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RELATIONS AMONG FALSE-BELIEF UNDERSTANDING, EXECUTIVE FUNCTION, AND SOCIAL COMPETENCE: A LONGITUDINAL ANALYSIS

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ABSTRACT

During the preschool years, children acquire an understanding of false-belief; that is, they recognize that people can believe things that are untrue. The extant literature suggests that false-belief understanding has important correlates during early childhood, which include language ability, executive function, and social competence. The majority of previous studies, however, have been cross-sectional and limited to a select high-income population. The present study explored longitudinal relations among false-belief and its correlates within a Head Start sample. Sixty-nine children (average age = 5 years 1 month) were assessed during the spring of their preschool year and again in the spring of their kindergarten year. Children's false-belief understanding, language ability, and executive function were assessed directly with laboratory tasks. Social competence was measured via teacher report. Results indicate a bidirectional relation between false-belief understanding and social competence, which exists independent of children's language ability. In contrast, concurrent, rather than longitudinal, relations were reported between false-belief understanding and executive function. False-belief understanding was supported as a mediator of the longitudinal relation between executive function and social competence. There was no evidence, however, that gender moderated relations between false-belief understanding and its correlates. These findings represent a significant contribution to the false-belief literature and have important implications for future research and practice.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

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CHAPTER 1

Introduction and Background

One aspect of cognitive development that has received increased attention in recent years is the development of children's understanding of minds. Within this domain, research has focused almost exclusively on false-belief understanding. Literature suggests that during the preschool years, children acquire an understanding of false-belief; that is, they recognize that people can believe things that are untrue. Once children obtain this understanding, they are able to attribute false-beliefs to themselves, as well as to others (Gopnik & Astington, 1988).

In the classic false-belief paradigm, a situation is contrived so that a child's initial belief is false, but the child's current belief reflects reality. For example, children are often shown a familiar box, such as a crayon box, and asked to guess its contents. Following the child's correct response (i.e., "crayons"), the experimenter opens the box to reveal its unexpected contents (i.e., candy), closes the box, and then asks the child to recall their initial belief concerning the box's contents. Children with a secure understanding of false-belief recognize that their own beliefs can be false and correctly recall their previous incorrect belief (i.e., that the box contained crayons). These children pass the task because they are able to distinguish their own initial false-belief from the present reality (Gopnik & Astington, 1988).

Similarly, children who understand false-belief also realize that another person may hold and act on a false-belief. Thus, these children can predict a character's

thoughts and behavior based on the character's false-belief rather than on the child's own knowledge (Wimmer & Perner, 1983). In an extension of the above task, children with false-belief understanding predict that a character who has not looked inside the misleading box will guess that the box contained crayons, even though the children have already looked inside and know that the box contains candy. Once children have acquired false-belief understanding, they are able to mentally represent one's own, as well as another's, false-belief and use this information to inform their social perception and inference. Thus, false-belief understanding represents an important component of children's social cognition (Astington & Jenkins, 1995; Flavell & Miller, 1998; Lewis & Carpendale, 2002).

The relation between social cognition and social behavior has been widely investigated, and specific associations between these constructs have been established (for reviews, see Dodge & Feldman, 1990; Eisenberg & Harris, 1984; Lewis & Carpendale, 2002). Given that an understanding of the mind is believed to be a powerful social tool (Moore & Frye, 1991), researchers hypothesized that false-belief understanding serves important social functions. As expected, a growing body of research has linked false-belief understanding with increased prosocial behavior and the development of self-regulation (Astington & Jenkins, 1995; Capage & Watson, 2001; Hughes, White, Sharpen, & Dunn, 2000; Jenkins & Astington, 2000; Lalonde & Chandler, 1995; Watson, Nixon, Wilson, & Capage, 1999), as well as with decreased problem behavior (Fahie & Symons, 2003; Hughes, Dunn, & White, 1998).

Unfortunately, the majority of the research in this area has been cross-sectional, thus limiting information concerning the direction of the association between these

constructs. That is not to say, however, that the extant literature does not imply a direction between these variables. On the contrary, the majority of the research in this area, including both cross-sectional (Capage & Watson, 2001; Razza & Blair, 2003) and longitudinal studies (Jenkins & Astington, 2000; Slomkowski & Dunn, 1996), present false-belief understanding as a predictor of children's social competence. Thus, the first aim of this study is to address the direction of the relation between false-belief understanding and social competence over one year in early childhood. Given that individual differences in false-belief understanding (Dunn, Brown, Slomkowski, Tesla, & Youngblade, 1991; Hughes & Dunn, 1998; Wellman, Cross, & Watson, 2001) and social competence (Baumrind, 1971; Capage & Watson, 2001) are relatively stable across the early childhood years, a positive relation between false-belief understanding and social competence is expected in both preschool and kindergarten. Furthermore, false-belief understanding in preschool is expected to predict social competence in kindergarten over and above false-belief understanding in kindergarten.

False-belief understanding does not develop in isolation of other cognitive abilities. Two cognitive correlates that have received increased attention in recent years are language ability and executive function. The extant literature supports language ability as a correlate (Astington & Jenkins, 1995; Cutting & Dunn, 1999; Happe, 1995; Jenkins & Astington, 1996; Hughes, 1998a; Watson et al., 1999), as well as a predictor (Astington & Jenkins, 1999; Hale & Tager-Flusberg, 2003; Hughes & Dunn, 1998; Lohmann & Tomasello, 2003), of false-belief understanding. Language ability, however, also has implications for children's social competence (Brinton & Fujiki, 1993; Cole, Usher, & Cargo, 1993). Thus, the second aim of this study is to clarify the relations

among language ability, false-belief understanding, and social competence during early childhood. It is proposed that false-belief understanding will account for unique variance in social competence even after language ability is controlled.

Executive function refers to a collection of cognitive skills that underlie goal-directed behaviors (Duncan, 1986; Welsh, Pennington, & Grossier, 1991; Zelazo, Carter, Reznick, & Frye, 1997). The extant literature suggests that advances in executive function are related to developments in false-belief understanding over the early childhood years (Carlson & Moses, 2001; Carlson, Mandell, & Williams, 2004; Carlson, Moses, & Breton, 2002; Frye, Zelazo, & Palfai, 1995; Hughes, 1998b). Moreover, research suggests that executive function also has implications for children's social competence (Hughes et al., 1998; Fahie & Symons, 2003; Shultz, Izard, Ackerman, & Youngstrom, 2001). With the exception of two studies (i.e., Carlson, Moses et al., 2004; Hughes 1998b), however, research in this area has been correlational, which precludes the identification of causal pathways among these constructs. Therefore, the third aim of this study is to clarify the directions of the relations among false-belief understanding, executive function, and social competence. One specific model that will be tested proposes false-belief understanding as a partial mediator of the relation between executive function and social competence.

In addition to the need for longitudinal study in this area, there is also a need for research exploring the role of gender. Gender has important implications for child development in a number of domains, two of which are highly relevant to false-belief understanding: language and social behavior. Specifically, more often than boys, females use language (Leaper, Anderson, & Sanders, 1998), engage in collaborative discourse

with peers (Leaper, 1991), and score high on tasks of language ability (Halpern, 1997; Halpern & LaMay, 2000; Huttenlocher, Haight, Bryk, Seltzer, & Lyons, 1991). Similarly, when compared to their male peers, females are typically rated as displaying more social skills and fewer problem behaviors (Achenbach, Howell, Quay, & Conners, 1991; Cole, Cho, Martin, Seroczynski, Tram, & Hoffman, 2001; Keiley, Lofthouse, Bates, Dodge, & Pettit, 2003). Given relations among false-belief understanding, language ability, and social competence, gender interactions within these associations are possible, yet largely unexplored. Results from preliminary studies suggest that gender moderates the concurrent relation between false-belief understanding and social competence. Specifically, data suggest that this relation is exclusive to, or at least stronger for, females (Razza & Blair, 2003; Peters, Jantzer, & Blair, 2003; Razza, Blair, Rothrauff, & Holland, 2004). Thus, the fourth aim of this study is to further explore gender interactions among false-belief understanding and its correlates over time.

The present study explores the above four objectives within a Head Start[1] sample. The focus on low-income children is important because this population has been largely ignored within the false-belief literature. Furthermore, this study may be particularly relevant to this population because one of Head Start's primary goals is to promote skills associated with children's school readiness, such as social competence (Raver & Zigler, 1997). Although there is evidence that Head Start children demonstrate gains in social

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[1] Head Start is a federally funded program directed at increasing school readiness skills among children from low-income backgrounds. Head Start services include educational center-based care, health and nutrition supplements, and parent education. Children are eligible for Head Start if they are between the ages of 3- and 5-years-old and their families' incomes are below the poverty line or if their families are eligible for public assistance. In 2002, the poverty lines were $11,940 and $18,100 for families of two and four, respectively (http://aspe.hhs.gov/poverty/02poverty.htm).

skills over the preschool year (Currie, 2000), it is unclear whether increasing levels of false-belief understanding are related to this development. If false-belief understanding has implications for school readiness, then the documentation of this relation within a Head Start population is both appropriate and necessary. Thus, the goal of this study is not to make comparisons of false-belief understanding across income groups. Rather, the intent of this study is to learn more about the relations between false-belief understanding and its correlates among low-income children.

The Development of False-belief Understanding

Descriptive research and theory suggest that children's understanding of false-belief emerges and develops rapidly between three and five years of age (Gopnik & Astington, 1988; Kuhn, 1999; Wimmer & Perner, 1983). This understanding is based on the consistent failure of 3-year-olds and success of 5-year-olds across a series of false-belief tasks. The results of a recent meta-analysis confirm that success on false-belief tasks is strongly correlated with chronological age during early childhood and suggest that a significant change in performance occurs around 4 years of age (Wellman et al., 2001). Thus, researchers are in agreement that children demonstrate substantial development in false-belief understanding during the preschool period. The theory behind this development and the mechanism underlying this change, however, are sources of dispute in the field. The four major theories of theory of mind development are reviewed below.

Theories of Theory of Mind

Historically, four major theories have dominated the theory of mind literature (Astington, 1996; Astington & Gopnik, 1991; Lillard, 1998). These four theories include "theory-theory" (Gopnik, 1996; Perner, 1991; Wellman, 1990), "simulation theory" (Harris, 1991; Johnson, 1988), "innate module theory" (Baron-Cohen, 1995; Leslie, 1987), and the "enculturation view" (Bruner, 1990; Dunn et al., 1991; Feldman, 1992). This section provides a brief review of each of these theories and their proposed developmental mechanisms.

Theory-theory. According to theory-theorists, children develop an understanding of the mind by means of reasoning processes that closely resemble scientific theory formation (Gopnik, 1996; Perner, 1991; Wellman, 1990). More specifically, children's concepts of mental states are proposed as coherent and abstract theoretical postulates used to generalize, explain, and predict people's behavior (Gopnik, 1993). Like scientific theories, these theoretical postulates are challenged by counterevidence and eventually are either replaced by new theories (Gopnik & Wellman, 1992), or extended to accommodate new evidence (Perner, 1991). Given that one's current theory affects interpretation of new data, and new data influences one's current theory, the developmental mechanism associated with this theory is inherent in the theory-formation process. In other words, according to proponents of this view, children's understanding of minds is advanced and refined through the interaction between theory construction and theory testing (Astington & Gopnik, 1991). One result of this interaction is a fundamental theory change around 4 years of age, which equips children with a new

understanding of representation (Forguson & Gopnik, 1988; Perner, 1991; Wellman, 1990). Specifically, children's discovery of the causal relation between mental concepts, such as beliefs, and the real world allows them to use representations to predict actions (Astington, 1993). In sum, according to theory-theory, children acquire a theory of mind through a process of theorizing.

Simulation Theory. Simulation theorists argue that children's understanding of the mind develops via introspection (Harris, 1991, 1992; Johnson, 1988). Specifically, it is proposed that children develop a theory of mind via a mental simulation process that involves putting themselves in another person's shoes and applying their own mental states to that person. That is, children learn to predict other people's behavior by pretending to be that person, which includes imputing their own direct beliefs and desires to that person and then imagining what they themselves would do if they were that person (Harris, 1991, 1992). Thus, rather than constructing theoretical postulates, children are intuitively aware of mental states in themselves and ultimately extend this information to others (Harris, 1989, 1991). This extension occurs around 4 years of age and is linked with children's increasingly flexible imagination (Harris, 1991). In sum, simulation theory proposes that children obtain a theory of mind through a process of self-reflection.

Innate Module Theory. According to modularity theorists, children's understanding of the mind is innate and its development is the result of maturational mechanisms (Fodor, 1992; Leslie, 1987). In particular, as children mature, specific neural processors, primarily those associated with informational-processing abilities, are activated, which allow for more sophisticated social reasoning (Baron-Cohen, 1995; Leslie, 1991). Leslie's Theory-of-Mind-Mechanism / Selection Processing (ToMM / SP)

model provides a more specific account of this view (Leslie & Polizzi, 1998; Scholl & Leslie, 1999, 2001). In brief, according to ToMM / SP, children have an innate theory of mind module (ToMM) that addresses people's behaviors and infers the contributing mental states. ToMM is triggered by specific environmental factors and is constrained by a general executive process, known as SP. Thus, children have the ability to understand minds at an early age, but cannot express this ability until around the age of 4 years, when SP has matured (Scholl & Leslie, 1999). In sum, according to the innate module theory, children's theory of mind is acquired through maturational processes.

Enculturation View. Central to enculturation theory is the belief that children's understanding of the mind is dependent on social and cultural experiences (Brunner, 1990; Dunn, 1988; Feldman, 1992). Thus, in contrast to the previous three theories, which attribute the development of theory of mind to processes within the child, the enculturation view emphasizes the role of interpersonal processes in children's acquisition of theory of mind (Astington, 1996). Borrowing from Vygotskian theory (e.g., Vygotsky, 1962), which suggests that cognitive competencies have social origins, the enculturation view contends that social factors play a major role in development of social cognition (Astington, 1996; Lillard, 1998). For example, it is suggested that social interactions, such as conversations with parents about beliefs and intentions, provide children with the mental state concepts that they later apply to themselves and to others (Bruner, 1983; Dunn et al., 1991). Thus, social participation plays a critical role in the development of theory of mind because it exposes children to a variety of ideas, beliefs, and behaviors within their culture. As a result of these experiences, around the age of 4 years, children come to the realization that different people can think different thoughts

(Kuhn, 1999). In sum, the enculturation view argues that children develop a theory of mind via social processes.

Summary. The four prominent theories in theory of mind development include theory-theory, simulation theory, innate module theory, and the enculturation view. These theories are presented as contrasting views of development, however, they may not be as mutually exclusive as they appear. In fact, careful review suggests that they may each hold some explanatory power in theory of mind development (Astington & Gopnik, 1991). Although theories behind children's understanding of the mind remain a popular source of debate, the field recently shifted its attention and headed in a new direction. Specifically, the focus has moved from the above theoretical debate to the identification of important correlates of theory of mind and its components, including false-belief understanding (Lewis & Carpendale, 2002). Thus, a growing number of studies are investigating the relation between false-belief understanding and domain-general skills. One relation, in particular, that has received a great deal of interest is that between false-belief understanding and social competence.

The Relation between False-belief Understanding and Social Competence

By definition, children who demonstrate an understanding of false-belief are able to interpret another person's mental state (Kuhn, 1999). From a theoretical perspective, this ability to interpret the perceptions, desires, and beliefs of other people has important implications for children's social development. Specifically, over the preschool years, children become increasingly able to predict and explain relations between mental states

and actions (Astington, Harris, & Olson, 1988; Gopnik & Astington, 1988; Wellman, 1990; Wellman et al., 2001). During this time, children learn that mental states are related to both emotional and behavioral outcomes (Wimmer & Perner, 1983). Thus, children's knowledge of false-belief, coupled with their understanding of the relation between belief and behavior, may influence children's social competence.

Researchers have proposed a variety of ways by which children's false-belief understanding may promote prosocial behavior. For example, the ability to understand the causal relation between false-belief and behavior may be socially advantageous because it helps children comprehend the actions of others, which makes for more harmonious interactions (Watson et al., 1999). Furthermore, the ability to reference one's own and others' beliefs may allow children to better justify their actions, which may have implications for children's cooperative learning and social maturity (Astington, 1998). In addition, the ability to reason flexibly about why another person may think something is true or false may allow children to inhibit reactive responses and demonstrate more prosocial behaviors (Capage & Watson, 2001). Thus, it is not a surprise that results from both normative and clinical samples support false-belief understanding as an indicator of social competence.

Results from Normative Samples

The first study to examine the implications of individual differences in false-belief understanding for children's social competence was conducted by Lalonde and Chandler (1995). In this study of 3-year-olds, performance on a battery of six false-belief

tasks was compared with teacher ratings of social-emotional maturity. Preschool teachers completed a 40-item questionnaire tapping various social behaviors, which was adapted from the Vineland Socialization Scale (Sparrow, Balla & Cicchetti, 1984) and the Portage Checklist (Bluma, Shearer, Frohman, & Hilliard, 1976). From this measure, two types of social competence were assessed: intentional skills and conventional skills. Intentional skills included social behaviors that require insight into mental states, such as following game rules without being reminded or pretend play. Alternatively, conventional skills included routine social behaviors that reflected learned behavioral patterns rather than insight, such as saying "please" and "thank you." As expected, results supported a significant positive relation between false-belief understanding and intentional prosocial behaviors, even after controlling for age (Lalonde & Chandler, 1995). In other words, children who demonstrated higher levels of false-belief understanding were more likely to exhibit social behaviors requiring insight about mental life than children who performed less well on false-belief tasks. Thus, false-belief understanding appears to have important implications for aspects of children's interpersonal competence that involve an understanding of others' mental states.

Support for the relation between false-belief understanding and social competence has been replicated in a growing number of studies. For example, the results of two studies conducted by Watson et al. (1999) indicate a strong significant relation between preschoolers' and kindergarteners' false-belief understanding and teacher-reported social interaction skills. In the first study, children's social competence was measured using a global question regarding the extent to which the child engaged in positive peer interaction. In the second study, teachers completed a 10-item questionnaire adapted

from Harter's (1979) Perceived Competence Scale for Children. The reported correlations between false-belief understanding and social competence for the two studies were quite high and estimates of unique variance in measures of social competence associated with false-belief understanding were substantial. In brief, after controlling for age and language comprehension, false-belief understanding accounted for significant quantities of additional variance in social competence (Watson et al., 1999).

A similar study by Capage & Watson (2001) also found support for the relation between false-belief understanding and social competence among preschoolers and kindergarteners. Children were administered standard false-belief tasks along with the Preschool Interpersonal Problem-Solving Test (PIPS; Shure, 1990) and teachers completed a 7-item questionnaire adapted from Harter's (1979) Perceived Competence Scale for Children and the Preschool Aggression Scale (Minde, 1992). Results suggest a significant relation between false-belief understanding and the PIPS score, such that when presented with interpersonal problems, children with higher levels of false-belief understanding produced more alternative relevant solutions and fewer forceful solutions (i.e., aggressive actions) than children with lower levels of false-belief understanding. The relation between false-belief understanding and teacher-reported aggression was negative and significant. Furthermore, results from hierarchical regression suggest that even after controlling for age, language comprehension, and aggression, false-belief understanding was a significant predictor of social competence. Interestingly, although the PIPS score was also significantly related to social competence, findings suggest that false-belief understanding explained more unique variance in social competence than PIPS. Therefore, the ability to consider counterfactual information concerning one's own

and another's beliefs has unique and important implications for children's social competence (Capage & Watson, 2001).

Results from observational research provide additional evidence of a relation between false-belief understanding and social competence during early childhood. During pretend play sessions with peers, preschoolers with an increased understanding of false-belief made more joint proposals (requests for another child to participate in a shared activity; i.e., "pretend you're squirting me again"), and more role assignments (assignments of pretend roles to self or other; i.e., "you be the teacher"), than children with lower levels of false-belief understanding (Astington & Jenkins, 1995; Jenkins & Astington, 2000). The above relations remained significant after controlling for both age and general language ability. These findings suggest that children with an advanced understanding of false-belief recognize that the thoughts of their peers may not be consistent with their own ideas. Therefore, these children explicitly state their plans and ideas during pretend play, which indicates sophistication in cooperative peer interaction. Thus, false-belief understanding has implications for interaction with peers and is associated with important "real world" social behaviors in children (Astington & Jenkins, 1995). Not surprisingly, results also suggest that false-belief understanding influences peer acceptance, as measured by Coie and Dodge (1983), especially among older preschool children. Specifically, false-belief understanding was positively correlated with social preference scores among children over 5 years old (Slaughter, Dennis, & Pritchard, 2002).

In brief, the extant literature on normative development suggests the practical significance of false-belief understanding for children's social functioning. For example,

children who are unable to take the perspective of another child may respond to conflict in an inappropriate (Watson et al., 1999). Likewise, children who are unable to discuss their beliefs or explain their actions may have trouble with collaborative learning (Astington, 1998). Thus, the negative consequences of deficiencies in false-belief understanding are applicable to both playground and classroom situations. Furthermore, the literature suggests that false-belief understanding allows children to recognize that people can have thoughts that differ from their own. In sum, false-belief understanding may motivate children to make their ideas explicit to peers during pretend play and to consider multiple perspectives when faced with interpersonal problems, which may affect their social interaction and status among peers and siblings (Astington & Jenkins, 1995; Capage & Watson, 2001; Jenkins & Astington, 2000; Slaughter et al., 2002).

Results from Clinical Samples

Early interest in the relation between false-belief understanding and social competence can be traced back to the autism literature. Autism is a disorder characterized by severe deficits in social cognition and social interaction (American Psychiatric Association, 1994). As a result of these impairments, autistic children are rarely able to develop social relations. Not surprisingly, autistic children also demonstrate failure across all types of false-belief tasks (Baron-Cohen, Leslie, & Frith, 1985; for a review of studies, see Happe, 1995). According to the "theory of mind" account of autism, children's social impairments are a direct result of their inability to represent mental states (Frith, 1989). Thus, although other factors associated with

autism, such as mental retardation, may add to children's social incompetence, research suggests that false-belief understanding offers unique explanatory power (Baron-Cohen et al., 1985).

More recently, the relation between false-belief understanding and social competence has gained attention within behaviorally disturbed samples. For example, the results of one study comparing preschoolers identified as "hard-to-manage" by parents with matched controls suggest that the two groups differed significantly on false-belief understanding. Specifically, the socially impaired children were worse at predicting and remembering false-belief than their socially competent peers (Hughes et al., 1998). A similar trend was reported for slightly older children (*M*=78 months, *SD*=11), who were clinically referred for attention and behavior problems. Among these children, false-belief understanding was negatively related to both parent and teacher ratings of social problems. Although the significance of these relations fell below significance once executive function impairments were considered, the authors still proposed false-belief understanding as a marker for metacognitive deficiencies that give rise to social problems (Fahie & Symons, 2003).

The Direction Between False-belief Understanding and Social Competence

Although the concurrent relation between false-belief understanding and social competence is supported within both normative and clinical samples, the direction of this relation remains unclear. One possibility, which is frequently implied in the above-cited studies, is that false-belief understanding promotes social competence. According to this

theory, the ability to simultaneously represent multiple and conflicting beliefs may allow children to better coordinate their own thoughts and beliefs with those of others, which would result in more successful interactions (Astington & Jenkins, 1995). For example, false-belief understanding may promote social competence by reducing the ambiguity associated with social interactions (Jenkins & Astington, 2000), as well as by preventing the occurrence of reactive and inappropriate responses (Capage & Watson, 2001). Empirical support for this theory comes from studies in which false-belief understanding accounts for unique and significant variance in children's social competence (Capage & Watson, 2001; Razza & Blair, 2003). Furthermore, longitudinal studies spanning a 7-month period support false-belief understanding as a predictor of peer communication skills (Slomkowski & Dunn, 1996) and social behavior (Jenkins & Astington, 2000). Thus, recent findings support false-belief understanding as a predictor of social competence.

A second possibility, however, is that positive social interaction stimulates the development of false-belief understanding. This theory is based on the premise that children's experiences with other people's thoughts and beliefs during pretend play may increase their awareness of the distinction between mental states and reality, which would foster false-belief understanding (Flavell, Flavell, & Green, 1987; Youngblade & Dunn, 1995). Empirical support for this theory is also found in the literature, albeit via a broad interpretation of social competence. For instance, early cooperation with siblings, and engagement in conversation about emotions and the causes of behavior, predicted later false-belief understanding in young children (Dunn, 1995; Dunn et al., 1991).

A third possibility also exists, which is that the relation between false-belief understanding and social competence is bidirectional, whereby positive social interactions present the opportunity for learning more about the relation between thought and behavior, and increased understanding of one's own and other's minds encourages successful social behavior (Moore, Barresi, & Thompson, 1998; Watson et al., 1999). Although reciprocal relations between social cognition and social skills are plausible, this alternative has not been widely tested. Results from the only longitudinal study to test both causal models, however, failed to support bidirectional effects. Specifically, although findings indicated false-belief understanding as a significant predictor of joint planning and role assignment, these social behaviors were not found to be significant predictors of false-belief understanding (Jenkins & Astington, 2000).

Due to the limited number of longitudinal studies in this area, the direction of the relation between false-belief understanding and social competence remains unclear. The identification of this direction, however, is critical to the false-belief literature. Specifically, information concerning this direction could inform the above three views and advance our theory of false-belief understanding. The direction of this relation also has significant implications for applied research in multiple areas, especially prevention and intervention. For, example, extant literature suggests that disruptive behavior disorders may begin as early as preschool and are relatively stable throughout childhood (Rose, Rose, & Feldman, 1989; Wehby, Dodge, Valente, et al., 1993). Later outcomes of poor social relations in childhood include academic failure, substance abuse, and criminal behavior (Parker & Asher, 1987). Thus, if accelerated development of false-belief has important implications for children's social competence, then educators should consider

teaching children false-belief understanding in preschool as one means to avoid the early onset of behavior problems. Similarly, if false-belief understanding underlies social functioning, then it could be a valid target for mental health professionals working with behaviorally disturbed children. Interestingly, the results of recent false-belief training studies suggest that such interventions are successful at enhancing children's false-belief understanding (Appleton & Reddy, 1996; Clements, Rustin, & McCallum, 2000; Slaughter & Gopnik, 1996). In sum, longitudinal studies examining the relation between false-belief understanding and social competence are needed to inform theories of false-belief and to clarify the value and appropriateness of interventions targeting false-belief. Thus, the first aim of this study is to address the direction of the relation between false-belief understanding and social competence over one year in early childhood.

Cognitive Correlates of False-belief Understanding

False-belief understanding does not develop in a vacuum. Thus, an increasing amount of research has been dedicated to the identification of important cognitive correlates of false-belief understanding. The two cognitive skills that have received the most amount of attention are language ability and executive function (Bialystok & Senman, 2004). Specifically, research suggests that there is a relation between false-belief understanding and language ability (Astington & Jenkins, 1995; Cutting & Dunn, 1999; Happe, 1995; Hughes, 1998a, Watson et al., 1999). Similarly, there is increasing support for an association between false-belief understanding and executive function (Carlson & Moses, 2001; Carlson et al., 2002; Frye et al., 1995; Hala, Hug, & Henderson,

2003; Hughes, 1998b). Longitudinal analyses of false-belief that do not address the potential roles of these significant cognitive correlates may exaggerate, or erroneously represent, the role of false-belief understanding in social competence.

Language Ability

Obviously, to some extent, children's ability to pass false-belief tasks depends on their understanding of the narrative that accompanies them (Lewis, Freeman, Hagestadt, & Douglas, 1994). More importantly, however, language may contribute to the *development* of false-belief understanding (Astington, 2001). For example, according to some researchers, children become aware of the mind through social interaction and conversation involving mental state terms (Dunn, 1995; Nelson, Plesa, & Henseler, 1998). Consistent with this view is the idea that mental state words, such as "think" and "know," are predecessors of false-belief understanding (Olson, 1988). Interestingly, these mental terms are used frequently in conversation and pretend play by three years of age (Bretherton & Beeghlt, 1982). Research suggests that there is a relation between children's understanding of mental state terms and performance on false-belief tasks (Moore, Pure, & Furrow, 1990). Furthermore, children's mental state talk is associated with their false-belief understanding (Brown, Donelan-McCall, & Dunn, 1996). Thus, early references to mental states may lay the foundation for mental discovery.

It is also possible, however, that language motivates the acquisition of false-belief understanding by providing a way for children to represent and report false-beliefs (Plaut & Karmiloff-Smith, 1993). Specifically, syntax of complementation, which allows for

the representation of falsely embedded propositions, is thought to be a prerequisite for the development of false-belief understanding (de Villiers & de Villiers, 2000). Moreover, training studies targeting this ability have reported improvement in children's false-belief performance (Hale & Tager-Flusberg, 2003; Lohmann & Tomasello, 2003). Thus, early syntactic skills may promote false-belief understanding.

Although the specific role of language in the attainment of false-belief understanding is debatable, it is agreed that the two constructs are closely related (Astington & Jenkins, 1999). The correlation between language ability and false-belief performance is pervasive throughout the literature (Astington & Jenkins, 1995; Cutting & Dunn, 1999; Happe, 1995; Jenkins & Astington, 1996; Hughes, 1998a; Watson et al., 1999). This relation has been validated using a variety of language measures, including but not limited to, the Test of Early Language Development (TELD; Astington & Jenkins, 1995, 1999; Jenkins & Astington, 1996, 2000), the British Picture Vocabulary Test (BPVT; Cutting & Dunn, 1999; Happe, 1995; Hughes, 1998a; Hughes & Dunn, 1998) and the Peabody Picture Vocabulary Test (PPVT-R; Carlson, Moses, & Claxton, 2004; Davis & Pratt, 1995), and the Test for the Auditory Comprehension of Language (TACL-R; Capage & Watson, 2001; Watson et al., 1999). Thus, false-belief understanding has been linked to expressive and receptive forms of syntactic and semantic ability, receptive vocabulary, and knowledge of words, morphology, and sentence construction, respectively. Furthermore, longitudinal studies support language ability as a predictor of false-belief understanding (e.g., Astington & Jenkins, 1999; Hughes & Dunn, 1998). Specifically, in both of the above studies, general language ability at 3 years of age predicted false-belief understanding later in the preschool years.

The above findings suggest that language ability has implications for false-belief understanding. Thus, this relation must be accounted for in studies of false-belief understanding. Controlling for language is especially important in the present study given the relation between language ability and social competence (Brinton & Fujiki, 1993; Cole et al., 1993). Furthermore, it is common practice in studies examining the relation between false-belief understanding and social competence (e.g., Astington & Jenkins, 1995; Capage & Watson, 2001; Jenkins & Astingtin, 2000; Watson et al., 1999). Therefore, the second aim of this study is to determine the unique variance in social competence accounted for by false-belief understanding once language ability is controlled.

Executive Function

Executive function includes the processes involved in goal-oriented behavior, which are generally subsumed under the following three factors: inhibitory control, attentional flexibility, and working memory (Hughes, 1998a; Welsh et al., 1991). These processes underlie children's ability to monitor and control thought and action. There are two prominent theories in regards to how executive function may affect false-belief understanding: the expression account and the emergence account (see Carlson & Moses, 2001; Moses, 2001). According to the expression account, young children already possess an understanding of false-belief, but are unable to express it because of the executive demands inherent in typical false-belief tasks. For example, in order to pass a false-belief task, children must inhibit their knowledge of reality and instead provide an

answer based on false pretenses. Thus, inhibitory processes may directly impact performance on false-belief tasks by enabling children to supercede typical or prepotent tendencies to base their beliefs in reality (Carlson, Moses, & Hix, 1998; Moore, Jarrold, Russell, Lumb, Sapp, & MacCallum, 1995). Studies in which children demonstrated a greater understanding of false-belief when the executive demands of tasks were reduced provide support for the expression account (e.g., Carlson et al, 1998; Freeman, Lewis, & Doherty, 1991; Leslie & Polizzi, 1998; Mitchell & Lacohee, 1991; Moses, 1993; Robinson & Mitchell, 1995). Specifically, the results of such studies suggest that the inhibitory demands associated with false-belief tasks, rather than actual deficits in mental representation, were responsible for limiting children's success rate on these tasks.

In contrast, the emergence account asserts that a certain level of executive ability is required for the construction of mental concepts. In other words, the ability to consider multiple mental representations is not possible without some executive skill (Hughes, 1996; Russell, 1996). According to this view, children's failure on false-belief tasks is a matter of competence, not performance. Thus, lessening executive demands on tasks, such as reducing the role of inhibitory control demand, will not increase performance because children lack the requisite concept of false-belief (Moses, 2001). Results of Wellman et al.'s (2001) meta-analysis of false-belief understanding, which suggest that task manipulations do not improve younger children's performance to above-chance levels, support this hypothesis. Additional support for the emergence account is derived from recent studies that report significant relations between children's executive function performance and their performance on nontraditional false-belief understanding tasks, such as those with reduced inhibitory demands (Perner & Lang, 1999; Perner, Lang, &

Kloo, 2002), or those that do not include prepotent response options (Moses & Carlson, 2004). Specifically, the results of such studies suggest that the association between executive function and false-belief understanding is not merely the result of the inhibition demands in false-belief tasks, but rather is the result of conceptual links between these two constructs.

Given that support exists for both executive accounts of false-belief understanding development, it has recently been proposed that executive function plays a role in both the expression and the emergence of false-belief understanding (Carlson & Moses, 2001). The above findings support this proposal, in that together, they demonstrate how advances in inhibitory control may facilitate, as well as may be required for, advances in false-belief understanding. Furthermore, examination of the relation between false-belief understanding and other components of executive function provides theoretical support for the above proposal. For example, working memory may affect children's acquisition of false-belief understanding by enabling children to hold conflicting perspectives in their minds. In addition, working memory may influence children's performance on false-belief tasks by allowing children to minimize information irrelevant to false-belief understanding (Keenan, Olson, & Marini, 1998). Thus, research and theory suggest that the emergence and expression accounts may operate as coexisting, rather than as competing, hypotheses.

Although the results of recent studies offer insight into the executive accounts of false-belief development, they fail to clarify other critical issues related to the executive function-false-belief understanding association, such as the direction of the relation between these constructs (Carlson & Moses, 2001). The extant literature supports

executive function as an important correlate of false-belief understanding during the preschool years (Carlson & Moses, 2001; Carlson et al., 2002; Fahie & Symons, 2003; Frye et al., 1995; Hughes, 1998a, 1998b). Specifically, concurrent relations have been found between false-belief understanding and individual components of executive function, including attentional flexibility (Frye et al., 1995; Ozonoff, Pennington, & Rogers, 1991; Perner et al., 2002), inhibitory control (Bialystok & Senman, 2004; Carlson & Moses, 2001; Carlson, Moses, et al., 2004), and working memory (Davis & Pratt, 1995; Hughes, 1998a; Keenan et al., 1998). Furthermore, recent studies report correlations between children's false-belief understanding and their performance on executive function tasks that include a combination of components, such as inhibitory control and working memory (Carlson et al., 2002; Hala et al., 2003). Given that the above research has been correlational, the causal relation between executive function and false-belief understanding remains unclear. Regardless of this limitation, however, researchers have adopted conflicting hypotheses concerning the developmental ordering of these constructs.

One hypothesis, which is frequently cited in this literature, is that executive function predicts false-belief understanding. While this argument is closely associated with the emergence account of false-belief development, it is also compatible with the expression account (Carlson & Moses, 2001). Consistent with this hypothesis, the results of numerous cross-sectional studies suggest that executive function accounts for unique and significant variance in children's false-belief understanding (e.g., Carlson et al., 2002; Carlson et al., 1998; Davis & Pratt, 1995; Hala et al., 2003; Hughes, 1998a). Moreover, the results of the two studies that have examined the longitudinal relation

between these constructs provide additional support this hypothesis (Carlson, Mandell, et al., 2004; Hughes, 1998b). Specifically, in both studies, early executive function predicted later false-belief understanding. Furthermore, neither study found evidence of early false-belief understanding as a predictor of later executive function. Thus, the above results suggest a one-way causal relation between these constructs, with executive function serving as a predictor of false-belief understanding.

Despite the above findings, other researchers argue that false-belief understanding predicts executive function. This hypothesis is clearly consistent with the expression account of false-belief understanding. Moreover, proponents of this hypothesis argue that in order for children to exert executive control over their behavior, they must possess metarepresentational skills (Perner & Lang, 1999; Perner, Stummer, & Lang, 1999). Specifically, Perner and colleagues suggest that in order to pass executive function tasks, children must be capable of mentally representing the task objectives along with the possible obstacles to those objectives, such as prepotent responses. In other words, children's capacity for metarepresentation, which is inherent in false-belief understanding, has causal implications for their development of executive function. Although the above-cited studies speak against this hypothesis, it is important to note that causal relations were only truly investigated in two studies. Thus, additional longitudinal research is needed to clarify the direction of the relation between executive function and false-belief understanding.

Although the directional relation between executive function and false-belief understanding has important implications for understanding cognitive development, this relation may also reveal specific relations between cognitive and social development.

Executive function has been linked with self-regulation (Cole et al., 1993), and impairments in executive function have been associated with disruptive behavioral disorders (for review, see Pennington & Ozonoff, 1996). Given the relations among executive function and social competence (e.g., Hughes et al., 1998; Shultz et al., 2001), executive function and false-belief (e.g., Carlson et al., 2002; Hughes, 1998b; Hala et al., 2003), and false-belief and social competence (e.g., Astington & Jenkins, 1995; Capage & Watson, 2001; Hughes, White, et al., 2000; Lalonde & Chandler, 1995; Watson et al., 1999), it has been proposed that executive function may impact social competence both directly and indirectly (Hughes et al., 1998). Thus, it is possible that false-belief understanding partially mediates the relation between executive function and social competence (see Figure 1). Unfortunately, this model has not been tested with longitudinal data. Therefore, the third aim of this study is to determine the direction of the relation between false-belief understanding and executive function and to test a model of partial mediation.

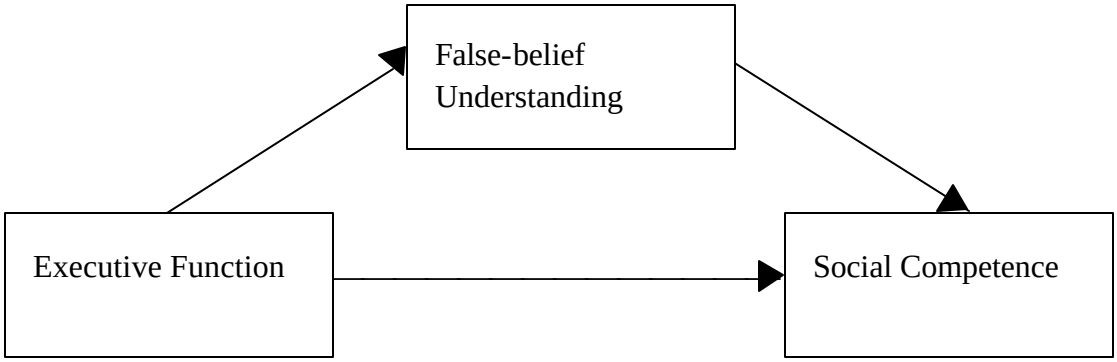

Figure 1. Proposed partial mediation model illustrating the affect of false-belief understanding on the relation between executive function and social competence.

The Role of Gender

The issue of gender has been largely ignored in studies addressing false-belief understanding. Interestingly, however, gender differences are well documented in numerous areas of child development, including two areas related to false-belief understanding: language ability and social competence. Specifically, females demonstrate a greater rate of vocabulary growth during early childhood than males (Huttenlocher et al., 1991), as well as use language more often than males (Leaper, 1991; Leaper et al., 1998). Females also demonstrate superior use of mental state terms during preschool (Hughes & Dunn, 1998) and generally outperform males on tasks of language ability across the elementary years (Halpern, 1997; Halpern & LaMay, 2000). Similarly, when compared to their male peers, females are typically rated as displaying more social

skills and fewer externalizing behaviors (Achenbach et al., 1991; Cole et al., 2001; Keiley et al., 2003; Pellegrini, 1985).

One plausible hypothesis that arises from the above findings is that gender differences also exist in false-belief understanding. Specifically, given the acknowledged relation between language ability and false-belief understanding, and the fact that females exhibit greater linguistic skill than males, it is possible that gender differences in language ability lead to gender differences in false-belief understanding. Similarly, given the proposed relation between false-belief understanding and social competence, and the fact that females demonstrate higher levels of social competence, it is possible that gender differences in social competence arise from gender differences in false-belief understanding. Despite these relations, however, reports of gender differences in false-belief understanding are rare (for exceptions reporting slight advantages for females, see Charman, Ruffman, & Clements, 2002; Cutting & Dunn, 1999; Happe, 1995). Thus, the majority of research exploring the role of gender in false-belief understanding, including preliminary results from our research lab (Razza & Blair, 2003; Peters et al., 2003; Razza et al., 2004), suggests that children's false-belief understanding does not differ by gender (e.g., Astington & Jenkins, 1995; Holmes, Black, & Miller, 1996; Hughes, 1998a).

An alternative hypothesis, and the one proposed in this study, is that gender does not directly affect false-belief understanding, but rather influences the relations between false-belief understanding and its correlates. This hypothesis is grounded in gender theory, which suggests that there are differences in the way males and females communicate and interact with peers during the early childhood years (Maccoby, 1998). For example, during free play, communication among females is predominantly

collaborative and characterized by cooperative exchanges, such as reciprocal affirmations, joint proposals, and elaborations. In contrast, speech among males is predominantly controlling and characterized by competitive remarks, such as commands, prohibitions, and rejections (Leaper, 1991). Furthermore, when presented with a conflict, females tend to apply mitigation strategies to restore interpersonal harmony. In contrast, males are more inclined to use threats and physical force to further their own agendas (Miller, Danaher, & Forbes, 1986; Sheldon, 1990). Given these qualitative differences in communication style, it follows that the vocabularies of males and females would also reflect qualitative differences. One difference that is particularly relevant to false-belief understanding is that females exhibit more frequent and more advanced mental state talk than males (Hughes & Dunn, 1998). Given that children's mental state talk is associated with their false-belief understanding (Brown et al., 1996), females' speech may be more applicable to the development of false-belief understanding, and thus, the relation between language and false-belief understanding may be stronger for females than for males.

Fundamental gender differences in children's social interaction may also affect the relation between false-belief understanding and social competence. In general, males exhibit more competitive and aggressive play than females, and females engage in more nurturing and communication-based play than males (Maccoby, 1998; Maccoby & Jacklin, 1987). Thus, it is not surprising that gender differences exist in children's play activities. In particular, while males typically engage in activities that emphasize an instrumental orientation, such construction play, females generally participate in activities that stress an expressive orientation, such as socio-dramatic play (Hughes,

1991; Leaper & Gleason, 1996). Research suggests that these gender-typed activities may provide males and females with different opportunities for applying their cognitive and social skills (Leaper, 2000; Liss, 1983). Specifically, feminine-stereotyped play activities, such as playing with a toy store set, involve cooperation and social-relational behaviors. In contrast, masculine-stereotyped play activities, such as building a car, emphasize independence and power-assertive behaviors (Leaper, 1994). Thus, it is possible that females' activities involve more opportunities to apply false-belief understanding, as well as benefit more from its application, than males' activities.

Furthermore, the social cognition literature suggests that males and females may have the same ability to understand another's thoughts, but may demonstrate differences in their tendency to apply this skill because of social factors. For example, it has been proposed that the sociocognitive skills related to social status differ by gender. Specifically, social status among males may be largely discriminated by sociocognitive skills associated with aggression, such as attributional biases, whereas differentiation in social status among females may rely mostly on sociocognitive skills related to cooperation, such as perspective-taking (Dodge & Feldman, 1990). Thus, we would expect to see males and females exercising different sociocognitive skills. Consistent with this assumption is research suggesting that males are more likely to interpret a peer's assertive behavior as aggressive than are females (Feldman & Dodge, 1987). Likewise, males have mitigation strategies in their repertoire and know how to apply them, but just do so less often then females (Sachs, 1987). In sum, it may not be to a male's social advantage to consider false-beliefs when interacting with other males. Thus, false-belief understanding may not play as important of a role in the development of social

competence for males as it does for females. As a result, the relation between false-belief understanding and social competence may be stronger for females than for males.

Preliminary analyses from our research lab provide additional support for this alternative hypothesis. Specifically, in two out of three studies, relations between false-belief understanding and both language ability and social competence were limited to females (Razza & Blair, 2003; Razza et al., 2004). Given that levels of false-belief understanding, language ability, and social competence did not differ by gender in the above studies, mean differences across these variables cannot explain the gender effect. In addition, the gender effect cannot be attributed to increased variability among variables for females because regression analyses are not influenced by potential variance inequalities. Therefore, other factors, such as the underlying differences in how males and females utilize their knowledge of false-belief in social situations, may have explanatory power.

Given that the above findings were correlational and specific to our lab, additional research in this area is necessary. Therefore, the fourth aim of this study is to investigate the role of gender in relations among false-belief understanding, language ability, and social competence. Specifically, the relation between language ability and false-belief understanding will be examined for interactions with gender. Furthermore, based on previous findings from our lab (Razza & Blair, 2003; Peters et al., 2003; Razza et al., 2004), a moderation model will be tested to determine the extent to which gender influences the relation between false-belief understanding and social competence (see Figure 2).

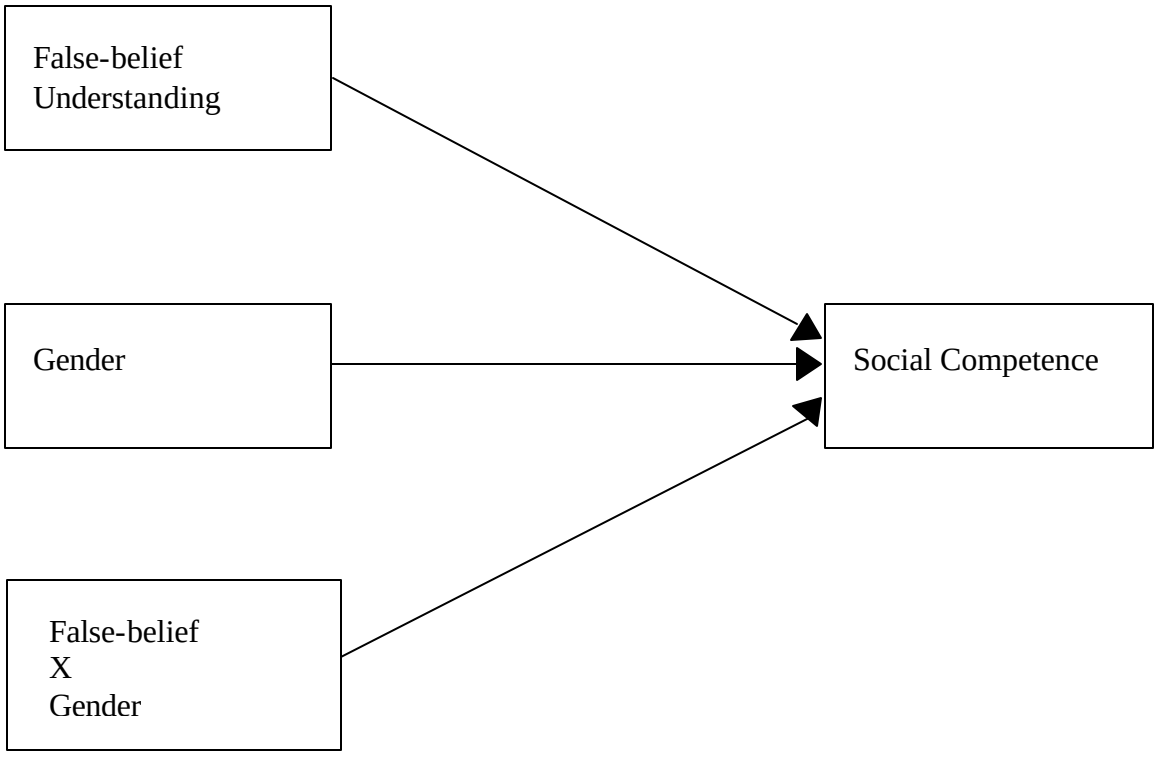

Figure 2. Proposed moderation model depicting the influence of gender on the relation between false-belief understanding and social competence.

Low-income Sample

Although general findings regarding false-belief are well established, it is currently unknown whether the construct and its correlates are similar across populations. Despite the fact that interest in the development of false-belief understanding has grown over the last decade, the majority of the research has been conducted with a select

population. Specifically, although we know about false-belief understanding and its correlates in white, middle and upper-middle class children, predominantly those from the United Kingdom, less is known about false-belief in children from low-income backgrounds (Wellman et al., 2001).

The very limited early research on false-belief understanding in children from low-income backgrounds suggests that the observed consistency among tasks typically reported in the false-belief literature might be reduced for this population. Specifically, in the first study to examine false-belief understanding in a Head Start population, children exhibited only moderate consistency across a variety of false-belief tasks, which suggests that false-belief understanding may be a less unified construct for children from low-income backgrounds than for children from higher income backgrounds (Holmes et al., 1996). It is important to note, however, that these results were generated from a single study with a select population of low-income, predominantly African-American children, only half of which were enrolled in Head Start. Thus, the generalization of these findings to all Head Start children, or to low-income children in general, is questionable.

Furthermore, results from subsequent studies of false-belief understanding within low-income samples suggest moderate consistently across false-belief tasks (Hughes, 1998b; Razza & Blair, 2003). Research also suggests that the relations between false-belief understanding and its correlates are consistent across income-level. For example, there is support for the relation between false-belief understanding and both verbal ability and executive function within low-income samples (Hughes, 1998a, 1998b). Research also suggests that false-belief understanding is related to social competence for children

from low-income backgrounds (Razza & Blair, 2003). It is not the intent, or within the ability, of the proposed study to make comparisons of false-belief understanding across income levels. Rather, the proposed study seeks to increase our understanding of false-belief understanding and its correlates within children from low-income backgrounds.

Preliminary Studies

This section reviews the findings of three previous studies examining false-belief understanding in low-income children. Overall, these studies provide support for gender-specific relations between false-belief understanding and teacher-reported social competence. The studies were conducted through collaborations between The Pennsylvania State University and area Head Start Centers.

The first study examining the role of gender in false-belief understanding included a sample of 53 preschoolers (26 males and 27 females; mean age = 4 years, 6 months). The results suggest gender as a moderator in the relation between false-belief and social competence, such that the relation was supported only for females. Specifically, false-belief was significantly related to social skills, t (23) = .35, p = .05, and problem behavior, t (23) = -.39, p = .05, for females, but not for males, t (26) = -.16 and t (26) = .05, both ps ns, respectively. Interestingly, the relation between language ability and false-belief understanding also reached significance for females, t (23) = .39, p = .05, but not for males, t (26) = -.10, ns. Multiple regression analyses were conducted to better identify the predictors of social competence. The final model verified false-belief understanding (ß = 1.01), and the false-belief by gender interaction, (ß = -1.11, R^2 = .27),

F (5, 44) = 3.14, *p* = .05, as predictors of children's social competence (Razza & Blair, 2003). Gender, language ability, and the language by gender interaction all failed to reach significance. These results indicate a gender-specific effect with respect to false-belief understanding. Specifically, females who demonstrated a greater understanding of false-belief exhibited significantly higher teacher-reported social competence than females who performed more poorly on the false-belief battery. For males, however, performance on tasks of false-belief understanding was unrelated to teacher-reported social competence.

Similar results were reported for the second study of 125 children (64 males and 61 females; mean age = 4 years, 9 months). Participants represent a sub-sample of a larger cross-sectional study, which includes 162 children. The relation between false-belief understanding and social competence reached significance for females, *t* (61) = .30, *p* = .05, but not for males, *t* (64) = .07, ns. Likewise, the relation between false-belief understanding and language ability reached significance for females, *t* (55) = .27, *p* = .05, but not for males, *t* (58) = .16, ns, (Peters et al., 2003). Multiple regression analyses supported false-belief understanding, (ß = .23) and gender (ß = .21, R^2 = .14), *F* (3, 122) = 7.86, *p* = .05, as significant predictors of social competence. In the final model, which added language ability and the false-belief by gender interaction, only false-belief understanding remained as a significant predictor of social competence, (ß = .23, ? R^2 = .01), *F* (4, 108) = 4.73, *p* = .05. Although the false-belief by gender interaction failed to reach significance (ß = .17), including it in the model did eliminate gender as a predictor (ß = .09). This result is confusing and may suggest a suppression

effect. Overall, however, results support a significant positive relation between false-belief understanding and social competence for both males and females, but suggest that the relation may be stronger for females.

The third study explored the role of gender within a cohort of 91 children (53 males and 38 females; mean age = 5 years, 1 month). The relation between false-belief understanding and social competence again failed to reach significance for the full sample, t (79) = .14, ns. Analysis by gender, however, revealed that false-belief was related to social skills for females, t (36) = .41, p = .05, but not for males, t (43) = -.02, ns (Razza et al., 2004). Results of a multiple regression analysis supported gender ($ß$ = .30) and language ability ($ß$ = .29, R^2 = .21), F (3, 69) = 6.25, p = .05, as significant predictors of social competence. After adding the false-belief by gender interaction into the model, language ability ($ß$ = .28) and the interaction term ($ß$ = .38; R^2 = .06), F (4, 68) = 6.35, p = .05, were significant predictors of social competence. These results provide additional support for the influence of gender on the relation between false-belief understanding and social competence. Again, false-belief understanding was related to teacher-reported social behavior in the Head Start classroom for females, but not for males.

Although the above three preliminary studies suggest that gender influences the relations among false-belief understanding, language ability, and social competence, results are far from conclusive. One limitation associated with these studies is that relations among constructs were not consistent across studies. For example, language ability remained a significant predictor of social competence in only one of the studies (Razza et al., 2004). Furthermore, once the false-belief by gender interaction term was

added to the model, false-belief understanding remained an independent predictor of social competence in only two of the studies (Razza & Blair, 2003; Peters et al., 2003). A second limitation of the above studies is that gender interactions were not consistent across studies. For instance, the false-belief by gender interaction term failed to reach significance in one study (Peters et al., 2003). Similarly, the association between language ability and false-belief understanding was specific to females in two of the studies (Razza & Blair, 2003; Peters et al., 2003). A third limitation associated with the previous studies is that they were all cross-sectional. Thus, it is unclear whether the reported relations among constructs, as well as the role of gender within these relations, are consistent over time. In addition, predictive relations among these constructs and interactions are unknown. This study addresses the above limitations by exploring relations between, and gender interactions among, false-belief understanding and its correlates over time. This study is a longitudinal extension of the second preliminary study (Peters et al., 2003). Specifically, a subset of Head Start children from the abovementioned study was reassessed in the spring of their Kindergarten year.

Statement of Purpose

Although numerous studies have documented relations between false-belief understanding and its correlates, few studies have investigated these relations over time. Thus, the major goal of this study is to examine the relations among false-belief understanding and its correlates over one year in early childhood. Specifically, this study seeks to increase our understanding of these relations by addressing four important issues

in the false-belief understanding literature. First, this study examines the longitudinal relation between false-belief understanding and social competence, thereby testing the directional relation implied in numerous correlational studies. Second, the present study examines relations between false-belief understanding and its cognitive correlates over time. Specifically, the proposed longitudinal relation between language ability and false-belief understanding is explored and its significance to the relation between false-belief understanding and social competence in considered. Similarly, the directional relation between executive function and false-belief understanding is investigated and a partial mediational model is tested to determine the extent to which children's false-belief understanding influences the relation between executive function and social competence. Third, this study investigates the role of gender in the relations between false-belief understanding and it correlates. Preliminary studies and social cognitive research suggest that relations between false-belief understanding and both language ability and social competence may be stronger for females than for males. Thus, moderational models are tested to determine the extent to which gender affects the relation between false-belief understanding and the above correlates. Finally, the present study examines the above issues within low-income children, which is a population that has been largely ignored by the false-belief literature.

Research Hypotheses

H1. Concurrent Relations Among False-belief Understanding and its Correlates.

a. Children's false-belief understanding will be positively related to their social competence both in preschool and in kindergarten.

b. Children's false-belief understanding will be positively related to their language ability in preschool.

c. Children's false-belief understanding will be positively related to their executive function skills both in preschool and in kindergarten.

H2. The Relation Between False-belief Understanding and Social Competence.

a. The following constructs will demonstrate stability over time: False-belief understanding, executive function, and social competence.

b. Children's false-belief understanding in preschool will predict social competence in kindergarten.

c. Children's false-belief understanding in preschool will account for unique variance in their social competence once language ability is controlled.

H3. The Relation Between False-belief Understanding and Executive Function.

a. Children's executive function in preschool will predict their false-belief understanding in kindergarten.

b. False-belief understanding will partially mediate the relation between executive function and social competence.

H4. The Role of Gender in Relations Between False-belief Understanding and its Correlates.

a. Gender will moderate the relation between false-belief understanding and language ability, such that the relation will be stronger for females than for males.

b. Gender will moderate the relation between false-belief understanding and social competence, such that the relation will be stronger for females than for males.

CHAPTER 2

Method

Participants

Participants were recruited from nine Head Start centers, which were comprised of fifteen classrooms, spanning three rural counties in central Pennsylvania. Participants were part of a larger longitudinal study (N = 170) targeting school readiness among Head Start preschool children. To be eligible for the present study, children had to be between 3.5 and 6 years of age and prepared to enter Kindergarten the following school year. Eighty-eight children met these requirements and were included in the Time 1(T1) sample. Head Start personnel obtained parental consent for the T1 data collection during a routine home visit. Parental consent for the kindergarten year, or Time 2 (T2), was collected via mail or was provided at the time of the child interview. Children provided verbal consent at both the Head Start and Kindergarten assessments.

Of the 88 families at T1, three children were later identified as having developmental problems and were excluded from the study. In addition, one child was dropped from the study because the family moved before the child could be assessed. Another child was excluded from analyses because of an extreme score (greater than 2.5 standard deviations from the sample mean) on the social competence measure. The final number of families available for analysis at T1 was 83.

Caregiver demographic information is displayed in Table 1. The mean age of the primary caregiver was 31 years (range = 21 to 57 years). The majority of primary caregivers were mothers (88%), had either a high school degree or GED (58%), and were employed (54%). For those who reported their earnings (88%), the mean monthly income was $1,720 (range = $279 to $6500). The majority of households were comprised of two adults (69%). The average number of children per household was 2.4 and the average number of moves per year was one. Children's demographic information is displayed in Table 2. The mean chronological age of the children was 5 years 1 month (range = 3 years 8 months to 5 years 7 months). The majority of children were over 5 years of age (69%), female (59%), and Caucasian (87%).

Parental consent for T2 was received from 72 families. Three of these families, however, were living out of state, and thus, child and teacher assessments were not collected. Sixty-nine children were included in the longitudinal sample. The retention rate was 83%, which is notable given the high mobility of many Head Start families. With two exceptions, attrition was due to the inability to contact a family due to relocation rather than to refusal to participate. At T2, children were spread across 36 kindergarten classrooms in 26 elementary schools in central Pennsylvania.

Table 1

Demographic Characteristics of Primary Caregiver (n = 83)

Variable	Frequency	Percentage
Relation to Child		
Mother	73	88
Father	6	7
Grandmother	4	5
Age		
20 - 30 years	46	56
30 - 40 years	25	30
40 - 50 years	10	12
50 years or above	2	2
Highest Educational Level Attained		
8th grade or less	1	1
9th to 11th grade	13	16
GED/High school diploma	48	58
Some College	5	6
Associates Degree	7	8
Bachelors Degree or higher	9	11
Employment Status		
Unemployed	38	46
Part time	19	23
Full time	26	31
Monthly Income		
Less than $1,000	20	24
$1,000 - 2,000	34	41
Greater than $2,000	19	23
Not reported	10	12
Family Type		
One adult	20	24
Two adults	57	69
Other	6	7
Family Size		
One child	14	17
Two children	39	47
Three or more children	30	36
Number of Moves		
Did not move	39	47
One move	22	27
Two moves	11	13
Three or more moves	11	13

Table 2

Demographic Characteristics of the Children (n = 83)

Variable	Frequency	Percentage
Age		
Less than 4 years old	1	1
4 – 5 years old	25	30
Greater than 5 years old	57	69
Gender		
Female	49	59
Male	34	41
Ethnicity		
Caucasian	72	87
African American	3	4
Asian	1	1
Multiracial	5	6
Other	1	1
Not reported	1	1

Design

The present study utilized a short-term longitudinal design to acquire data on children's false-belief understanding, executive function, language ability, and social competence at two occasions during early childhood. The first wave of data was

collected during the spring of the child's Head Start year. The second wave of data was collected approximately one year later, during the spring of the child's kindergarten year. As previously mentioned, a subset of the children in this longitudinal sample was previously reported on in a preliminary study. Specifically, 63 of these 69 children were included in the sample for the second preliminary study (Peters et al., 2003). The remaining six children were not included in previous analyses because their data were incomplete at that time. Thus, this study can be considered one follow-up assessment in larger longitudinal project focusing on issues of school readiness.

Procedure

Children were seen individually on two separate occasions in the Spring of their Head Start year and then again on one occasion in the Spring of their Kindergarten year. A team of trained child interviewers consisting of graduate students, undergraduate students, and hired research staff administered the interviews. All Head Start interviews were conducted in a quiet area down the hall from the child's classroom. Children were removed from regular class activities to participate in this study. A member of the Head Start staff, who remained in the room throughout both interviews, accompanied children at T1. Kindergarten interviews were primarily conducted in either an unoccupied room of a centrally located Head Start center or in a university child research laboratory. A primary caregiver or guardian, who remained in the room throughout the interview, accompanied children at T2. In a few instances, due to transportation or employment issues, Kindergarten interviews were conducted in the family's home. In these cases, a

primary caregiver, as well as a second child interviewer, were present. Due to variation in children's Kindergarten schedules, some children were seen before or after their school day and others were seen on their day off. Each interview lasted approximately 45 minutes and children were rewarded with stickers, regardless of their performance. Families were paid $50 at both T1 and T2 for their participation.

As mentioned above, children participated in a total of three interviews, two during their Head Start year and one during their Kindergarten year. These interviews were part of a larger longitudinal study targeting psychological and physiological indicators of school readiness. The Head Start assessment was divided into Child Interviews A and B, which were conducted approximately two weeks apart. This division was necessary given the length of the Head Start evaluation. Child Interview A included the following measures: false-belief understanding battery, Kusche Emotional Inventory, Peg Tapping task, and Day/Night task. Child Interview B included the following assessments: saliva collection #1, vagal tone resting (interviewer read a book to the child while child's heart rate variability was recorded), vagal tone suppression (interviewer administered the Peabody Picture Vocabulary Test (PPVT) to child while child's heart rate variability was recorded), Flexible Item Selection Task (FIST), saliva collection #2, Woodcock Johnson Reading Mastery Letter Identification Task, Rapid Automatized Naming Task, Syllable Deletion Task, and saliva collection #3.

The Kindergarten interview was conducted in one session and included a field test version of the Head Start National Reporting System Direct Child Assessment (HSNRS; 2003). The HSNRS is a multi-component measure designed to assess a specific set of literacy and language indicators. In brief, the HSNRS includes measures of English

comprehension, backward digit span, backward word span, revised PPVT, letter naming, phonological awareness, and early math skills. The Kindergarten interview was presented as follows: saliva collection #1, Head Start National Reporting System Task, vagal tone resting (interviewer read a book to the child), vagal tone suppression (interviewed administered the Self-Ordered Pointing Task to the child), saliva collection #2, false-belief understanding battery, Raven's Colored Progressive Matrices, Peg Tapping Task, FIST, and saliva collection #3.

Head Start and Kindergarten teachers rated children's social competence, behavior, and temperament in the Spring of the school year. The teacher-report battery consisted of the following measures: Teacher Observation of Classroom Adaptation (TOCA-R), Children's Behavior Questionnaire (CBQ), Behavioral Inhibition Scale (BIS), and the Preschool and Kindergarten Behavior Scales (PKBS). Teachers were paid $10 for each child that they assessed. Information regarding the child's family background, such as child and maternal age and ethnicity, maternal education, and family income, was collected from parents during the consent process.

Measures

The measures associated with the present study are described in the remainder of this chapter. These measures include four false-belief understanding tasks, one measure of receptive vocabulary, three executive function tasks, and one teacher report of social competence. See Appendix for measure protocol.

False-belief Understanding Tasks

Four tasks, which are considered standard false-belief tasks in the literature with preschoolers, were chosen for this study. The four tasks comprising the false-belief battery included an unexpected *contents* task (Prototypical Box), two sub-tasks of an unexpected *identity* task (Peep-through Book), and an unexpected *location*s task (Locations Task). Each task was scored as either a pass (1) or fail (0), and a false-belief aggregate, ranging from 0 to 4, was created to reflect performance across all four tasks.

Due to the experimental nature of these tasks, reliability and validity have not been formally established. Results of a recent study using standard false-belief tasks on a normative sample, however, suggest strong test-retest reliability correlations [$r(46) = .77$] for false-belief aggregate scores (Hughes, Adlam, Happe, Jackson, Taylor, & Caspi, 2000). Moreover, this study reported substantial internal consistency (alpha = .76 and .82 at times 1 and 2, respectively) for a battery of standard false-belief tasks. In terms of validity, these measures correlate well with other false-belief tasks involving puppets and ranging in verbal demands (Hughes, 1998; Hughes & Dunn, 1998). These findings suggest that the measures have construct validity.

Prototypical Box

This unexpected contents task is a descendent of Perner, Leekam, and Wimmer's (1987) "smarties" task. The version used in this study is similar to Hughes' (1998b) adaptation of the original task. At Time 1, an egg carton was placed in front of the child and the child was asked, "What do you think is inside this carton?" Children were

required to answer this pretest question correctly (i.e., “eggs”) to continue, but this question was not scored. The egg carton was then opened and the child was shown that the carton really contained crayons. The carton was shut and the child was asked the test question, "What did you think was inside the carton, before we opened it?" followed by the reality control question, "What is in the carton really?" If the child did not respond, a forced-choice prompt was provided (i.e., "eggs or crayons"). Children were successful if they responded correctly to both the test and control questions (Hughes, 1998a; Hughes & Dunn, 1998; Hughes, White, et al., 2000). This task was scored as either a pass (1) or a fail (0). A similar procedure was followed at Time 2, but a crayon box containing gum was used in place of the egg carton with crayons.

Peep-Through Book

The original unexpected identity book task was developed by Chandler and Helm (1984), and later modified by Gopnik and Astington (1988). The version used in the present study was modeled after the “Ears book” created by Slaughter and Gopnik (1996). This task was divided into two subtasks. In the first subtask, children’s understanding of their own false-belief was assessed. In this subtask, the child was read a story from a peep-through book. Each page of the book contained a clear window, through which the child could see part of the picture from the subsequent page. For the first three pages, the picture appeared to be ears of different animals. Before turning to the final page, the child was asked, "What do you think these are?" This pretest question was not scored, but it had to be answered correctly (i.e., “ears”) in order to administer the

task. Next, the page was turned, revealing that the ears were really petals on a flower. The book was then turned back to the prior page and the child was asked the test question, "Before we turned the page, what did you think these would be, ears or petals?" and a reality control question, "What are these really, ears or petals?"

The second subtask assessed children's understanding of another's false-belief. For this subtask, the book was closed and the child was introduced to a cat cut-out. The cat was introduced as follows: "Look, this is Charlie. Charlie has never seen this book before. If he comes over and looks through this window, what will he think these are, ears or petals?" This second test question was followed by a second reality control question, "What are they really, ears or petals?" In order to pass a subtask, children had to respond correctly to both the test and control questions (Cutting & Dunn, 1999; Gopnik & Astington, 1988; Hughes & Dunn, 1998; Hughes, White, et al., 2000). Each subtask was scored as either a pass (1) or a fail (0).

Locations Task

This unexpected locations task was modeled after the original Wimmer and Perner (1983) Maxi task. Thus, children were told a story where the location of an object was changed by Character A while Character B was out of sight and were then asked to predict where Character B, who did not witness the change, would look for the object upon his/her return. Figurines of two familiar characters, Big Bird and Elmo, were used to act out this scenario. The protocol was identical to that presented by Holmes et al. (1996). Specifically, Elmo put a chocolate bar in a drawer and went out to play. While

he was gone, Big Bird moved the chocolate from the drawer to the refrigerator. Elmo returned home and wanted some chocolate. Children were asked, "Do you remember where Elmo put the chocolate in the beginning?" If the child could not remember, he/she was reminded of the original location. This memory question was not scored. Next, children were asked the reality control question, "Do you remember where the chocolate is now?" This question was followed by the test question, "Where will Elmo look for the chocolate?" In order to pass this task, children had to correctly answer both the control and test questions (Astington & Jenkins, 1995; Holmes et al., 1996; Wimmer & Perner, 1983). This task was scored as either a pass (1) or a fail (0).

Language Ability

Language ability, specifically receptive vocabulary, was assessed using the Peabody Picture Vocabulary Test (PPVT-III; Dunn & Dunn, 1997). In this task, children were presented with a picture booklet and asked to identify a variety of vocabulary terms. Each page of the booklet contained four pictures and it was the child's task to point to the picture that corresponded to the word spoken by the child interviewer (e.g., "Point to dog"). Testing began with a set of twelve terms determined by the child's chronological age and continued until the child missed at least eight out of the twelve terms in a given set. Children's raw scores, which reflected the total number of terms correctly identified, were converted to standardized scores at T1. The PPVT has high internal reliability, alpha = .94, for children ages 3 to 6 years, as well as strong validity (Williams & Wang, 1997). The PPVT is the English equivalent of the British Picture Vocabulary Scale

(BPVS; Dunn, Dunn, Whetton, & Pintilie, 1982), a task used by false-belief researchers in the United Kingdom (Ruffman, Perner, & Parkin, 1999). Given the stability of PPVT scores and the length of the Kindergarten battery, this task was only conducted at T1.

Executive Function

The executive function battery consisted of three tasks commonly used with preschoolers and school-aged children (Zelazo & Mueller, 2002). These tasks assess inhibitory control (Peg Tapping), set shifting or mental flexibility (Flexible Item Selection Task; FIST), and working memory (Self-Ordered Pointing; SOP). Although these tasks are not standardized, their popularity within the literature suggests their validity. Furthermore, these tasks were derived from standard neuropsychological tests used with adults, which are reliable and valid tests of prefrontal functions (Hughes, 1998a; Zelazo & Jacques, 1996).

Peg-Tapping Task

The peg-tapping task (Diamond & Taylor, 1996; Luria, 1966) requires children to inhibit a natural response, which is to imitate the interviewer's tapping pattern, and thus it is a measure of children's inhibitory control. For this task, children were presented with a wooden peg and instructed to tap twice on the table when the interviewer tapped once (Rule 1), and to tap once when the interviewer tapped twice (Rule 2). Once children demonstrated an understanding of each rule, the practice session ended and the pre-test

began. The interviewer began the pre-test by tapping once and handing the peg to the child without a verbal prompt. If the child responded correctly, the child was praised and the interviewer tested the child on Rule 2. If the child responded incorrectly, the child was reminded of Rule 1 and the pre-test was repeated. During the pre-test, the interviewer was allowed to review the rules with the child up to four times, beginning with the first rule that the child identified incorrectly. If the child failed the pre-test after the final reminder, testing was discontinued and the child received a score of zero. For those children who demonstrated an understanding of both rules, the pre-test session ended and the testing session began. Pre-test trials 1 and 2 were counted as trials 1 and 2 of the testing session, which consisted of 16 trials presented in a fixed pseudorandom order. The total number of trials passed ranged from 0 to 16. The child's total score was converted into a percent-correct score. (Diamond, Prevor, Callendar, & Druin, 1997; Diamond & Taylor, 1996).

Flexible Item Selection Task (FIST).

The FIST (Jacques & Zelazo, 2001) assesses preschoolers' set-shifting ability. This task was adapted from the Visual-Verbal Test (Feldman & Drasgow, 1951), which is an early measure of abstraction and cognitive flexibility. The FIST requires children to select two out of three cards that match on one dimension first (i.e., color), and then select a different pair of cards that match on another dimension (i.e., size). For this task, children were presented with pictures that varied in size, shape, and color. Children had to correctly identify the three different sizes, shapes, and colors, in order to participate in

this task. Next, children were introduced to the "favorites" game. For this part of the task, children were shown a page with three pictures and asked to select their two favorite pictures on that page. The point of this game was to make sure that the child could limit themselves to selecting only two pictures on a page, rather than selecting all three. Children had three opportunities to demonstrate this ability. If a child continued to select all three pictures, testing was discontinued.

Children who passed the above game continued on to the trial session. To begin the trial, children were shown a page containing three pictures that varied in two out of the three possible dimensions (e.g., size, shape, and color). For example, the first practice page contained the following three pictures: 1) large yellow boat, 2) large yellow teacup, and 3) small red boat. Children were expected to point to two pictures that went together in one way (i.e., pictures 1 and 2), and then to two more pictures that went together in another way (i.e., pictures 1 and 3). During the entire task, the interviewer never mentioned the terms "size," "shape," or "color." Thus, it was the child's responsibility to recognize these dimensions on his/her own and respond appropriately. Children passed the trial if they correctly identified both matches on at least one of the two practice pages. The testing session consisted of 15 trials, which were scored as 0 (first selection incorrect), 1 (first selection correct, second selection incorrect), or 2 (both selections correct). The scores across all 15 test trials were summed to reflect the total score (Jacques & Zelazo, 2001).

Self-Ordered Pointing Task (SOP).

The SOP is a measure of working memory. Specifically, this task requires children to remember stimuli already selected and to choose new stimuli without repeating a selection. In the original task devised by Petrides and Milner (1982), children were presented with series of cards depicting abstract drawings and asked to touch one picture at a time, in any order, without repeating a choice. Diamond and colleagues (e.g., Diamond, Briand, Fossella, & Gehlbach, 2004) created a computerized version of this task, which depicted familiar objects, such as a car and a balloon, in changing locations on a computerized touch screen. The version used in the present study included pictures identical to those in the above task, but images were displayed on pages in a binder, rather than on a computer screen (for similar procedures, see Smith et al., 1998, Smith, Klim, & Hanley, 2000).

The SOP binder was arranged so that the same pictures were displayed on each page of a set of six or eight cards, but the locations of the pictures were different. For example, if the snowflake was in the top left of the first page, it may have been in the bottom right on the subsequent page. As in previous versions of this task, the child was asked to point to a different picture on each page so that at the end of the set, each picture would be touched only once. The test contained four sets, two with six pictures and two with eight pictures, respectively. The same images were repeated across both sets of six or eight cards, but images from the six card sets were not repeated in the eight card sets. The total number of pictures selected at least once was summed across all four sets and subtracted from the total number of possible correct responses to produce the total

number of errors, or the number of times a picture was selected more than once (Archibald & Kerns, 1999; Smith et al., 1998, 2000). This task was only conducted at Time 2.

Social Competence

Teacher-report was chosen as the source for information on child social competence. Ideally, information on child social competence should be collected from multiple sources, including child self-report or interview, behavioral observation, and adult- (teacher and/or parent) report (Merrell, 1996). Due to the nature of this study, however, teacher-report was believed to be the best method for data collection. The age and developmental stage of the children in this sample excluded self-report as an option. Furthermore, prior research has found self-report measures invalid in Head Start populations (Fantuzzo, McDermott, Manz, Hampton, & Burdick, 1996). In order for classroom observation data to be deemed valid, a minimum of eight hours of observation is required (Greenfield, Wasserstein, Gold, & Jordon, 1997). The time-intensive nature of classroom observation ruled out this source of data. In contrast to the above methods of data collection, teacher-report was not restricted by the design of this study. Teacher-report is cited as an accurate and reliable source of data on child social competence (Greenfield et al., 1997).

Social competence was measured using the Preschool and Kindergarten Behavior Scales (PKBS; Merrell, 1994). The PKBS is a standardized instrument for assessing typical problem behaviors and social skills in preschool- and kindergarten-aged children.

Head Start teachers were already familiar with this measure, as they have to complete it for each child as part of the agency's required assessment. The 76-item instrument generates two distinct scales: a 34-item Social Skills scale and a 42-item Problem Behavior scale. The Social Skills scale (Scale A) was included in the present study. For this measure, teachers were asked to rate children on a variety of typical classroom behaviors using a 4-point Likert scale (0 = "Never," 1 = "Rarely," 2 = "Sometimes," 3 = "Often"). The items on Scale A constitute three separate domains of social skills: Social Cooperation (12 items), Social Interaction (11 items), and Social Independence (11 items). The Social Cooperation subscale includes items such as "Is cooperative," "Shows self-control," and "Follows instructions from adults." The Social Interaction subscale is comprised of items such as "Tries to understand another child's behavior," "Comforts other children who are upset," and "Invites other children to play." The Social Independence subscale contains items such as "Plays with several different children," "Attempts new tasks before asking for help," and "Is confident in social situations." Scores across these three subscales were summed to create an overall social skills score, with higher numbers representing higher levels of social competence. Typical mean values for overall social skills, which were derived from various sub-samples of the national normative group for the PKBS, range between 81 and 83 (e.g., Holland & Merrell, 1998; Merrell & Holland, 1997; Merrell & Wolfe, 1998). For university-based samples, however, mean values approach 90 (Winsler & Wallace, 2002).

The PKBS is regarded as a psychometrically sound instrument (Bracken Keith, & Walker, 1998). The Social Skills scale, specifically, demonstrates strong reliability, with an alpha of .96 for internal consistency and .69 for test-retest over 3-month intervals

(Merrell, 1996; Merrell & Wolfe, 1998). The Social Skills scale also demonstrates both convergent and divergent construct validity (Canivez & Bordenkircher, 2002; Holland & Merrell, 1998; Jentzsch & Merrell, 1996; Merrell, 1995, 1996). For example, the PKBS social skills total is correlated in the expected direction with scores on established comparison measures (Merrell, 1995), including the Social Skills Rating System (r = .76 for social skills total, r = -.56 for problem behavior total; SSRS: Gresham & Elliott, 1990), the Matson Evaluation of Social Skills with Youngsters (r = .84 for appropriate social skills; MESSY: Matson, Rotari, & Helsel, 1983), the Conners Teacher Rating Scale (r = -.68 for hyperactivity index; CTRS-39: Conners, 1990), and the School Social Behavior Scales (r = .86 for social competence total; SSBS: Merrell, 1993). In addition, the PKBS Social Skills scale correlates positively with the Scale of Social Competence and School Adjustment (r = .88; SSCSA: Walker & McConnell, 1995), and negatively with the problem behavior scale from the Teacher's Report Form (r = -.62; TRF: Achenbach, 1991), which supports its convergent and divergent validity, respectively (Jentzsch & Merrell, 1996).

CHAPTER 3

Results

The results of this study are divided into the following four sections: (1) attrition, (2) missing data, (3) preliminary analyses, (4) main analyses. The purpose of Section 1 is to assess the effects of attrition by making comparisons across the T1 and T2 samples. In Section 2, missing data analyses are explained. Section 3 reports descriptive statistics on the primary variables of interest. Section 4 addresses the main research questions associated with this study. Specifically, correlations among false-belief understanding and its correlates are reported and the stability of the variables over time is explored. In addition, longitudinal analyses examine the proposed directional relations among false-belief understanding and its correlates and mediation analyses assess the partial mediation associated with false-belief understanding in the relation between executive function and social competence. Finally, moderation analyses explore the moderating role of gender in the relations among false-belief understanding, language ability, and social competence.

Attrition

Sixty-nine (83%) of the original 83 participants were included in the longitudinal sample. Thus, a total of 14 participants were lost between T1 and T2. Differences between the returning 69 participants and the missing 14 participants were explored using

independent t-tests. Results suggest that these groups did not differ significantly on the primary variables of interest, all *p*s ≤ .05. In other words, retuning participants were not fundamentally different from those lost to attrition on measures of false-belief understanding, language ability, executive function, or social competence. Results of additional independent t-tests exploring differences in a subset of demographic variables also failed to reach significance, suggesting that the returning and missing participants were similar in terms of child age, primary caregiver age, number of children in the home, number of adults in the home, monthly family income, and number of moves in the last year.

Similarly, a series of Chi square analyses failed to report significant differences between retuning and missing participants in terms of child gender, child ethnicity, or primary caregiver's gender, marital status (when restricted to "single," "married," or "divorced"), full-time versus part-time employment, and last grade competed in school. A significant difference was reported, however, for the employment status of the primary caregiver, c^2 (1, N = 83) = 4.46, $p \leq .05$. Specifically, participants lost to attrition were more likely to have unemployed primary caregivers than participants in the returning sample. In sum, the T2 sample closely resembled the T1 sample and the effect of attrition was minimal.

Missing Data

For the longitudinal sample of 69 participants, data were missing at both T1 and T2. At T1, false-belief understanding data were missing for 6 children, PPVT data were

missing for 10 children, FIST data were missing for 14 children, and PEG data were missing for 6 children. At T2, false-belief understanding data were missing for 1 child, FIST data were missing for 3 children, PEG data were missing for 2 children, and SOP data were missing for 1 child. Sources of this missingness include scheduling conflicts, child absences, and time constraints. In addition, due to teacher nonresponse, 7 children were missing PKBS data at T2.

Missing data patterns for the primary variables of interest were assessed using SPSS Missing Value Analysis module (SPSS, Inc., 2001, Chicago, IL). Across the set of ten primary variables, five trends in missing data were identified. Specifically, children missing false-belief understanding data, t (62) = -4.30, $p \leq .05$, PPVT data, t (62) = -2.20, $p \leq .05$, or PEG data, t (62) = -4.30, $p \leq .05$, in Head Start had higher PKBS scores in kindergarten than children whose earlier data on these measures were complete. In addition, children missing PKBS data in kindergarten demonstrated superior performance on the FIST task, t (66) = -2.80, $p \leq .05$, as well as on the SOP task, t (68) = 3.2, $p \leq .05$, in kindergarten compared to children whose data on these executive function measures were complete. Despite these missing data trends, Little's MCAR test failed to reach significance, c^2 (1, N = 69) = 76.81, ns, which suggests that the variables in the data set as a whole exhibit a pattern of values that are missing at random. To maximize statistical power, missing data were imputed using the EM estimation method from the SPSS Missing Value Analysis module. The EM method uses an iterative process to replace missing values with imputed values. Thus, the following analyses were based on data from 69 participants.

Preliminary Analyses

Children's success rate varied across false-belief tasks. At T1, 51 children (74%) passed the locations task, 38 (55%) passed the box task, 21 (30%) passed the "own" questions on the peep-through book task, and 20 (29%) passed the "other" questions on the peep-through book task. Similarly, at T2, 62 children (90%) passed the locations task, 55 (80%) passed the box task, 52 (75%) passed the "own" questions on the peep-through book task, and 36 (52%) passed the "other" questions on the peep-through book task. Gender differences in performance were assessed individually for each false-belief task and only one significant difference was reported. Specifically, at T1, females outperformed males on the locations task, t (67) = 2.89, $p \leq .05$.

Coherence across false-belief tasks was assessed using the phi contingency statistic. The phi contingency statistic is a measure of the association between dichotomous variables and is familiar to a Pearson correlation coefficient among categorical variables (Hays, 1988). Table 3 contains the phi contingency coefficients for the false-belief tasks at both T1 and T2. Findings indicate coherence among false-belief tasks and support the use of an aggregate measure of false-belief understanding.

Table 3

Phi Contingency Coefficients for False-belief Tasks (n = 69)

Tasks	HS	K
BOX – OWN	.22^{+}	.63**
BOX – OTHER	.26*	.24*
BOX - LOC	.33**	.31**
OWN - OTHER	.20^{+}	.40**
OWN - LOC	.18	.25*
OTHER - LOC	.09	.16

Note. BOX = Prototypical box, OWN = "Own" subtask of Peep-Through book, OTHER = "Other" subtask of Peep-Through book, LOC = Locations task. HS = Head Start year; K = Kindergarten year.
* $p \leq .05$. ** $p \leq .01$. $^{+}$ $p \leq .10$.

Children's performance across executive function measures was also examined for coherence. Specifically, correlational analyses were conducted to assess the association between scores on the peg tapping task and the FIST. The SOP task was excluded from these analyses because it was only assessed at T2. Results suggest moderate coherence across the peg tapping task and the FIST. Specifically, although inhibitory control and mental flexibility were not significantly related at T1, r (69) = .19, ns, the correlation was in the expected direction and approached significance. Furthermore, at T2, the correlation between these two measures reached significance, r (69) = .31, $p \leq .01$. Given these findings, an aggregate score was calculated by combining the percent correct for each task and then taking the average of that score. In addition to providing a more robust indicator of children's executive function,

aggregating across the peg tapping task and the FIST also results in an aggregate variable with distributional properties that are superior to those of either task on its own.

Table 4 displays the means, standard deviations, and ranges for the final set of variables used in the reported analyses. Table 5 displays the means and standard deviations by gender for the final set of variables. Results of independent samples t-tests indicated that males and females differed significantly on two primary variables. Specifically, preschool females received higher social competence scores than preschool males and kindergarten females made fewer errors on the self-ordered pointing task than kindergarten males.

All variables were examined for normality, which included an inspection for skewness and kurtosis. The SOP K variable deviated from the normal distribution and thus underwent a data transformation. Specifically, to correct for its negatively skewed distributions, the age-adjusted standardized residual for this variable was used for future analyses. Across all variables in the final dataset, skewness ranged from -1.23 to 1.10 and kurtosis ranged from -.83 to 2.10.

Table 4

Means, Standard Deviations, and Ranges for Primary Variables (n = 69)

Variable	Mean	Std	Range
FBU HS	1.85	1.17	0-4
FBU K	2.97	1.17	0-4
PPVT HS	97.91	8.84	76-122
EF HS	.66	.21	.17-.98
EF K	.88	.10	.52-1.00
SOP K	4.25	2.14	0-12
PKBS HS	85.62	11.86	55-102
PKBS K	83.08	13.34	49-102

Note. FBU = False-belief Understanding Aggregate; PPVT = Peabody Picture Vocabulary Test; EF = Executive Function Aggregate; SOP = Self-Ordered Pointing task; PKBS = Preschool and Kindergarten Behavior Scales, Social Skills Scale. HS = Head Start year; K = Kindergarten year.

Table 5

Means and Standard Deviation by Gender for Primary Variables (n = 69)

	Gender				
	Female		Male		
Variable	Mean	Std	Mean	Std	Pr > t
FBU HS	2.07	1.17	1.58	1.13	.09
FBU K	3.15	1.04	2.73	1.31	.16
PPVT HS	98.40	9.25	97.27	8.39	.60
EF HS	.70	.20	.61	.22	.07
EF K	.89	.10	.88	.11	.62
SOP K	3.79	1.67	4.83	2.53	.04
PKBS HS	88.44	10.23	81.97	12.97	.02
PKBS K	83.71	13.42	82.25	13.43	.66

Note. FBU = False-belief Understanding Aggregate; PPVT = Peabody Picture Vocabulary Test; EF = Executive Function Aggregate; SOP = Self-Ordered Pointing task; PKBS = Preschool and Kindergarten Behavior Scales, Social Skills Scale. HS = Head Start year; K = Kindergarten year.

Main Analyses

Correlational Analyses

Table 6 displays the correlations among the primary variables at, and across, both T1 and T2. Given that social competence at T2 was the only variable with a significant age effect, r (69) = .24, $p \leq .05$, age was omitted from the correlation table.

Concurrent Relations Among False-belief Understanding and its Correlates

It was hypothesized (H1a) that children with greater false-belief understanding would be more socially competent, both in preschool and in kindergarten, than children with lower levels of false-belief understanding. The results in Table 6 provide partial support for this hypothesis. Specifically, children's false-belief understanding and social competence were positively correlated in kindergarten, r (69) = .33, $p \leq .01$, but not in Head Start, r (69) = .19, ns.

It was also hypothesized (H1b) that children with greater language ability would demonstrate higher levels of false-belief understanding in preschool than children with lesser language ability. This hypothesis was fully supported by the results. Specifically, children's language ability and false-belief understanding were positively correlated at T1, r (69) = .32, $p \leq .01$.

Finally, it was hypothesized (H1c) that children with higher levels of executive function would demonstrate greater understanding of false-belief, both in preschool and in kindergarten, than children with lower levels of executive function. There was full

support for this hypothesis at T1 and partial support for this hypothesis at T2. Specifically, in preschool, false-belief understanding was significantly related to executive function, r (69) = .43, $p \leq .01$. Unfortunately, at T2, the relation between false-belief understanding and executive failed to reach significance, r (69) = .12, ns. The correlation between the false-belief aggregate and the SOP task, however, did reach significance at T2, r (69) = -.26, $p \leq .05$, which suggests that higher levels of false-belief understanding were associated with fewer errors on the SOP task, or greater working memory, in kindergarten.

Construct Stability

The results presented in Table 6 are consistent with the hypothesis (H2a) that the constructs would demonstrate stability over time. Specifically, false-belief understanding in preschool was significantly correlated with false-belief understanding in kindergarten, r (69) = .46, $p \leq .01$. Similar correlations over time were reported for social competence, r (69) = .40, $p \leq .01$ and executive function, r (69) = .45, $p \leq .01$.

Table 6

Correlations Among Primary Variables at Times 1 and 2 (n = 69)

Variable	PPVT HS	EF HS	PKBS HS	FBU K	EF K	SOP K	PKBS K
FBU HS	.32**	.43**	.19	.46**	.24*	-.05	.41**
PPVT HS		.49**	-.01	.41**	.32**	-.12	.20
EF HS			.36**	.38**	.45**	-.23*	.29*
PKBS HS				.45**	.01	-.07	.40**
FBU K					.12	-.26*	.33**
EF K						-.25*	.28*
SOP K							-.01

Note. FBU = False-belief Understanding Aggregate; PPVT = Peabody Picture Vocabulary Test; EF = Executive Function Aggregate; SOP = Self-Ordered Pointing task; PKBS = Preschool and Kindergarten Behavior Scales, Social Skills Scale. HS = Head Start year; K = Kindergarten year.
** $p \leq .01$. * $p \leq .05$. $^{+}p \leq .10$.

Longitudinal Analyses

The Relation between False-belief Understanding and Social Competence

To assess the direction of the relation between false-belief understanding and social competence, step-wise hierarchical regressions were conducted. As expected, the relation between false-belief understanding at T1 and social competence at T2 reached significance (see Table 6). Thus, the first regression model addressed the hypothesis

(H2b) that false-belief understanding in preschool would predict social competence in kindergarten. Results of this model are displayed in Table 7**.** Age, language ability, and social competence at T1 were entered in Step 1. Together, these variables accounted for 23 % of the variance in social competence scores at T2, F (3, 65) = 6.61, $p \leq .001$. In Step 2, false-belief understanding at T1 was entered into the model and accounted for an additional 9% of the variance in social competence scores at T2, F (4, 64) = 7.43, $p \leq .001$. Thus, false-belief understanding in Head Start predicted social competence scores in kindergarten. Furthermore, as hypothesized (H2c), false-belief understanding in preschool accounted for unique variance in social competence in kindergarten even after controlling for language ability.

Table 7

Hierarchical Regression Analyses Predicting Social Competence from False-belief Understanding (n = 69)

Variable	*B*	*SE B*	*b*	R^2 or ΔR^2
Step 1				
Age	8.90	5.00	.20^{+}	.23***
Language Ability, T1	.28	.16	.18^{+}	
Social Competence, T1	.43	.12	.38***	
Step 2				
Age	8.40	4.76	.18^{+}	.09***
Language Ability, T1	.13	.17	.09	
Social Competence, T1	.36	.12	.32**	
False-belief Understanding, T1	3.55	1.27	.31**	

Note. Dependent variable = PKBS K. T1 = Time 1.
*** $p \leq .001$. ** $p \leq .01$. $^{+}$ $p \leq .10$.

Interestingly, the relation between social competence at T1 and false-belief understanding at T2 also reached significance (see Table 6). Thus, a second set of analyses were performed to assess the contribution of preschool social competence ratings to variability in kindergarten false-belief understanding scores. Results of this model are displayed in Table 8**.** Age, language ability at T1, and false-belief understanding at T1 were entered in Step 1. Together, these variables accounted for 31% of the variance in false-belief understanding scores at T2, F (3, 65) = 9.49, $p \leq .001$. In Step 2, social competence at T1 was entered into the model and accounted for an

additional 14% of the variance in false-belief understanding scores at T2, F (4, 64) = 12.94, $p \leq .001$. Thus, contrary to expectations, social competence in Head Start predicted false-belief understanding scores in kindergarten. Furthermore, this relation remained significant after controlling for language ability.

Table 8

Hierarchical Regression Analyses Predicting False-belief Understanding from Social Competence (n = 69)

Variable	*B*	*SE B*	*b*	R^2 or ΔR^2
Step 1				
Age	.52	.42	.13	.31***
Language Ability, T1	.04	.01	.29**	
False-belief Understanding, T1	.36	.11	.36**	
Step 2				
Age	.40	.38	.10	.14***
Language Ability, T1	.04	.01	.32**	
False-belief Understanding, T1	.28	.10	.27**	
Social Competence, T1	.04	.01	.39***	

Note. Dependent variable = FBU K. T1 = Time 1.
*** $p \leq .001$. ** $p \leq .01$.

The Relation between False-belief Understanding and Executive Function

To assess the direction of the relation between false-belief understanding and executive function, step-wise hierarchical regressions were conducted. As expected, executive function at T1 was significantly related to false-belief understanding at T2 (see Table 6). Thus, the hypothesis (H3a) that executive function in preschool would predict false-belief understanding in kindergarten was addressed using a hierarchical regression model. Results of this model are displayed in Table 9**.** Age, language ability, and false-belief understanding at T1 were entered in Step 1. Together, these variables accounted for 31 % of the variance in false-belief understanding scores at T2, F (3, 65) = 9.49, $p \leq .001$. In Step 2, executive function at T1 was entered into the model and accounted for less than 1% of additional variance in false-belief understanding scores at T2, F (4, 64) = 7.25, $p \leq .001$. These results indicate that executive function performance in Head Start failed to remain significantly predictive of false-belief understanding scores in kindergarten once age, language ability, and initial false-belief scores were taken into account. Thus, contrary to expectations, executive function in Head Start failed to predict unique variance in false-belief understanding in kindergarten.

Table 9

Hierarchical Regression Analyses Predicting False-belief Understanding from Executive Function (n = 69)

Variable	*B*	*SE B*	*b*	R^2 or ΔR^2
Step 1				
Age	.52	.42	.13	.31***
Language Ability, T1	.04	.01	.29**	
False-belief Understanding, T1	.36	.11	.36**	
Step 2				
Age	.48	.42	.12	.00
Language Ability, T1	.03	.02	.25*	
False-belief Understanding, T1	.33	.12	.33**	
Executive Function, T1	.57	.70	.10	

Note. Dependent variable = FBU K. T1 = Time 1.
*** $p \leq .001$. ** $p \leq .01$. * $p \leq .05$

Interestingly, the relation between false-belief understanding at T1 and executive function at T2 also reached significance (see Table 6). Thus, a second set of analyses were performed to assess the contribution of preschool false-belief understanding performance to variability in kindergarten executive function scores. Results of this model are displayed in Table 10. Age, language ability, and executive function at T1 were entered in Step 1. Together, these variables accounted for 22 % of the variance in executive function scores at T2, F (3, 65) = 6.02, $p \leq .001$. In Step 2, false-belief understanding at T1 was entered into the model and accounted for less than 1% of

additional variance in executive function scores at T2, F (4, 64) = 4.48, $p \leq .01$. These results indicate that false-belief performance in Head Start failed to remain a significant predictor of executive function scores in kindergarten once age, language ability, and initial executive function scores were taken into account. Thus, there was no support for a predictive relation between false-belief understanding in preschool and executive function in kindergarten.

Table 10

Hierarchical Regression Analyses Predicting Executive Function from False-belief Understanding (n = 69)

Variable	*B*	*SE B*	*b*	R^2 or ΔR^2
Step 1				
Age	.03	.04	.08	.22***
Language Ability, T1	.00	.00	.13	
Executive Function, T1	.18	.06	.37**	
Step 2				
Age	.03	.04	.08	.01
Language Ability, T1	.00	.00	.13	
Executive Function, T1	.17	.07	.35**	
False-belief Understanding, T1	.00	.01	.04	

Note. Dependent variable = EF K. T1 = Time 1.
*** $p \leq .001$. ** $p \leq .01$. * $p \leq .05$.

To address the hypothesis (H3b) that false-belief understanding would partially mediate the relation between executive function and social competence (see Figure 1), a series of separate regression analyses were conducted. For these analyses, Baron and Kenny's (1986) four criteria for mediation were assumed and evaluated. Thus, in order for mediation to be supported, the following conditions had to be satisfied: (1) executive function should predict social competence, (2) executive function should predict false-belief understanding, (3) false-belief understanding should predict social competence, and (4) the relation between executive function and social competence should be reduced or eliminated when both executive function and false-belief understanding were entered together into the model.

Based on the assumption that prediction would be strongest among constructs measured at the same time-point, the mediator model was initially tested using concurrent data. At T1, executive function predicted social competence, $b = .36$, $p \leq .01$, and false-belief understanding, $b = .43$, $p \leq .001$. Although these results satisfy the first and second criteria for mediation, respectively, false-belief understanding failed to predict social competence, $b = .19$, ns. Given that the third criterion was not met, it was concluded that false-belief understanding did not mediate the relation between executive function and social competence in Head Start. At T2, executive function and false-belief understanding both predicted social competence, $b = .28$, $p \leq .05$, and $b = .33$, $p \leq .01$, respectively. Although these relations support the first and third criteria for mediation, executive function failed to predict false-belief understanding, $b = .12$, ns. Given that the

second criterion was not met, it was concluded that false-belief understanding did not mediate the relation between executive function and social competence in kindergarten.

Although the mediation model was not supported using concurrent data, the model was supported using longitudinal data. The results of this model are displayed in Figure 3. Specifically, executive function at T1 predicted social competence at T2, b = .29, $p \leq .05$, executive function at T1 predicted false-belief understanding at T1, b = .43, $p \leq .001$, and false-belief understanding at T1 predicted social competence at T2, b = .41, $p \leq .001$. Given support for the first three criteria, executive function at T1 and false-belief understanding at T1 were entered simultaneously as predictors of social competence at T2. Together, these variables accounted for 19% of the variance in kindergarten social competence, F (2, 66) = 7.63, $p \leq .001$. Furthermore, as expected, with both predictors in the model, the effect of false-belief understanding remained significant, b = .35, $p \leq .01$, and the effect of executive function was eliminated, b = .14, ns.

Results of a hierarchical regression with executive function entered at Step 1 and false-belief understanding added at Step 2 provide additional support for the mediator model. Results of this model are displayed in Table 11. According to the Sobel test, the amount of mediation associated with false-belief understanding reached significance, z = 2.30, $p \leq .05$. Specifically, 51% of the total effect of executive function on social competence was mediated by false-belief understanding. Thus, false-belief understanding mediated the longitudinal relation between executive function in preschool and social competence in kindergarten.

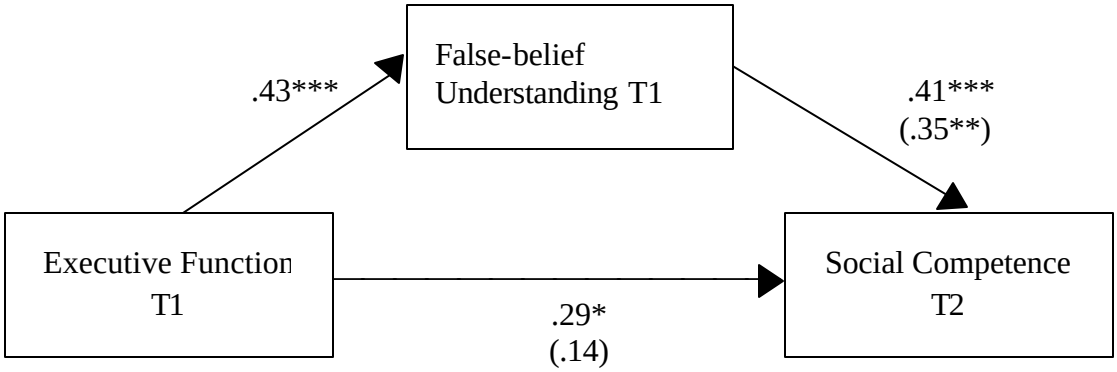

Figure 3. Mediational model for relations between executive function and social competence as mediated by false-belief understanding. Values on paths are path coefficients (standardized βs). Path coefficients outside parentheses are zero-order correlations (rs). Path coefficients in parentheses represent standardized partial regression coefficients from hierarchical regression analyses.
*** $p \leq .001$. ** $p \leq .01$. * $p \leq .05$.

Table 11

Hierarchical Regression Analyses Testing False-belief Understanding as a Mediator of the Executive Function – Social Competence Association (n = 69)

Variable	*B*	*SE B*	*b*	R^2 or ΔR^2
Step 1				
Executive Function, T1	18.35	7.32	.29*	.09*
Step 2				
Executive Function, T1	8.95	7.68	.14	.10**
False-belief Understanding, T1	4.03	1.40	.35**	

Note. Dependent variable = PKBS K. T1 = Time 1.
** $p \leq .01$. * $p \leq .05$.

The Role of Gender in Relations Between False-belief Understanding and its Correlates

Gender as a Moderator Between False-belief Understanding and Language Ability

It was hypothesized (H4a) that gender would moderate the relation between false-belief understanding and language ability, such that the relation would be stronger for females than for males. To address this hypothesis, a series of hierarchical regressions were conducted with false-belief understanding as the dependent variable. For each regression, language ability and gender were entered at Step 1 and the gender by language ability interaction was entered at Step 2. Given that language ability was only assessed at T1, models were only conducted for T1 and the longitudinal relation.

In the final model for T1, language ability remained a significant predictor of false-belief understanding, $b = .28$, $p \leq .05$, but gender, $b = -1.05$, and the gender by language ability interaction, $b = 1.24$, failed to reach significance, both *p*s ns. Similarly, in the final model for the longitudinal relation, language ability at T1 remained a significant predictor of false-belief understanding at T2, $b = .40$, $p \leq .001$, but gender, $b = -.07$, and the gender by language interaction, $b = .22$, failed to reach significance, both *p*s ns. Thus, contrary to expectations, gender did not moderate the concurrent or the longitudinal relation between language ability and false-belief understanding. In other words, the relation between language ability and false-belief understanding did not differ significantly by gender.

Gender as a Moderator Between False-belief Understanding and Social Competence

It was hypothesized (H4b) that gender would moderate the relation between false-belief understanding and social competence, such that the relation would be stronger for females than for males. To address this hypothesis, a series of hierarchical regressions were conducted with social competence as the dependent variable. For each regression, false-belief understanding and gender were entered at Step 1and the gender by false-belief interaction was entered at Step 2. Given that false-belief was not related to social competence at T1, models were only conducted for T2 and the longitudinal relation.

In the final model at T2, false-belief understanding remained a significant predictor of social competence, $b = .33$, $p \leq .01$, but gender, $b = .00$, and the gender by false-belief interaction, $b = -.00$, failed to reach significance, both *p*s ns. Similarly, in the final model for the longitudinal relation, false-belief understanding at T1 remained a significant predictor of social competence at T2, $b = .41$, $p \leq .001$, but gender, $b = -.15$, and the gender by false-belief interaction, $b = .14$, failed to reach significance, both *p*s ns. Thus, contrary to expectations, gender did not moderate the concurrent or the longitudinal relation between false-belief understanding and social competence. In other words, the relation between false-belief understanding and social competence did not differ significantly by gender.

CHAPTER 4

Discussion

The present study examined false-belief understanding in children living in poverty in the United States by addressing four related issues. The first issue concerned the relation between false-belief understanding and social competence. The second and third issues addressed relations between false-belief understanding and its cognitive correlates, which included language ability and executive function, respectively. Finally, the fourth issue focused on the role of gender in the relations among false-belief understanding and its correlates. With the exception of the fourth issue, partial to full support was found for hypotheses in each of the above areas. Thus, the proposed relations between false-belief understanding and its correlates do not appear to be specific to children from advantaged backgrounds, but rather generalize to low-income samples.

The Relation between False-belief Understanding and Social Competence

It was hypothesized that children's false-belief understanding would be positively related to their social competence both in preschool and in kindergarten. This hypothesis was partially supported in that the above relation only reached significance in kindergarten. Thus, kindergarteners who performed better on the false-belief aggregate had significantly higher social competence ratings than kindergarteners who performed less well on the aggregate measure. The lack of a significant relation between false-

belief understanding and social competence in preschool was surprising and is inconsistent with previous research (e.g., Astington & Jenkins, 1995; Lalonde & Chandler, 1995; Razza & Blair, 2003; Watson et al., 1999). Given that the correlation approached moderate significance and was in the expected direction, the most likely explanation for its failure to reach significance is the reduced variance on the social competence variable at T1. Thus, false-belief understanding and social competence may have been related at both time points, but differences in variability may have made the correlation more difficult to detect at T1 than at T2.

Although concurrent relations between false-belief understanding and social competence were expected, the first aim of this study was to determine the direction of the relation between these constructs over time. Thus, it was further hypothesized that false-belief understanding in preschool would predict social competence in kindergarten. The results of this study support this hypothesis. After controlling for earlier social competence, language ability, and age, false-belief understanding in preschool accounted for unique and significant variance in social competence in kindergarten. In particular, earlier false-belief understanding accounted for an additional 9% of the variance in later social competence. This finding is consistent with previous longitudinal research reporting false-belief understanding as a predictor of social competence (e.g., Jenkins & Astington, 2000; Slomkowski & Dunn, 1996). Furthermore, this finding supports the theory that the ability to simultaneously consider counterfactual and conflicting beliefs stimulates positive social interaction (Astington & Jenkins, 1995; Capage & Watson, 2001). Thus, as expected, false-belief understanding positively affected the development of social competence.

Interestingly, however, the results of this study also support the opposite directional relation, in which social competence serves as a predictor of false-belief understanding. After controlling for earlier false-belief understanding, language ability, and age, social competence in preschool accounted for unique and significant variance in false-belief understanding in kindergarten. Specifically, earlier social competence accounted for an additional 14% of the variance in later false-belief understanding. This finding is consistent with previous longitudinal studies that report social competence as a predictor of false-belief understanding (e.g., Dunn, 1995; Dunn et al., 1991). Furthermore, this finding supports the theory that positive social interaction motivates the acquisition of false-belief understanding (Flavell et al., 1987; Youngblade & Dunn, 1995). Thus, results suggest that social competence positively influenced the development of false-belief understanding.

Although the above results appear conflicting, taken together, they indicate a bidirectional relation between false-belief understanding and social competence. In other words, the causal relation between false-belief understanding and social competence appears to be reciprocal, in that earlier false-belief understanding promotes later social competence, and earlier social competence promotes later false-belief understanding. These results are consistent with the proposal that the ability to understand one's own and other's minds promotes favorable social interaction, and that constructive social interactions present the opportunity for learning more about mental states (Moore et al., 1998; Watson et al., 1999). Furthermore, they provide additional support for both directional relations between false-belief understanding and social competence and suggest that these constructs are closely intertwined in early childhood.

The Relation Between False-belief Understanding and Language Ability

It was hypothesized that children's false-belief understanding would be positively related to their language ability in preschool. This hypothesis was fully supported. As expected, children with greater language ability demonstrated higher levels of false-belief understanding than children with lesser language ability. These results are consistent with prior research that suggests a concurrent relation between language ability and false-belief understanding (e.g., Astington & Jenkins, 1995; Cutting & Dunn, 1999; Happe, 1995; Hughes, 1998a, Watson et al., 1999). Thus, this study provides additional support for the notion that language ability and false-belief understanding are closely related in early childhood.

Although a concurrent relation between false-belief understanding and language ability was proposed, language ability was included in this study mainly as a control variable. Specifically, the second aim of this study was to determine the unique variance in social competence accounted for by false-belief understanding after language ability was controlled. As previously mentioned, false-belief understanding in preschool accounted for 9% of additional variance in social competence in kindergarten, even after controlling for language ability. Thus, as expected, the longitudinal relation that existed between false-belief understanding and social competence was independent of language ability.

The Relation Between False-belief Understanding and Executive Function

There was partial support for the hypothesis that executive function would be positively related to false-belief understanding in both preschool and kindergarten. As expected, in preschool, children with higher levels of executive function demonstrated a greater understanding of false-belief than children with lower levels of executive function. Also as expected, in kindergarten, children with higher levels of working memory demonstrated a greater understanding of false-belief than children with lower levels of working memory. These findings are consistent with prior research that supports executive function as a correlate of false-belief understanding (e.g., Carlson & Moses, 2001; Davis & Pratt, 1995; Frye et al., 1995; Hughes, 1998a, 1998b).

Surprisingly, however, the relation between the executive function aggregate and the false-belief aggregate failed to reach significance in kindergarten. Thus, contrary to expectations, greater executive function, as indexed by a combination of inhibitory control and mental flexibility, was not related to greater false-belief understanding in kindergarten. One explanation for this pattern of results is that the relation between executive function, as indexed by inhibitory control and attentional flexibility, and false-belief understanding does not extend beyond preschool for children from low-income backgrounds. This explanation is unlikely, however, given that previous research has reported correlations between these executive function components and false-belief understanding beyond preschool for children with similar characteristics (e.g., Hughes, 1998b; Perner et al., 2002). Thus, methodological issues are more likely responsible for these findings. Specifically, compared to T1 scores, there was considerably less

variability in the executive function aggregate at T2. This situation may be the result of children's performance on the peg tapping task and the FIST experiencing a ceiling effect in kindergarten. For example, from T1 to T2, the percentage of children receiving a perfect score on the peg tapping task increased from 13% to 46%. Similarly, from T1 to T2, the percentage of children receiving a perfect score on the FIST increased from 3% to 19%. As a comparison, only 1% of children received a perfect score on the SOP at T2. Thus, executive function and false-belief understanding may have been related in kindergarten, but methodological limitations associated with the measures of inhibitory control and attentional flexibility used in this study prevented this relation from being detected.

In addition to exploring concurrent associations between false-belief understanding and executive function, the present study also investigated longitudinal relations between these constructs. The third aim of this study was to determine the direction of the relation between executive function and false-belief understanding over time. It was further hypothesized that executive function in preschool would predict false-belief understanding in kindergarten. Surprisingly, this hypothesis was not supported. After controlling for earlier false-belief understanding, language ability, and age, executive function in preschool accounted for less than 1% of the variance in false-belief understanding in kindergarten. This finding is inconsistent with previous longitudinal research reporting executive function as a predictor of false-belief understanding (e.g., Carlson, Mandell, et al., 2004; Hughes, 1998b).

There was one substantial difference between the previous longitudinal studies and the current study that may provide some insight as to why the longitudinal relation

was not supported in this sample: the age of the children. The children in the present study were older (mean age at T1 = 5 years 1 month; mean age at T2 = 6 years 2 months) than the children in both of the previous longitudinal investigations. Specifically, Carlson, Mandell, et al. (2004) followed children from 24 months to 39 months of age and Hughes (1998b) followed children from a mean age of 3 years 11 months to a mean age of 5 years 0 months. Given that majority of children acquire an understanding of false-belief by 5 years of age, as indexed by their ability to pass standard false-belief tasks (Wellman et al., 2001), it follows that executive function would not predict false-belief understanding much beyond the preschool years. Despite their older age, however, only 42% of the children in the present study demonstrated perfect performance across the false-belief aggregate in kindergarten. Thus, results do not support a universal acquisition of false-belief understanding at T2.

A related possibility, however, is that the relation between executive function and false-belief understanding is subject to a threshold effect. For example, it is possible that executive function contributes to the development of false-belief understanding until a certain level of executive skill is passed, at which point the causal link ceases to exist. In other words, there may be a level of executive function above which additional executive function skill fails to promote the development of false-belief understanding. Given the previously noted age advantage of the children in the present study, it is possible that these children already passed that executive function threshold. Specifically, at T1, the mean and median scores for the executive function aggregate were .66 and .71, respectively, which indicates above-average performance across executive function

measures. Thus, it is possible that executive function predicts false-belief understanding, but that this causal association is dependent on children's level of executive function.

Although the results of this study do not support executive function as a predictor of false-belief understanding across the preschool and kindergarten years, they do not rule out a longitudinal relation between these constructs at earlier times. Thus, current results do not directly contradict previous longitudinal findings. Moreover, although the relation between executive function at T1 and false-belief understanding at T2 did not reach significance after controlling for key variables, it was in the expected direction. There was less evidence, however, of a reciprocal relation between these constructs in which early false-belief understanding predicted later executive function. Thus, although neither directional relation reached significance in the present study, current findings offer more support for executive function as a predictor of false-belief than vice versa, which is consistent with previous longitudinal results.

An alternative explanation for the current results, however, is that a causal relation does not exist between executive function and false-belief understanding. Rather, the close relation between these constructs during early childhood is due to their association with a common factor. This explanation is consistent with the theory that there are domain-general processes that are responsible for developments in cognition (e.g., Moore, 1996; Frye et al., 1995). The domain-general ability that has received the most attention in this area is the capacity to reason about complex problems using a higher-order rule system (Frye, Zelazo, & Burack, 1998; Zelazo & Frye, 1998; Zelazo & Jacques, 1996). Specifically, it has been proposed that the acquisition of a rule-based reasoning system is what gives rise to developments in children's executive function and

false-belief understanding. Although previous longitudinal data speak against this theory, the results of the present study do not rule out this alternative conceptualization of the association between executive function and false-belief understanding.

Finally, the relation between executive function and false-belief understanding was examined within a mediational framework. Although the results of previous studies have implied mediational models (e.g., Hughes et al., 1998), this study is the first to specify and test a model using longitudinal data. Specifically, it was hypothesized that false-belief understanding would partially mediate the relation between executive function and social competence. Although it was assumed that mediation would be strongest among constructs measured in the same grade, the mediational model was not supported using concurrent data. In other words, false-belief understanding did not account for a significant amount of the shared variance between executive function and social competence at either T1 or at T2. More importantly, however, the model was supported using longitudinal data, which supports the proposed causal pathways among the variables. As expected, false-belief understanding accounted for a significant amount of the shared variance between executive function at T1 and social competence at T2. Specifically, 51% the total effect of executive function in preschool on social competence in kindergarten was mediated by false-belief understanding. These results support the proposal that executive function influences children's social competence both directly and indirectly (Hughes et al., 1998). Moreover, this study identifies false-belief understanding as a mechanism through which early executive function affects later social competence.

The Role of Gender

Preliminary findings from our research lab identified gender as a moderator of relations between false-belief understanding and its correlates. Based on these results, it was hypothesized that gender would moderate the association between false-belief understanding and language ability, such that the relation would be stronger for females than for males. Similarly, it was hypothesized that gender would moderate the association between false-belief understanding and social competence, such that the relation would be stronger among females than among males. Neither of these hypotheses were supported. Thus, the relations between false-belief understanding and both language ability and social competence did not differ by gender. The results of the present study are inconsistent with the results from the first and third preliminary studies (i.e., Razza & Blair, 2003; Razza et al., 2004), both of which support the above relations only among preschool females. The current results are consistent, however, with the results of the second preliminary study (i.e., Peters et al., 2003), which failed to support the false-belief by gender interaction term as a significant predictor of social competence. Given that 91% of the children in the present study were included in the second preliminary study's sample, this consistency may have been expected. Regardless, these results were replicated using only half of the original sample from the second study.

There are several explanations as to why there was no support for gender as a moderator between false-belief understanding and its correlates. First, it is possible that gender does play a role in the proposed relations, but that sample used in the second preliminary study, and thus the present study, was unique. Given that these children were

recruited from the same Head Start centers, were approximately the same age, and had similar demographics as the children in the third preliminary study, however, this explanation is unlikely. Thus, a second explanation, which is consistent with the present findings, is that gender does not play a role in the relation between false-belief understanding and its correlates. Rather, other factors, such as small sample size (i.e., Razza & Blair, 2003), or significant gender differences on the social competence measure (i.e., Razza et al., 2004), may have contributed to the gender effects reported in the preliminary studies.

Likewise, it is possible that a third factor, such as family size, accounted for the gender effects reported in previous studies and that gender merely served as a proxy for that variable. For example, in the first study, males were significantly more likely to live in one-parent, only-child households (Razza & Blair, 2003). Research suggests that children from larger families have a more sophisticated understanding of false-belief understanding than children from smaller families (e.g., Cutting & Dunn, 1999; Jenkins & Astington, 1996; Perner, Ruffman, & Leekam, 1994). Thus, one might speculate that the relations between false-belief understanding and its correlates would be stronger among children from larger families because these children would have more opportunities to acquire and apply their knowledge of false-belief. Therefore, the gender effect reported in the first study may be due to the fact that the children from larger families also happened to be disproportionately female.

In sum, the results of the present study suggest that the relations between false-belief understanding and both language ability and social competence are not influenced by gender. In other words, the proposed relations between false-belief understanding and

its correlates exist for both males and females. Although these findings are inconsistent with the hypotheses related to gender, they provide additional support for the hypothesized relations between false-belief understanding and its correlates. Specifically, these relations appear more robust given that they apply to both males and females. Thus, the lack of a gender effect can be interpreted as evidence of more widespread relations between false-belief understanding and both language ability and social competence.

Low-income Sample

The intent of this study was to learn more about the relations between false-belief understanding and its correlates among low-income children. As previously mentioned, children from low-income backgrounds represent an important population largely ignored within the false-belief literature. Although it was not the intent, or within the facility, of this study to make comparisons of false-belief understanding across income levels, several remarks can be made with respect to previous studies. Although the majority of children in this study did not demonstrate perfect performance on the false-belief aggregate, their rate of success at T1 was greater than that reported for a sample of Head Start preschoolers of a similar age (e.g., Holmes et al., 1996). Unfortunately, however, this success rate still fell below the percentage typically reported for middle- and upper-class samples, as calculated by the Watson et al.(2001) meta-analysis. This finding is consistent with the limited research directly comparing false-belief scores within an income-diverse sample (i.e., Cole & Mitchell, 2000; Cutting & Dunn, 1999). It is

important to note, however, that false-belief performance may differ across income levels due to a number of factors, such as familiarity with the format of the false-belief tasks or comfort level with the interview process. Thus, I urge caution in concluding that these variations in performance reflect fundamental differences in the acquisition of false-belief understanding.

Given that the PPVT and PKBS are nationally standardized measures, comparisons of these scores across samples are straight-forward. For the present sample, the mean PPVT score was 97.91 (see Table 4), which is almost equivalent to aged-based standard mean score of 100. Thus, the children in this study were performing, on average, at the expected receptive language level for their age. Similarly, the mean PKBS scores for the present sample were 85.62 and 83.08 (see Table 4) at T1 and T2, respectively, which are within or above the normative range of 81 to 83 (see page 58). Thus, the average level of social competence demonstrated by the children in the present study was comparable to the level typically reported for this instrument. In sum, despite their low-income backgrounds, the children in this sample did not demonstrate deficits in language ability or social competence.

Furthermore, as expected, the results of the present study suggest that the targeted associations previously reported for higher-income samples are also relevant for Head Start samples. Moreover, results indicate that these relations not only exist for children from low-income backgrounds, but that the magnitude of these relations closely resemble those reported for more advantaged samples. For example, in the present study, false-belief understanding in preschool accounted for 9% of unique variance in social competence in kindergarten, which is within the 9 to 14% range reported for higher

income samples (e.g., Capage & Watson, 2001; Watson et al., 1999). Likewise, the strength of the correlations between false-belief understanding and executive function coincided with the .30 to .60 range typically reported in the literature (e.g., Carlson & Moses, 2001; Frye et al., 1995; Hala et al., 2003). Thus, the relations between false-belief understanding and its correlates among children from low-income backgrounds are similar to those reported for children from higher-income samples.

Implications of Findings

The current findings have significant implications for theory, research, and practice. With respect to theory, the present study expands our conceptualization of the relation between false-belief understanding and social competence. Although the results are consistent with proposals that an understanding of false-belief would promote children's social competence (e.g., Astington & Jenkins, 1995; Capage & Watson, 2001), they are also consistent with proposals that successful social behavior stimulates false-belief understanding (e.g., Flavell et al., 1987; Youngblade & Dunn, 1995). Thus, current findings are the first to support recent claims that the relation between false-belief understanding and social competence is bidirectional during early childhood (e.g., Moore et al., 1998; Watson et al., 1999). The results of the present study also inform theory concerning the relation between false-belief understanding and executive function. Specifically, concurrent relations between false-belief understanding and executive function were supported, which is consistent with claims that the development of these constructs is closely related during early childhood (e.g., Carlson & Moses, 2001; Frye et

al., 1995; Hughes, 1998a). Interestingly, however, the results do not support theoretical claims of causal relations between these constructs (e.g., Carlson et al., 2002; Perner & Lang, 1999), which raises the question of whether directional associations exist between these constructs beyond the preschool years, or at all.

The current findings also inform theory through their adherence to, or deviation from, the proposed hypothetical models. For example, the present results are the first to support a mediational model in which false-belief understanding mediates the longitudinal relation between executive function and social competence. Although indirect relations between executive function and social competence have been previously speculated (e.g., Hughes et al., 1998), this study is the first to identify false-belief understanding as a mechanism through which executive function affects social competence. Thus, these findings suggest a new conceptualization of how executive function influences social competence. The current study's failure to support a moderational model in which gender moderates relations between false-belief understanding and its correlates also informs theory. Specifically, these results suggest that the principles of gender theory do not manifest themselves in the proposed relations involving children's false-belief understanding.

The present findings have valuable implications for research as well. First, the results are consistent with previous studies examining relations between false-belief understanding and its correlates. Specifically, current findings provide additional evidence for concurrent and longitudinal relations between false-belief understanding and social competence, as well as concurrent relations between false-belief understanding and both language ability and executive function. Second, the current results contribute to the

limited research on false-belief understanding within low-income samples and suggest that the relations previously reported for higher-income samples are also relevant for Head Start samples. Third, regarding the preliminary studies conducted by our research lab, present results suggest that the reported gender effects may have not generalize to other samples, including those comprised Head Start children with similar background characteristics. Finally, the current study offers further support for the addition of the Preschool and Kindergarten Behavior Scales (PKBS; Merrell, 1994) to the repertoire of effective teacher-reported social competence measures used in false-belief understanding research. This finding is beneficial to the research community because the PKBS is a relatively short assessment of children's social behavior that is already familiar to Head Start teachers. Furthermore, in contrast to the social skills measures used in previous studies (e.g., Capage & Watson, 2001; Lalonde & Chandler, 1995; Watson et al., 1999), the PKBS is a standardized instrument, which is beneficial when making comparisons across different samples.

Finally, there are important implications of the current findings for practice. Specifically, the present study can inform applied research in the areas of both prevention and intervention. With regards to prevention, the current study suggests that advanced false-belief understanding may serve as a protective factor against the early onset of problem behaviors. For example, the current results identify false-belief understanding as a valid predictor of children's social competence during the early childhood years. Furthermore, the present study supports false-belief understanding as a mediator of the longitudinal relation between executive function and social competence. These findings suggest that false-belief understanding may play an even more important role in the

promotion of social competence than previously thought and should be acknowledged in future efforts to prevent disruptive behavioral disorders. Given that previous research suggests that preschool children can be trained quickly and successfully on false-belief understanding (e.g., Appleton & Reddy, 1996; Clements et al., 2000; Slaughter & Gopnik, 1996), one possibility would be to directly coach children on false-belief tasks. An alternative or supplemental approach would be to have teachers refer to mental states, including false beliefs, throughout their regular classroom lessons and activities, thus providing children an opportunity to learn about their own and other's thoughts.

Given the predictive relation between false-belief understanding and social competence, it is not difficult to imagine how the results of the present study can also inform intervention science. For example, if false-belief understanding underlies social functioning, then it could serve as a valid target for mental health professionals working with behaviorally disturbed children. Thus, practitioners could use false-belief training as a means to ameliorate children's existing behavioral problems. The legitimacy of this approach is supported by previous research reporting reduced false-belief understanding in preschool children labeled as "hard-to-manage" (Hughes et al., 1998). Of course, given the close relation between false-belief understanding and executive function, and the fact that children with behavioral problems may also suffer from executive dysfunction (Fahie & Symons, 2003), future interventions targeting problem behavior may also require an executive function component.

In sum, false-belief understanding may be an important component for future interventions designed to promote children's social competence or correct problem behavior. As mentioned previously, the extant literature suggests that disruptive behavior

disorders may begin as early as preschool and are relatively stable throughout childhood (Rose et al., 1989; Wehby et al., 1993). Furthermore, recent research suggests that children's social competence in preschool has a lasting effect on peer acceptance, regardless of subsequent modifications in their social conduct (see review, Johnson, Ironsmith, Snow, & Poteat, 2000). Thus, early intervention to promote positive social behavior is critical and the results of the present study suggest that false-belief understanding may play an important role in such interventions.

Limitations and Directions for Future Research

Although this study provides important information in an area largely unaddressed by previous research, it is not without limitations. First, there was a ceiling effect on multiple measures during the kindergarten year. Specifically, at T2, children's performance approached perfection on the false-belief aggregate and on the executive function aggregate, which was comprised of the peg tapping task and the FIST. Thus, the tasks used in this study appear to have been too easy for kindergarteners. This situation resulted in reduced variability in these measures, which may have compromised concurrent as well as longitudinal relations between false-belief understanding and executive function. Thus, future research should include more challenging measures of false-belief understanding and executive function. For example, although false-belief tasks are specific to young children, there are measures of social understanding that assess the more general theory of mind construct and are appropriate for older children (e.g., Bosacki, 2000; Bosacki & Astington, 1999). Furthermore, as previously noted,

many of the executive function tasks used with preschoolers are scaled down versions of adult tasks. Thus, it may be in the best interest of future studies targeting this age group to vary the tasks over time in the interest of detecting meaningful relations.

Second, the present study only examined relations between false-belief understanding and its correlates over one year in early childhood. Consequently, the results are specific to the period across preschool and kindergarten. Given that false-belief understanding is typically acquired by 5 years of age (Wellman et al., 2001), it is possible that the relations among constructs may differ with age. For example, the longitudinal relation between executive function and false-belief understanding may be stronger, or only exist, across earlier ages. Furthermore, the present study can only identify the immediate implications of false-belief understanding for children's social competence. Thus, the question of whether early false-belief understanding has long-term implications for children's social competence remains unanswered. Future research can address these related issues by altering the timeframe of the study. Specifically, to learn more about the directional relation between false-belief understanding and executive function, future studies should examine these constructs across earlier periods in childhood. To learn more about the long-term implications of early false-belief understanding for later social competence, future research should continue to assess children's social competence across the elementary school years.

A third concern involves the social competence assessment. Although teacher-report has been a successful method for assessing children's social competence in previous studies (e.g., Capage & Watson, 2001; Hughes et al., 1998; Lalonde & Chandler, 1995; Watson et al., 1999), the inclusion of observational data may have

resulted in a more comprehensive understanding of the relation between false-belief understanding and social competence. Specifically, the results of the current study support a particular relation between children's false-belief understanding and teacher-reported social competence. Future research can address this limitation by including observational measures of children's social competence.

Given that the majority (87%) of children in the present sample were Caucasian, a fourth limitation is the homogeneity of the sample. According to the Head Start Bureau (2004), in the fiscal year 2002, the national Head Start racial composition was dominated by the following three groups: Black (32.6%), Hispanic (29.8%), and White (28.4%). Although Black and Hispanic children embody a substantial proportion of the Head Start population, these two groups were largely underrepresented in the present study. Therefore, it is unclear whether the current findings would generalize to low-income children from these ethnic backgrounds. Thus, future research should examine the proposed relations in more ethnically diverse samples.

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APPENDIX

Measure Protocol

Prototypical Box: Time 1
Scoring: 0 = child responded incorrectly to either or both questions 2 and 3; 1 = child responded correctly to both questions 2 and 3.

1. [PRETEST QUESTION]. Place the egg carton on the table in front of the child. **What do you think is inside this carton?** This question does NOT get scored.

2. [TEST QUESTION]. Open the egg carton and show the child that the carton really contains crayons. Close the lid. **What did you think was inside the carton, before we opened it?**

3. [REALITY CONTROL QUESTION]. **What is in the carton really?** If needed, a force-choice prompt was provided (e.g., **eggs or crayons?**).

Prototypical Box: Time 2
Scoring: 0 = child responded incorrectly to either or both questions 2 and 3; 1 = child responded correctly to both questions 2 and 3.

1. [PRETEST QUESTION]. Place the crayon box on the table in front of the child. **What do you think is inside this box?** This question does NOT get scored.

2. [TEST QUESTION]. Open the crayon box and show the child that the box really contains gum. Close the lid. **What did you think was inside the box, before we opened it?**

3. [REALITY CONTROL QUESTION]. **What is in the box really?** If needed, a force-choice prompt was provided (e.g., **crayons or gum?**).

Ears Book
PART 1.
Scoring Part 1: 0 = child responded incorrectly to either or both questions 2 and 3; 1 = child responded correctly to both questions 2 and 3.

Story: Place book on table in front of child. **I am going to read you a little story. This is the Ears book. See, here are ears** (point to ears on cover of book). On each of the pages the child is shown "ears" through a window in the page and then the window page is turned to reveal the whole animal (rabbit, horse, cat). So, before turning the cover page, point to the "ears" in the window and ask the child **What do you think these**

things are?" Turn the page and say **These are ears.** Continue through horse and cat in same way. DO NOT SAY THINGS LIKE "these are the rabbit's ears".

1. [PRETEST QUESTION]. Before turning to the final page, ask the child **What do you think these things are?"** Turn to the final page, which reveals that the "ears" are really petals on a flower.

2. [TEST QUESTION]. Turn back to the prior page and point to the picture through the window**. Before we turned the page, what did you think these would be, ears or petals?**

3. [REALITY CONTROL QUESTION]. **What are these really, ears or petals?**

PART 2.
Scoring Part 2: 0 = child responded incorrectly to either or both questions 4 and 6; 1 = child responded correctly to both questions 4 and 6.

1. [TEST QUESTION]. Keep book open to page with cat on it. Show the child Charlie the Cat cut-out. **Look, this is Charlie. Charlie has never seen this book before. If he comes over and looks through this window** (position cat so that he is looking down into window)**, what will he think these are, ears or petals?**

2. [JUSTIFICATION QUESTION]. **Why will Charlie think these are _____?** (child's previous answer).

3. [REALITY CONTROL QUESTION]. **What are these really, ears or petals?**

Locations Task
Scoring: 0 = child responded incorrectly to either or both questions 2 and 3; 1 = child responded correctly to both questions 2 and 3.

Story: **I have some friends here with me today and I would like to tell you a story about them.** Hold dolls and say, **Big Bird and Elmo were shopping. They bought some chocolate and brought it home with them.** Bring dolls with chocolate into kitchen and say, **Elmo wanted to help put the chocolate away. Big Bird told him to put the chocolate in the *drawer*. Elmo puts the chocolate in the drawer** (brown matchbox). **Then Elmo went out to play.** Elmo is removed from scene and placed under the table. **Big Bird took the chocolate out to bake a cake.** Big Bird takes chocolate out of drawer. **But he didn't have any eggs for the cake. He has to go back to the store to buy eggs. Big Bird puts the chocolate in the *refrigerator* and goes to the store.** Big Bird puts chocolate into white matchbox and is removed from scene. **Elmo comes inside from playing. He wants some of the chocolate for a snack.** Elmo reappears and enters kitchen.

1. [MEMORY QUESTION]. **Do you remember where Elmo put the chocolate in the beginning?** If the child cannot remember, he or she is reminded of the correct location. This question is NOT scored.

2. [REALITY CONTROL QUESTION] **Do you remember where the chocolate is now?** The child is shown the correct location if he or she cannot remember.

3. [TEST QUESTION] **Where will Elmo look for the chocolate?**

4. [JUSTIFICATION QUESTION] **Why will Elmo look for the chocolate in the _____?** (child's answer)

Peg Tapping Task
Scoring for Trials 1-16: 0 = incorrect response; 1 = correct response.

Practice: RULE 1: **When I tap one time** (tap one time and hand the child the peg) **I want you to tap two times and then hand the peg back to me.** Practice until the child is successful on two consecutive trials. RULE 2: **When I tap two times** (tap the peg two times on the table and hand it to the child) **I want you to tap one time and then hand the peg back to me.** Continue practicing until the child is successful on two consecutive trials. **Ready to play my game? Remember, after you are done tapping, you should hand the peg back to me.**

Testing Order (number of taps by experimenter):
1. 1
2. 2
3. 2
4. 1
5. 2
6. 2
7. 1
8. 1
9. 1
10. 2
11. 1
12. 2
13. 2
14. 1
15. 1
16. 2

Flexible Item Selection Task (FIST)
Scoring for Trials 1-15: 0 = Selection 1 incorrect; 1 = Selection 1 correct, selection 2 incorrect; 2 = Selections 1 and 2 correct.

Demonstration trial instructions: **Now, you and I are going to play a different pick-some-pictures game. We are going to pick some more pictures together with our magic pointing finger. But we are going to play a different pick-some-pictures game. I'm going to pick some pictures first, just to show you how we pick pictures in this game, and then it will be your turn. OK?**

I'm going to pick two pictures that go together in one way. So I'm going to put my magic pointing finger on this picture here and on this picture here, because these two pictures here go together in one way. That picture over there doesn't go with these two pictures here. No! So these two pictures here go together in one way.

Now you know what I'm going to do? I'm going to pick two pictures that go together, but in another way. So I'm going to put my magic pointing finger on this picture here and on this picture here, because these two pictures here go together but in another way. That picture over there doesn't go with these two pictures. No! So these two pictures here go together, but in another way. So see, these two pictures here go together in one way, and these two pictures here go together, but in another way.

Practice trial instructions: **Now, it's your turn to pick some pictures! Put your magic pointing finger on two pictures that go together in one way.** (Selection 1) **Now, can you put your magic pointing finger on two pictures that go together, but in another way?** (Selection 2)

Test trial instructions**: I think you know how to play my game now. Right? Yes! So I think we can go a little bit faster now. Show me two pictures that go together in one way** (Selection 1). **Now, show me two pictures that go together, but in another way?** (Selection 2).

Dominant Cue Order:

1. color, size
2. size, shape
3. shape, color
4. color, size
5. shape, color
6. size, shape
7. color, size
8. shape, color
9. size, shape
10. color, size
11. shape, color
12. color, size
13. size, shape
14. shape, color
15. size, shape

Self-Ordered Pointing (SOP)
Scoring for each target picture in Trials 1-4: 0 = child fails to point to target picture. 1 = child points to target picture one or more times.

Introduction: **I am going to show you some cards with pictures on them. What I want you to do is touch one picture on the card. After you touch a picture, I will show you a new card with pictures in different places. Then I want you to touch a different picture so that by the time you are done, each picture will have had a turn. Ready?**

TRIAL 1: After introducing the task as above, turn to the first card and wait for child to point to a picture. If child does not point to a picture, prompt child ***"point to one picture on the card."*** After the child finishes all six cards, praise him/her.

TRIAL 2: Before beginning trial 2, tell the child, **Now we're going to play again. Try to give every picture one turn again.** After the child finishes all six cards, praise him/her.

TRIAL 3: Before beginning, tell the child, **This time there are eight pictures. Make sure every picture gets a turn.** After the child finishes all eight cards, praise him/her.

TRIAL 4: Before the fourth trial, tell the child, **You'll do the same thing again. Make Sure each one gets a turn.** After the child finishes all eight cards, praise him/her.

Preschool and Kindergarten Behavior Scales, Scale A, Prosocial Skills (PKBS)
Scale: 0 = Never; 1 = Rarely; 2 = Sometimes; 3 = Often.

1. Works or plays independently
2. Is cooperative
3. Smiles and laughs with other children
4. Plays with several different children
5. Tries to understand another child's behavior ("why are you crying?")
6. Is accepted and liked by other children
7. Follows instructions from adults
8. Attempts new tasks before asking for help
9. Makes friends easily
10. Shows self-control
11. Is invited by other children to play
12. Uses free time in an acceptable way
13. Is able to separate from parent without extreme distress
14. Participates in family or classroom discussions
15. Asks for help from adults when needed
16. Sits and listens when stories are being read
17. Stands up for other children's rights ("That's his!")
18. Adapts well to different environments

19. Has skills or abilities that are admired by peers
20. Comforts other children who are upset
21. Invites other children to play
22. Cleans up his/her messes when asked
23. Follows rules
24. Seeks comfort from an adult when hurt
25. Shares toys and other belongings
26. Stands up for his/her rights
27. Apologizes for accidental behavior that may upset others
28. Gives in or compromises with peers when appropriate
29. Accepts decisions made by adults
30. Takes turns with toys and other objects
31. Is confident in social situations
32. Responds appropriately when corrected
33. Is sensitive to adult problems ("Are you sad?")

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Razza, R.P., & Blair, C. (2003). False-belief understanding in a low-income population. Early Education and Development, 14, 425-439.

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Razza, R. P., & Blair, C. The Relation between false-belief understanding and social competence in early childhood: A longitudinal analysis. Poster accepted for presentation at the Biennial Conference for the Society for Research in Child Development, Atlanta, GA, April 2005.

Razza, R. P., Blair, C., Rothrauff, T., & Holland, R. Relations between false-belief understanding and social competence: Are females at an Advantage? Poster presented at the Head Start 7th National Research Conference, Washington, DC, June 2004.

Peters, R., & Jantzer, C. Relations among false-belief understanding, verbal ability, and social competence: Are females at an advantage? Poster presented at the Biennial Conference for the Society for Research in Child Development, Tampa, FL, April 2003.

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