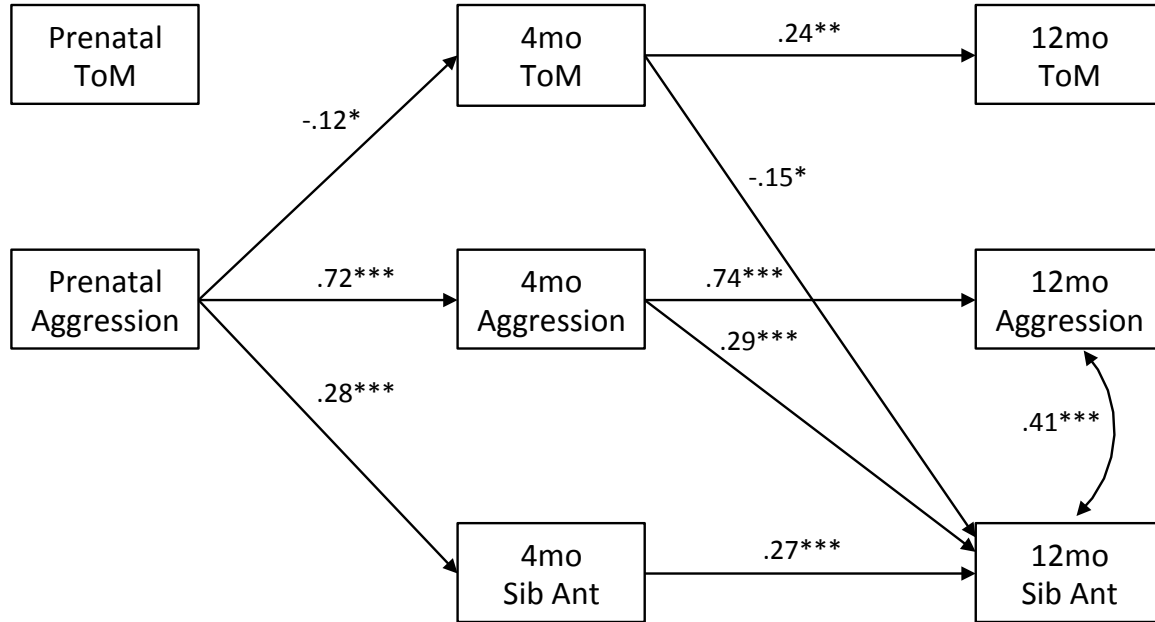
Figure 1.2. Standardized parameters for a cascade model (final Model 3). χ^2 (22, $N = 208$) = 39.79, $p < .05$, CFI = .98, RMSEA = .06, 90 CI = .03 - .09. Non-significant parameters remain in the model but are not displayed in the figure. Children's age, verbal IQ, and mothers' education are included as covariates.

$^*p < .05$. $^{**}p < .01$. $^{***}p < .001$.

References

Achenbach, T. M., & Rescorla, L. A. (2000). *Manual for the ASEBA preschool forms & profiles*. Burlington, VT: University of Vermont, Research center for children, youth, & families.

Adrián, J. E., Clemente, R. A., & Villanueva, L. (2007). Mothers' use of cognitive state verbs in picture-book reading and the development of children's understanding of mind: A longitudinal study. *Child Development, 78*, 1052-1067. doi:10.1111/j.1467-8624.2007.01052.x

Alink, L. A., Mesman, J., van Zeijl, J., Stolk, M. N., Juffer, F., Koot, H. M., Bakermans-Kranenburg, M. J., & van IJzendoorn, M. H. (2006). The early childhood aggression curve: Development of physical aggression in 10- to 50-month-old children. *Child Development, 77*, 954-966. doi:10.1111/j.1467-8624.2006.00912.x

Arbuckle J. L. (2013). *IBM SPSS Amos 22 User's Guide.*

Arsenio, W. F., & Lemerise, E. A. (2004). Aggression and moral development: Integrating social information processing and moral domain models. *Child Development, 75*, 987-1002. doi:10.1111/j.1467-8624.2004.00720.x

Astington, J. W. (2001). The future of theory-of-mind research: Understanding motivational states, the role of language, and real-world consequences. *Child Development, 72*, 685-687. doi:10.1111/1467-8624.00305

Baydar, N., Greek, A., & Brooks-Gunn, J. (1997). A longitudinal study of the effects of the birth of a sibling during the first 6 years of life. *Journal of Marriage and the Family, 59*, 939-956. doi:10.2307/353794

Brown, J. R., Donelan-McCall, N., & Dunn, J. (1996). Why talk about mental states? The

    significance of children's conversations with friends, siblings, and mothers. *Child*

    Development, *67*, 836-849. doi:10.2307/1131864

Caspi, A., & Moffitt, T. E. (1995). The continuity of maladaptive behavior: From description to

    understanding in the study of antisocial behavior. In D. Cicchetti, D. J. Cohen

    (Eds.), *Developmental psychopathology, Vol. 2: Risk, disorder, and adaptation* (pp. 472-

    511). Oxford, England: John Wiley & Sons.

Choe, D. E., Lane, J. D., Grabell, A. S., & Olson, S. L. (2013). Developmental precursors of

    young school-age children's hostile attribution bias. *Developmental Psychology*, *49*,

    2245-2256. doi:10.1037/a0032293

Crick, N. R., & Dodge, K. A. (1994). A review and reformulation of social information-

    processing mechanisms in children's social adjustment. *Psychological Bulletin*, *115*, 74-

    101. doi:10.1037/0033-2909.115.1.74

Dodge, K. A., & Coie, J. D. (1987). Social-information-processing factors in reactive and

    proactive aggression in children's peer groups. *Journal of Personality and Social*

    Psychology, *53*, 1146-1158. doi:10.1037/0022-3514.53.6.1146

Dunn, J. (1988). *The beginnings of social understanding*. Cambridge, MA, US: Harvard

    University Press.

Dunn, J., Brown, J., Slomkowski, C., Tesla, C., & Youngblade, L. (1991). Young children's

    understanding of other people's feelings and beliefs: Individual differences and their

    antecedents. *Child Development*, *62*, 1352-1366. doi:10.2307/1130811

Dunn, J. &. Kendrick, C. (1982). *Siblings: Love, envy and understanding*. Cambridge, MA:

    Harvard University Press.

Ensor, R., Marks, A., Jacobs, L., & Hughes, C. (2010). Trajectories of antisocial behaviour towards siblings predict antisocial behaviour towards peers. *Journal of Child Psychology and Psychiatry*, *51*, 1208-1216. doi:10.1111/j.1469-7610.2010.02276.x

Fink, E., Begeer, S., Hunt, C., & de Rosnay, M. (2014). False-belief understanding and social preference over the first 2 years of school: A longitudinal study. *Child Development, 85*, 2389-2403. doi: 10.1111/cdev.12302.

Foote, R. C., & Holmes-Lonergan, H. A. (2003). Sibling conflict and theory of mind. *British Journal of Developmental Psychology*, *21*, 45-58. doi:10.1348/026151003321164618

Garcia, M. M., Shaw, D. S., Winslow, E. B., & Yaggi, K. E. (2000). Destructive sibling conflict and the development of conduct problems in young boys. *Developmental Psychology*, *36*, 44-53. doi:10.1037/0012-1649.36.1.44

Harris, P. L. (2006). Social cognition. In W. Damon, R. M. Lerner, D. Kuhn, & R. Siegler (Eds.), *Handbook of child psychology. Vol. 2: Cognition, perception, and language* (6th ed., pp. 811–858). New York, NY: Wiley.

Herrera, C., & Dunn, J. (1997). Early experiences with family conflict: Implications for arguments with a close friend. *Developmental Psychology*, *33*, 869-881. doi:10.1037/0012-1649.33.5.869

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, *6*, 1-55. doi:10.1080/10705519909540118

Hughes, C., Dunn, J., & White, A. (1998). Trick or treat? Uneven understanding of mind and emotion and executive dysfunction in 'hard-to-manage' preschoolers. *Journal of Child Psychology and Psychiatry*, *39*, 981-994. doi:10.1111/1469-7610.00401

Hughes, C., & Ensor, R. (2005). Executive function and theory of mind in 2 year olds: A family affair? *Developmental Neuropsychology*, *28*, 645-668. doi:10.1207/s15326942dn2802_5

Hughes, C., & Ensor, R. (2006). Behavioural problems in 2-year-olds: Links with individual differences in theory of mind, executive function and harsh parenting. *Journal of Child Psychology and Psychiatry*, *47*, 488-497. doi:10.1111/j.1469-7610.2005.01519.x

Hughes, C., & Leekam, S. (2004). What are the links between theory of mind and social relations? Review, reflections and new directions for studies of typical and atypical development. *Social Development*, *13*, 590-619. doi:10.1111/j.1467-9507.2004.00285.x

Hyde, L. W., Shaw, D. S., Gardner, F., Cheong, J., Dishion, T. J., & Wilson, M. (2013). Dimensions of callousness in early childhood: Links to problem behavior and family intervention effectiveness. *Development and Psychopathology*, *25*, 347-363.

Izard, C. E., Fine, S., Mostow, A., Trentacosta, C., & Campbell, J. (2002). Emotion processes in normal and abnormal development and preventive intervention. *Development and Psychopathology*, *14*, 761-787. doi:10.1017/S0954579402004066

Jenkins, J. M., & Astington, J. W. (1996). Cognitive factors and family structure associated with theory of mind development in young children. *Developmental Psychology*, *32*, 70-78. doi: 10.1037/0012-1649.32.1.70

Katz, L. F., Kramer, L., & Gottman, J. M. (1992). Conflict and emotions in marital, sibling, and peer relationships. In C. U. Shantz, W. W. Hartup (Eds.), *Conflict in child and adolescent development* (pp. 122-149). New York, NY, US: Cambridge University Press.

Kline, R. B. (2005). *Principles and practice of structural equation modeling (2nd ed.)*. New York, NY, US: Guilford Press.

Lane, J. D., Wellman, H. M., Olson, S. L., Miller, A. L., Wang, L., & Tardif, T. (2013).

> Relations between temperament and theory of mind development in the United States and

> China: Biological and behavioral correlates of preschoolers' false-belief understanding.

> *Developmental Psychology*, *49*, 825-836. doi:10.1037/a0028825

MacKinnon, D. P., Lockwood, C. M., Hoffman, J. M., West, S. G., & Sheets, V. (2002). A

> comparison of methods to test mediation and other intervening variable

> effects. *Psychological Methods*, *7*, 83-104. doi:10.1037/1082-989X.7.1.83

Masten, A. S., & Cicchetti, D. (2010). Developmental cascades. *Development and*

> *Psychopathology*, *22*, 491-495. doi:10.1017/S0954579410000222

McElwain, N. L., Olson, S. L., & Volling, B. L. (2002). Concurrent and longitudinal associations

> among preschool boys' conflict management, disruptive behavior, and peer

> rejection. *Early Education and Development*, *13*, 245-263.

> doi:10.1207/s15566935eed1303_1

Meltzoff, A. N. (1995). Understanding the intentions of others: Re-enactment of intended acts by

> 18-month-old children. *Developmental Psychology*, *31*, 838-850. doi:10.1037/0012-

> 1649.31.5.838

Minde, K. (1992). Aggression in preschoolers: Its relation to socialization. *Journal of the*

> *American Academy of Child & Adolescent Psychiatry*, *31*, 853-862.

> doi:10.1097/00004583-199209000-00012

Oh, W., Volling, B. L., & Gonzalez, R. (2015). Trajectories of children's social interactions with

> their infant sibling in the first year: A multidimensional approach. *Journal of Family*

> *Psychology*, *29*, 119-129. doi:10.1037/fam0000051

Olson, S. L., Sameroff, A. J., Lansford, J. E., Sexton, H., Davis-Kean, P., Bates, J. E., Pettit, G. S., & Dodge, K. A. (2013). Deconstructing the externalizing spectrum: Growth patterns of overt aggression, covert aggression, oppositional behavior, impulsivity/inattention, and emotion dysregulation between school entry and early adolescence. *Development and Psychopathology*, *25*, 817-842. doi: 10.1017/S0954579413000199

Patterson, G. R. (1984). Siblings: Fellow travelers in a coercive system. In R. J. Blanchard & D. C. Blanchard (Eds.), *Advances in the study of aggression* (Vol. 1, pp. 173–215). New York: Academic Press.

Patterson, G. R. (1986). Performance models for antisocial boys. *American Psychologist*, *41*, 432-444. doi:10.1037/0003-066X.41.4.432

Perlman, M., & Ross, H. S. (1997). The benefits of parent intervention in children's disputes: An examination of concurrent changes in children's fighting styles. *Child Development*, *68*, 690-700. doi: 10.1111/j.1467-8624.1997.tb04230.x

Peterson, C. C. (2000). Influence of siblings' perspectives on theory of mind. *Cognitive Development*, *15*, 435-455. doi:10.1016/S0885-2014(01)00040-5

Peterson, C. C., Wellman, H. M., & Slaughter, V. (2012). The mind behind the message: Advancing theory-of-mind scales for typically developing children, and those with deafness, autism, or Asperger syndrome. *Child Development*, *83*, 469-485.

Rothbart, M. K., & Bates, J. E. (2006). Temperament. In N. Eisenberg, W. Damon & R. M. Lerner (Eds.), *Handbook of child psychology: Vol. 3, Social, emotional, and personality development (6th ed.).* (pp. 99-166). Hoboken, NJ US: John Wiley & Sons Inc.

Shaw, D. S., & Gross, H. (2008). Early childhood and the development of delinquency: What we

    have learned from recent longitudinal research. In A. Lieberman (Ed.), *The long view of*

    crime: A synthesis of longitudinal research (pp. 79–127). New York: Springer.

Slomkowski, C. L., & Dunn, J. (1992). Arguments and relationships within the family:

    Differences in young children's disputes with mother and sibling. *Developmental*

    Psychology, *28*, 919-924. doi:10.1037/0012-1649.28.5.919

Sobel, M. E. (1982). Asymptotic confidence intervals for indirect effects in structural equation

    models. In S. Leinhardt (Ed.), *Sociological methodology* (pp. 290-312). Washington, DC:

    American Sociological Association.

Song, J. -H., & Volling, B. L. (2015). Coparenting and children's temperament predict

    firstborns' cooperation in the care of an infant sibling. *Journal of Family Psychology*, *29*,

    130-135. doi:10.1037/fam0000052

Stewart, R. J. (1990). *The second child: Family transition and adjustment*. Thousand Oaks, CA,

    US: Sage Publications, Inc.

Stillwell, R., & Dunn, J. (1985). Continuities in sibling relationships: Patterns of aggression and

    friendliness. *Child Psychology & Psychiatry & Allied Disciplines*, *26*, 627-637.

    doi:10.1111/j.1469-7610.1985.tb01645.x

Suway, J. G., Degnan, K. A., Sussman, A. L., & Fox, N. A. (2012). The relations among theory

    of mind, behavioral inhibition, and peer interactions in early childhood. *Social*

    Development, *21*, 331-342. doi:10.1111/j.1467-9507.2011.00634.x

Tremblay, R. E., Nagin, D. S., Séguin, J. R., Zoccolillo, M., Zelazo, P. D., Boivin, M., Pérusse,

    D., & Japel, C. (2005). Physical Aggression During Early Childhood: Trajectories and

    Predictors. *Canadian Child and Adolescent Psychiatry Review*, *14*, 3-9.

Volling, B. L. (2012). Family transitions following the birth of a sibling: An empirical review of changes in the firstborn's adjustment. *Psychological Bulletin*, *138*, 497-528. doi:10.1037/a0026921

Volling, B. L., & Elins, J. (1998). Family relationships and children's emotional adjustment as correlates of maternal and paternal differential treatment: A replication with toddler and preschool siblings. *Child Development, 69*, 1640–1656.

Wechsler, D. (2002). *Wechsler preschool and primary scale of intelligence, Third edition.* San Antonio, TX: The Psychological Corporation.

Wellman, H. M. (2014). *Making minds: How theory of mind develops*. New York, NY, US: Oxford University Press.

Wellman, H. M., Fang, F., Liu, D., Zhu, L., & Liu, G. (2006). Scaling of theory-of-mind understandings in Chinese children. *Psychological Science*, *17*, 1075-1081. doi:10.1111/j.1467-9280.2006.01830.x

Wellman, H. M., Lane, J. D., LaBounty, J., & Olson, S. L. (2011). Observant, nonaggressive temperament predicts theory of mind development. *Developmental Science, 14,* 319–326. doi: 10.1111/j.1467-7687.2010.00977.x.

Wellman, H. M., & Liu, D. (2004). Scaling of theory-of-mind tasks. *Child Development, 75,* 523–541. doi:10.1111/j.1467-8624.2004.00691.x

Wellman, H. M., & Miller, J. G. (2008). Including deontic reasoning as fundamental to theory of mind. *Human Development*, *51*, 105-135. doi:10.1159/000115958

Wood, J. J., Cowan, P. A., & Baker, B. L. (2002). Behavior problems and peer rejection in preschool boys and girls. *The Journal of Genetic Psychology: Research and Theory on Human Development, 163*, 72-88. doi:10.1080/00221320209597969

CHAPTER 3 (Study 2)

Firstborn's Theory-of-Mind Development and Early Sibling Relationship

: Parental Discipline Matters

Theory-of-Mind (ToM) is a child's ability to understand that people can have different desires, knowledge, and beliefs, and that actions are often a product of these mental states (Harris, 2006; Wellman, 2014). This fundamental social-cognitive skill underlies children's competencies to build social relationships even in the early years of life and is associated with higher levels of prosociality and empathy, and fewer antisocial behaviors beyond childhood (Hughes, 2011). Most children acquire fundamental ToM understanding by age 6 (Wellman & Liu, 2004), yet there are individual differences in the pace of development during the preschool period. The quality of sibling relationships and parent-child relationships are closely associated with these individual differences (Dunn, Brown, Slomkowski, Tesla, & Youngblade, 1991; Hughes, 2011, Peterson, 2000), but few studies have attempted to understand the effect of early sibling relationships (Peterson, 2000), especially in conjunction with the influence of parent-child relationships, on actively developing ToM. When studies do examine the relation between ToM and social relationships, most of them examine cross-sectional rather than longitudinal associations, making it difficult to draw causal inferences (Cutting & Dunn, 1999; Hughes & Ensor, 2005). Thus, several important questions remain unanswered: What is the direction of influence between ToM understanding and sibling relationship quality? How does the presence of an infant influence children's ToM development? What role does mothers' and fathers' discipline play in the relations between sibling interaction and ToM development? The present

longitudinal study examined the associations between firstborn children's ToM development, the quality of sibling interaction, and parental discipline during the first year after the birth of an infant sibling in order to address these questions. We will refer to the firstborns as children and the infants as siblings in the remainder of this paper.

The Transition to Siblinghood

The transition to siblinghood is understudied in the literature despite its potential importance for enhancing children's social understanding, during the formative years between 2 and 3 when many children experience the birth of a sibling (Baydar, Greek, & Brooks-Gunn, 1997). In fact, Dunn and Kendrick (1982) reported a sharp increase in children's discussions of self and other (i.e., baby) when the sibling was born, underscoring the potential impact of the arrival of a sibling on children's social-cognitive development. The birth of a second child is a joyful life event for family members, but it also creates a period of disruption as the family readjusts to the changes in family dynamics that accompany the arrival of another child. For example, positive interactions between firstborn children and their mothers decline after the sibling's birth, and controlling and negative interactions increase, most likely because mothers must divide their attention between two children and manage children's behavior in the presence of a baby (Baydar et al., 1997; Dunn & Kendrick, 1982; Volling, 2012). Children's initial acceptance of the baby sibling helps alleviate parental concerns and predicts later sibling relationship quality (Dunn, Kendrick, & MacNamee, 1981; Song & Volling, 2015).

There are individual differences in how children react to the arrival of a baby sibling depending on their own temperamental and social cognitive characteristics (see Volling, 2012 for review), but also due to supportive parent-child relationships and patterns of communication (Kendrick & Dunn, 1980; Volling & Belsky, 1992). For example, Dunn and colleagues (1981)

found that children who were highly unmalleable and emotionally intense protested more when their mothers interacted with the baby sibling 14 months after the birth. Dunn and Kendrick (1982) also reported that in families where mothers referred to the baby as a person and emphasized the joint responsibility of mother and child in caring for the infant during the first weeks after the birth, children were more likely to show positive interest in and affection toward the baby at 8 months. Because most children become older siblings around toddlerhood and the early preschool years, early sibling interactions and parent-child conversations about the infant can provide a rich social context, which facilitates children's understanding of others' minds (Randell & Peterson, 2009; Slomkowski & Dunn, 1992).

Sibling Relationships and ToM Development

Many studies have examined the associations between sibling relationship quality and ToM development by focusing on: the presence or absence of a sibling (Jenkins & Astington, 1996), the number of siblings children have (Perner, Ruffman, Leekman, 1994), birth order (Ruffman, Perner, Naito, Parkin, & Clements, 1998), the age gap between siblings (Peterson, 2000), and sibling relationship quality (Hughes, 2011). Although there are some discrepancies among these various studies, researchers agree that having at least one sibling benefits children's social cognitive development compared to being an only child (Jenkins & Astington, 1996; Peterson, 2000). The sibling relationship, it seems, is a powerful socializing context for children's ToM development (Dunn, 2008).

Two dimensions of sibling interaction stand out as particularly important for ToM development. First, children who engaged in more positive sibling interactions—cooperative or joint pretend play—have better social understanding (Dunn et al., 1991). While sharing enjoyment during positive interactions, siblings often refer to mental states and align their

viewpoints (Hughes, 2011). Second, negative interactions, such as conflict, also contribute to children's social cognitive development. Dunn (1988) suggested that the opposition and different viewpoints expressed during daily conflicts between siblings and their parents contributed to their social understanding of others' emotions and minds. Moreover, conflicts often elicit the mentalistic conversations (e.g., talking about the causes of emotions, connections with other's mental states) with the caregiver about the negative emotions expressed during conflicts, which can be conducive to the development of ToM (Lagatutta & Wellman, 2002). In fact, sibling conflict is both a positive and negative predictor of ToM development depending on the affective tone and destructive nature of the conflict, and how parents manage it (Foote & Holmes-Lonergan, 2003; Slomkowski & Dunn, 1992; Randell & Peterson, 2009). For example, Randell and Peterson (2009) found that preschool-age children showed higher scores on ToM tasks if they displayed more positive emotion during sibling disputes, but lower scores if they showed post-conflict distress.

Still, there are several limitations in the sibling-ToM literature. First, most studies have been cross-sectional (McAlister & Peterson, 2007), so the directionality between ToM and sibling social conflicts cannot be determined. Do children develop better ToM because they engage in constructive sibling interactions or do children with better social cognitive abilities create positive interactive experiences with their siblings? A second limitation is that few studies have focused on early sibling interactions with an infant when discussions about the newborn sibling are frequent (Dunn, 1988). Instead, most studies focus on preschool sibling relationships, a time when both siblings can actively participate in reciprocal interactions, to examine the relations between sibling interactions and ToM development. Peterson (2000) recently found that preschool-age older siblings, with a younger sibling as young as 12 months, showed significantly

more advanced ToM understanding compared to only children or children with an adolescent sibling. This finding begs the question of "how" an infant sibling might benefit children's ToM development when the infant sibling is too young to actively engage in interaction (e.g., fantasy or pretend play).

Parenting and ToM Development

How mothers communicated with their children after the birth of a sibling predicted the quality of sibling relationships over time (Dunn & Kendrick, 1982; Hughes, 2011). How parents interact with the child can also influence children's understanding of others' desires, feelings, and beliefs. Dunn and Kendrick (1982) suggested that family conversational patterns (e.g., how frequently they discussed emotions and talked about intentions) contributed to variability in the growth rate of ToM. For example, a longitudinal observation of toddler and preschool siblings by Dunn and colleagues (1991) found that in families where there were rich and varied mentalistic conversations, children had better false-belief understanding, a core component of ToM. Similarly, inductive parental discipline, which involves parents' use of child-centered explanations and an emphasis on the consequences of children's behavior for others, encourages children to reflect on how their own actions may affect others' thoughts and feelings (Hughes, 2011).

Should parents use inductive strategies focused on the sibling's feelings and thoughts during negative sibling interactions (e.g., conflict), then these conversations may provide fruitful opportunities for children to learn about others' minds (Hughes, 2011). Randell and Peterson (2009) found that if mothers viewed sibling conflicts as constructive, as opposed to destructive, preschool-age children were more likely to show positive affect even during sibling debate and this was, in turn, positively associated with greater ToM understanding. Although cross-

sectional, these findings provide preliminary evidence for the potential moderating role of parental discipline in explaining the relations between sibling conflict and children's ToM. Negative sibling interactions may hamper social cognitive development, particularly if parents use punitive or harsh discipline in response to children's misbehavior with their infant sibling (e.g., annoying, intruding, poking). Punitive and controlling strategies include suppressing children's emotional expression, particularly negative emotions for fear that older children may harm the infant (Dunn & Kendrick, 1982; Perozynski & Kramer, 1999). Although some parental control may be appropriate to prevent harm to the infant, a lack of directive parenting and high levels of punitive or harsh parenting may undermine the development of children's social understanding by curtailing children's opportunities to regulate negative emotions toward sibling (e.g., jealousy), and learn about self and other. Therefore, it will be important to consider the role of parental discipline in understanding the effects of sibling antagonism on children's ToM development.

There are two notable limitations to the current literature on parenting and ToM development. First, few studies have examined both sibling interaction and parenting, even though both are likely to influence ToM development. Parenting may be especially important for ToM development during the transition to siblinghood, because young children are not yet socially adept at interacting with their infant sibling without adult assistance. The manner in which parents interact and communicate with their children before and after their sibling's birth may contribute to children's ToM development, as well as the quality of the developing sibling relationship (Kendrick & Dunn, 1980). Second, most studies have focused exclusively on mothers' behavior and have not taken into account the role of fathers for children's ToM and sibling relations. In fact, fathers' parenting may be critical for the firstborns' adjustment after the

birth of a second child because mothers are largely preoccupied with caring for the infant (Kreppner, Paulsen, Schuetze, 1982).

Some studies find no notable difference in mothers' and fathers' mind-mindedness during interactions with their children (Arnott & Meins, 2007) and their positive associations with children's ToM understanding (Lundy, 2013). Others find that mothers and fathers react to children's negative emotions differently (e.g., Eisenberg, Fabes, & Murphy, 1996) and interact with children differently. For example, mothers responded to children's negative emotions using more supportive reactions (e.g., encourage expression) than fathers, whereas fathers used more unsupportive reactions (e.g., punitive reaction, minimizing expression) than mothers (McElwain, Halberstadt, & Volling, 2007; Nelson, O'Brien, Blankson, Calkins, & Keane, 2009). Also, mothers engaged in more comfort activities and mental state talk, whereas fathers used more rough-and-tumble play, and organized games (e.g., Clarke-Stewart, 1978; Jenkins, Turrell, Kogushi, Lollis, & Ross, 2003). Together, these previous works suggest fathers may not be creating rich, positive mentalistic conversations with their children about others.

Literature on children's social cognitive outcomes, however, suggests that mothers and fathers' conversation with children both contribute to children's social cognitive development. For instance, mothers' references to emotions and use of causal explanatory language for emotions were positively related to children' emotion understanding at age 3; fathers' use of causal explanatory language concurrently and longitudinally also predicted ToM at age 3 (LaBounty, Wellman, Olson, Lagattuta, & Liu, 2008). Meanwhile, 4-year-old children who had insecure attachments to both mothers and fathers (McElwain & Volling, 2004), and 4- to 7-year-old children who experienced punitive and ignoring parenting from both parents (Denham, Mitchell-Copeland, Strandberg, Auerbach, & Blair, 1997) showed poor social understanding.

These research findings collectively point to the importance of including fathers as influential socializing agents for children's social cognitive development.

Study Objectives and Hypotheses

The current study examined the associations among firstborn children's ToM development, early interactions with an infant sibling, and mothers' and fathers' discipline in response to children's misbehavior toward their siblings in the year following the birth of an infant sibling. The first aim was to examine the direction of effects between ToM and sibling interaction using a pre-post design, in which ToM was measured before and after sibling interactions were measured. The second aim was to test how different discipline styles (i.e., directive parenting, controlling parenting) in response to sibling misbehavior moderated the associations between sibling interactions and ToM development. The current study investigated these research questions while testing the unique roles of both mothers' and fathers' parenting styles rather than focusing exclusively on mothers. Children's negative reactivity before the birth of a sibling was included in the analyses to control for the influence of temperament on sibling interaction.

We hypothesized that children's high ToM and low negative reactivity before the birth of a sibling would predict more positive engagement and less antagonism with the infant sibling. Additionally, we expected the moderation effect of parental discipline in the link between sibling conflict and 12-month ToM. Specifically, we hypothesized that sibling antagonism would predict poorer ToM at 12 months when parents use low directive or high controlling parenting, whereas it would predict better ToM when parents use high directive or low controlling parenting. We expected the discipline of both parents would have an effect on ToM; even though mothers may be the primary caregivers in most cases, fathers' parenting was expected to be particularly

influential given the specific situational characteristics of the transition to siblinghood and mothers' involvement with the infant sibling.

Methods

Participants

Families in the current study were part of a longitudinal study of firstborn children's adjustment after the birth of a second child. Initially, 241 mothers pregnant with their second child were recruited through obstetric clinics, local hospitals, child care centers, pediatricians' offices, and child-birth education classes, and through local printed media. Firstborn children were on, average, 30 months old (SD = 10 months) when the infant sibling was born. All infants were born full-term, and neither of the siblings had developmental or physical disabilities. Mothers and fathers were primarily white (86%) with 14% representing other racial and ethnic minorities. Most families earned $60,000 - $99,999, with the majority of parents having a Bachelor's degree or above. The families of 208 firstborn children who were 18 months-3.5 years old at the first visit (M_{age} at prenatal = 29.74 months; M_{age} at 4 months = 35.36 months; M_{age} at 12 months = 43.49 months; SD = 7.69 months; 117 girls) were included in the current study in order to reduce the wide age-gap among children for age-sensitive measures (e.g., ToM). Missing data were handled with full information maximum likelihood (FIML) estimation (Enders & Bandalos, 2001) using AMOS, Version 22. Families (N = 208) included in the current analyses did not differ significantly from the original recruited sample (N = 241) on most of the demographic indicators (i.e., family income, parents' race/ethnicity, age, years of marriage, or siblings' gender) except that mothers in the current sample had significantly higher education levels, χ^2 (2) = 8.43, p < .05.

Design and Procedures

The longitudinal project consisted of five time points: prenatal (the last trimester of the

mother's pregnancy with the second child) and 1, 4, 8, 12 months after the birth of the second

child. At each time point, information about both older siblings' adjustment and family

interactions were collected using observations, interviews, and questionnaires during home

visits. The present study used information collected at the prenatal-, 4-, 8-, and 12-month time

points. Specifically, we used mother- and father-reports of children's interactions with the infant

sibling at 4- and 8-months, parental discipline in response to children's misbehavior toward the

sibling at 8 months, and children's temperament prenatally, in addition to assessments of

children's ToM from the prenatal and 12-month time points.

Measures

   Theory-of-Mind. Children's social understanding was measured with six ToM tasks

developed by Wellman and Liu (2004) that most children master in sequence before age 6 (The

six tasks were presented in the following order). For each task, children were shown a vignette

and were asked questions: In the *diverse desires* task, children were asked to judge whether two

persons (the child vs. someone else) had different desires about the same objects. In the *diverse*

beliefs task, children had to judge how people (the child vs. someone else) might have different

beliefs about the same object, when the child did not know which belief was true or false. In the

knowledge access task, children saw what was in a box and judged (yes-no) the knowledge of

another person who had not seen what was in a box. In the *explicit false-belief* task, children

judged how someone would search, given the person's mistaken belief, and in the *contents false-*

belief task, children judged another person's false belief about what was in a distinctive container

when the child knew what it was. Lastly, the *hidden emotion* task tested whether children

understood that a person might feel one thing but display a different emotion. A total score was

computed by summing the number of tasks the children answered correctly reflecting their understanding of others' desire, belief, or emotion. Given that ToM measures are highly age sensitive during these early years (Wellman, Cross, & Watson, 2001), the tasks we used to assess children's ToM understanding were different at the two time points to avoid highly skewed data and assure the tasks were appropriate for the age group being examined (e.g., Adrián, Clemente, & Villanueva, 2007; Fink, Begeer, Hunt, & de Rosnay, 2014). ToM scores were calculated by summing the first three tasks (pre-false belief tasks: diverse desires, diverse beliefs, knowledge access) for the prenatal time points because most children (75%) were still under age 3 at this time point. This means many of them were still too young to achieve false-belief understanding or appearance-reality emotions (Wellman & Liu, 2004), which are measured by the last three tasks. For ToM scores at 12 months, all six tasks were used when 80 percent of children were between 36 months and 59 months.

Interactions with infant sibling. *The Sibling Relationships in Early Childhood scale* (Volling & Elins, 1998) was used to measure children's interactive behaviors toward the infant sibling at 4 and 8 months. Mothers and fathers were asked to rate firstborn children's behaviors toward the infant on a 5-point Likert scale (1 = *almost never*, 3 = *sometimes*, 5 = a*lmost always*), which yielded subscales of *Positive Engagement* (e.g., initiates play or interactions with baby, 7 items, α = .84 - .85)*, Antagonism* (e.g., is physically aggressive with baby, 5 items, α = .74 - .75)*, and *Avoidance* (e.g., stays away from baby if possible, 3 items, α = .56 - .67). Because of low internal consistency, only positive engagement and antagonism were included in the current analyses.

Parental discipline in response to children's misbehavior. At 8 months, *The Managing Children's Conflict questionnaire* (Perozynski & Kramer, 1999) was modified and used to assess

parents' response to firstborn children's negative interactions with their infant sibling. Mothers and fathers were asked to use a 3-point Likert scale (1 = *almost never*, 2 = *sometimes*, 3 = *usually*) to rate how often they used each of the possible management strategies in response to their firstborn child's misbehavior toward the infant sibling in the past month. The measure yielded two subscales (see Table 2.1): *Directive parenting* (e.g., asked the child to explain their side and worked with them to reach a solution, 4 items, α = .72 for both parents) and *Controlling parenting* (e.g., told my older child that s/he would be punished if s/he did not stop misbehaving, 9 items, α = .74 - .77).

Negative reactivity. At the prenatal time point, both parents reported on children's negative reactivity using the Child Behavior Questionnaire (CBQ; Rothbart, Ahadi, & Hershey, 1994). Parents were asked to rate their children's behaviors on a 7-point Likert scale ranging from 1 (*extremely untrue*) to 7 (*extremely true*). *Soothability* (13 items, α = .75 - .77) assessed the rate of recovery from peak distress, excitement, or general arousal (e.g., "If upset, cheers up quickly when s/he thinks about something else"). *Anger* (13 items, α = .73 - .77) indicated the amount of negative affect related to goal blocking (e.g., "Has temper tantrums when s/he doesn't get what s/he wants"). The correlation between soothability and anger was $r = -.51$ for mother-report and $r = -.42$ for father-report, which were significant at $p < .01$. A total negative reactivity score was created by subtracting children's soothability score from their anger score.

Verbal IQ. Children's verbal IQ at the prenatal time point was measured with the receptive vocabulary subscale of the Wechsler Preschool and Primary Scale of Intelligence, Third Edition (WPPSI-III; Wechsler, 2002). It was included as a covariate in analyses along with child age, gender, and mothers' and fathers' education.

Analysis Overview

After examining correlations among study variables, we used structural equation modeling (SEM; Kline, 2005) to create latent variables using mothers' and fathers' reports as indicators for child temperament (i.e., negative reactivity at the prenatal time point) and sibling interactions (i.e., positive engagement and antagonism at 4- and 8 months). To address the first aim, a structural model including ToM at the prenatal time point and 12 months, and sibling interactions at 4- and 8 months was tested to examine the direction of effects, while controlling for prenatal negative reactivity. For the second aim, multi-group analyses were tested to examine the moderating effects of mothers' and fathers' directive and controlling parenting at 8 months in explaining relations between sibling interaction and ToM (Figure 2.1 and 2.2). To understand the unique roles of mothers' and fathers' discipline (i.e., directive and punitive at 8 months), their moderating roles were examined separately. Directive parenting and controlling parenting were also tested separately to examine their distinct effects. AMOS Version 22 (Arbuckle, 2013) was used for testing all measurement and structural equation models. Multiple fit indices including the comparative fit index (CFI; > .90 for good fit), and the root mean square error of approximation (RMSEA; < .05 for good fit; < .08 for moderate fit) were used to evaluate the fit of each model (McDonald & Ho, 2002). Chi-squares were presented but not used to evaluate the fit because they are highly sensitive to sample size (Kline, 2011).

Results

Preliminary Analyses

Descriptive statistics and correlations between all variables are shown in Table 2.2. Negative reactivity before the birth of a sibling was positively related to children's antagonism toward the infant at 4 and 8 months and controlling parenting by both mothers and fathers, and negatively related to mothers' reports of children's positive engagement with the infant at 8

months. Also, ToM at the prenatal time point was negatively correlated with mother-reported

controlling parenting at 8 months. Antagonism at both time points was positively related with

directive parenting, as well as with controlling parenting for both parents, and mothers' and

fathers' reports of directive and controlling parenting were positively correlated. Children's

positive engagement with the sibling was positively correlated with both mothers' and fathers'

directive parenting, and mother-reported positive sibling engagement at 8 months was negatively

related to fathers' controlling parenting at 8 months.

Positive sibling engagement and sibling antagonism were not correlated, thus we

included them in the structural model as two separate latent constructs with mother- and father-

reports as indicators. Because directive and controlling parenting were positively, not negatively

correlated, we tested mothers' and fathers' directive parenting and controlling parenting as

separate variables, in order to examine the unique role of directive and controlling parenting for

sibling interaction processes involved in children's ToM development. Children's age, verbal IQ,

and gender, and mothers' and fathers' education were included as covariates in the SEM

analyses.

Measurement Model

Before examining the main structural models, a measurement models was tested to check

whether the manifest variables were related to one another in the expected direction. The

measurement model included five latent constructs: negative reactivity at prenatal time point,

positive engagement at 4 and 8 months, and antagonism at 4 and 8 months. Mothers' and fathers'

scores were use as indicators for each of the latent constructs. Correlations among the latent

factors were estimated and unique variances within parent were allowed to co-vary when

suggested by the modification indices. The measurement model fit the data well, χ^2 (27, $N = 208$)

= 52.58, $p < .01$, CFI = .95, RMSEA = .07 (90% CI = .04 - .10). Model estimated loadings for the indicators were all significant in the expected direction (standardized loadings for the indicators of all latent variables ranged from .43 to .99, ps < .001).

Structural Model with ToM and Sibling Interactions

Our first goal was to test the directionality of effects in the relations between children's ToM and sibling interactions, expecting children's ToM before the birth of a sibling would predict more positive sibling interactions. The structural model we tested consisted of children's ToM and negative reactivity at the prenatal time point, sibling antagonism and positive engagement at 4 and 8 months (allowed to co-vary at each time point), and ToM at 12 months (Figure 2.1). The model fit the data well, $\chi^2 (100, N = 208) = 149.23$, $p < .01$, CFI = .95, RMSEA = .05 (90% CI = .03 - .06). Children's ToM at the prenatal time point predicted higher positive engagement with the sibling at 4 months and negative reactivity predicted higher antagonism at 4 months. Both sibling interactions stayed stable from 4 to 8 months, indicated by the significant autoregressive paths. Neither of the sibling interactions predicted 12-month ToM.

Multiple-Group Analyses: Directive parenting as Moderator

Our second goal was to examine whether parental discipline moderated the links between sibling interaction and ToM, expecting that the link between sibling antagonism and later ToM would be negative when parents use low directive or high controlling parenting, whereas the link would be positive when parents use high directive or low controlling parenting. Thus, we used a multi-group modeling strategy, to test whether the associations between sibling interactions and ToM differed significantly across high and low levels of mothers' and fathers' directive and controlling parenting. Median splits were calculated to divide parents into high and low levels of directive or controlling parenting. As presented in Figures 2.2 (mothers) and 2.3 (fathers), the

same structural model used for aim 1 was tested for the moderating effects of high and low levels

of mothers' and fathers' directive parenting and controlling parenting, respectively. Both

unconstrained and constrained models (all the paths were constrained to be equal across the high

and low groups) were conducted. A significant chi-square difference test between the two

models indicates that path coefficients differ across high and low groups. If a chi-square

difference was significant, then all individual paths were compared across the two groups, using

z-test to determine which paths were significantly different.

Chi-square difference tests revealed that mothers' directive parenting was a significant

moderator, $\Delta\chi^2 (21) = 33.78$, $p < .05$. Figure 2.2 shows standardized paths coefficients for the

low maternal directive parenting group (numbers before slashes) and high maternal directive

parenting group (numbers after slashes). The paths from 4-month antagonism to 8-month

antagonism ($z = -2.20$, $p < .01$), and 8-month antagonism to 12-month ToM ($z = 1.69$, $p < .10$)

were different across the two groups. Specifically, children in the low maternal directive

parenting group had higher stability in antagonism from 4 to 8 months compared to children

whose mothers used high directive parenting. Also, children's 8-month antagonism negatively

predicted 12-month ToM only in the low maternal directive parenting group. Fathers' directive

parenting showed similar moderating effects, $\Delta\chi^2 (21) = 32.07$, $p = .057$, Figure 2.3 shows

standardized paths coefficients for the low (numbers before slashes) and high (numbers after

slashes) paternal directive parenting groups. The path from prenatal ToM to 12-month ToM ($z =$

-2.45, $p < .05$), the path from 4-month positive engagement to 8-month positive engagement ($z =$

2.24, $p < .05$), and the path from 8-month antagonism to 12-month ToM ($z = 2.62$, $p < .01$) were

significantly different across the two groups. Specifically, children in the high paternal directive

parenting group had higher stability in sibling positive engagement from 4 to 8 months compared

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to children in the low paternal directive parenting group. Similar to mothers' directive parenting, children's antagonism toward the infant at 8 months negatively predicted 12-month ToM score when fathers were low in directive parenting, but not when fathers were high in directive parenting. Mothers' and fathers' controlling parenting did not moderate the links between children's ToM and sibling interactions.

Discussion

Between the ages of 2 and 3, the time coinciding with the arrival of a younger sibling for many firstborn children, children begin to understand categorization of self and others, as well as social rules in interactions with others (Campbell, 2006). Prior research suggests the presence of a sibling provides rich opportunities for children to constantly monitor and interact with other family members as parents care for and interact with the infant sibling. Depending on the way children interpret their experiences with the sibling and communicate with parents about the sibling's desires and needs, the presence of an infant sibling may have different consequences for children's social-cognitive development. To understand these processes, the current study examined the longitudinal associations between firstborn children's ToM before the birth, their interactions with their sibling after the birth, and the roles of mothers' and fathers' discipline in response to sibling misbehavior, while controlling for firstborns' age, gender, verbal IQ, temperament, and parents' education. The results yielded some important conclusions that further an understanding of how family processes and social interactions are related to children's ToM development. First, children's ToM before the birth of a sibling predicted sibling interaction quality during the first year of siblinghood. Second, sibling antagonism negatively predicted ToM when mothers or fathers used low levels of directive parenting.

The literature on the associations between sibling relationship and ToM has introduced two possible accounts regarding the directionality of the influence. One is that children's ToM understanding contributes to better sibling relationship quality. The other is that sibling interactions provide a rich environment for young children to develop social cognitive awareness. Our results provide evidence for both directions: The result that children's ToM before the birth of a sibling predicted more positive engagement at 4 months is consistent with the hypothesis that advanced ToM understanding assists children to become better playmates and caregivers for their younger siblings and thus contributes to building more positive sibling relationships (Hughes & Ensor, 2005). Meanwhile, sibling antagonism at 8 months negatively predicted children's ToM at 12 month only when parents used low directive parenting. This suggests that the relation between sibling interaction and ToM is more complex than a simple unidirectional effect of one to the other.

Before interpreting our findings, it is important to note that the sibling interactions were measured within the very first year of the siblinghood. Although siblings are not mutually interactive since the infant sibling is too young to be an active social communicator, the presence of a sibling in the family can have indirect stimulating effects for firstborn children's social cognitive development through its significant impact on children's relationship with their caregivers as well as on the whole family dynamic (e.g., McAlister & Peterson, 2007). Children's communications with the caregiver about the sibling's behaviors and desires, and the rules regarding how to interact with the sibling can contribute to developing social understanding (Hughes, 2011). In line with this idea, the results from the present study support the key role of parental directive parenting, but not controlling parenting, in particular for children's social-cognitive growth and developing early sibling relationships.

It is well documented that mothers' sensitive mind-mindedness (i.e., thinking about and talking to the child in psychological terms) and mental state talk—key components of our directive parenting scale—can promote mother-child relationships (Meins, Fernyhough, Wainwright, Das Gupta, Fradley, & Tuckey, 2002) and children's awareness of mental states in preschool-age children (Hughes & Ensor, 2005; Laranjo, Bernier, Meins, & Carlson, 2014). Also, talking about the causes and the consequences of emotions and their connections to other mental states can improve sophisticated thinking about emotions and the ability to articulate this understanding, presumably because children learn about the causes and consequences of emotions and the connections between emotions and mental states (Lagattuta & Wellman, 2002). Especially in the context of sibling conflict, mothers who engage in directive as opposed to controlling parenting may assist children to maintain positive attitudes toward the sibling, which in turn increases their interest in positive sibling interactions rather than antagonistic relationships in the future (e.g., Dunn & Kendrick, 1982). Thus, non-controlling parenting might not be sufficient but inductive and mentalistic conversation with the emotionally supportive parents might be essential for children to benefit from the presence of an infant sibling.

Then, what if parents rarely use directive strategies? Do children still gain much social-cognitive benefit from interacting with their baby siblings? Based on our findings, the tentative answer to this question would be "No." The moderation models comparing families where parents were using high and low directive parenting clearly indicated that children engaging in antagonistic interactions with their siblings at 8 months, whose parents rarely responded with directive parenting, were less likely to show growth in their ToM understanding compared to children whose parents respond with directive parenting a lot. Moderation effects of mothers' directive parenting were found in predicting the stability of their sibling interaction style across

the first year as well. When mothers used directive parenting less often in responding to sibling misbehavior in the early months after the birth, children continue to engage in highly antagonistic interactions with the infant from 4 to 8 months, even after controlling for the children's age, temperament and verbal IQ.

Moreover, the moderating effect of fathers' directive parenting showed that only in families where fathers reported using low directive parenting did children's ToM at prenatal time point continue to predict ToM at 12 months. Thus, when children had low ToM understanding prenatally, they continued to be lower on ToM understanding at 12 months when fathers were low on directive parenting. This was not the case when fathers engaged in high directive parenting. The rank ordering of children's ToM understanding over time from prenatal to 12 months changed (the autoregressive path was not significant) in these families. In addition, when fathers were high in directive parenting, positive engagement between the firstborn children and their infant sibling was stable from 4 to 8 months in contrast to families where fathers responded with low directive parenting. Because sibling interactions were measured 4 months prior to when parental discipline was measures, it is also possible that sibling interaction styles might have triggered different levels of directive parenting from parents. This calls for future research using a cross-lagged design or a person-centered approach in order to examine how they both change over time interdependently.

Collectively, our results suggest that children benefit from both mothers' and fathers' use of directive parenting in response to misbehaviors directed toward their infant sibling. Not only is sibling antagonism less stable and positive sibling engagement more stable when parents facilitate mentalistic conversations with the child in a supportive manner (i.e., directive parenting), but there is also growth in children's ToM understanding (from the prenatal time

point to 12 months), quite possibly because parents are talking about the infant's emotional states and desires during these disciplinary encounters. These findings are consistent with earlier studies finding that parents' encouragement of curiosity and openness (Brody, Stoneman, & MacKinnon, 1986), their reference to the feelings of others (Dunn & Kendrick, 1982), and their supportive guidance while teaching the firstborn (Volling & Belsky, 1992) predicted positive sibling relationships. Connectedness in the conversation between the caregiver and the child promotes children's openness to socialization, which also contributes to an understanding of others' minds (Ensor & Hughes, 2008). Similarly, Dunn (1988) argued that the growth of social understanding derives from children's interest in and responsiveness to the behavior and feelings of others. If children frequently engage in antagonistic sibling interactions without their parents' intervention and explanations of the social and moral consequences of harmful behaviors directed toward the infant, these children lose the opportunity to gain an understanding of others' feelings and needs, as well as the fundamentals of early moral development. Further, children, particularly aggression-prone children, may be more distressed by the lack of supportive and inductive guidance that would help them regulate negative emotions induced by any conflict situations, that others have found related to poorer ToM performance (Randell & Peterson, 2009). It is not surprising, then, that few opportunities to learn about others thoughts and feelings, the experiencing of high levels of distress during conflict situations, and a lack of adult models communicating about emotions and thoughts following the often stressful period surrounding the transition to siblinghood could interfere with children's social-cognitive development. Thus, to help aggressive children's adjustment during the transition to siblinghood, it might be particularly important for parents to have enough conversations with their children

about feelings and thoughts in a emotionally supportive fashion, rather than simply reducing harsh discipline in managing children's misbehaviors toward their sibling.

In addition to the main findings on sibling interactions and ToM, we also found that children's negative reactivity was positively correlated with their ToM at both the prenatal and 12-month time points. This result is in line with previous findings that children's shy-withdrawal and perceptual sensitivity (Wellman, Lane, LaBounty, & Olson, 2011), as well as stress reactivity measured with salivary cortisol (Lane, Wellman, Olson, Miller, Wang, & Tardif, 2013), were positively related to false-belief performance in preschoolers. Children who have high negative reactivity might be more susceptible to environmental changes and others' social cues (Belsky, Bakermans-Kranenburg, & van IJzendoorn), which can facilitate their social cognitive development.

There are several strengths of this study. First, the longitudinal design provides insights into the processes involved in developing ToM within the family dynamics over time. Specifically, the pre-post design allowed us to test the directionality of the effects between children's ToM and sibling interactions as well as the longitudinal contribution of parental disciplines in these relations. A second unique strength of this study was the inclusion of fathers. Fathers may play a particularly informative role for children's adjustment after the transition to siblinghood because of the need for parents to balance the care of two young children, one a newborn infant, and the changes that occur in mother-firstborn interactions after the sibling's birth (Kreppner et al., 1982; Stewart, 1990). Fathers' directive parenting was particularly important for children' s positive engagement of the infant sibling over time, which is consistent with earlier studies finding associations between fathers' discipline and facilitative instruction for positive sibling relationship quality (Brody, Stoneman, & McCoy, 1992; Volling & Belsky,

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1992). These findings are also in line with work examining the positive influence of mothers and fathers' mind-mindedness on children's social understanding (e.g., Lundy, 2013). Although fathers are still underrepresented in most developmental studies, our results indicate that fathers' directive parenting in response to children's antagonism with the infant shortly after the birth has implications for whether or not children develop and maintain positively engaging social interactions with their infant sibling in the year following the birth. Given the high stability of positive sibling interaction starting within the month following the birth to the end of the first year (Kendrick & Dunn, 1982) into preschool (Kramer & Gottman, 1992), middle childhood (Dunn, Slomkowski, & Beardsall, 1994) and even into adolescence (Kramer & Kowal, 2005), it is clear that future research on the transition to siblinghood and positive sibling engagement may want to take the father's role more seriously.

There are several limitations of this study. Participating families were intact two-parent families and mainly middle-class and white, which may limit the generalizability of the findings to children from different family backgrounds. Our findings, however, emerged even after controlling for several child and family factors, including the child's age, verbal IQ and parents' education. Second, the measures of children's interactions with their sibling and parents' directive parenting were drawn from mother- and father-reports. Observations of sibling and parent-child interactions may have yielded a richer, and potentially different pattern of findings, although there are potential shortcomings to both self-reports and observational assessments. Whereas parent-reports may suffer from subjective biases, observational assessments are often not long enough to adequately sample low-frequency events such as children's antagonistic or aggressive behaviors. In the current study, we attempted to deal with these limitations by using multi-informant reports from mothers and fathers, and averaging them to create composites of

children's antagonism and positive engagement with an infant sibling. Future research may benefit by using both parent-reports and observational assessments. The age range of children was also relatively wide (i.e. ages 1.5-3.5 years) which reflects the fact that parents decide to have their second child at different times following the birth of their first child. Due to the unique characteristics of the current investigation and the overall goal of trying to understand firstborn children's adjustment before and after the birth of a sibling, the time points were established to coincide with the age of the second-born children and not based on the age of the firstborn children. To compensate for the wide age-rang and the fact that ToM measures are sensitive to age-related change, we restricted the age range of the firstborns (1.5 - 3.5) and statistically controlled for age in months and verbal IQ in our analyses. Despite the limitations, the current study used a longitudinal design with data collected through multiple informants including mother- and father-reports and child interviews (for ToM). Especially, while controlling for demographic information and firstborns' temperament, we also included the main study constructs measured at multiple time points to take into account their stability.

In sum, the present study examined the role of sibling interactions and parental discipline for children's ToM development during the transition to siblinghood. Firstborn children's social understanding before the birth of the sibling predicted positive sibling interaction, and sibling antagonism also directly predicted firstborn children's poorer social understanding when parents used low directive parenting. These findings indicated that communications between parents and their firstborn child during directive parenting encounters involving the infant are important for children's ToM development. Future research should be mindful of how mothers' and fathers' engage firstborn children following the birth of an infant sibling, and that directive parenting, whether imparted by mothers or fathers, contributes to the development of young children's

social-cognitive understanding and the emergence of positive sibling interactions even as early as the first year after the sibling's birth.

Table 2.1.

Directive Parenting and Controlling Parenting Subscales

Directive parenting (4 items)	Controlling parenting (9 items)
Asked my older child to explain their side and worked with them to reach a solution	Told my older child to stop misbehavior and be nice to the baby.
Comforted my older child if they were upset.	Separated my older child from the baby.
Asked my older child about his/her feelings about the misbehavior.	Asked my spouse to handle my older child's misbehavior.
Helped my older child use words to express his/her feelings about the misbehavior.	Raised my voice and told my older child to stop misbehavior toward the baby.
	Used a form of physical punishment to stop my older child's misbehavior.
	Redirected my older child to another activity.
	Told my older child that he/she would be punished if he did not stop misbehaving, not intending to carry through with the threat.
	Told my older child that he/she would be punished if he did not stop misbehaving, fully intending to carry through with the threat.
	Withdrew privileges for my older child.

Table 2.2.

Descriptive Statistics and Correlations between Study Variables (N = 208)

Variable	1	2	3	4	5	6	7	8	9
Prenatal									
1 ToM (observed)	-	-.02	.05	.05	.10	-.05	-.02	-.11	.53**
2 Negative Reactivity	.16*	**.55****	.06	.23**	-.02	.21*	.13†	.20*	.07
4 months									
3 Sibling Positive Engagement	.13†	-.09	**.42****	.06	.65**	-.16*	.17*	-.04	.01
4 Sibling Antagonism	.07	.24**	.01	**.47****	-.02	.51**	.22**	.32**	.13
8 months									
5 Sibling Positive Engagement	.12	-.19*	.67**	.08	**.40****	-.08	.17*	.07	.05
6 Sibling Antagonism	-.001	.29**	-.05	.57**	-.01	**.51****	.16*	.54**	.02
7 Parent Directive Parenting	.04	.10	.21**	.21**	.14†	.26**	**.22****	.38**	.02
8 Parent Controlling Parenting	-.21**	.21**	.06	.35**	.12	.49**	.35**	**.35****	.002
12 months									
9 ToM (observed)	.53**	.15*	.12	.03	.12	-.03	.10	-.06	-
Father *M*	.93	-.74	3.63	1.62	3.64	1.92	1.90	1.65	2.46
SD	.93	1.13	.62	.60	.60	.61	.49	.35	1.45
Mother *M*	-	-.79	3.80	1.65	3.85	1.98	1.96	1.74	-
SD	-	1.26	.65	.57	.59	.65	.51	.37	-

Note. Except ToM, all variables are reported by both mothers and fathers; *r*s for mother-reports are presented below the diagonal, father-reports above the diagonal, and cross-parents in the diagonal.
†*p* < .10. **p* < .05. ***p* < .01.
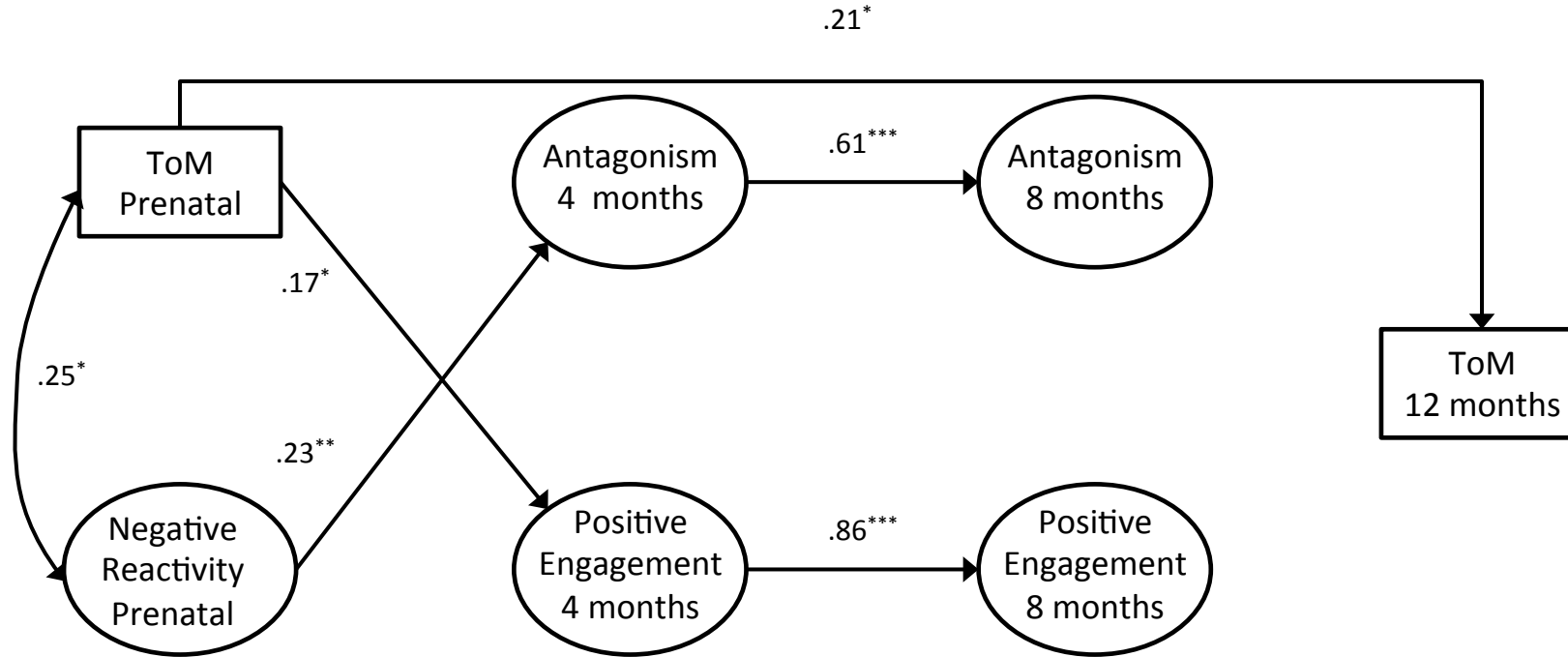
Figure 2.1. Structural model examining the relations between Theory-of-Mind and sibling interactions. Only significant paths/correlations that are displayed. Non-significant paths/correlations remained in the model. The result shows that ToM at the prenatal time point predicts more positive engagement with a sibling and negative reactivity at the prenatal time point positively predicts sibling antagonism. Sibling antagonism or positive engagement at 8 months does not predict ToM at 12 months. Age, gender, verbal IQ, mothers' and fathers' education are included as covariates but not shown. χ^2 (100, $N = 208$) = 149.27, $p < .01$, CFI = .95, RMSEA = .05 (90% CI = .03 - .06).

$^*p < .05.$ $^{**}p < .01.$ $^{***}p < .001.$

Figure 2.2. Multi-group analysis with maternal directive parenting as a moderator, $\Delta \chi^2 (21) = 33.78$, $p < .05$. Paths/correlations that are at least marginally significant in one group are displayed. Non-significant paths/correlations remained in the model. Numbers before slashes indicate standardized coefficients for the low directive group, and numbers after slashes indicate standardized coefficients for the high directive group. *z* values indicate paths that differ between the two groups. Results show that sibling antagonism predicts poor ToM only among children whose mothers reported low levels of directive parenting. Sibling antagonism does not predict poor ToM when mothers reported high levels of directive parenting. The stability of sibling antagonism from 4 to 8 months is significantly stronger when mothers reported low levels of directive parenting. Age, gender, verbal IQ, mothers' and fathers' education are included as covariates but not shown. $\chi^2 (219) = 273.26$, $p < .01$, CFI = .94, RMSEA = .04 (90% CI = .02 - .05). $^\dagger p < .10$. $^* p < .05$. $^{**} p < .01$. $^{***} p < .001$
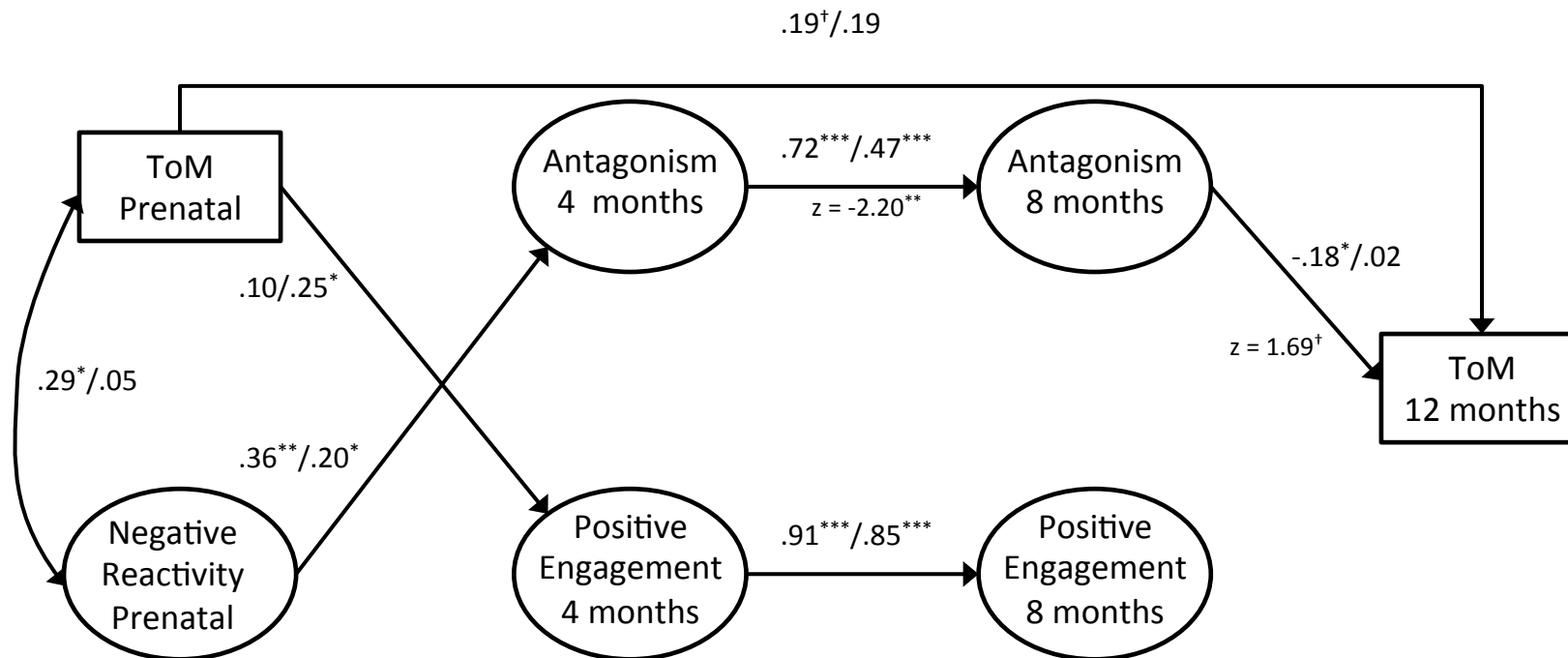
72
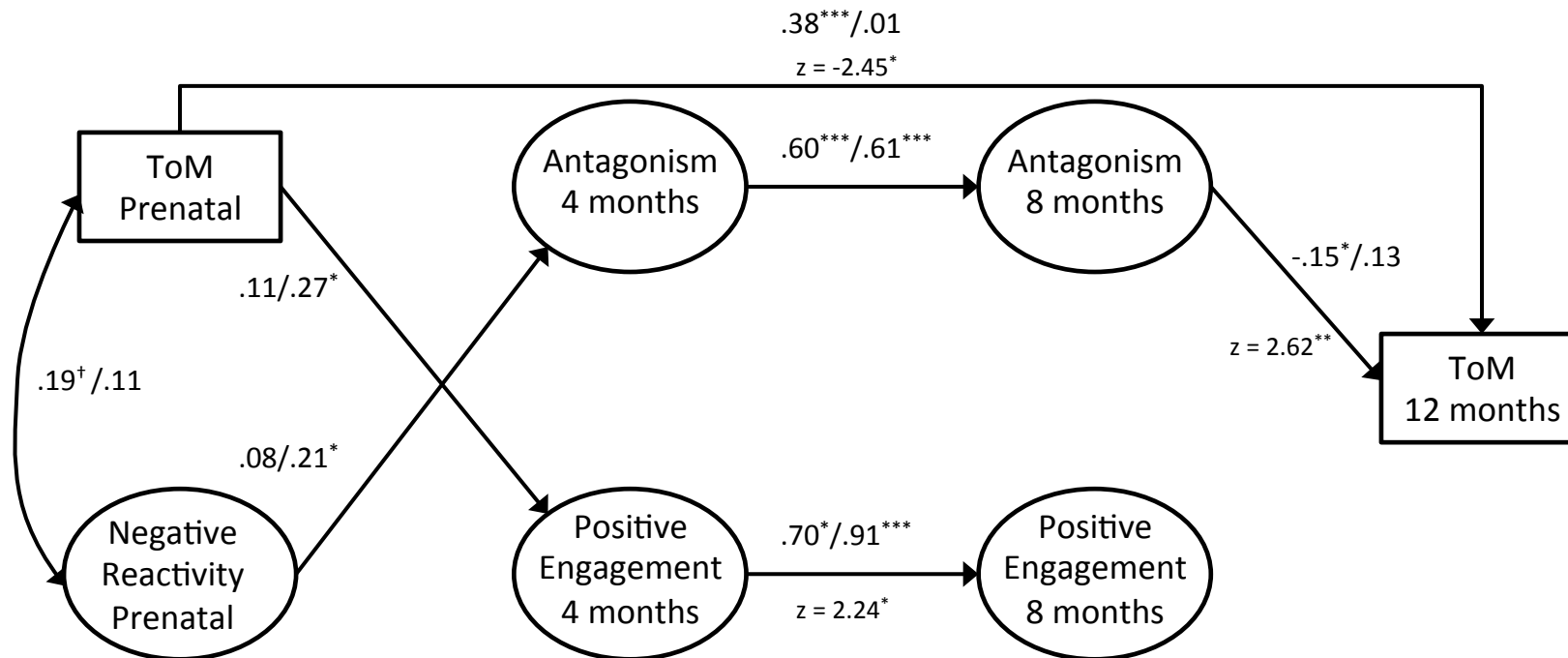
Figure 2.3. Multi-group analysis with paternal directive parenting as a moderator, $\Delta\chi^2 (21) = 32.07$, $p = .057$. Paths/correlations that are at least marginally significant in one group are displayed. Non-significant paths/correlations remained in the model. Numbers before slashes indicate standardized coefficients for low directive group, and numbers after slashes indicate standardized coefficients for high directive group. *z* values indicate paths that differ between the two groups. Results show that sibling antagonism predicts poor ToM only among children whose fathers reported low levels of directive parenting. Sibling antagonism does not predict poor ToM when fathers reported high levels of directive parenting. The stability of positive engagement from 4 to 8 months is significantly stronger when fathers reported high levels of directive parenting. Prenatal ToM positively predicted 12-month ToM only when fathers reported low levels of directive parenting. Age, gender, verbal IQ, mothers' and fathers' education are included as covariates but not shown. $\chi^2 (218) = 297.10$, $p < .01$, CFI = .93, RMSEA = .04 (90% CI = .03 - .06).
$^\dagger p < .10$. $^* p < .05$. $^{**} p < .01$. $^{***} p < .001$.

References

Adrián, J. E., Clemente, R. A., & Villanueva, L. (2007). Mothers' use of cognitive state verbs in picture-book reading and the development of children's understanding of mind: A longitudinal study. *Child Development, 78*, 1052-1067. doi:10.1111/j.1467-8624.2007.01052.x

Arbuckle J. L. (2013). *IBM SPSS Amos 22 User's Guide.*

Arnott, B., & Meins, E. (2007). Links among antenatal attachment representations, postnatal mind-mindedness, and infant attachment security: A preliminary study of mothers and fathers. *Bulletin of the Menninger Clinic*, *71*, 132-149. doi:10.1521/bumc.2007.71.2.132

Baydar, N., Greek, A., & Brooks-Gunn, J. (1997). A longitudinal study of the effects of the birth of a sibling during the first 6 years of life. *Journal of Marriage and the Family*, *59*, 939-956. doi:10.2307/353794

Belsky, J., Bakermans-Kranenburg, M. J., & van IJzendoorn, M. H. (2007). For better and for worse: Differential susceptibility to environmental influences. *Current Directions in Psychological Science*, *16*, 300-304. doi:10.1111/j.1467-8721.2007.00525.x

Brody, G. H., Stoneman, Z., & MacKinnon, C. E. (1986). Contributions of maternal child-rearing practices and play contexts to sibling interactions. *Journal of Applied Developmental Psychology*, *7*, 225-236. doi:10.1016/0193-3973(86)90031-6

Brody, G. H., Stoneman, Z., & McCoy, J. K. (1992). Associations of maternal and paternal direct and differential behavior with sibling relationships: Contemporaneous and longitudinal analyses. *Child Development*, *63*, 82-92. doi:10.2307/1130903

Campbell, S. B. (2006). Maladjustment in Preschool Children: A Developmental Psychopathology Perspective. In K. McCartney, D. Phillips (Eds.), *Blackwell handbook*

of early childhood development (pp. 358-377). Malden: Blackwell Publishing. doi:10.1002/9780470757703.ch18

Clarke-Stewart, K. A. (1978). And daddy makes three: The father's impact on mother and young child. *Child Development, 49,* 466-478. doi:10.2307/1128712

Cutting, A. L., & Dunn, J. (1999). Theory of mind, emotion understanding, language, and family background: Individual differences and interrelations. *Child Development*, *70*, 853-865. doi:10.1111/1467-8624.00061

Denham, S. A., Mitchell-Copeland, J., Strandberg, K., Auerbach, S., & Blair, K. (1997). Parental contributions to preschoolers' emotional competence: Direct and indirect effects. *Motivation and Emotion*, *21*, 65-86. doi:10.1023/A:1024426431247

Dunn, J. (1988). *The beginnings of social understanding*. Cambridge, MA, US: Harvard University Press.

Dunn, J. (2008). Relationships and children's discovery of the mind. In U. Müller, J. M. Carpendale, N. Budwig, B. W. Sokol (Eds.), *Social life and social knowledge: Toward a process account of development* (pp. 171-182). New York, NY: Taylor & Francis Group/Lawrence Erlbaum Associates.

Dunn, J., Brown, J., Slomkowski, C., Tesla, C., & Youngblade, L. (1991). Young children's understanding of other people's feelings and beliefs: Individual differences and their antecedents. *Child Development*, *62*, 1352-1366. doi:10.2307/1130811

Dunn, J. &. Kendrick, C. (1982). *Siblings: Love, envy and understanding*. Cambridge, MA: Harvard University Press.

Dunn, J., Kendrick, C., & MacNamee, R. (1981). The reaction of first-born children to the birth of a sibling: Mothers' reports. *Journal of Child Psychology and Psychiatry, 22*, 1-18. doi: 10.1111/j.1469-7610.1981.tb00527.x

Dunn, J., Slomkowski, C., & Beardsall, L. (1994). Sibling relationships from the preschool period through middle childhood and early adolescence. *Developmental Psychology*, *30*, 315-324. doi:10.1037/0012-1649.30.3.315

Eisenberg, N., Fabes, R. A., & Murphy, B. C. (1996). Parents' reactions to children's negative emotions: Relations to children's social competence and comforting behavior. *Child Development*, *67*, 2227-2247. doi:10.2307/1131620

Enders, C. K., & Bandalos, D. L. (2001). The relative performance of full information maximum likelihood estimation for missing data in structural equation models. *Structural Equation Modeling*, *8*, 430-457. doi:10.1207/S15328007SEM0803_5

Ensor, R., & Hughes, C. (2008). Content or connectedness? Mother-child talk and early social understanding. *Child Development*, *79*, 201-216. doi:10.1111/j.1467-8624.2007.01120.x

Fink, E., Begeer, S., Hunt, C., & de Rosnay, M. (2014). False-belief understanding and social preference over the first 2 years of school: A longitudinal study. *Child Development, 85*, 2389-2403. doi: 10.1111/cdev.12302.

Foote, R. C., & Holmes-Lonergan, H. A. (2003). Sibling conflict and theory of mind. *British Journal of Developmental Psychology*, *21*, 45-58. doi:10.1348/026151003321164618

Harris, P. L. (2006). Social cognition. In W. Damon, R. M. Lerner, D. Kuhn, & R. Siegler (Eds.), *Handbook of child psychology. Vol. 2: Cognition, perception, and language* (6th ed., pp. 811–858). New York, NY: Wiley.

Hughes, C. (2011). *Social understanding and social lives: From toddlerhood through to the transition to school*. New York, NY, US: Psychology Press.

Hughes, C., & Ensor, R. (2005). Executive function and theory of mind in 2 year olds: A family affair? *Developmental Neuropsychology*, *28*, 645-668. doi:10.1207/s15326942dn2802_5

Jenkins, J. M., & Astington, J. W. (1996). Cognitive factors and family structure associated with theory of mind development in young children. *Developmental Psychology*, *32*, 70-78. doi: 10.1037/0012-1649.32.1.70

Jenkins, J. M., Turrell, S. L., Kogushi, Y., Lollis, S., & Ross, H. S. (2003). A longitudinal investigation of the dynamics of mental state talk in families. *Child Development*, *74*, 905-920. doi:10.1111/1467-8624.00575

Kendrick, C., & Dunn, J. (1980). Caring for a second baby: Effects on interaction between mother and firstborn. *Developmental Psychology*, *16*, 303-311. doi: 10.1037/0012-1649.16.4.303

Kendrick, C., & Dunn, J. (1982). Protest or pleasure? The response of first-born children to interactions between their mothers and infant siblings. *Child Psychology & Psychiatry & Allied Disciplines*, *23*, 117-129. doi:10.1111/j.1469-7610.1982.tb00057.x

Kline, R. B. (2011). *Principles and practice of structural equation modeling (3rd ed.)*. New York, NY, US: Guilford Press.

Kramer, L., & Gottman, J. M. (1992). Becoming a sibling: 'With a little help from my friends.' *Developmental Psychology*, *28*, 685-699. doi:10.1037/0012-1649.28.4.685

Kramer, L., & Kowal, A. K. (2005). Sibling relationship quality from birth to adolescence: the enduring contributions of friends. *Journal of Family Psychology*, *19*, 503-511. doi:10.1037/0893-3200.19.4.503

Kreppner, K., Paulsen, S., & Schuetze, Y. (1982). Infant and family development: From triads to

    tetrads. *Human Development*, *25*, 373-391. doi:10.1159/000272821

LaBounty, J., Wellman, H. M., Olson, S., Lagattuta, K., & Liu, D. (2008). Mothers' and fathers'

    use of internal state talk with their young children. *Social Development*, *17*, 757-775.

    doi:10.1111/j.1467-9507.2007.00450.x

Lagattuta, K. H., & Wellman, H. M. (2002). Differences in early parent-child conversations

    about negative versus positive emotions: Implications for the development of

    psychological understanding. *Developmental Psychology, 38*, 564-580. doi:

    10.1037/0012-1649.38.4.564

Lane, J. D., Wellman, H. M., Olson, S. L., Miller, A. L., Wang, L., & Tardif, T. (2013).

    Relations between temperament and theory of mind development in the United States and

    China: Biological and behavioral correlates of preschoolers' false-belief

    understanding. *Developmental Psychology*, *49*, 825-836. doi:10.1037/a0028825

Laranjo, J., Bernier, A., Meins, E., & Carlson, S. M. (2014). The roles of maternal mind-

    mindedness and infant security of attachment in predicting preschoolers' understanding

    of visual perspective taking and false belief. *Journal of Experimental Child Psychology*,

    *125*48-62. doi:10.1016/j.jecp.2014.02.005

Lundy, B. L. (2013). Paternal and maternal mind-mindedness and preschoolers' theory of mind:

    The mediating role of interactional attunement. *Social Development*, *22*, 58-74.

    doi:10.1111/sode.12009

McAlister, A., & Peterson, C. (2007). A longitudinal study of child siblings and theory of mind

    development. *Cognitive Development*, *22*, 258-270. doi: 10.1016/j.cogdev.2006.10.009

McDonald, R. P., & Ho, M. R. (2002). Principles and practice in reporting structural equation

  analyses. *Psychological Methods*, *7*, 64-82. doi:10.1037/1082-989X.7.1.64

McElwain, N. L., Halberstadt, A. G., & Volling, B. L. (2007). Mother- and father-reported

  reactions to children's negative emotions: Relations to young children's emotional

  understanding and friendship quality. *Child Development*, *78*, 1407-1425.

  doi:10.1111/j.1467-8624.2007.01074.x

McElwain, N. L., & Volling, B. L. (2004). Attachment security and parental sensitivity during

  infancy: Associations with friendship quality and false-belief understanding at age

  4. *Journal of Social and Personal Relationships*, *21*, 639-667.

  doi:10.1177/0265407504045892

Meins, E., Fernyhough, C., Wainwright, R., Das Gupta, M., Fradley, E., & Tuckey, M. (2002).

  Maternal mind-mindedness and attachment security as predictors of theory of mind

  understanding. *Child Development, 73*, 1715-1726. doi: 10.1111/1467-8624.00501

Nelson, J. A., O'Brien, M., Blankson, A. N., Calkins, S. D., & Keane, S. P. (2009). Family stress

  and parental responses to children's negative emotions: Tests of the spillover, crossover,

  and compensatory hypotheses. *Journal of Family Psychology*, *23*, 671-679.

  doi:10.1037/a0015977

Peterson, C. C. (2000). Influence of siblings' perspectives on theory of mind. *Cognitive

  Development*, *15*, 435-455. doi:10.1016/S0885-2014(01)00040-5

Perner, J., Ruffman, T., & Leekam, S. R. (1994). Theory of mind is contagious: You catch it

  from your sibs. *Child Development, 65*, 1228-1238. doi: 10.2307/1131316

Perozynski, L., & Kramer, L. (1999). Parental beliefs about managing sibling conflict.

  Developmental Psychology, 35, 489-499. doi: 10.1037/0012-1649.35.2.489

Randell, A. C., & Peterson, C. C. (2009). Affective qualities of sibling disputes, mothers' conflict

    attitudes, and children's theory of mind development. *Social Development*, *18*, 857-874.

    doi:10.1111/j.1467-9507.2008.00513.x

Rothbart, M. K., Ahadi, S. A., & Hershey, K. L. (1994). Temperament and social

    behavior in childhood. *Merrill-Palmer Quarterly, 40*, 21-39.

Ruffman, T., Perner, J., Naito, M., Parkin, L., & Clements, W. A. (1998). Older (but not

    younger) siblings facilitate false belief understanding. *Developmental Psychology, 34*,

    161-174. doi: 10.1037/0012-1649.34.1.161

Slomkowski, C. L., & Dunn, J. (1992). Arguments and relationships within the family:

    Differences in young children's disputes with mother and sibling. *Developmental*

    Psychology, *28*, 919-924. doi:10.1037/0012-1649.28.5.919

Song, J. –H., & Volling, B. L. (2015). Coparenting and children's temperament predict

    firstborns' cooperation in the care of an infant sibling. *Journal of Family Psychology*, *29*,

    130-135. doi:10.1037/fam0000052

Stewart, R. J. (1990). *The second child: Family transition and adjustment*. Thousand Oaks, CA,

    US: Sage Publications, Inc.

Volling, B. L. (2012). Family transitions following the birth of a sibling: an empirical review of

    changes in the firstborn's adjustment. *Psychological Bulletin*, *138*, 497-528.

    doi:10.1037/a0026921Volling & Belsky, 1992

Volling, B. L., & Belsky, J. (1992). The contribution of mother-child and father-child

    relationships to the quality of sibling interaction: A longitudinal study. *Child*

    Development, *63*, 1209-1222. doi:10.2307/1131528

Volling, B. L., & Elins, J. (1998). Family relationships and children's emotional adjustment as correlates of maternal and paternal differential treatment: A replication with toddler and preschool siblings. *Child Development, 69*, 1640–1656. doi:10.1111/j.1467-8624.1998.tb06182.x

Wechsler, D. (2002). *Wechsler preschool and primary scale of intelligence, Third edition.* San Antonio, TX: The Psychological Corporation.

Wellman, H. M. (2014). *Making minds: How theory of mind develops*. New York, NY, US: Oxford University Press.

Wellman, H. M., Cross, D., & Watson, J. (2001). Meta-analysis of theory-of-mind development: The truth about false belief. *Child Development*, *72*, 655-684. doi:10.1111/1467-8624.00304

Wellman, H. M., Lane, J. D., LaBounty, J., & Olson, S. L. (2011). Observant, nonaggressive temperament predicts theory-of-mind development. *Developmental Science*, *14*, 319-326.

Wellman, H. M., & Liu, D. (2004). Scaling of theory-of-mind tasks. *Child Development, 75,* 523–541. doi:10.1111/j.1467-8624.2004.00691.x

CHAPTER 4 (Study 3)

Early Callous-Unemotional Behavior, Theory-of-mind, and Anxious Temperament

Predict Externalizing Problems in Middle Childhood

Across the preschool years, children show dramatic increases in their ability to regulate behavior (Shonkoff & Phillips, 2000), internalize social norms (Kochanska & Aksan, 2006), and develop an awareness of others' desires, beliefs, and emotions (Wellman, 2014). By the end of the preschool period, these core developmental milestones help to reduce the normative high levels of aggressive behaviors that are typically shown by children from ages 2 to 4 years old (Tremblay, 2000; Hay, Payne, & Chadwick, 2004). However, some children show persisting behavior problems and do not reduce their aggressive behaviors across the transition from the preschool period to the middle- and late-childhood period (NICHD Early Child Care Research Network, 2004). These children have been shown to have a wide range of adjustment problems in both social and academic domains across the school-age years (Caspi & Moffitt, 1995; Dodge, Greenberg, & Malone, 2008; Morrow, Hubbard, McAuliffe, Rubin, & Dearing, 2006). Thus, research has focused on identifying specific developmental and child-level characteristics that predict persisting forms of aggressive and externalizing behavior problems into the early school period (Shaw, Gilliom, Ingoldsby, & Nagin, 2003) in order to more effectively target children at highest risk of poor outcomes via intervention or treatment (i.e., those who are less likely to desist from normatively high initial levels of aggression).

Callous-Unemotional (CU) Behavior

One approach that has been adopted in recent years to identify those children at highest risk of persisting behavior problems has focused on the presence or absence of callous unemotional (CU) behavior (see Frick, Ray, Thornton, & Kahn, 2014 for a review). Children with high levels of CU behavior tend to prefer dangerous and novel activities (Frick, Cornell, Bodin, Dane, Barry, & Loney, 2003), exhibit hyporesponsivity to affective cues (Blair, 1999; Kimonis et al., 2006), and low levels of empathy and guilt (Frick & White, 2008). These characteristics appear to increase the risk of children developing particularly severe and chronic behavior problems over time (Frick et al., 2014). A growing body of studies suggests that childhood CU behavior adds predictive utility in forecasting the severity of later behavior problems, particularly in the late childhood and adolescence period, over and above stability in behavior problems in general (Frick et al., 2003). Moreover, these findings have been replicated across different types of samples (e.g., community, clinical, forensic), and different demographic backgrounds (e.g., age, gender, and culture; Frick et al., 2014).

Preschool CU Behavior and Later Behavior Problems

More recently, studies have begun to examine CU behavior in preschool samples, as increasing evidence demonstrates that CU behavior can be reliably measured as early as at age 3 (Hyde, Shaw, Gardner, Cheong, Dishion, & Wilson, 2013; Kimonis et al., 2006; Willoughby, Waschbusch, Moore, & Propper, 2011). Consistent with research findings with older children and adolescents, CU behavior in the preschool years is also associated with severe and persisting behavior problems across childhood. For example, Willoughby, Mills-Koonce, Gottfredson, and Wagner (2014) found that high CU behavior at age 3 uniquely predicted high and stable teacher-rated aggression from ages 6 to 12. In the current sample, Waller, Hyde, Grabell, Alves, and Olson (2014) showed that higher CU behavior (mother-reported) at age 3 predicted teacher-

reported externalizing problems concurrently and longitudinally at age 6 while controlling for earlier ADHD and oppositional behaviors. Taken together, these studies highlight that early CU behavior may represent an important way to identify young children at high risk of severe and persisting behavior problems across childhood (Hyde et al., 2013; Waller et al., 2014).

While there appears to be a link between early CU behavior and severe behavior problems, however, questions continue to surround the underlying mechanisms by which CU behavior affects externalizing outcomes. Broadly, theory and some empirical evidence suggest that disruptions in *affective development* may play a role in the development of severe antisocial problems in high-CU children (Frick & Viding, 2009). The theoretical premise is that insensitivity to emotional cues in others (e.g., upset parent signaling punishment, crying peer signaling distress) and a fearless or bold temperament may interfere with the development of empathy and guilt (Fowles & Kochanska, 2000). Jointly, both *affective* and *cognitive* mechanisms could increase the risk for severe behavior problems when combined with high levels of CU behavior. In particular, when children are poorly attuned to others and experience fearless and low shy temperaments on top of their high CU characteristics, they may be more likely to show reduced conscience (Dadds & Salmon, 2003) and higher aggressive behavior (Blair, 1995) across development. Despite the growing number of studies that have examined CU behavior among preschoolers, few studies have examined the interaction of CU behavior with other cognitive or temperamental characteristics that also predict persisting behavior problems. The current study thus examined whether links between CU behavior and later behavior problems were moderated by children's cognitive capabilities related to recognizing or 'knowing' others' perspective, as indexed by Theory-of-Mind (ToM) and their propensity towards affective distress or 'feeling', as indexed by anxious temperament.

Theory-of-Mind (ToM)

During the preschool period, children show a dramatic development in ToM, defined as the ability to understand that others can have desires, beliefs, and emotions that are different from your own, and that mental states influence behavior (Wellman, 2014). Although most children show ToM understanding via successful performance on false-belief tasks by the end of preschool years, there are individual differences in the rate of development of ToM (Wellman, Harris, Banerjee, & Sinclair, 1995; Wellman, Cross, & Watson, 2001). Evidence from longitudinal research suggests that the consequences of a slower rate of ToM development in real-world social behavior endure long after children have developed ToM (Astington, 2001). For example, a number of studies have demonstrated that delays in ToM are related to higher externalizing behavior during childhood (e.g., Hughes, Dunn, & White, 1998; Hughes & Ensor, 2006; Lemerise & Arsenio, 2000). This may be because poor ToM contributes to biases and difficulties in interpreting social cues, which can result in reactive and aggressive behaviors toward others (Dodge & Coie, 1987). For example, in the current sample, Choe, Lane, Grabell, and Olson (2013) found that preschoolers who had low levels of ToM showed more hostile attribution biases at age 6.

Whereas these studies reported that low ToM is related to more behavior problems, this finding has not been consistently replicated across all studies. For instance, no significant link between ToM and aggression was reported in both a cross-sectional (e.g., Hughes, White, Sharpen, & Dunn, 2000), and a longitudinal study (Olson, Lopez-Duran, Lunkenheimer, Chang, & Sameroff, 2011). This inconsistency across findings of previous studies suggests that preschool-aged low levels of ToM alone may not be sufficient to explain increased risk for more behavior problems (Hughes, 2011). In fact, Wellman (2014) argued that competence in ToM

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understanding does not always translate into competence in social behaviors (e.g., prosocial behavior), and in the same vein, Astington (2003) wrote ToM is 'sometimes necessary but never sufficient' to guide children's social interactions' (p.13). In other words, low ToM may not independently contribute to later behavior problems, but could operate to increase risk for later externalizing *in conjunction with other child-level characteristics*.

However, while high levels of CU behavior may be particularly problematic for children with a slower rate of ToM development, no studies exist that have examined the interacting effects of CU behavior and ToM in the preschool years in the prediction of later behavior problems. In the current study, we were particularly interested in the question of how individual differences in ToM contributed to the developmental pathways of children with high CU behavior. As outlined, children with low levels of ToM are thought to be at increased risk for behavior problems due to difficulties in understanding others' intention and poor cognitive empathy (Hughes, 2011). At the same time, children with high CU behavior are thought to be at risk for behavior problems because of deficits in affective empathy (Waller, Hyde, Grabell, Alves, & Olson, 2014), which seems to underlie difficulties associating their harmful actions toward others with emotions of distress in others (Blair, 1995). Together, it is plausible that children who have 'dual risk'—lower ToM *and* higher CU behavior—could show worse externalizing outcomes when compared to children who have high levels of ToM or low levels of CU behavior. It is noteworthy that previous studies that have examined CU behavior and ToM (i.e., cognitive empathy) have typically assessed older samples of children or adolescents and have focused on how these CU behavior and ToM are *related* to each other (Dadds et al., 2009; Jones, Happé, Gilbert, Burnett, & Viding, 2010; Pasalich, Dadds, & Hawes, 2014). In the current sample, Waller and colleagues (2014) previously reported mother-reported CU behavior was

negatively correlated with ToM concurrently at age 3, although this association became non-significant when overlap between ADHD, oppositional, and CU behavior was accounted for. However, we are yet to test whether CU behavior and ToM *interact* with one another to predict worse outcomes across childhood.

Anxious Temperament

A second child characteristic that is thought to be important to the development of behavior problems, particularly CU behavior, is a low anxious temperament. A large body of literature suggests that 'optimal' levels of fear and shyness (i.e., an 'optimal' normative level of temperamental anxiety) are conducive to the development of conscience (Kochanska, Gross, Lin, & Nichols, 2002) and the inhibition of aggression (Frick & Viding, 2009) due to the discomfort felt after wrongdoing and the modulatory effect of anxiety on disinhibition associated with externalizing behavior. Thus, normative levels of arousal and anxiety inhibit future aggressive or rule-breaking behavior (Lahey & Waldman, 2003; Patrick, Fowles, & Krueger, 2009). Importantly, CU behavior has been linked to *low anxiety* in studies assessing the late-childhood period (e.g., Pardini, Lochman, & Powell, 2007; Waller, Wright, et al., 2015) although other studies have reported that high levels of CU behavior are related to *higher* levels of internalizing problems of anxiety (e.g., Berg et al., 2013; Essau, Sasagawa, & Frick, 2006). To address this heterogeneity, Kimonis and colleagues have proposed differentiating between primary versus secondary variants within children who show high CU behavior (see Kimonis, Frick, Cauffman, Goldweber, & Skeem, 2012; Kimonis, Skeem, Cauffman, & Dmitrieva, 2011). In particular, the primary CU behavior variant is theorized to be defined by low levels of anxiety whereas the secondary variant is associated with high levels of anxiety. Importantly, both variants are theorized to show comparable levels of disruptive behavior problems but via different emotional

mechanisms (Kimonis et al., 2012). Despite work examining associations between CU behavior and anxiety, and the person-centered approach of describing primary versus secondary variants, very few studies have examined main and interactive effects of CU behavior and anxiety in the prediction of externalizing behavior problems. In particular, it is yet to be established the extent to which high levels of CU behavior versus low levels of anxiety in early childhood are related to more behavior problems later on, or again whether there is some effect of 'dual risk' whereby low levels of anxiety combined with high levels of CU behavior may be particularly problematic leading to increasing behavior problems across childhood.

Gaps in the Literature

Several gaps thus emerge in this emerging literature that has, to date, linked early childhood CU behavior to greater risk for persisting and chronic behavior problems across childhood. First, studies are needed that examine long-term developmental consequences of early CU behavior across even longer-follow-up periods. In the current sample, Waller and colleagues (2014) have previously reported that CU behavior at age 3 predicted externalizing problems at the transition to school at age 6. Yet, we are yet to establish whether CU behavior at age 3 continues to predict problem behaviors at the end of elementary school at age 10. Given that important developmental changes occur during middle childhood (ages 5 to 10), which likely have long-term implications for persisting behavior problems across adolescence and into adulthood (Feinstein & Bynner, 2006), an examination of whether early childhood CU behavior predicts externalizing problems at both ages 6 and 10 is needed to isolate any development specificity in the extent of any prediction. Second, poor ToM and high CU behavior in the early preschool period have yet to be considered together in terms of how they individually influence or interact to predict the development of more behavior problems in late childhood. In particular,

it is not known whether cognitive components of empathy (e.g., ToM) could buffer or exacerbate the development of more severe behavior problems in relation to key deficits in affective empathy (e.g., high CU behavior). Finally, no studies have examined whether early childhood anxious temperament interacts with CU behavior, which may shed light on different emotional processes involved in the development of behavior problems.

Current Study

The overarching goal of this study was to examine the unique contributions of early CU behavior, ToM, and anxious temperament at age 3 to school-aged teacher-reported externalizing problems assessed at ages 6 and 10, over and above the effects of earlier externalizing problems and relevant covariates. We hypothesized that higher CU behavior, lower ToM, and lower anxious temperament at age 3 would each uniquely predict more externalizing behavior problems in middle (age 6) and late (age 10) childhood. Our second goal was to explore interactions between early childhood CU behavior, ToM, and anxious temperament. We hypothesized that high levels of CU behavior and low levels of ToM, as well as high levels of CU behavior and low levels of anxious temperament, would interact to predict more behavior problems at age 6 and 10.

<center>**Method**</center>

Participants

Participants were 241 children (118 girls) who were part of a longitudinal study of young children at risk for school-aged conduct problems (Olson, Sameroff, Kerr, Lopez, & Wellman, 2005). Families were recruited through preschools, advertisements in newspapers, and pediatrician referrals. Once parents indicated interest in participating in the study, a screening questionnaire and a short telephone interview were conducted to explain the longitudinal study

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procedure and to determine the eligibility of the family. Children with serious health problems, mental retardation, and pervasive developmental disorders were excluded. Participating children represented the full range of externalizing problems severity on the Child Behavior Checklist for ages 2-3 (CBCL 2/3; Achenbach, 1992), and children who were in the upper range of the externalizing problem subscale of the CBCL were oversampled for the purpose of the project.

The study consisted of three time points: children were around 3 years old at T1 ($M = 41.40$, $SD = 2.09$ months), 6 years old at T2 ($M = 68.90$, $SD = 3.85$ months), and 10 years old at T3 ($M = 125.52$, $SD = 7.20$ months). Families consisted of primarily those self-identifying as European American (85%), as well as 5% self-identifying as African American, and 8% biracial. The majority of mothers (81%) and fathers (76%) had completed 4 years of college and above (e.g., graduate or professional training) and the rest (19% of mothers and 24% of fathers) had achieved high school education. The median family income was $52,000 with the range of $20,000-$100,000. Most mothers were married (89%), 5% were single, 3% lived with a partner, and 3% were divorced.

At T1, mothers and a subsample of fathers (66%) answered questionnaires about demographic information and child behavior during a home interview. To test whether participants for whom paternal data were available differed from the participants with mother participation only, a multivariate analysis of variance (MANOVA) was conducted to compare major study variables across the two groups. There were no significant differences between the two subsamples (Kerr, Lopez, Olson, & Sameroff, 2004). Among the total sample, 91% of families continued to participate in the study at T3. Families who left the study did not differ on socio-demographic characteristics except that they reported a lower average annual household income than families who remained in the study, $t(20) = 2.09$, $p < .05$. Household income was

thus included as a covariate in all analyses. Missing data was handled using multiple imputation (Little & Rubin, 2002) in SPSS vs. 22, which creates five imputed data sets. Simulation studies have shown that multiple imputation results in unbiased estimates while preserving sample size and statistical power (Asendorpf, van de Schoot, Denissen, & Hutteman, 2014; covariance coverage: mother-reported data = .97-.98; father-reported data = .62-.65; teacher-reported data = .78-.80; observed data = .93).

Procedures

At T1, children were observed and interviewed during a 4-hour Saturday laboratory session at a local preschool while completing a series of cognitive and self-regulatory tasks (Kerr et al., 2004). Families were compensated $100 for each time point that they participated in. Additionally, children's teachers were asked to provide ratings of child externalizing behavior at school at all three time points. Approximately 80% of teachers at T1, 83% of teachers at T2, and 83% of teachers at T3 completed questionnaires. Teachers were given gift certificates for participating.

Measures

CU behavior (parent-report). Mothers and fathers completed the Child Behavior Checklist for ages 2-3 (CBCL/2-3, Achenbach, 1992) at T1. The CBCL is a 99-item measure, which is widely used to assess children's behavioral and emotional problems. Items describe behavior of children over the prior two months, using a 3-point scale ('0' = not true; '1' = somewhat or sometimes true; '2' = very true or often true of the child). The CU behavior score measure comprised 5 items (e.g., shows lack of guilt after misbehavior, seems unresponsive to affection), previously validated in this sample and shown to factor separately from other dimensions (i.e., opposition and ADHD symptoms) within the broadband externalizing domain

(see Waller et al., 2014 for factor analytic modeling). The reliabilities of the CU behavior

subscale for mother-report (α = .59) and father-report (α = .55) were low, but consistent with

previously reported alphas by other studies using the same five CU behavior items (α = .65,

Willoughby et al., 2011; α = .55, Willoughby et al., 2014) and using a five-item deceitful-callous

scale with two overlapping items (α = .64, Hyde et al., 2013). Mother and father reports of CU

behavior showed moderate convergence (r = .35, p < .01) and thus their reports were averaged to

utilize multiple informants (α = .66).

Theory-of-Mind. Children's ToM understanding was assessed with the False Belief

Prediction and Explanation Tasks-Revised (Bartsch & Wellman, 1989). Children were shown

four vignettes where the location of a desired object was switched while the story protagonist

was unaware. Experimenters then asked children to predict and explain choices of the

protagonists about locations of objects. For each vignette, children answered where the

protagonist would look for the object (prediction task) and why the protagonist searched in the

wrong place (explanation task). A ToM composite score was computed by summing the number

of correct responses, for a maximum score of 8. Based on random sample of 15 cases, the

reliability of scoring was .97.

Anxious temperament. Mothers and a subsample of fathers completed an abbreviated

195-item version of Child Behavior Questionnaire (CBQ; Ahadi, Rothbart, & Ye, 1993) to report

child's temperament using a 7-point scale (ranging from '1' = extremely untrue, to '7' =

extremely true). We created an anxious temperament scale by combining items from the

'Shyness' (13 items; αs = .92-.93; e.g., 'Gets embarrassed when strangers pay a lot of attention to

her/him') and 'Fearfulness' subscales of the CBQ (13 items; αs = .73; e.g., 'is afraid of loud

noises'). As with the CU behavior scale, mother and father reports had a moderately high level of convergence ($r = .57$, $p < .01$) and thus were averaged.

Child behavior problems (teacher-report). At T1, preschool teachers completed the Caregiver-Teacher Report Form for ages 1.5-5 (CTRF; Achenbach, 1997). To control for auto-regressive effects in the current analysis, the broadband externalizing problems scale (40 items; α = .96) was used, which consists of the attention problems and aggressive behavior subscales. At T2 and T3, teachers completed the Teacher Report Form for ages 6-18 (TRF/6-18, Achenbach & Rescorla, 2001; Achenbach, Dumenci, & Rescorla, 2002). The broadband externalizing problem scale, which includes the rule-breaking behavior and aggressive behavior subscales (32 items; $M_\alpha = .94$) at T2 and T3 were tested as separate outcome variables in the current study.

Covariates. At T1, information on child gender, age, and family income was collected via parent interview, and children's verbal IQ was assessed with the Vocabulary subtest of Wechsler's Preschool and Primary Scale of Intelligence-Revised (Wechsler, 1989). We included these covariates to control for potential effects of these variables on externalizing behavior problems, as well as well-established links between ToM and verbal IQ and between age and ToM.

<div align="center">

Results

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First, in preliminary analyses, we explored descriptive statistics and zero-order correlations among all study variables (Table 1). Higher levels of CU behavior were associated with more externalizing behavior problems at all three time points. In contrast, lower ToM was associated with more externalizing problems only concurrently at age 3. Anxious temperament was unrelated to other study variables. We found moderate correlations between teacher reports

of externalizing behavior problems from age 3, 6, to 10, suggesting some stability of externalizing behavior problems across childhood despite the changing informant.

Second, using hierarchical multiple regression analyses, we examined whether age 3 CU behavior, ToM, or anxious temperament *uniquely* contributed to later child externalizing problems at age 6 or 10, controlling for the contributions of child age, gender, verbal IQ, family income, as well as externalizing problems at age 3. We also explored the potential moderating effects of ToM and anxious temperament on the associations between CU behavior and later externalizing behavior problems. We created interaction terms between CU behavior and ToM and between CU behavior and anxious temperament after centering all variables. We examined separate regression models for anxious temperament versus ToM interactions due to concerns about multi-collinearity by including both interactions simultaneously (Table 2). For each regression model, demographic variables (i.e., child age, gender, verbal IQ, family income) and teacher-reported externalizing problems at age 3 were entered as covariates in Step 1. Next, CU behavior and the potential moderator (i.e., ToM or anxious temperament) were entered in Step 2. Finally, a two-way interaction between CU behavior and the moderator was entered in Step 3.

Table 2 presents a summary of the multiple regression models. CU behavior significantly predicted increases in externalizing problems from age 3 to 6, and from age 3 to 10, controlling for age 3 externalizing behavior problems and over and above the effects of anxious temperament and ToM, as well as demographic covariates. Both ToM and anxious temperament moderated links between CU behavior and externalizing behavior problems. The interaction between CU behavior and ToM at age 3 significantly predicted externalizing problems at both age 6 and 10. In addition, the interaction between CU behavior and anxious temperament showed a trend-level effect ($p = .08$) in the prediction of externalizing problems at age 6.

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To explore these significant interactions, we followed the recommendations of Aiken and West (1991) for testing and plotting simple slopes at 1 *SD* below (low) and 1 *SD* above (high) the mean of the moderating variable. We also examined *regions of significance* to provide values of the moderators for which simple slopes were statistically significant (Preacher, Curran, & Bauer, 2006). In the interaction between CU behavior and ToM, we found that there was a significant effect of age 3 CU behavior on more externalizing behavior at age 6 when children had low levels of ToM ($b = 12.75$ (2.42), $t = 5.27$, $p < .01$), but not when they had high levels of ToM, ($b = 3.93$ (2.91), $t = 1.35$, *ns* (Figure 1). The regions of significance indicated that the slope of age 6 externalizing problems regressed on CU behavior was significantly different from zero for *scores of ToM below 4* (maximum of 8), which included 80% of the sample. Similarly, age 3 CU behavior significantly predicted higher externalizing problems at age 10 only when children showed low levels of ToM, $b = 9.60$ (1.86), $t = 5.15$, $p < .01$, but not when they showed high levels of ToM, $b = 1.90$ (2.24), $t = 0.85$, *ns* (Figure 2). The region of significance showed that the slope was significant for *scores of ToM below 3*, which included 72% of the sample. Finally, the trend level interaction between CU behavior and anxious temperament revealed that high CU behavior at age 3 predicted more externalizing problems at age 6 more strongly when children displayed *low levels of anxious temperament*, $b = 13.04$ (2.52), $t = 5.18$, $p < .001$, compared to high levels of anxious temperament, $b = 6.46$ (2.26), $t = 2.86$, $p < .01$. The region of significance analysis indicated that the slope was significant for values of anxious temperament below 9.24 (maximum of 11.72), which included most of the sample (90%), and non-significant only for the top 10%.

Discussion

The current study provides further evidence to support a robust association between early childhood CU behavior and externalizing behavior problems in both middle and late childhood, over and above stability in behavior problems, and across informants and settings. Moreover, the current study demonstrated that the link between CU behavior and externalizing behavior problems appears to be moderated by other, key child-level characteristics. Specifically, we found that high levels of CU behavior predicted increased externalizing problems when children had low levels of ToM, but not when they had high ToM. The trend-level interaction between anxious temperament and CU behavior also provides preliminary evidence to suggest that high levels of CU behavior may predict externalizing problems more strongly when children have lower temperamental anxiety. We discuss each of these findings in relation to our main hypotheses and outline implications for identifying heterogeneous pathways to school-aged problems.

First in line with our hypothesis, higher levels of parent-reported CU behavior at age 3 predicted more teacher-reported externalizing behavior problems at ages 6 and 10, even controlling for externalizing problems at age 3, and accounting for the effects of ToM and anxious temperament. This finding is consistent with other studies that have demonstrated the unique contribution of early preschool-age CU behavior to more externalizing behavior problems in later childhood (e.g., Kimonis et al., 2006; Willoughby et al., 2014) and an earlier study in the current sample (Waller et al., 2014). These findings highlight the importance of examining early childhood CU behavior as a unique risk factor for particularly severe and persisting externalizing behavior problems throughout the childhood, which potentially could be used for targeting preschoolers who require early preventive support (e.g., Dadds, Cauchi, Wimalaweera, Hawes, & Brennan, 2012; Waller, Gardner, & Hyde, 2013).

Second, consistent with some previous studies (Hughes et al., 2000; Olson et al., 2011), we found that low levels of ToM were not uniquely related to higher externalizing behavior problems. However, the interaction between CU behavior and ToM did predict more externalizing problems. We corroborated this interaction effect when externalizing behavior problems were assessed at age 6 and again at age 10 (i.e., by different teachers at different ages). This robust finding across the elementary years supports the notion that low ToM alone may not be sufficient for explaining increased risk for problem behaviors, but could have enduring social consequences for children in the context of other behavioral or emotional risk factors (i.e., CU behavior). Thus, particularly when young children with high CU behavior, more developed cognitive empathy (i.e., high levels of ToM) may *alleviate* risk for developing increasing aggressive or rule-breaking behaviors. Interventions that target cognitive empathy and perspective-taking may therefore help to reduce the likelihood that children with high CU behavior will go on to exhibit persisting behavior problems. For example, within intervention efforts, one way to foster children's cognitive empathy might be guiding parents to use more inductive reasoning (i.e., using child-centered explanation of the consequences of certain behavior on others) or develop their mind-mindedness (i.e., thinking about and talking to the child in psychological terms), that are reported to be conducive to children's early ToM development (Hughes, 2011; Ruffman, Slade, & Crowe, 2002).

Second, providing some support for our hypothesis, while we did not find that anxious temperament independently predicted later externalizing problems, the interaction between anxious temperament and CU behavior showed trend-level prediction of outcomes at age 6, but not age 10. Therefore, our results are somewhat consistent with a previous study in a high-risk preschool sample, which found no significant interaction between CU behavior and behavioral

inhibition predicting aggressive behaviors 6 months later (Kimonis et al., 2006). Nevertheless, our study adds to the literature with the suggestion that low anxiety may interact with high CU behavior to predict more externalizing behavior problems in middle-childhood. Similar to ToM, low levels of anxious temperament could predict increasing externalizing problems only in the presence of other temperamental characteristics, such as CU behavior. In particular, the finding of a combination of a low anxious temperament and high CU behavior leading to higher levels of externalizing problems shows some parallels with the triarchic theory of psychopathy, which proposes that interactions among three core phenotypic components of psychopathy— disinhibition, boldness, and meanness—yield various manifestations of psychopathic traits and antisociality (Patrick et al., 2009). However, as the interaction term we reported was only trend-level, and given the very young age of our sample, we emphasize the speculative nature of this interpretation, with a clear need for studies to investigate the developmental origins of the triarchic psychopathy phenotypes.

Strengths and Limitations

The current study had several strengths including the multiple-informant methods, observational assessment of ToM, and the prospective longitudinal design utilizing three time points across seven years. Use of observational assessments and mother-, father-, and teacher-reported measures helps to reduce the potential issue of shared method variance. Also, the current study focused on the predictive effects of child characteristics during the early preschool years for behavior problems across childhood, which has implications for early prevention and intervention. The results from our community-based sample including both boys and girls could also contribute to the relatively little research on CU behavior and behavior problems in non-clinically referred, non-forensic samples. At the same time, however, because the participating

families were mostly middle-class white with intact family structure, the generalizability of the findings may be limited to those experiencing more risk. Also, the five-item CU behavior using items drawn from the CBCL can be considered a 'home-grown' measure that was not originally developed to assess the CU behavior construct. Its predictive and construct validity, however, has been supported in a previous study in the current sample (Waller et al., 2014).

Conclusions and Implications

The current study suggested that CU behavior in very early childhood is an important risk factor for behavior problems in both middle and late childhood. We demonstrated that examining other child characteristics could further increase the precision in identifying different developmental pathways to later behavior problems among children with high levels of CU behavior. In particular, children's cognitive empathy (i.e., ToM) and, to a lesser extent, their anxious temperament during the preschool period appear to play important moderating roles in the link between early CU behavior and later behavior problems. When high levels of CU behavior was combined with low levels of ToM or anxious temperament, it was associated with worse externalizing behavior outcomes later on, whereas higher levels of ToM appeared to reduce the risk that high CU behavior would predict worse outcomes. These findings add to calls for increasingly personalized preventive intervention according to specific child characteristics (see Hyde, Waller, & Burt, 2014; Waller et al., 2013).

Table 3.1.

Descriptive Statistics and Correlations between Study Variables

	1	2	3	4	5	6
1. Callous-Unemotional (P, T1)	-					
2. Theory-of-Mind (O, T1)	-.11	-				
3. Anxious temperament (P, T1)	.10	.02	-			
4. Externalizing (T, T1)	.22**	-.25**	-.10	-		
5. Externalizing (T, T2)	.38***	-.11	-.08	.48***	-	
6. Externalizing (T, T3)	.36***	-.09	-.01	.47***	.61***	-
M	.29	1.59	7.17	10.01	4.39	3.39
SD	.27	2.14	1.53	12.42	8.10	6.12

Note. P = parent-reported; O = observed; T = teacher-reported
T1 = time 1 (age 3); T2 = time 2 (age 6); T3 = time 3 (age 10)
$^{**}p < .01$, $^{***}p < .001$.

Table 3.2.

Parent-reported Callous-Unemotional Behavior, Theory-of-Mind, and Anxious Temperament at Age 3 Predicting Teacher-reported Externalizing at Ages 6 (T2) and 10 (T3)

	EXT (T2)			EXT (T3)		
	ΔR^2	B(SE)	β	ΔR^2	B(SE)	β
Step 1: Covariates	.27***			.27***		
EXT		.28(.05)	.43***		.22(.03)	.45***
Age		-.25(.27)	-.06		-.24(.22)	-.08
Gender		-1.16(1.12)	-.07		-1.70(.89)	-.13†
Income		-.49(.20)	-.17*		-.14(.16)	-.07
Vocab		.11(.16)	.04		.22(.13)	.11
Step 2: Main effects	.09***			.07***		
CU		9.40(1.93)	.30***		6.33(1.56)	.27***
ToM		.13(.23)	.03		.14(.19)	.05
AXT		-.52(.34)	-.09		.05(.25)	.01
Step 3: Interaction effects						
CU x ToM	.01*	-2.10(1.03)	-.13*	.02*	-1.83(.89)	-.14*
CU x AXT	.01*	-2.16(1.26)	-.11†	.002	-.22(1.15)	-.01

Note. CU = parent-reported callous-unemotional; AXT = parent-reported anxious temperament; ToM = Observed Theory-of-Mind; EXT = teacher-reported externalizing. T2 = time 2 (age 6); T3 = time 3 (age 10). Regression coefficients and ΔR^2 for main effects are when three predictors are entered simultaneously. Regression coefficients and ΔR^2 for interaction effects are from two separate regression analyses testing independent moderating effects of ToM and AXT while controlling for their separate main effects. †$p < .10$, *$p < .05$, **$p < .01$. ***$p < .0$
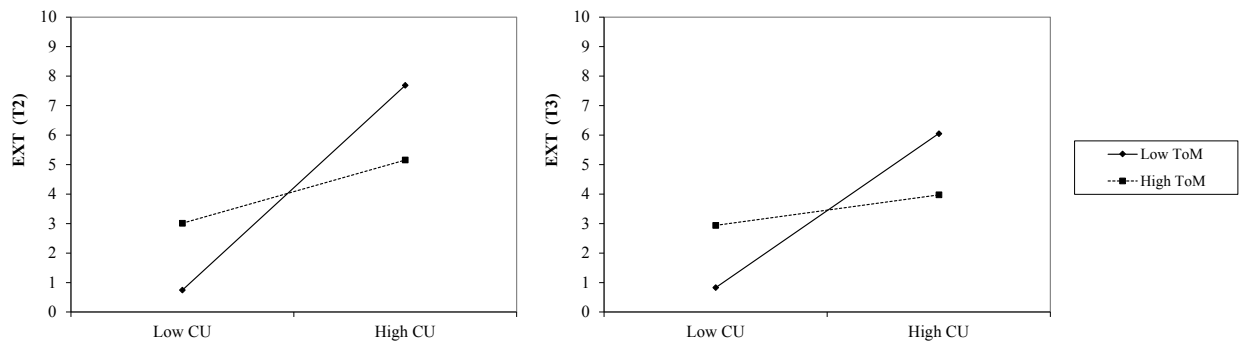
Figure 3.1. Theory-of-Mind moderates the association between parent-reported callous-unemotional behavior at age 3 (T1) and teacher-reported externalizing problems at ages 6 (T2) and 10 (T3). For T2, the slope for low ToM is significantly different from zero, $b = 12.75$ (2.42), $t = 5.27$, $p < .01$, but not for high ToM, $b = 3.93$ (2.91), $t = 1.35$, ns. For T3, the slope for low ToM is significantly different from zero, $b = 9.60$ (1.86), $t = 5.15$, $p < .01$, but not for high ToM, $b = 1.90$ (2.24), $t = 0.85$, ns.

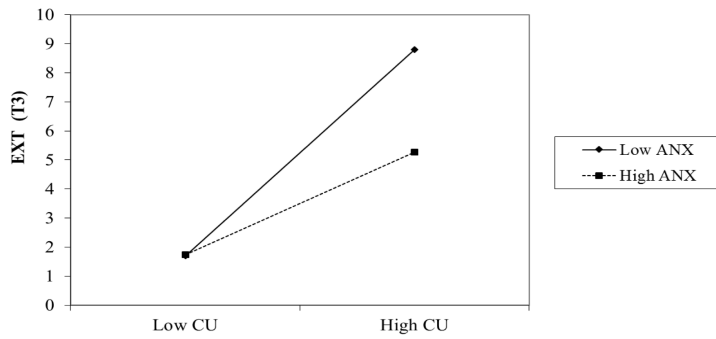*Figure 3.2.* Anxious temperament moderates the association between parent-reported callous-unemotional behavior at age 3 (T1) and teacher-reported externalizing problems at age 6 (T2) (trend-level, $p = .08$). Both slopes are significantly different from zero: for low anxious temperament, $b = 13.04$ (2.52), $t = 5.18$, $p < .001$ and for high anxious temperament, $b = 6.46$ (2.26), $t = 2.86$, $p < .01$.

References

Achenbach, T. M. (1992). *Manual for the child behavior checklist/2–3 and 1992 profile.*

    Burlington, VT: University of Vermont, Department of Psychiatry.

Achenbach, T. M. (1997). *Teacher/caregiver report form for ages 2–5.* Burlington, VT:

    University of Vermont, Department of Psychiatry.

Achenbach, T. M., Dumenci, L., & Rescorla, L. A. (2002). Ten-year comparisons of problems

    and competencies for national samples of youth: Self, parent and teacher reports. *Journal*

    of Emotional and Behavioral Disorders, *10*, 194-203.

    doi:10.1177/10634266020100040101

Achenbach, T. M., & Rescorla, L. A. (2001). *Manual for ASEBA School-Age Forms & Profiles.*

    Burlington, VT: University of Vermont, Research Center for Children, Youth, &

    Families.

Ahadi, S. A., Rothbart, M. K., & Ye, R. (1993). Children's temperament in the US and China:

    Similarities and differences. *European Journal of Personality*, *7*, 359-377.

    doi:10.1002/per.2410070506

Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions.*

    Thousand Oaks, CA: Sage Publications, Inc.

Asendorpf, J. B., van de Schoot, R., Denissen, J. A., & Hutteman, R. (2014). Reducing bias due

    to systematic attrition in longitudinal studies: The benefits of multiple

    imputation. *International Journal of Behavioral Development*, *38*, 453-460.

    doi:10.1177/0165025414542713

Astington, J. W. (2001). The future of theory-of-mind research: Understanding motivational

   states, the role of language, and real-world consequences. *Child Development*, *72*, 685-

   687. doi:10.1111/1467-8624.00305

Astington, J. W. (2003). Sometimes necessary, never sufficient: False-belief understanding and

   social competence. In B. Repacholi, V. Slaughter. (Eds.) , *Individual differences in theory*

   of mind: Implications for typical and atypical development (pp. 13-38). New York, NY,

   US: Psychology Press.

Bartsch, K., & Wellman, H. (1989). Young children's attribution of action to beliefs and

   desires. *Child Development*, *60*, 946-964. doi:10.2307/1131035

Blair, R. R. (1995). A cognitive developmental approach to morality: Investigating the

   psychopath. *Cognition*, *57*, 1-29. doi:10.1016/0010-0277(95)00676-P

Blair, R. R. (1999). Responsiveness to distress cues in the child with psychopathic

   tendencies. *Personality and Individual Differences*, *27*, 135-145. doi:10.1016/S0191-

   8869(98)00231-1

Caspi, A., & Moffitt, T. E. (1995). The continuity of maladaptive behavior: From description to

   understanding in the study of antisocial behavior. In D. Cicchetti & D. J. Cohen

   (Eds.), *Developmental psychopathology, Vol. 2: Risk, disorder, and adaptation* (pp. 472-

   511). Oxford, England: John Wiley & Sons.

Choe, D. E., Lane, J. D., Grabell, A. S., & Olson, S. L. (2013). Developmental precursors of

   young school-age children's hostile attribution bias. *Developmental Psychology*, *49*,

   2245-2256. doi:10.1037/a0032293

Dadds, M. R., Cauchi, A.J., Wimalaweera, S., Hawes, D.J., & Brennan, J. (2012). Outcomes,

   moderators, and mediators of empathic-emotion recognition training for complex conduct

problems in childhood. *Psychiatry Research, 199,* 201–207.

doi:10.1016/j.psychres.2012.04.033

Dadds, M. R., Hawes, D. J., Frost, A. D., Vassallo, S., Bunn, P., Hunter, K., & Merz, S. (2009).

Learning to 'talk the talk': the relationship of psychopathic traits to deficits in empathy

across childhood. *Journal of Child Psychology and Psychiatry, 50*, 599-606.

doi:10.1111/j.1469-7610.2008.02058.x

Dadds, M. R., & Salmon, K. (2003). Punishment insensitivity and parenting: Temperament and

learning as interacting risks for antisocial behavior. *Clinical Child and Family

Psychology Review, 6,* 69-86. doi:10.1023/A:1023762009877

Dodge, K. A., & Coie, J. D. (1987). Social-information-processing factors in reactive and

proactive aggression in children's peer groups. *Journal of Personality and Social

Psychology*, *53*, 1146-1158. doi:10.1037/0022-3514.53.6.1146

Dodge, K. A., Greenberg, M. T., & Malone, P. S. (2008). Testing an idealized dynamic cascade

model of the development of serious violence in adolescence. *Child Development*, *79*,

1907-1927. doi:10.1111/j.1467-8624.2008.01233.x

Feinstein, L., & Bynner, J. (2006). Continuity and discontinuity in middle childhood:

Implications for adult outcomes in the UK 1970 birth cohort. In A. C. Huston, M. N.

Ripke (Eds.), *Developmental contexts in middle childhood: Bridges to adolescence and

adulthood* (pp. 327-349). New York, NY, US: Cambridge University Press.

doi:10.1017/CBO9780511499760.017

Fowles, D. C., & Kochanska, G. (2000). Temperament as a moderator of pathways to conscience

in children: The contribution of electrodermal activity. *Psychophysiology*, *37*, 788-795.

doi:10.1017/S0048577200981848

Frick, P. J., Cornell, A. H., Bodin, S. D., Dane, H. E., Barry, C. T., & Loney, B. R. (2003).

    Callous-unemotional traits and developmental pathways to severe conduct

    problems. *Developmental Psychology*, *39*, 246-260. doi:10.1037/0012-1649.39.2.246

Frick, P. J., Lilienfeld, S. O., Ellis, M., Loney, B., & Silverthorn, P. (1999). The association

    between anxiety and psychopathy dimensions in children. *Journal of Abnormal Child*

    Psychology, *27*, 383-392. doi:10.1023/A:1021928018403

Frick, P. J., & Viding, E. (2009). Antisocial behavior from a developmental psychopathology

    perspective. *Development and Psychopathology*, *21*, 1111-1131.

    doi:10.1017/S0954579409990071

Frick, P. J., & White, S. F. (2008). Research review: The importance of callous-unemotional

    traits for developmental models of aggressive and antisocial behavior. *Journal of Child*

    Psychology and Psychiatry, *49*, 359-375. doi:10.1111/j.1469-7610.2007.01862.x

Frick, P. J., Ray, J. V., Thornton, L. C., & Kahn, R. E. (2014). Can callous-unemotional traits

    enhance the understanding, diagnosis, and treatment of serious conduct problems in

    children and adolescents? A comprehensive review. *Psychological Bulletin*, *140*(1), 1-57.

    doi:10.1037/a0033076

Hay, D. F., Payne, A., & Chadwick, A. (2004). Peer relations in childhood. *Journal of Child*

    Psychology and Psychiatry, *45*, 84-108. doi:10.1046/j.0021-9630.2003.00308.x

Hughes, C. (2011). *Social understanding and social lives: From toddlerhood through to the*

    transition to school. New York, NY, US: Psychology Press.

Hughes, C., Dunn, J., & White, A. (1998). Trick or treat? Uneven understanding of mind and

    emotion and executive dysfunction in 'hard-to-manage' preschoolers. *Journal of Child*

    Psychology and Psychiatry, *39*, 981-994. doi:10.1111/1469-7610.00401

Hughes, C., & Ensor, R. (2006). Behavioural problems in 2-year-olds: Links with individual

　　differences in theory of mind, executive function and harsh parenting. *Journal of Child*

　　Psychology and Psychiatry, *47*, 488-497. doi:10.1111/j.1469-7610.2005.01519.x

Hughes, C., White, A., Sharpen, J., & Dunn, J. (2000). Antisocial, angry, and unsympathetic:

　　'Hard-to-manage' preschoolers' peer problems and possible cognitive influences. *Journal*

　　of Child Psychology and Psychiatry, *41*, 169-179. doi:10.1017/S0021963099005193

Hyde, L. W., Shaw, D. S., Gardner, F., Cheong, J., Dishion, T. J., & Wilson, M. (2013).

　　Dimensions of callousness in early childhood: Links to problem behavior and family

　　intervention effectiveness. *Development and Psychopathology, 25*, 347-363.

　　doi:10.1017/S0954579412001101

Hyde, L. W., Waller, R., & Burt, S. A. (2014). Commentary: Improving treatment for youth with

　　callous-unemotional traits through the intersection of basic and applied science—

　　Reflections on Dadds et al. (2014). *Journal of Child Psychology and Psychiatry*, *55*, 781-

　　783. doi:10.1111/jcpp.12274

Jones, A. P., Happé, F. E., Gilbert, F., Burnett, S., & Viding, E. (2010). Feeling, caring,

　　knowing: Different types of empathy deficit in boys with psychopathic tendencies and

　　autism spectrum disorder. *Journal of Child Psychology and Psychiatry*, *51*, 1188-1197.

　　doi:10.1111/j.1469-7610.2010.02280.x

Kerr, D. R., Lopez, N. L., Olson, S. L., & Sameroff, A. J. (2004). Parental discipline and

　　externalizing behavior problems in early childhood: The roles of moral regulation and

　　child gender. *Journal of Abnormal Child Psychology*, *32*, 369-383.

　　doi:10.1023/B:JACP.0000030291.72775.96

Kimonis, E. R., Frick, P. J., Boris, N. W., Smyke, A. T., Cornell, A. H., Farrell, J. M., & Zeanah, C. H. (2006). Callous-Unemotional Features, Behavioral Inhibition, and Parenting: Independent Predictors of Aggression in a High-Risk Preschool Sample. *Journal of Child and Family Studies*, *15*, 745-756. doi:10.1007/s10826-006-9047-8

Kimonis, E. R., Frick, P. J., Cauffman, E., Goldweber, A., & Skeem, J. (2012). Primary and secondary variants of juvenile psychopathy differ in emotional processing. *Development and Psychopathology*, *24*(3), 1091-1103. doi:10.1017/S0954579412000557

Kochanska, G., & Aksan, N. (2006). Children's Conscience and Self-Regulation. *Journal of Personality*, *74*, 1587-1617. doi:10.1111/j.1467-6494.2006.00421.x

Kochanska, G., Gross, J. N., Lin, M., & Nichols, K. E. (2002). Guilt in young children: Development, determinants, and relations with a broader system of standards. *Child Development*, *73*, 461-482. doi:10.1111/1467-8624.00418

Lahey, B. B., & Waldman, I. D. (2003). A developmental propensity model of the origins of conduct problems during childhood and adolescence. In B. B. Lahey, T. E. Moffitt, & A. Caspi (Eds.), *Causes of conduct disorder and juvenile delinquency* (pp. 76-117). New York, NY, US: Guilford Press.

Lemerise, E. A., & Arsenio, W. F. (2000). An integrated model of emotion processes and cognition in social information processing. *Child Development, 71,* 107–118. doi:10.1111/1467-8624.00124

Little, R. J, & Rubin, D. B. (2002). *Statistical Analysis with Missing Data*, 2nd edition, New York, NY: John Wiley.

Morrow, M. T., Hubbard, J. A., McAuliffe, M. D., Rubin, R. M., & Dearing, K. F. (2006). Childhood aggression, depressive symptoms, and peer rejection: The mediational model

revisited. *International Journal of Behavioral Development*, *30*, 240-248.

doi:10.1177/0165025406066757

NICHD Early Child Care Research Network. (2004). Trajectories of physical aggression from

toddlerhood to middle childhood. *Monographs of the Society for Research in Child*

Development, 69(4, Serial No. 278).

Olson, S. L., Sameroff, A. J., Kerr, D. C. R., Lopez, N. L., & Wellman, H. M. (2005).

Developmental foundations of externalizing problems in young children: The role of

effortful control. *Development and Psychopathology, 17,* 25–45.

doi:10.1017/S0954579405050029

Olson, S. L., Lopez-Duran, N., Lunkenheimer, E. S., Chang, H., & Sameroff, A. J. (2011).

Individual differences in the development of early peer aggression: Integrating

contributions of self-regulation, theory of mind, and parenting. *Development and*

Psychopathology, *23*, 253-266. doi:10.1017/S0954579410000775

Pardini, D. A., Lochman, J. E., & Powell, N. (2007). The development of callous-unemotional

traits and antisocial behavior in children: Are there shared and/or unique

predictors?. *Journal of Clinical Child and Adolescent Psychology*, *36*, 319-333.

doi:10.1080/15374410701444215

Pasalich, D. S., Dadds, M. R., & Hawes, D. J. (2014). Cognitive and affective empathy in

children with conduct problems: Additive and interactive effects of callous–unemotional

traits and autism spectrum disorders symptoms. *Psychiatry Research*, *219*, 625-630.

doi:10.1016/j.psychres.2014.06.025

Patrick, C. J., Fowles, D. C., & Krueger, R. F. (2009). Triarchic conceptualization of

psychopathy: Developmental origins of disinhibition, boldness, and

meanness. *Development and Psychopathology*, *21*, 913-938.

doi:10.1017/S0954579409000492

Ruffman, T., Slade, L., & Crowe, E. (2002). The relation between children's and mothers' mental

state language and theory-of-mind understanding. *Child Development*, *73*, 734-751.

doi:10.1111/1467-8624.00435

Shaw, D. S., Gilliom, M., Ingoldsby, E. M., & Nagin, D. S. (2003). Trajectories leading to

school-age conduct problems. *Developmental Psychology*, *39*(2), 189-200.

doi:10.1037/0012-1649.39.2.189

Shonkoff, J. P., & Phillips, D. A. (2000). *From neurons to neighborhoods: The science of early*

childhood development. Washington, DC, US: National Academy Press.

Tremblay, R. E. (2000). The development of aggressive behaviour during childhood: What have

we learned in the past century?. *International Journal of Behavioral Development*, *24*,

129-141. doi:10.1080/016502500383232

Waller, R., Gardner, F., & Hyde, L. W. (2013). What are the associations between parenting,

callous–unemotional traits, and antisocial behavior in youth? A systematic review of

evidence. *Clinical Psychology Review*, *33*, 593-608. doi:10.1016/j.cpr.2013.03.001

Waller, R., Hyde, L. W., Grabell, A. S., Alves, M. L., & Olson, S. L. (2014) Differential

associations of early callous-unemotional, oppositional, and ADHD behaviors: multiple

domains within early-starting conduct problems?. *Journal of Child Psychology and*

Psychiatry, Advance online publication. doi:10.1111/jcpp.12326

Waller, R., Wright, A. C., Shaw, D. S., Gardner, F., Dishion, T. J., Wilson, M. N., & Hyde, L.

W. (2014). Factor structure and construct validity of the parent-reported inventory of

callous-unemotional traits among high-risk 9-year-olds. *Assessment,* Advance online

publication. doi:10.1177/1073191114556101

Wechsler, D. (1989). *Preschool and primary scale of intelligence– Revised*. San Antonio, TX:

Psychological Corporation.

Wellman, H. M. (2014). *Making minds: How theory of mind develops*. New York, NY, US:

Oxford University Press.

Wellman, H. M., Cross, D., & Watson, J. (2001). Meta-analysis of theory-of-mind development:

The truth about false belief. *Child Development*, *72*, 655-684. doi:10.1111/1467-

8624.00304

Wellman, H. M., Harris, P. L., Banerjee, M., & Sinclair, A. (1995). Early understanding of

emotion: Evidence from natural language. *Cognition and Emotion*, *9*, 117-149.

doi:10.1080/02699939508409005

Willoughby, M.T., Mills-Koonce, W.R., Gottfredson, N.C., & Wagner, N.J. (2014). Measuring

callous unemotional behaviors in early childhood: Factor structure and the prediction of

stable aggression in middle childhood. *Journal of Psychopathology and Behavioral

Assessment, 36*, 30-42. doi:10.1007/s10862-013-9379-9

Willoughby, M.T., Waschbusch, D.A., Moore, G.A., & Propper, C.B. (2011). Using the ASEBA

to screen for callous unemotional traits in early childhood: Factor structure, temporal

stability, and utility. *Journal of Psychopathology and Behavioral Assessment, 33*, 19-30.

doi:10.1007/s10862-010-9195-4

CHAPTER 5

General Discussion

Among multiple models of child development introduced by Sameroff (2010), the

representational model provides interpretive structures for the self, others, and experiences.

Cognitive processes based on this model lead to actions, which then change our social

environment, which further our cognitions (Sameroff, 2010). The present dissertation aimed to

capture these dynamic processes among children's representations, social-behavioral

characteristics, and social environment. The overarching purpose of this dissertation was to

examine how social and behavioral characteristics are related to individual differences in ToM

development. First, I summarize the main findings and the implications of each chapter. Then, I

address how this dissertation supports the transactional relations between individual differences

in ToM understanding and social development. Finally, I discuss the strengths of this dissertation

and future directions.

Summary and Implications

Chapter 2 examined intra-individual dynamics between behavioral characteristics and

ToM as well as inter-personal dynamics in the family context. Specifically, this chapter explored

longitudinal associations between firstborns' aggression, Theory-of-Mind (ToM) development,

and sibling antagonism during the one year following the birth of a younger sibling. The

associations were tested using a developmental cascade model to examine how characteristics in

one domain of development influenced the characteristics of other multiple domains over time. I

expected that aggression would predict poorer ToM and higher sibling antagonism, and ToM

would negatively predict sibling antagonism and aggression. Structural equation modeling revealed that children's aggression before the birth of a sibling and at 4 months postpartum indeed consistently predicted increased sibling antagonism during the first year of siblinghood. Pre-birth aggression also predicted lower ToM at 4 months, which in turn predicted increased sibling antagonism at 12 months. These paths show one domain (i.e., aggression) of development influencing the other domains (i.e., ToM, sibling antagonism) both directly and indirectly over time. The implication of these cascade effects is that intervention for one part of a developmental system may have effects that spread out to adjacent parts. Specifically, intervening in children's aggressive behavior may reduce their risk for consequent difficulties in ToM development and poorer sibling relationships. At the same time, facilitating children's ToM development despite aggressive behavioral characteristics may unbind the indirect link from aggression to sibling antagonism, suggesting multiple ways to intervene in aggressive children's negative sibling relationships at the beginning of siblinghood.

Chapter 3 brings in more environmental influences by including mothers and fathers to the story. The study investigated the relations among the firstborn's sibling interaction, their ToM development, and parental discipline strategies during the transition to siblinghood. The specific aims of the second paper included 1) examining longitudinal links between two types of the firstborn's interactions with the infant sibling—positive involvement and antagonism—at 4 and 8 months postpartum, and their ToM before the birth of the sibling as well as at 12 months postpartum, and 2) examining if parental discipline strategies moderated the link between sibling antagonism at 8 months and their ToM development at 12 months. I hypothesized firstborns' ToM before the birth of a sibling would predict more positive sibling interactions, but sibling interaction would not directly predict ToM at 12 months, given that the younger sibling was too

young to participate in mutual social exchanges. Having an infant sibling, however, was still expected to facilitate children' ToM development through conversations with parents in the form of directive parenting. Results showed that ToM predicted positive engagement with the infant sibling at 4 months. Sibling antagonism, however, had a negative effect on ToM development when mothers and fathers used low levels of directive parenting. The implication of these findings is that parents play influential roles for firstborns' ToM development during early siblinghood, emphasizing the benefits of taking a family systems' approach to understanding children's social cognitive development. One important intervention implication that can help firstborn children's adjustment after the birth of a second child is that they can benefit from having rich conversations with their parents about sibling interactions. Specifically, for better social cognitive growth and positive sibling relationships, recommendations for parents should focus on increasing supportive and emotionally directive parenting rather than avoiding strict and controlling parenting.

Chapter 2 and 3 tested ToM as a predictor and as a consequence of social-behavioral characteristics in the family context. In Chapter 4, I examined the role of ToM as a moderator between early callous-unemotional (CU) behavior and later externalizing problems in school. The specific aims were 1) to examine whether CU behavior at age 3 predicted externalizing problems at age 6 and 10, and 2) to test whether children's ToM and anxious temperament moderated this link at age 3. As hypothesized, CU behavior at age 3 predicted externalizing problems at age 6 and 10 even after controlling for the baseline externalizing behavior at age 3. More importantly, the level of ToM understanding at age 3 significantly moderated this link; CU behavior predicted externalizing problems only when ToM was low, but not when it was high. These results underscore the potential protective role of advanced ToM understanding for

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children who have high CU behavior, presumably because ToM, as cognitive empathy, compensates for poor emotional empathy among these children. Important implications of these findings are that intervention for ToM might alleviate the behavioral difficulties for children with early signs of CU characteristics. Especially, the regions of significance analyses provided some preliminary ideas about cut-off scores for ToM task performance that can be used as a screening device for identifying young children who are at increased risk for later externalizing problems due to their high CU behavior.

Findings from Chapters 2 and 3 answered questions about what social-behavioral factors (i.e., aggression, mothers' directive parenting, sibling antagonism) contributed to ToM in the family setting. Also, all three studies supported the role of ToM as a predictor for social outcomes, including positive engagement and antagonistic interactions with an infant sibling and externalizing problems in school. Results from Chapter 4 further revealed that ToM could be a moderator for behavioral characteristics (i.e., CU behavior) in predicting social outcomes (i.e., externalizing problems in school). In sum, results from this dissertation imply that ToM can be an intrapersonal buffer for emotional and behavioral predispositions that create potential risks for later adjustment problems (chapter 4). Children's ToM influences the social world in which children engage (chapter 2 and 3), and ToM can be improved or hampered by behavioral characteristics and social experiences (chapter 2 and 3). The findings from the three related studies thus strengthen the importance of understanding variations in children's achievement of ToM in relation to their social lives.

Transactional Processes Associated with Individual Differences in ToM

ToM is considered a universal developmental milestone in terms of its proximal developing sequence and timetable. Individual differences in *when* children come to ToM

understanding are not extreme; children master false-belief understanding between ages 2 and 5 (Wellman, 2014). Typically developing children eventually reach basic ToM understanding, even though there could be some delay or acceleration depending on their social experiences.

Given that ToM understanding is something all children grasp at some point around the preschool years, it is impressive that such small variations in this cognitive ability are associated—either as a predictor or as an outcome—with a relatively wide range of social-behavioral experiences in children's lives. This pattern resembles the butterfly effect (Kauffman, 1991) in the sense that small discrepancies are magnified into larger differences across a short period of time, as well as in the distant future. For example, in chapter 4, I found that individual differences in ToM at age 3 predicted externalizing problems at age 10 conjointly with CU behavior, although there may be missing pieces of information across the intervening 7 years, such as conscience development or parent-child relationship quality as potential mediating mechanisms. The other two studies provided richer information about how ToM is linked to social adjustment through more proximal influences within approximately one year. For example, chapter 2 showed that aggression predicted poorer ToM, which in turn predicted more sibling antagonism over an approximately 8-month gap. Also, chapter 3 found that children's ToM predicted their positive engagement with the sibling, which stayed highly stable throughout the first year. Moreover, variations in the social experiences with siblings and parents led to different ToM outcomes, which adds to the complexity of how different socializing agents influence children's development.

Thus, the findings from this dissertation support the benefit of looking at complex relations and interactions between social and cognitive development in a longitudinal, transactional framework. This approach expands our restricted view of looking at social domains

and cognitive domains separately. This approach also challenges our knowledge of examining development as linearly progressing from one stage to the next. It may be extremely challenging to capture the constantly changing nature of the person-environment, and social-cognitive transactions across time (Kuczynski, Parkin, & Pitman, 2015), but the findings of this dissertation suggest that looking at multiple time points using multiple measures allows us to break unidirectional, linear assumptions about the relations among different developmental domains. Moreover, looking at all these different factors together helps us identify key nodes that are connected to maladjustment, which we can target for effective intervention. If the butterfly effect does indeed apply to processes of child development, then even small, well-targeted changes in the system may have powerful intervening effects for children who are at behavioral or social-cognitive risk for social competence.

Strengths, Contributions, and Future Directions

The studies presented in this dissertation contribute to the literature in several important ways. Other than using the transactional framework, there are some methodological contributions pertaining to the use of longitudinal repeated measures and multiple informants.

Although longitudinal data sets are increasingly available in the field, there is still a lack of longitudinal studies on social antecedents and consequences of individual differences in ToM development. Measuring outcome variables at multiple time points is essential to make an argument about the unique contribution of target predictors on the outcome variable. For example, in chapter 4, if externalizing problems were only measured at the later time point, it might have been less convincing to argue that high CU and low ToM at age 3 contributed to externalizing problems because children with these characteristics may have had high externalizing problems already at age 3 and we were only observing the stability of externalizing

problems over time. Similarly, in chapters 2 and 3, I could make a more convincing argument about the contribution of aggression and sibling interaction to ToM *development* because the baseline ToM score was controlled so any prediction was prediction of ToM change.

The other strength is that data were collected through multiple informants including mother- and father-reports, teacher-reports, and lab assessments. All three studies used mother and father composite scores for focal predictors to reduce potential reporter bias. For chapter 4, teacher-reported externalizing problems were used as outcome variables, reducing shared method variance. In future studies, using observational data for sibling interaction and parental discipline might further increase the objectivity of the measurement.

Findings from this dissertation add some new information to the literature on social antecedents and consequences of individual differences in ToM: the role of early sibling interactions for ToM development and ToM as a moderator for social development. First, I tested whether and how early sibling interaction contributed to individual differences in ToM development. Findings on the role of infant siblings in older children's ToM development are limited to cross-sectional evidence (e.g., Peterson, 2000). Results from chapters 2 and 3 revealed that the quality of interaction with an 8-month-old infant sibling does not have a direct positive influence on children's ToM development. In chapter 2, children's poorer ToM predicted increased sibling antagonism, but not vice a versa. In chapter 3, antagonistic interaction and positive engagement with the infant sibling did not predict ToM until the role of parental discipline was taken into account. Only when we considered the level of mothers' or fathers' directive parenting, children's antagonistic interaction with the 8-month-old infant sibling was related to their ToM 4 months later. Notably, sibling antagonism negatively predicted ToM, suggesting that the direct influence of antagonism between an older sibling and the infant could

be harmful for developing ToM if parents do not guide them much with directive parenting. Caution should be used when interpreting these results, however, so as not to overgeneralize the findings. Because all the participating children in the two studies had a sibling, an argument comparing children with and without a sibling cannot be established. Therefore, the *quality* of interactions do not seem to be directly influential for enhancing ToM at this early period of sibling relationship, but *having a sibling per se* might be still beneficial—maybe through discussion about the baby with the parents—compared to being an only child. Future studies may benefit from including only children as a control group to test this hypothesis more directly.

Second, the moderating effect of ToM in predicting long-term social consequences adds new information to the literature. Chapter 4 found that high levels of ToM at age 3 protected the risk of early CU behavior at age 3 for later externalizing problems at age 6 and 10. Although we do not know the mechanisms through which ToM reduced the risk for children with high levels of CU behavior, one possible interpretation may be that cognitive perspective-taking abilities compensated for the deficiency in their emotional empathy, which had lasting protective effects. Thus, another important way to contribute to bridging social and cognitive development is examining the *interaction* between the two factors, which provides an important story about how children develop through dynamic transactions between social and cognitive domains. Future studies should also examine the mediating mechanisms through which ToM moderates behavioral influences on social outcomes.

Conclusion

Social cognitive development and behavioral development interact to affect children's social lives. The current dissertation examined multiple ways in which individual differences in children's ToM understanding can be a predictor, an outcome, and a moderator of social-

behavioral characteristics in children's lives from an early age. The idea that small initial differences result in larger social consequences—the butterfly effect—aids our understanding of human development. Ward (1995) borrowed descriptions of chaos theory from physics to further an understanding of family systems and noted:

"They do not show simple linear cause and effect sequences; rather they are nonlinear and small causes may produce disproportionately large effects, or none at all. Such systems are sensitive to initial conditions. That is, unless these conditions can be determined with infinite precision, an impossible standard to achieve, the small inaccuracies will multiply so that two apparently similar events will produce widely varying consequences." (Ward, 1995, p. 630)

This same principle may apply to an understanding of child development. When each individual child is seen as a developmental system (Sameroff, 2010), small "inaccuracies" in the experiences and personal characteristics of children may be amplified, resulting in varying outcomes. At the same time, making small changes as a means of intervention may result in significant differences across different domains in one's developmental trajectory. It is my desire and belief that the findings from this dissertation can contribute to the literature on children's ToM by showing the transactional patterns between children's behavioral, social and cognitive development and ultimately, provide sufficient evidence for guiding preventative intervention in developmental systems.

References

Kauffman, S. A. (1991). Antichaos and adaptation. *Scientific American, 265*, 78.84. doi:10.1038/scientificamerican0891-78

Kuczynski, L., Parkin, C. M., & Pitman, R. (2015). Socialization as dynamic process: A dialectical, transactional perspective. In J. E. Grusec, P. D. Hastings (Eds.), *Handbook of socialization: Theory and research (2nd ed.)* (pp. 135-157). New York, NY, US: Guilford Press.

Peterson, C. C. (2000). Influence of siblings' perspectives on theory of mind. *Cognitive Development*, *15*, 435-455. doi:10.1016/S0885-2014(01)00040-5

Sameroff, A. (2010). A unified theory of development: A dialectic integration of nature and nurture. *Child Development*, *81*, 6-22. doi:10.1111/j.1467-8624.2009.01378.x

Ward, M. (1995). Butterflies and bifurcations: Can chaos theory contribute to our understanding of family systems? *Journal of Marriage and the Family*, *57*, 629-638. doi:10.2307/353918

Wellman, H. M. (2014). *Making minds: How theory of mind develops*. New York, NY, US: Oxford University Press.