Relations in the Development of Social Cognition

by

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ABSTRACT

The relations between aspects of social understanding (e.g., theory of mind, ToM, and emotion understanding, EU) were studied in relation to language and effortful control (EC). Data were collected when children were 30, 42, and 54 months of age (N's = 216, 192, and 168 for T1, T2, and T3, respectively). Children were assessed via mother and caregiver reports, and through observational measures. Although language and ToM did not relate within time, there was limited support for early language positively predicting later ToM. Language and EU were positively related within time, and there was some support for early language positively predicting later EU. Unexpectedly, significant positive relations were found for early EU predicting later language. ToM and EC were positively related within T3, and there was some support for early EC predicting later ToM. EU and EC were often positively related within time. Early EU also tended to positively predict later EC, whereas the opposite relation was not found. There was no support for significant a significant relation between EU and ToM. Findings suggest that children's early language may lead to later EC, and that early EU may help promote later EC and language; thus, it is important for parents and teachers to promote these early skills.

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Chapter 1

INTRODUCTION AND LITERATURE REVIEW

Developmental psychologist Jean Piaget stated that young children were egocentric and were only able to see the world from their own point of view (Piaget & Inhleder, 1956). However, research over the past 20 years has shown us that children begin to develop social cognition or social understanding at a young age. *Social cognition* refers to the mental processes that allow us to make sense of the social world, including cognition, affect, and motivation (Kunda, 1999; Martin, 2006; Dunn, 2000); it allows us to interpret, analyze, and remember social information (Pennington, 2000).

As children develop social cognition, they begin to recognize that other humans are cognitive beings with their own mental states. For instance, James' 10th birthday is coming up and he found the present his father had hidden in the closet – a remote control car. James realized that his father did not know he had found the present and that his father would be disappointed if he discovered this, so when James opened the present two days later, he acted surprised. In this story, James is able to understand and think complexly about someone else's (i.e., his father's) internal states and consequent actions. James has developed competence in some aspects of social cognition, such as emotion understanding and theory of mind.

Research findings show that there are different aspects of social cognition, such as understanding others' affect and cognitions, which should be viewed as

related, but distinct from each other (Dunn, 1995; Dunn, Brown, Slomkowski, Telsa & Youngblade, 1991; Cutting & Dunn, 1999). This study focused on social cognition from both cognitive and affective perspectives. The main constructs explored in this study include theory of mind, or knowledge about others' internal states, and emotion understanding, or cognition about others' emotions. Additionally, the development of language and emotion regulation was considered. Emotion regulation refers to the control of responses and behavior related to feeling states.

The main goal of this study was to identify constructs influencing the development of theory of mind and emotion understanding in young children. Currently, there is a lack of consensus on the nature of the relation between theory of mind and the understanding of emotions (Cutting & Dunn, 1999; Hughes & Dunn, 1998). Further, studies of additional constructs related to the development of these aspects of social cognition remain limited in number. Language and emotion regulation, for instance, have both been studied in relation to social cognition, but neither has been studied extensively, nor produced conclusive findings. Language has been found in some cases to be related to aspects of theory of mind (deVilliers & deVilliers, 2000; Hale & Tager-Flusberg, 2003; Jenkins & Astington, 1996), and to account for part of the variance in children's emotion understanding (Cutting & Dunn, 1999). Additionally, aspects of regulation have been found to be related to belief understanding (Carlson & Moses, 2001). Also, a relation between regulation and emotion understanding has

been found in some cases (Izard, Schultz, Fine, Youngstrom, & Ackerman, 2000). More empirical evidence is needed on the relations between social understanding and regulation.

This proposed study added to the literature in a few domains. Overall, this study contributed to a clearer understanding of constructs underlying the development of theory of mind and emotion understanding. In particular, this study examined the relations of language and regulation in the development of the understanding of emotions and theory of mind.

Another important facet of this study included the developmental nature of the research, as data were collected on children at ages when their skills in understanding others were maturing (Eisenberg, Murphy & Shepard, 1997; Flavell & Miller, 1998). Specifically, children were studied at 30, 42, and 54 months. To more accurately study the relations of both language and regulation to different aspects of social cognition, information was collected at multiple points in time in a longitudinal study.

Data were collected using a number of measures in this study. Not only were questionnaire measures used, but information was also collected from direct observation, with children participating in tasks in a laboratory setting. This provided for multiple ways to study different constructs, such as effortful control, which was both reported and observed.

Moreover, the variables identified in this study may also relate to other factors applicable to school and parenting settings. For instance, studies indicate

that children's skills in social cognition are related to their social competence (Gnepp, 1989; Shields et al., 2001). Accordingly, because of these broader implications, more empirical research is needed to understand the factors related to the development of social cognition in children. This study provided such data using a longitudinal approach.

Theory of Mind

Theory of mind is a term used to describe the ability to understand a person's actions in terms of that person's thoughts, beliefs, intentions, desires, and emotions (Astington, 1998; see Astington, 1993, for a review). Theory of mind, described more generally, is knowledge about others' internal states (Eisenberg, Fabes & Spinrad, 2006) and is an aspect of social cognition or social understanding (Astington, 1993).

Beliefs are internal, mental states that can reflect either reality or an incorrect understanding of the real state of the world. If children are able to understand that a person has a belief that is false, then it is clear that they are aware of the difference between reality and a subjective belief. Thus, to assess developing theory of mind, false belief tasks are often presented to children. In many studies, the following classic false belief story is presented (Wimmer & Perner, 1983, as cited in Wellman, Cross & Watson, 2001):

> Maxi puts his chocolate in the kitchen cupboard and leaves the room to play. While he is away (and cannot see), his mother moves the chocolate

> from the cupboard to the drawer. Maxi returns. Where will he look for the chocolate, in the drawer or the cupboard? (p. 655)

False belief tasks, such as this, require a participant to recall, predict and explain another person's perspective in a specific situation (Cutting & Dunn, 1999). Research over the past 25 years has utilized similar false belief procedures and has shown that normally developing children tend to attain a theory of mind by four years of age (see Wellman et al., 2001, for a review). The development of this skill occurs around this age in many different cultures (e.g., Canada, India, Peru, Somoa, and Thailand) and is found despite wide assessment task variation (Callaghan et al., 2005; Wellman et al., 2001).

Other types of tasks have been created to attempt to demonstrate earlier manifestations of theory of mind. A study by Woodward (1998) showed that infants as young as five and nine months were able to recognize others' goal-directed behavior when reaching for target objects. In addition, Repacholi and Gopnik (2007) studied infants' ability to differentiate their own preferences for food from others'. Infants as young as 18 months were able to indicate another person's preferred food, despite the fact that it was different from their own (Repacholi & Gopnik, 2007). In contrast, 14-month-old children were not able to perform the task correctly. The actions of the 18-month-olds in this study indicate that young children may understand that other people are entities separate from themselves – with diverse thoughts and preferences. Studies have also indicated that three-year-olds who do not pass typical false belief tasks demonstrate implicit

understanding based on their eye movements (Garnham & Ruffman, 2001). Onishi and Baillargeon (2002) had similar findings for children only 15 months of age.

At three years of age, children may not systematically understand others' intentions in situations, but they are able to understand this better at four years (Feinfeld, Lee, Flavell, Green, & Flavell, 1999). Thus, it is clear that children's theory of mind develops over time, with them generally being able to pass false belief tasks by four years of age.

Emotion Understanding

Emotion understanding has been defined as a person's ability to recognize, understand and label emotions, as well as to judge how others may feel in a particular situation (Eisenberg et al., 1997). This begins developing in children in infancy, but continues to develop for many years.

Starting at a very young age, five to seven months, children are able to distinguish among different facial expressions (Walker-Andrews & Dickson, 1997). When they both hear and see emotional cues, 7-month-old children express a preference for congruence (e.g., happy voice and happy facial expression)(Walker-Andrews & Dickson, 1997).

By the second year of life, children are able to label happiness and by the third year, they are able to identify situations that might elicit happiness in others (Eisenberg et al., 1997; Denham & Couchoud, 1990). Other emotions, such as anger and sadness are accurately identified somewhat later. Children can identify

both of these emotions by ages three and four years (Eisenberg et al., 1997; Widen & Russell, 2003). The identification of sad situations becomes accurate around age four. A study by Fabes, Eisenberg, Nyman, and Michealieu (1991) observed three to five-year-old preschoolers in their daycare settings. Following emotional incidents at the daycare, children were asked to identify others' emotions and the reasons for the responses; children's replies included statements like "He's angry because he wanted some more juice." The researchers found that five-year-olds were more accurate in labeling other children's emotions (about three-quarters of the time) than 3-year-olds were (about two-thirds of the time), with happy being labeled correctly more often other emotions such as sad or angry.

Also during late preschool and early school years, children become able to accurately label the emotions of fear and surprise (Eisenberg et al., 1997; Widen & Russell, 2003). Moreover, around the age of five and six years, children understand that if another person is given a reminder of a past emotional event, this may elicit an emotional reaction in that individual (Lagattuta, Wellman & Flavell, 1997). After the age of seven years, more complex social emotions, such as pride, jealousy, shame, and guilt can be understood; by preadolescence, children begin to use more subtle emotion terms such as "disappointed" and "relieved" (Harris, Olthof, Terwogt, & Hardman, 1987). Additionally, during this time period, children can discuss the causes of emotions, such as a boy being sad because he has no one to play with (Lagattuta & Wellman, 2002). They can also

understand that internal states can lead to emotions and behaviors, such as a lonely child being sad and crying (Lagattuta & Wellman, 2002).

Overall, these results suggest that children's emotion understanding develops with age. Children go from understanding basic emotions to more complex ones and become able to recognize the situations that may lead to affective reactions.

Relation between Theory of Mind and Emotion Understanding

Theory of mind and the understanding of emotions are both regarded as aspects of social cognition; however, they are viewed as distinct from one another (Cutting & Dunn, 1999; Harwood & Farrar, 2006). The relation between the two has not been clear in the research (Cutting & Dunn, 1999; Hughes & Dunn, 1998). A few studies have found that the understanding of emotions and of false beliefs were not correlated (Dunn, 1995; Dunn et al., 1991). Other researchers found that the relation between emotion understanding and belief understanding may be influenced by other factors such as age, language, and SES (Cutting & Dunn, 1999). Cassidy and colleagues found a significant relation between emotion understanding and theory of mind, but this relation was no longer significant after controlling for children's language abilities (Cassidy, Werner, Rourke, Zubernis & Balarman, 2003). On the other hand, some researchers found a relation between theory of mind and emotion understanding skills (Weimer & Guajardo, 2005), sometimes even while controlling for factors such as language abilities and age (Hughes & Dunn, 1998).

Regarding the relation between the two types of social cognition discussed, Bartsch and Estes (1996) argue that emotion understanding precedes the development of theory of mind. However, Repacholi and Slaughter (2003) disagree, claiming that theory of mind leads to the development of social and emotional understanding. As there is currently no consensus on the direction of relation between theory of mind and emotion understanding, this area requires additional examination.

Language and Social Cognition

Investigators have asserted that language ability is related to the development of social cognition. For instance, using standardized verbal assessments and verbal indices of tests, Happé (1995) found that the ability to master false-belief theory of mind tasks was linked to verbal ability in both autistic and typically developing children. Garner, Curenton, and Taylor (2005) also found language to be related to false belief performance, even when SES was taken into account. Moreover, studies have found that children's language abilities predicted their later theory of mind ability (Astington & Jenkins, 1999). For instance, Watson, Painter, and Bornstein (2001) found that children's language at 24 months of age was a predictor of theory of mind performance at 48 months. It has been suggested that language both precedes and promotes the development of theory of mind (Astington & Jenkins, 1999). General language abilities have also been found to relate to the understanding of emotion (Bosacki & Moore, 2004; Pons, Lawson, Harris, & de Rosney, 2003); in some cases, these

abilities account for unique variance, independent of the child's age or SES (Cutting & Dunn, 1999). Pons and colleagues (2003), specifically examining language and emotion understanding, suggest that language not only serves as a tool allowing cognitive representation, but language serves as a tool of communication that allows for additional discussion of emotion, which in turn may help them learn and mentally represent emotions.

Developmental psychologists such as Saarni (2001) have theorized that language, including narratives, scripts, and discourse, are tools that children use to help them understand emotions and theory of mind (Cassidy et al., 2003). It is theorized that the tool of language allows children to think abstractly and reflect on mental states and behaviors (Flavell, 2004; Weimer & Guajardo, 2005).

Specific aspects of language have been found to relate to understanding others' mental states. Bartsch and Wellman (1995) studied the utterances of children ages 18 months to five years, and found that within approximately 200,000 of these utterances, 12,000 included terms referring to mental states; these contained belief terms such as *think* and *know*, as well as desire terms such as *wish* and *hope*. Children begin to use these terms between 18 and 24 months of age (Bartsch & Wellman, 1995). The use of these words may indicate early understanding of other's internal states.

Other evidence regarding the relation between language and theory of mind has surfaced from studies including children with language or communication delays. Peterson and Siegal (2000) found that deaf children tend

to perform poorly on theory of mind tasks when compared to hearing children. Yet deaf children who learn to sign fluently early in childhood perform similarly to hearing children on these tasks. Thus, the researchers concluded that delays in experience with language and communication may impair performance on theory of mind tasks (Peterson & Siegal, 2000). Similarly, children who have language impairments tend to also have impairments in the development of theory of mind (Farmer, 2000).

Intervention studies have also shown the relation between language and theory of mind. In a couple studies, researchers trained three-year-olds, who failed false belief tasks, by discussing protagonists' thoughts (Lohmann & Tomasello, 2003; Hale & Tager-Flusberg, 2003); these studies were successful in promoting the three-year-olds' theory of mind performance. The researchers claim that conversation about mental states supports theory of mind development.

Emotion Regulation and Social Cognition

Emotion regulation refers to a complex process of "initiating, avoiding, inhibiting, maintaining, or modulating the occurrence, form, intensity, or duration of internal feeling states, emotion-related physiological processes, emotion-related goals, and/or behavioral concomitants of emotion, generally in the service of accomplishing one's goal" (Eisenberg & Morris, 2002, p. 3).

Effortful control is a voluntary type of emotion regulation that has been defined by Rothbart in 2007 as the "ability to choose a course of action under conditions of conflict, to plan for the future, and to detect errors" (p. 207). This

involves a child's ability to suppress a dominant response in order to perform a subdominant response (Eisenberg, Smith, Sadovsky & Spinrad, 2004). Components of effortful control include attentional control (the ability to focus or shift attention as needed), inhibitory control (the ability to inhibit behavior voluntarily as required), and activational control (the ability to activate behavior when needed, even if one does not desire to do so) (Rothbart & Bates, 2006). Because effortful control involves the awareness of planned behavior, it is considered to be a part of executive attention (Posner & DiGirolamo, 2000).

Effortful control begins to emerge in children between 6 and 12 months of age, and improves significantly between 22 and 44 months (Rothbart & Bates, 2006; Kochanska, Murray & Harlan, 2000; Eisenberg, Smith, Sadovsky & Spinrad, 2004). It continues to develop through adolescence and adulthood (Williams, Ponesse, Schachar, Logan, & Tannock, 1999). Longitudinal research by Kochanska found stability in effortful control from toddler years through preschool and early school years (Kochanska & Knaack, 2003; Kochanska, Murray, & Coy, 1997); some theorists felt that findings such as these indicate that effortful control may be viewed as a trait-like quality, or a temperamental characteristic (Kochanska et al., 2000; Rothbart & Bates, 1998).

Emotion regulation has been linked to children's theory of mind. For instance, measures of executive functioning and inhibitory control were related to children's belief understanding task performance using various tasks (Perner, Lang, & Kloo, 2002; Carlson & Moses, 2001; Hughes & Dunn, 1998). The

relation between an aspect of effortful control – inhibitory control – and belief understanding existed beyond the contribution of working memory. This relation was also found with Chinese preschoolers (Sabbagh, Xu, Carlson, Moses, & Lee, 2006). Researchers have found that children's accurate performance on measures of effortful control tasks became consistent before their performance on false belief tasks did (Flynn, O'Malley & Wood, 2004). Flynn et al. (2004) proposed that children must first understand their own actions and regulate themselves before they are able to consider others' mental states. Similarly, Carlson and Moses (2001) state that inhibiting and modulating behavior is *required* for tasks of theory of mind – children must inhibit a default response (about reality) to perform correctly on tasks of false belief (identifying someone's incorrect thoughts). Self-regulation helps children to socially interact with others effectively, which in turn helps them develop theory of mind skills (Flynn et al., 2004). Along this line, research has shown that children's early performance on measures of effortful control predicts later performance on theory of mind tasks, whereas the opposite finding was not true (Hughes, 1998; Flynn et al., 2004). A recent study by Jahromi and Stifter (2008), however, found that executive functioning, and *not* behavioral or emotional self-regulation, was significantly related to theory of mind.

In addition, emotion regulation has been associated with emotion understanding skills. Broad measures of emotion regulation have been related to emotion situation knowledge and emotion expression knowledge (Schultz, Izard,

Ackerman & Youngstrom, 2001). Theorists have argued that, before developing their understanding of emotions, children must be able to regulate their own emotional arousal in situations in order to attend to the emotional cues and causes of others' emotions (Eisenberg, Sadovsky & Spinrad, 2005). Thus, children who are able to avoid emotion overarousal may learn more about emotions and improve in their emotion understanding (Hoffman, 1982). Researchers have found that regulation predicts emotion understanding (Izard, Schultz, Fine, Youngstrom & Ackerman, 1999-2000). Moreover, Feshbach (1983) proposed that when children develop skills such as theory of mind and emotion knowledge, they learn to regulate themselves and show less aggression in situations. The researchers suggested that social cognitive skills may allow children to understand consequences in situations (i.e., aggressive actions can lead to pain and distress in others), and this knowledge leads them to inhibit their behavior (Feshbach, 1983). The relation between emotion understanding and effortful control may be complex and requires additional study.

Demographic Variables

Socioeconomic Status

As mentioned earlier, factors such as SES tend to be related to the variables in this study. For instance, SES had been found to relate to false belief, emotion understanding, (Weimer & Guajardo, 2005) and language (Garner et al., 2005). Additionally, Valiente and colleagues (2003; 2004) found SES significantly related to measures of effortful control, with higher SES associated

with higher ratings of effortful control. Because SES may relate to a number of variables in this study, it was also studied.

Age

Age is another factor shown to relate to variables in this study. In other longitudinal studies, age was found to relate to both emotion understanding (Hughes & Dunn, 1998) and theory of mind (Jenkins & Astington, 1996, Carlson & Moses, 2005). In the current study, children were studied within approximately 2 months of becoming the target age at each time point (e.g., the youngest child at T3 was 52 months, and the oldest was 56). Due to the variation in age, this factor was also studied in relation to the study variables.

Sex

Additionally, sex has been found to relate to many other variables. Several studies have found that boys and girls differ on emotion understanding; girls tend to outperform boys on emotion understanding tasks (Bosaki & Moore, 2004; Brown & Dunn, 1996). In a similar manner, performance on theory of mind tasks has been found to significantly relate to sex, with girls outperforming boys (Carlson & Moses, 2005). Additionally, effortful control and sex relate (Else-Quest, Hyde, Goldsmith, & Van Hulle, 2006), with girls found to have greater emotion regulation (Bosaki & Moore, 2004). Language, similarly, during year two through five, has been found to relate to sex; girls outperform boys on measures of language (Bornstein, Hahn, & Haynes, 2004). Thus, because of the

differences in development of boys and girls in the early years, sex was studied in relation to the study variables.

Summary of the Hypotheses

A primary goal of this study was to examine the relation between different aspects of social cognition (i.e., theory of mind and emotion understanding). The second goal was to examine how other factors, such as language and effortful control, may relate to these aspects of social cognition. These relations were looked at within and between different time points. Based on other recent research findings (e.g., Weimer & Guajardo, 2005), it was hypothesized that positive relations would be found between cognitive perspective taking and emotion understanding. When examining these related aspects of social cognition, basic understandings of others' mental states, such as emotion understanding, tend to develop before more complex understandings of others' perspectives (such as in false belief tasks) (Eisenberg et al., 1997; Wellman et al., 2001); it may be that these early understanding of emotion in others allows for the development of the more abstract understanding of others' cognitive states in situations. Thus, it was expected that early emotion understanding would predict later theory of mind performance.

Language was explored in the relation to social cognition as well. In some studies, it was reported that language ability was positively associated with theory of mind (Happé, 1995), and in this study, it was hypothesized that language abilities would be positively related to theory of mind within time. That is, when

higher language skills were found, children would score higher on false belief understanding tasks. Early language ability was hypothesized to predict later theory of mind performance, because it has been suggested that language precedes and promotes theory of mind (Astington & Jenkins, 1999) by helping children reflect on mental states (Flavell, 2004). Similarly, general language abilities have been found to be related to emotion understanding (Bosacki & Moore, 2004). Accordingly, it was hypothesized that language ability would be positively related to emotion understanding within time – children with higher scores on language tasks would also score better on emotion understanding measures. Additionally, because language is theorized to be a tool that helps children understand mental states (Flavell, 2004), early language ability was hypothesized to predict later emotion understanding performance, with the earliest time point being more predictive of later emotion understanding. In addition, early emotion understanding was studied in relation to later language development, but it was hypothesized that there would not be significant prediction between the two.

The relation of emotion understanding and theory of mind to emotion regulation was also studied. Researchers have found emotion regulation to relate to children's theory of mind (Carlson & Moses, 2001). It was hypothesized in this study that effortful control would positively relate to theory of mind; thus, children who had higher scores on effortful control were expected to also score higher on concurrent tasks of theory of mind. Moreover, early effortful control was hypothesized to predict later theory of mind because effortful control has

been hypothesized to precede and be necessary for theory of mind development (Flynn et al., 2004). As theorists have postulated that children's emotional regulation may help them learn about emotions (Eisenberg et al., 2005), it was hypothesized that effortful control would positively relate to emotion understanding; that is, children who score higher on effortful control tasks would also score higher on measures of emotion understanding within time. Also, early effortful control was hypothesized to predict later emotion understanding. Emotion knowledge has been asserted to help children learn to regulate themselves (Feshbach, 1983); accordingly, it was hypothesized that early emotion understanding would predict later effortful control.

Because a number of variables in this study are expected to positively relate to later social cognition, it was also hypothesized that combined variables would also significantly predict aspects of social cognition. For instance, language, effortful control, and emotion understanding, together, are expected to predict theory of mind within and across time. Additionally, language and effortful control, together are hypothesized to predict emotion understanding performance; this is both within time and predicting across time.

The constructs measured multiple times during this study were expected to remain somewhat stable in terms of correlational, individual differences. Emotion understanding has been said to develop over time, with much development occurring during the third and fourth years. Longitudinal studies have shown, however, that individual differences in young children's emotion understanding

are quite stable over time (Pons & Harris, 2005; Hughes & Dunn, 1998). Thus, measures of this type of social cognition were expected to interrelate and remain stable in correlations across time. Language develops rapidly between 12 and 24 months, and then the growth slows but continues to develop (Huttenlocher, Haight, Bryk, Seltzer, & Lyons, 1991). Studying children older than this, from 30 to 54 months, it is expected that measures of language will be interrelated and be stable in correlations over time. Supporting this, Bornstein, Hahn, and Haynes's (2004) study found that children showed stability in their individual differences in language development. Effortful control was also expected to remain a stable construct; Kochanska and colleagues (2000) have stated that effortful control can be viewed as a trait-like and stable quality.

Research Questions and Hypotheses

The study's research questions are discussed in detail above, and a summary list is provided below.

Relations

Research Question 1: How will emotion understanding and theory of mind relate?

Hypotheses: Theory of mind and emotion understanding will have a significant positive relation within time. Across time, emotion understanding will positively predict later theory of mind.

Research Question 2: How will language and theory of mind relate?

Hypotheses: Language and theory of mind will have a significant positive relation within time. Also, early language will significantly predict later theory of mind performance.

Research Question 3: How will language and emotion understanding relate?

Hypotheses: Language and emotion understanding will have a significant positive relation within time. Additionally, early language will significantly predict later emotion understanding, with language at earlier times predicting more strongly. Across time, early emotion understanding will not predict later language development.

Research Question 4: How will effortful control and theory of mind relate?

Hypotheses: Effortful control and theory of mind will have a significant positive relation within time. Across time, early effortful control will significantly predict later theory of mind performance.

Research Question 5: How will effortful control and emotion understanding relate?

Hypotheses: Within time, effortful control and emotion understanding will have a significant positive relation. Early effortful control will significantly

predict later emotion understanding. Additionally, early emotion understanding will significantly predict later effortful control.

Research Question 6: Will the combined predictors of language, effortful control, and emotion understanding relate to theory of mind?

Hypotheses: Within time, the combined predictors of language, effortful control, and emotion understanding will positively relate to theory of mind. Across time, early combined language, effortful control, and emotion understanding will predict later theory of mind performance.

Research Question 7: Will the combined predictors of effortful control and language relate to emotion understanding?

Hypotheses: The combined predictors of effortful control and language will positively relate to emotion understanding within time. Across time, early combined effortful control and language will positively predict later emotion understanding.

Stability of Constructs

Research Question 8: Will the constructs in this study (emotion understanding, language, and effortful control) remain stable, in terms of individual differences, over time?

Hypotheses: All of the constructs measured at multiple time points (emotion understanding, language, and effortful control) are expected to remain stable.

Chapter 2

METHOD

Participants

This study is part of a longitudinal study conducted at a major southwestern university. To obtain a diverse sample representative of the area, participants were recruited from several hospital maternity wards in the Phoenix-metro area in 2001. The original sample began with 352 children (183 boys, 159 girls) at birth. The project investigators collected questionnaires from mothers, fathers and caregivers/teachers every six months. Annual laboratory visits began when the children were 18 months old and occurred at 30, 42, and 54 months. For the purposes of this study, time one (T1) refers to when the children were 30 months old. At this time, 216 of the original 352 families participated in the lab visit (*M* age = 29.77 months; 119 boys, 97 girls). Another assessment was conducted with 192 children from the same sample at time 2 (T2) or 42 months of age (*M* age = 41.75 months; 104 boys, 88 girls). Time 3 (T3) data were collected with 168 participating children at 54 months of age (*M* age = 53.89; 89 boys, 79 girls). Attrition occurred due to families moving or being unwilling to continue participation.

Demographic information was obtained from the children's mothers. Of the sample at 30 months, ethnicity for the participants was non-Hispanic (77.0%) and Hispanic (23.0%). In terms of race, participants were Caucasian (83.5%), African American (5.7%), Asian (2.6%), Native American (4.8%), two or more

minority races (1.3%), another race (0.9%), or race was unknown (1.3%). Also at T1, measures of the families' socioeconomic status (SES) were taken. The families' annual income was self-reported on a 7-point scale ranging from "less than $15,000" to "over $100,000". On average, the families' annual income was approximately $45,000 (a 4 on the scale). Also, mothers reported both mothers' and fathers' highest level of education (range from 1= grade school to 7= Ph.D.). A composite score of SES was formed by first averaging and mothers' and fathers' reported highest level of education (collected at T1 and T2); this was then standardized. Mean reported family income (T1, T2, T3) was also included in the measure of SES used in this study. This was averaged across time points and standardized. The standardized income and education scores were averaged to form the overall SES composite used.

Attrition

Forty-eight families had data at T1, but did not have data at T3. To compare characteristics of families participating in lab visits at T1 and at T3 versus families participating at T1 but not at T3, Pearson chi-square tests were calculated for children's sex, race, ethnicity, and *t*-tests were calculated for children's age, parents' education, and family income. The only difference found between attrited and non-attrited families was in age; children participating in T1 but not T3 were significantly older at the T1 lab visit than those participating at both time points, $t(214) = -2.15$, $p < .05$, $LL = -.43$, $UL = -.02$ (attrited $M = 29.95$, $SD = .69$, non-attrited $M = 29.72$, $SD = .63$).

Study variables at T1 were examined for differences in means for children with data at T1 and T3 versus with data at T1 but without data at T3 using *t*-tests. Children participating at T1 but not T3 had significantly higher scores on caregiver's ratings of attentional focusing and attentional shifting than those participating at both T1 and T3, *t*s(143, 140) = -2.97 and -2.45, *p*s < .01 and .05, *LL*s = -.80 and -.66, *UL*s = -.16 and -.07 (attrited *M*s = 4.92 and 5.14, *SD*s = .89 and .76, non-attrited *M*s = 4.44 and 4.78, *SD*s = .78 and .71). Additionally, children participating at T1 but not T3 performed significantly different than children participating at both T1 and T3 on the Waiting for Bow task; children participating at both times performed significantly better (i.e., had longer latencies on the task), $t(213) = 2.10$, $p < .05$, $LL = .01$, $UL = .51$ (attrited $M = 1.35$, $SD = .80$, non-attrited $M = 1.61$, $SD = .63$).

Procedure

During T1, T2, and T3, trained graduate and undergraduate psychology students collected data at a university laboratory. One of the parents (nearly always the mother – 100% of the time at T1, 99.5% at T2, and 99.4% at T3) filled in questionnaires before and/or during their participation in the laboratory visit.

After signing the consent forms, mothers and children were introduced to the laboratory room. Children participated in multiple activities alone, with their mother, or with a female experimenter. Following the session, parents were paid and children were given a small prize.

After receiving consent from the parent to contact a caregiver or teacher, questionnaires were sent to them in the mail. The completed questionnaires were returned in a self-addressed stamped envelope.

Measures

Measures in this study will tap several major constructs: (1) false belief understanding, (2) emotion understanding, (3) language abilities, (4) and effortful control.

False belief understanding (T3 only). Children's false belief understanding ability, which is the most common measure of theory of mind, was measured using a Smarties task measuring false belief of contents (Gopnik & Astington, 1988). To counterbalance, children were randomly assigned to one of two orders determining whether the correct response was given first or second in the test question. In the false belief contents task, the child was shown a cardboard crayon box and was asked, "What do you think is in here?" After a correct response was given, the child was shown that the box actually contained a small toy car. The car was removed, the child was allowed to briefly hold it, and then it was replaced into the crayon box. After the child correctly labeled the kind of box it was and what was currently inside of it, the test question was asked. The examiner stated the following: "Let's pretend I have another friend named Suzie waiting right outside the door. She's never seen inside this box. When she first looks at the box, *before she opens it*, will she think there is/are [crayons or a car/a car or crayons] inside?" Then depending on the child's response, the next question asked is,

"Why will she think there is/are [a car/crayons] inside?" This was coded as 0 for failing or 1 for passing the task.

Emotion Understanding (T1, T2, T3). Children's understanding of emotion was measured at all of the three time points. This measure is based on work by Denham (1986). First, children are shown felt faces with line drawings of basic emotion expressions such as happiness, anger, fear, and sadness. The protagonist's sex and approximate skin color was matched to the child's. Then, children were asked to expressively (i.e., verbally) label the emotions. They were also asked to receptively identify the emotions by pointing to the felt faces when prompted. During both the expressive and receptive parts of this task, the experimenter presented each prompt with a facial expression matching the correct emotion. For instance, when asking how the face displaying sadness felt, the experimenter would speak in a sad voice. To avoid children simply choosing the face closest to them as the answer, the correct response was always placed on one of the spots on the top row, further from the child. For both the expressive and receptive portions of this task, a correct response received a score of 2, a response of the correct emotional valence (i.e., positive or negative) received a score of 1, and an incorrect response received a score of 0.

Then, the children were told up to eight stories of stereotypical emotion-eliciting situations, with two of each of the four basic emotions listed previously. For example, the experimenter would enact a puppet saying, "Ooh, I am dreaming. There is a tiger chasing after me!! OH NO!!!" The experimenter

displayed the facial expression corresponding to the correct emotion – fear in this case. Then the children were asked how the character felt. A correct response was given a score of 2, a response of the correct emotional valence (i.e., positive or negative) was given a score of 1, and an incorrect response was given a score of 0. The scores across the eight situations were summed to form a stereotypical situation emotion understanding score.

At T2 only, an additional measure of emotion understanding was conducted. In addition to being presented with eight stereotypical vignettes, children were presented with 12 non-stereotypical vignettes. These vignettes were used to assess affective perspective-taking skills. The vignettes were altered depending on mothers' reports of their children's likely responses to situations listed on the Typical Emotion Questionnaire (Denham, 1986). For instance, if a mother reported that encountering a dog would make her child scared, the experimenter would act out a happy vignette, "Here comes a big dog. He looks nice; his big teeth are smiling at me." Children were queried about how the character felt (happy, in this case), and were prompted for a verbal response. Each child had to get at least 2 of the first 6 non-stereotypical stories correct in order to hear the last 6 non-stereotypical stories. Scores were recorded and coded in the same manner as they were for the stereotypical scenarios. The scores were summed across the 12 situations to provide a non-stereotypical emotion understanding score.

Language. To measure language ability at T1, parents were asked to report on their child's oral vocabulary using the MacArthur Communicative Development Inventory, Level II (Short version of the MacArthur Communicative Development Inventories, Fenson, Pethick, Renda, Cox, Dale, & Reznick, 2000). Parents were presented with a list of 100 words (e.g., cat, carry, under) and asked to indicate which words their child says in English, Spanish, or both. In this study, all tasks were assessed in English, so the count of English words only was calculated for each child. Normed percentile scores were acquired from Fenson et al.'s (2000) normative data, in which a reliability of .99 was found.

At T2, the MacArthur Communicative Development Inventory, Level IV was completed by parents; it was a version of the Short Communicative Developmental Inventories, developed by Dale, Price, Bishop, and Plomin (2003) based on their literature review and pilot testing. This version of the inventory included a list of 48 vocabulary words (e.g., bird, castle, make). Parents in this study were asked to report if their child had previously said the listed words in English, Spanish, or both. Again, because all tasks were performed in English, only the English word count was used in this study.

Language ability was measured at T3 only using the Wechsler Preschool and Primary Scale of Intelligence – Third Edition (WPPSI-III; Wechsler, 2002a) Expressive Vocabulary and Receptive Vocabulary scaled scores. The Expressive Vocabulary scale is comprised of 25 possible items, including 5 picture items and

20 verbal items. Testing began at the verbal items, and regressed as needed to the picture items. The Receptive Vocabulary scale includes 38 items; testing began at item 6 for children at T3, but could be regressed to lower items if need be. The scaled scores were computed from the children's raw scores, according to the WPPSI-III manual for the children's chronological age at the date of testing.

Effortful Control. Both questionnaires and observational tasks were used to measure children's effortful control. At T1, mothers and non-parental caregivers/teachers completed subscales on the Early Childhood Behavior Questionnaire (ECBQ; Rothbart, 2000). Subscales rating effortful control included Attention Focusing, Attention Shifting, and Inhibitory Control (1 = *never* to 7 = *always)*. The 12-item Attention Focusing subscale measured a child's ability to sustain orientation to an object and avoid distraction; this subscale included items such as, "*When engaged in an activity requiring attention, such as building with blocks, how often did your child stay involved for 10 minutes or more?"* (αs = .81 and .85 at T1 for mothers and for non-parental caregivers/teachers, respectively). The Attention Shifting subscale, consisted of 12 items measuring a child's ability to switch focus from one activity to another, and it included items such as, "*When playing outdoors, how often did your child look immediately when you pointed at something?"* (αs = .73 and .71 at T1 for mothers and for non-parental caregivers/teachers, respectively). The ability to stop or refrain from engaging in behavior due to instructions was measured in the 12-item Inhibitory Control subscale, with items such as, "*When told 'no', how*

often did your child stop the forbidden activity?" (αs = .88 and .88 at T1 for mothers and for non-parental caregivers/teachers, respectively).

The Childhood Behavior Questionnaire (CBQ) was intended for children ages three to seven years old (Rothbart, Ahadi, Hershey, & Fisher, 2001); subscales of this questionnaire were completed by mothers and non-parental caregivers at T2 and T3. Children's effortful control was measured by the same three subscales as in the ECBQ: Attention Focusing, Attention Shifting, and Inhibitory Control (1 = *never* to 7 = *always)*. The Attention Focusing subscale had 14 items, e.g., "*Sometimes becomes absorbed in a picture book and looks at it for a long time*," (αs = .77 and . 74 at T2, and .77 and .72 at T3 for mothers and for non-parental caregivers/teachers, respectively). The Attention Shifting subscale had 12 items, e.g., "*Has an easy time leaving play to do another activity,"* (αs = .67 and .80 at T2, and .73 and .82 at T3 for mothers and for non-parental caregivers/teachers, respectively). The 13-item Inhibitory Control subscale included items such as, "*Is usually able to resist temptation when told s/he is not supposed to do something,"* (αs = .77 and .82 at T2, and .80 and .83 at T3 for mothers and for non-parental caregivers/teachers, respectively). Activational control was not measured in the questionnaires used at T1 and T2. Composites of the subscales on the CBQ and ECBQ were created by averaging scores on each subscale following reversal of items with negative wording.

At all three time points, children engaged in a Dinky Toys task (Kochanska, Murray, Jacques, Koenig, & Vandegeest, 1996; Kochanska et al.,

2000, 2001). The experimenter placed an uncovered, transparent box full of small toys within reach of the children. Children were told to keep their hands in their lap. They were instructed to verbally tell the experimenter which toy they wanted so the experimenter could hand it to them. There were given up to two prompts to keep their hands in their lap during the task. Once the children chose a toy, the dinky toy task was repeated. Each child's overall level of self-restraint during this task was coded (1 = *child exhibits no attempt at self-restraint, reaches for the toy immediately each time* to 4 = *child exhibits extreme attempt at self-restraint, pulls back each time*). Coders reliably rated effortful control during the Dinky Toys task, *ICC*s(63, 58, 48) = .71 at T1, .92 at T2, and .72 at T3.

A Rabbit and Turtle task (Kochanska et al., 1996, 2000) was also used to measure effortful control at all time points. This task requires children to control their motor activity by moving toy characters along a laminated, curved path to a toy barn. First, children were given a toy child (sex-matched to the participant) and asked to keep the toy child on the path to take them home to the barn. The children were told to avoid the flowers, pond, and grass beside the path. While the children guided the toy child along the path, the experimenter kept a hand over the child's to help demonstrate the correct movement. Children were then asked to repeat the path independently with the toy child twice at T1 and T2 and once at T3. Then, at each time point, the children were given a toy rabbit and told it was "the fastest bunny in the world." The children were told to take the bunny home to the barn as fast as possible while remaining on the path. Two trials were

completed with the toy rabbit. Next, the children were given a toy turtle and told it was “the slowest turtle in the world.” The task here was to take the turtle home to the barn as slowly as possible while remaining on the path. Children completed two trials with the toy turtle at each time point. Coders scored children’s motor control during each trial by giving a baseline score of 1 point, then giving credit for each curve of the path the child navigated with the toy (2 = *child keeps the figure on the mat and stays within the lines of the path,* 1 = *child has the figure above the mat or follows the general curvature of the path,* 0 = *child ignores the particular curve*). The mean was calculated for all trials at each time point, with a maximum of 13 possible points. Coders reliably rated curve scores for the Rabbit and Turtle task, *ICC*s(58, 57, 65) = .96, .96, .98, at T1, T2, and T3 respectively.

At all three time points, children engaged in a task entitled Waiting for Bow (Kochanska et al., 2001). During this task, a box resembling a present was placed on a table directly in front of the child. The experimenter directed the child to remain seated and to avoid touching the box until the experimenter returned with the bow for the gift. The experimenter returned in two (T2, T3) or three (T1) minutes with a bow and then told the child to open the present. Each child’s response was coded on latency to touch, open, and/or take the gift out, as well as latency to leave the seat during the task, *ICCs*(63) = .98, 1.00, (not measured), and 1.00 at T1, *ICCs*(60) = .99, .99, 1.00, and .95 at T2, respectively, and *ICC*s(47) = .99, 1.00, 1.00, and .95 at T3, respectively. T1 had additional latency scores

coded, including latency to peek into the gift, and latency of the child putting their hand in the gift, *ICC*s(63) = .88 and .98. The latency scores at each time point were averaged to form composites.

Chapter 3

RESULTS

Statistical analyses were conducted using SPSS version 17. Descriptive statistics, correlations across time, regression within and across time, and prediction across time are discussed in regards to the study variables: theory of mind (ToM), emotion understanding (EU), language, and effortful control (EC).

Descriptive Information

Means and standard deviations of T1, T2, and T3 study variables are reported in Table 1. *T*-tests were used to examine sex differences in the study variables, and significant differences are presented in Table 1, with higher means for girls than boys on the following measures: T1 language (MCDI-II), $t(182) = -2.82$, $p < .01$, boys' $M = 67.34$ and girls' $M = 76.77$; T1 stereotypical puppet EU, $t(182) = -2.57$, $p < .05$, boys' $M = 3.68$ and girls' $M = 5.25$; T1 mother-reported inhibitory control, $t(187) = -2.20$, $p < .05$, boys' $M = 3.88$ and girls' $M = 4.17$; T2 expressive puppet EU, $t(176) = -2.85$, $p < .01$, boys' $M = 3.99$ and girls' $M = 5.07$; T3 WPPSI-III expressive language, $t(165) = -2.16$, $p < .05$, boys' $M = 10.81$ and girls' $M = 11.95$; and T3 mother-reported inhibitory control, $t(187) = -2.03$, $p < .05$, boys' $M = 4.60$ and girls' $M = 4.82$. As sex related to a number of different constructs, it was included as a covariate in subsequent regression analyses.

Relations of Socioeconomic Status to Study Variables

Because SES has been found to relate to a number of constructs included in this study, correlations were run to determine if SES was related to the target

variables (Tables 2-4). The composite score of SES was correlated with the study variables within each time point, and was significantly related to many measures. Notably, SES was significantly, positively related to language at T1 and T3, all measures of EU at all time points, Waiting for Bow at T1, all measures of observed EC at T2, and some measures of reported EC at all time points (see Tables 2-4). Thus, SES was used as a covariate in regression analyses. However, because SES is a variable reflecting environmental differences, it was of interest to also look at the same relations between study variables when SES was not controlled for, to examine the relations both ways.

Relations of Age to Study Variables

In the current study, children were studied within approximately two months of becoming the target age at each time point (e.g., the youngest child at T3 was 52 months, and the oldest was 56); thus, there was a range of no more than four months at a given time point.. Correlations of the study variables with age within each time point revealed that only the T2 Waiting for Bow showed a significant relationship with age. This task related (negatively) to age, $r(190) = -.16$ $p < .05$, with children's mean performance on Waiting for Bow lowest at T2 (see descriptive statistics in Table 1). Although age did not significantly correlate with variables within a given time point, it was still controlled for in consequent regression analyses to better predict over and above any effects of age in conjunction with other variables of interest.

Data Reduction

Data reduction techniques were utilized to manage analyses and combine measures of the same construct. First, a language composite was created averaging the scaled receptive and expressive WPPSI-III scores at T3. In addition, measures of EU were positively correlated, range of *r*s = .18 to .80, *p*s < .05 to .01; thus, receptive and expressive EU, measured on the same scale, were averaged within time to form a basic EU score for T1 and T2. Although the stereotypical puppets EU task was positively correlated with other EU measures, it was not combined with other measures because it related to other variables of interest differently. Additionally, the nonstereotypical puppets task was not used in further analyses due to the fact that it was not used at all time points (T2 only). Attention focusing, attention shifting, and inhibitory control on the ECBQ and the CBQ were averaged to form a reported EC score for the mother and separately for the caregiver; these composite scores were substantially, positively correlated, range of *r*s = .23 to .36, *p*s < .01, so they were further averaged to form one reported EC score for each time point. Additionally, individual scores from the Dinky Toys, Rabbit and Turtle, and Waiting for Bow tasks were positively correlated with each other within each time point, range of *r*s = .22 to .76, *p*s < .01, in all cases but one. Accordingly, these scores were standardized and averaged to create one observed EC score.

Construct Stability

Correlations were computed to examine relations within constructs (see Table 5). All measures of EU across the three different time points were positively correlated. Language measures were also all positively related across the time points. Additionally, reported measures of EC were positively related across time. Similarly, all composite scores of observed EC (combining Dinky Toys, Rabbit and Turtle, and Waiting for Bow) had significant positive relations across time. Reported and observed EC measures were also significantly, positively correlated within and across time, in all but one case (see Table 5). Nevertheless, these two variables were not combined in a composite due to the fact that they related to other variables of interest differently. As ToM was only measured at one time point (T3), no stability measures are included. In summary, individual differences in EU, language, and reported and observed EC were related over time, showing stability.

Change in Mean Levels of Variables with Time

To assess the effect of time on mean levels of variables, repeated measures ANOVAs were conducted. These analyses all used sex and SES to see if the effect of time or age varied due to these factors. To simplify these analyses and create meaningful categories of SES, annual household income, originally measured on a 7-point scale ranging from “less than $15,000” to “over $100,000 ” was recoded and grouped into three categories, low (less than $30,000), middle (between $30,000 and $75,000), and high (greater than $75,000) SES. These

simplified SES categories were used for the ANOVA analyses only (the aforementioned SES composite including parental education was used in regression analyses). Least Significance Difference post-hoc tests provided additional information on the relations in the repeated measures ANOVA analyses.

Effects of Sex, SES, and Time on Stereotypical Puppets EU

A 2 (sex) x 3 (SES) x 3 (time) repeated measures ANOVA was conducted to evaluate the effects of sex, SES, and time on children's scores on the EU measure using stereotypical puppet stories. Significant main effects were found for time, Hunyh-Feldt $F(1.80, 280.35) = 369.64$, $p < .01$, partial $\eta^2 = .70$. This shows that, over time, children's mean scores on the stereotypical puppets EU task increased, with significant differences between EU stereotypical puppets performance from T1 to T2, $M_D = 6.76$, $SE = .44$, $p < .01$, 95% CI from 5.90 to 7.63, T1 to T3, $M_D = 9.97$, $SE = .37$, $p < .01$, 95% CI from 9.24 to 10.69, and T2 to T3, $M_D = 3.21$, $SE = .31$, $p < .01$, 95% CI from 2.60 to 3.81. Additionally, a main effect was found for sex, $F(1, 156) = 6.73$, $p < .05$, partial $\eta^2 = .04$, with girls scoring higher than boys, $M_D = 1.08$, $SE = .42$, $p = .25$, 95% CI from .26 to 1.90. There was no main effect of SES, and no interactions were found between time, sex, or SES.

Effects of Sex, SES and Time on Basic EU

To assess the effects of time, SES, and sex on children's performance on basic EU (a composite of expressive and receptive measures, measured only at T1

and T2), a 2 (sex) x 3 (SES) x 2 (time) repeated measures ANOVA was conducted. A significant main effect of time was found Hunyh-Feldt $F(1, 1.66) = 603.47$, $p < .01$, partial $\eta^2 = .78$, with children performing significantly higher at T2, $M = 5.61$, $SE = .14$, than T1, $M = 1.91$, $SE = .14$. Sex also had a significant main effect, $F(1,166) = 6.72$, $p < .05$, partial $\eta^2 = .04$, with girls scoring higher than boys on the basic EU task, $M_D = .50$, $SE = .22$, $p < .05$, 95% CI from .06 to .94. Additionally, a main effect of SES was found, $F(2,166) = 8.15$, $p < .01$, partial $\eta^2 = .09$, with children from higher SES groups scoring better. There was a significant difference between low and middle SES groups, $M_D = .81$, $SE = .28$, $p < .01$, 95% CI from .26 to 1.36, and between low and high SES groups, $M_D = 1.20$, $SE = .30$, $p < .01$, 95% CI from .60 to 1.80. No significant interactions were found between time, SES, and sex on basic EU performance.

Effects of Sex, SES, and Time on Language

Language was measured at each time point for this study, yet the measures varied. At T1 and T2, expressive language use was reported by mothers (MCDI-II and MCDI-IV, respectively), and at T3, children were tested using receptive and expressive language subtests from an IQ test (WPPSI-III). Due to the differing measures, the effect of time was not able to be accurately determined through a repeated measures ANOVA analysis.

Effects of Sex, SES, and Time on Reported EC

To examine the effects of sex, SES, and time on children's reported EC (the CBQ composite of mother's and caregiver's ratings at T2 and T3 only), a 2 (sex) x 3 (SES) x 2 (time) repeated measures ANOVA was conducted. A significant main effect of time was found, Hunyh-Feldt $F(1,169) = 21.22$, $p < .01$, partial $\eta^2 = .11$, with children scoring higher on reported EC at the later time point, *M*s = 4.45, 4.60, *SE*s = .44, .45, at T2 and T3, respectively. Also, a significant main effect was found for sex, $F(1,169) = 5.05$, $p < .05$, partial $\eta^2 = .03$; in this case, girls scored significantly higher than boys on reported EC, $M_D = .17$, $SE = .08$, $p < .05$, 95% CI from .01 to .33. Neither a main effect of SES nor interactions were found for this variable.

Effects of Sex, SES, and Time on Observed EC

Multiple 2x3x3 repeated measures ANOVA were conducted to evaluate the effects of sex, SES, and time on the three different measures of children's observed EC.

Dinky Toys. The Dinky Toys task was used as a measure of observed EC at all three time points. The 2 (sex) x 3 (SES) x 3 (time) repeated measures ANOVA showed a main effect of time, Hunyh-Feldt $F(2, 308) = 115.06$, $p < .01$, partial $\eta 2 = .43$. There were significant differences between Dinky toys performance from T1 to T3, $M_D = 1.33$, $SE = .09$, $p < .01$, 95% CI from 1.15 to

1.50, and from T2 to T3, M_D = 1.14, *SE* = .31, $p < .01$, 95% CI from .95 to 1.33. There were no significant main effects of sex, SES, or any significant interactions.

Rabbit and Turtle. The Rabbit and Turtle task was another measure of observed EC. A 2 (sex) x 3 (SES) x 3 (time) repeated measures ANOVA evaluated the effects of sex, SES, and time on this task. There was a significant main effect of time, Hunyh-Feldt $F(1, 148) = 737.33$, $p < .01$, partial $\eta 2 = .83$, including significant differences between Rabbit and Turtle performance from T1 to T2, M_D = 7.51, *SE* = .34, $p < .01$, 95% CI from 6.84 to 8.17, from T1 to T3, M_D = 8.21, *SE* = .30, $p < .01$, 95% CI from 7.61 to 8.81, and from T2 to T3, M_D = .71, *SE* = .32, $p < .05$, 95% CI from .07 to 1.35. Additionally, there was a main effect of sex on Rabbit and Turtle performance, $F(1,148) = 6.16$, $p < .05$, partial η^2 = .04; girls scored significantly higher than boys, M_D = .80, *SE* = .32, $p < .05$, 95% CI from .16 to 1.44. Furthermore, a main effect of SES was found, $F(1,148)$ = 5.37, $p < .01$, partial $\eta^2 = .07$. Rabbit and Turtle performance was significantly higher for children from middle SES groups compared to low SES, M_D = 1.29, *SE* = .40, $p < .01$, 95% CI from .49 to 2.08, and for children from high SES groups compared to low SES, M_D = 1.17, *SE* = .43, $p < .01$, 95% CI from .31 to 2.02. There were no significant interactions between the time, sex, and SES on this task.

Waiting for Bow. In addition, the Waiting for Bow task, measured at all three time points, was tested using a 2 (sex) x 3 (SES) x 3 (time) repeated

measures ANOVA to evaluate the effects of sex, SES, and time on this task. At T1, the Waiting for Bow task was administered for three minutes, as compared to two minutes at T2 and T3. To ensure measures were comparable for repeated measures analyses, the T1 Waiting for Bow measure was reduced to include a maximum of two minutes of latency, placing it on the same scale as at T2 and T3. There was a main effect of time on this task, Hunyh-Feldt $F(1.81, 275.23) = 12.81$, $p < .01$, partial $\eta^2 = .08$. There were significant differences between Waiting for Bow performance from T1 to T3, $M_D = .19$, $SE = .05$, $p < .01$, 95% CI from .08 to .30, and from T2 to T3, $M_D = .25$, $SE = .04$, $p < .01$, 95% CI from .17 to .33, with children always performing better at later time points. In addition, a main effect was found for sex, $F(1, 152) = 8.34$, $p < .01$, partial $\eta^2 = .05$. Girls performed significantly better than boys on the Waiting for Bow task, $M_D = .16$, $SE = .06$, $p < .01$, 95% CI from .05 to .28. There was also a main effect of SES, $F(2, 152) = 8.92$, $p < .01$, partial $\eta^2 = .11$, in which children from higher SES groups always performed better; there was a significant difference between low and middle SES groups, $M_D = .15$, $SE = .07$, $p < .05$, 95% CI from .01 to .29, between low and high SES groups, $M_D = .32$, $SE = .08$, $p < .01$, 95% CI from .17 to .47, and between middle and high SES groups, $M_D = .17$, $SE = .06$, $p < .01$, 95% CI from .05 to .29. Moreover, a significant Sex x SES interaction was found, $F(2,152) = 3.09$, $p < .05$, partial $\eta^2 = .04$. In other words, the significant differences between income groups varied depending on the sex of the child.

Boys from the middle SES group performed better than boys from low SES group, and boys from the high SES group also performed better than boys from the low SES group, M_Ds = .32 and .45, *SE*s = .11 and .11, *p*s < .01 and <.01, 95% CIs from .12 to .53 and from .22 to .67. Girls, on the other hand, only had significant mean differences between middle and high SES groups, M_D = .21, *SE* = .09, $p < .05$, 95% CI from .03 to .39, with the higher SES group performing better.

Overall Effects of Sex, SES, and Time on Study Variables

Overall, on all of the measures collected at multiple time points, there were significant effects of time or age. This indicates significant improvements in children's ability as they age, specifically in EU and EC between 30 and 54 months of age. Additionally, there were significant main effects of sex for most of the repeated measures, with girls often performing better than boys on EU and EC. Main effects of SES also showed significantly better performance from higher SES groups compared to lower SES groups on measures of basic EU, Rabbit and Turtle (EC), and Waiting for Bow (EC).

Relations between Emotion Understanding and Theory of Mind

Relations between EU and ToM were examined, and ToM was not significantly correlated with measures of EU from any time point (Table 5). To further study the relations between EU and ToM when controlling for SES, sex, and age, regression analyses were conducted with these variables; these were done both within and across time.

EU and ToM Within Time

Within T3, a regression analysis was run to determine the significance of the relation between these two aspects of social cognition. In each analysis, covariates of SES, sex, and age were entered in the first step and the predictor was added in the second step of the regression. The composite measure of basic EU (receptive and expressive) and the stereotypical puppet stories were each used as predictors of the ToM false belief task. The measures of EU did not significantly relate to ToM performance within time (see Table 6).

EU and Tom Across Time

Across-time regressions examined longitudinal prediction of ToM (T3) from earlier EU (T1, T2). In these across-time analyses, covariates (SES, sex, age) were entered in the first step and the predictor, a measure of EU, was added in the second step of each regression. Table 6 shows *B*s, ΔR^2s, and $F\Delta$s associated with each regression between EU measures and ToM, none of which was significant. In this study, EU was not directly related to ToM.

Relations between Social-Cognitive and Language Variables

Both aspects of social cognition in this study, ToM and EU were examined in relation to children's language development. ToM is discussed first.

Theory of Mind and Language

The relation between ToM and language was examined using correlations and regressions to study both within and across time relations.

ToM and language within time. ToM and language did not significantly correlate within time, and regression analyses within time showed similar results. T3 language did not significantly relate to ToM over and above the covariates (Table 7).

ToM and language across time. Correlations of ToM and language across time indicated that language at T1 significantly, positively correlated with the T3 false belief measure of ToM, $r(157) = .20$, $p < .05$. Regression analyses similarly showed that T1 language significantly related to T3 ToM; this was when sex and age but not SES were not controlled for, $R^2\Delta = .03$, $F(1, 153) = 4.45$, $p < .05$. T2 language was not significantly related to ToM over and above the covariates (Table 7). In summary, only early language at T1 was able to predict ToM at T3.

Emotion Understanding and Language

The relation between EU (basic and stereotypical puppets measure) and language was also examined in correlations and regression analyses. Within-time relations are discussed first.

EU and language within time. Relations between EU and language are presented in Table 5. Language at T1 positively correlated with both measures of EU (basic and stereotypical puppets) within time. At T2, basic EU and language were significantly correlated, and at T3 both measures of EU correlated with the T3 language measure.

To further study the relations between language and EU, regression analyses were conducted with these variables. Within each time point, a

regression was run to determine the significance of the relation between EU and language (Table 8). Covariates (SES, sex, and age) were entered in the first step and language, the predictor, was added in the second step of the regression. Controlling for the aforementioned variables, the basic EU measures related significantly to language within T1 and T2. The stereotypical puppets measure did not significantly relate to language at T1 and T2; however, the T3 measure significantly related to T3 language over and above the covariates. Thus, there was some support that EU and language are related within time.

Early language and later EU. To further investigate the relation between language and EU, early language was examined as a predictor of later EU. Language at T1 had significant positive correlations with all later measures of EU. T2 Language did not correlate with T3 EU (Table 5).

Longitudinal prediction of EU from earlier language was also examined using multiple regression. Early language did not significantly predict later stereotypical puppets EU when controlling for sex, SES, age, and earlier EU performance (Table 9). A significant relation was found, however, between T1 language and the other measure of EU at T2 – basic EU, when controlling for demographic covariates and earlier EU performance, $R^2\Delta = .05$, $F(1, 171) = 11.16$, $p < .01$. Therefore, limited support was found for the hypothesis that early language predicts later EU.

Early EU and later language. Early EU was also looked at as a predictor of later language. For the correlations between T1 EU and later language

performance, there were significant positive relations between T1 basic EU and both later measures of language (Table 5). The other measure of EU at T1, stereotypical puppets, significantly, positively correlated with only T3 language. Both measures of EU at T2, though, were significantly correlated with language at T3.

To further study the relations between language and EU, regression analyses were conducted to examine across-time relations. Table 10 shows *B*s, ΔR^2s, and $F\Delta$s associated with each regression. Longitudinal prediction of language from earlier EU was examined first. All T1 and T2 measures of EU significantly related to later T3 language performance, while controlling for earlier language, SES, sex, and age. However, T1 EU did not significantly predict T2 language beyond the covariates. The findings may suggest that early EU predicts later language performance.

Overall Relations between Social-Cognitive and Language Variables

In summary, although language and ToM did not significantly relate within time (T3), there was some evidence that T1 positively predicts later T3 ToM. Additionally, some significant positive relations were found between measures of EU and language within each time point. Support for the hypothesis that early language predicts EU was limited; the only significant prediction (positive) was with T1 language and T2 basic EU. On the other hand, early EU positively predicted later language in many cases.

Relations between Social-Cognitive and Effortful Control Variables

Theory of Mind and Effortful Control

The relation between ToM and EC was studied using both correlations and multiple regression analyses. These were examined within time, as well as across time, to examine longitudinal prediction.

ToM and EC within time. Within T3, only reported EC was significantly correlated with ToM (Table 5); this was a positively relation. A regression analysis, shown in Table 11, also found a significant positive relation between T3 reported EC and ToM, after controlling for sex and age, but not SES, $R^2\Delta = .04$, $F(1, 153) = 5.78$, $p < .05$. This suggests that ToM and reported EC are positively related within time, when environmental variability is not accounted for.

ToM and EC across time. Looking across time, T1 EC did not significantly correlate with T3 ToM; on the other hand, T2 measures of EC did, and positively (Table 5). In addition, longitudinal relations of ToM and EC were examined with regression analyses. Although neither T1 EC measures predicted T3 ToM, both T2 measures of EC (reported and observed) significantly, positively predicted T3 ToM while controlling for SES, sex, and age (see Table 11). This to some extent supports the hypothesis that early EC predicts later ToM.

Emotion Understanding and Effortful Control

EU (basic and stereotypical puppets measures) was studied in relation to EC (reported and observed measures), using correlations and regressions. Within-time relations were investigated first.

EU and EC within time. Correlations between EU and EC are presented in Table 5. At T1, basic EU was related to both measures of EC. T2 measures of EU were significantly, positively correlated to concurrent observed, but not reported, EC measures. Within T3, the measure of EU (stereotypical puppets) positively correlated to both EC measures.

Studying the relation between EU and EC further, hierarchical regressions were conducted, again controlling for demographic covariates. First, within-time regressions, in accordance with previous hypotheses, examined EC as a predictor of EU. The analyses showed significant relations between basic T1 EU and observed EC, both T2 measures of EU and observed EC, as well as between T3 EU and both measures of EC. The *B*s, ΔR^2s, and $F\Delta$s associated with each regression are located in Table 12. In this study, EU often related to EC within each time point.

Early EU and later EC. Correlations between earlier measures of EU and later measures of EC can be found in Table 5. Both measures of T1 EU had significant positive relations with T2 observed EC and T3 reported EC. T1 basic

emotion was also significantly related to reported T2 EC. Both measures of T2 EU correlated positively with T3 EC measures.

Across time, regressions were run to examine longitudinal prediction of EC from earlier EU, while controlling for earlier EC, SES, sex, and age. Although not all relations were significant, many earlier measures of EU positively predicted later EC: both T2 measures of EC were predicted by T1 basic EU; T3 reported EC was significantly predicted by T1 stereotypical puppet EU and both measures of T2 EU; and T2 basic EU was significantly related to T3 observed EC (see Table 13).

Early EC and later EU. The relation between these two constructs was also examined in the other direction. T1 EC did not significantly correlate to later EU. T2 observed EC, but not T2 reported EC, positively related to T3 EU (Table 5). Looking at EC as the predictor of later EU in regression analyses, none of the earlier EC measures significantly predicted later EU measures beyond the effect of the covariates (Table 14).

Overall Relations between Social-Cognitive and Effortful Control Variables

In summary, some significant relations were found between EC and the social-cognitive variables in this study. For instance, there was some evidence that EC and ToM positively related within time (T3), and across time, T2 EC predicted T3 ToM. Relations were also found between EC and EU. Within time, EU was often significantly, positively predicted by EC. Across time, many

positive relations were found between early EU and later EC; however, the opposite was not found – early EC was not found to predict later EU.

Combined Predictors

Relations of Language, Effortful Control, and Emotion Understanding with Theory of Mind

Following analyses of individual constructs' relations to each other, study variables were combined to further analyze relations to social cognition. For instance, language, EU, and EC were entered together in a block as predictors of ToM in regression analyses (Table 15). Covariates, as before, were SES, sex, and age.

The T1 combined predictors of language, EU, and EC did not significantly relate to T3 ToM. Language, examined in earlier regression analyses as an individual T1 predictor, was found to positively predict T3 ToM; however, when analyzed in relation to other predictors of T3 ToM, T1 language was no longer significantly predictive. This indicates that T1 language may have some shared variance with EC or EU.

The combined T2 predictors of language, EU, and EC significantly predicted T3 ToM, $R^2\Delta = .07$, $F(5, 148) = 2.47$, $p < .05$. Initially, both reported and observed EC measures, as individual predictors, positively predicted T3 ToM. However, in the regression with combined T2 predictors of T3 ToM, only reported EC accounted for a significant amount of unique variance in this relation,

B = .15, p < .05, showing that this predictor had stronger unique prediction and that observed EC may have some shared variance with the other predictors.

Within T3, observed EC accounted for significant variance, B = .13, p < .05, but the combined language, EU, and EC step did not significantly predict ToM.

Overall, only at T2 were the combined predictors of language, EU, and EC significantly related to T3 ToM, with reported EC as the strongest unique predictor.

Relations of Effortful Control and Language with Emotion Understanding

Additionally, EC and language were combined in a block as predictors of EU in further regression analyses, with covariates of SES, sex, and age controlled for. Previous performance on EU was also used as a covariate when looking at relations across time.

Discussed first is combined EC and language's prediction of EU within time (Table 16). The combined IVs of EC and language did not significantly predict stereotypical puppets EU within T1, but they did significantly predict the other EU measure, basic EU, within T1, $R^2\Delta$ = .07, $F(3, 175) = 5.08$, p < .01. Language and SES predicted a significant amount of variance in this relation within T1, Bs = .02 and .52, ps < .01 and .01, respectively. When T1 observed EC was examined as an individual predictor of T1 basic EU, it was a significantly predictive, but this was no longer found when studied as a combined predictor with other EC and language measures; this suggests that observed EC may have

some overlapping variance with the other predictors. Language at T1 was a stronger unique predictor of T1 EU than EC.

Within T2, EC and language significantly predicted performance on the stereotypical puppets task, $R^2\Delta = .08$, $F(3, 171) = 5.81$, $p < .01$, with SES and observed EC predicting a significant amount of variance in this relation, Bs = .82 and 1.62, ps < .05 and .01, respectively. This is congruent with previously mentioned regression analyses showing T2 observed EC, as an individual predictor, positively related to T2 stereotypical puppets EU. Additionally, T2 basic EU was also predicted within time by combined EC and language, $R^2\Delta = .12$, $F(3, 171) = 9.38$, $p < .01$; this relation had a significant amount of variance accounted for by sex, SES, observed EC, and language, Bs = .57, .41, .60, and .04, ps < .05, .01, .01, and .01, respectively. Again, this is congruent with previously mentioned regression analyses – T2 observed EC and T2 language each, as individual predictors, positively related to T2 basic EU. Thus, the findings here indicate that both observed EC and language provide unique prediction of basic EU within T2.

Finally, within T3, combined EC and language significantly predicted T3 stereotypical EU, $R^2\Delta = .16$, $F(3, 160) = 11.01$, $p < .01$. In this relation, both observed EC and language accounted for significant variance, Bs = .57 and .23, ps < .01 and .01, respectively. Although the individual predictor of T3 reported EC had initially positively related to T3 EU, it no longer significantly related when analyzed as a combined predictor of EU. This indicated that reported EC likely

shares variance with the other EC or language measures, which were stronger unique predictors. Generally, it was found that combined EC and language predict EU within time; language and observed EC tended to be strong unique predictors.

The combined EC and language IVs were also assessed as predictors of later EU performance (Table 17). EC and language at T1 did not significantly predict T2 stereotypical puppets EU performance over and above the demographic covariates and earlier EU performance. On the other hand, the basic EU task at T2 was significantly predicted by the combined T1 variables of EC and language, $R^2\Delta = .06$, Fs (3, 168) = 4.48, ps < .01; SES, language and earlier EU accounted for significant variance in this relation, Bs = .39, .02, and .20, ps < .01, .01, and .05, respectively. This was congruent with previous regression analyses showing T1 language, but not T1 EC measures, significantly related to later T2 basic EU.

Across time, combined EC and language at T1 did not predict T3 stereotypical puppets EU, $R^2\Delta = .02$, F (3, 158) = 1.12, $p = .34$, but SES accounted for significant variance in predicting T3 EU, $B = .43$, $p < .05$.

Combined EC and language at T2 did not predict later (T3) stereotypical puppets performance either, $R^2\Delta = .01$, F (3, 159) = .87, $p = .46$; in this relation, earlier performance on EU predicted significant variance, $B = .17$, $p < .01$.
In summary, it was found that combined EC and language did not always predict later EU; in fact, only the combined predictors at T1 significantly predicted later

EU, as measured by the T2 basic EU task. Language at T1 was the significant, unique predictor in this relation.

Chapter 4

DISCUSSION

In the present longitudinal study, social cognition was studied in relation to other variables. That is, emotion understanding (EU) and Theory of Mind (ToM) were studied, looking at relations between the two, as well as at their relations to language and effortful control (EC). These relations were investigated within time and across T1, T2, and T3 (30, 42, and 54 months).

Overall, many of the original hypotheses for this study had research support. Language was studied in relation to social-cognitive variables. Although language and ToM did not relate within time, there was limited support for early language positively predicting later ToM.

Language and EU were positively related within time. Across time, there was some support for early language positively predicting later EU. Unexpectedly, significant positive relations were found for early EU predicting later language. Additionally, EC was examined in relation to this study's social-cognitive variables. ToM and EC were positively related within T3, and there was some support for early EC predicting later ToM. Also, EU and EC were often positively related within time. Early EU also tended to positively predict later EC, whereas the opposite relation (with early EC predicting later EU) was not found. In contrast to the original hypotheses, there was no support for significant relations between the social-cognitive variables of EU and ToM, either within or across time. Furthermore, combined IVs were studied in relation to the social-

cognitive variables. Combined language, EC, and EU did not significantly relate to ToM within time. Across time, T2 reported EC provided significant, unique prediction of T3 ToM. In addition, the combined predictors of EC and language had significant positive relations with EU within time; language and observed EC provided unique prediction of EU. Analyses with combined predictors also found that early language, as opposed to early EC, provides unique prediction of later EU. Moreover, the constructs in this study, including EU, language, and EC all were stable in terms of individual differences over time. These findings are discussed in more detail below.

Early Emotion Understanding and Later Language

One particularly surprising finding was the relation found between early EU and later language performance. It was not initially expected that a significant relation existed in this direction; however, correlations found many significant relations in which early EU predicted later language. Consistent with this, regression analyses controlling for a number of covariates showed that all of the earlier EU measures significantly positively predicted language at 54 months. Earlier language performance was also controlled for, allowing for examination of change in language. Therefore, it appears that EU in this study predicted later language performance.

One interpretation of this finding is that children's EU allows them to understand others' affective states. Perhaps this understanding allows them to better interact and communicate with others (Dunn & Cutting, 1999; Mostow,

Izard, Fine & Trentacosta, 2002), helping to develop their later language skills (Acra, Bono, Mundy, & Scott, 2009). For instance, when parents use emotion coaching, their children tend to have better EU (Gottman, Katz, & Hooven., 1997) and be more socially competent in interacting with peers (Katz & Windecker-Nelson, 2004). Additionally, some researchers state that social skills are imperative for language usage, which subsequently allows for language growth (Behrens, 2009). Thus, it is possible that children with stronger EU skills acquire better social skills, leading to opportunities for consequent language use and development. Because the emotion coaching may be verbally based, language may also be promoting EU; therefore, the relation between language and EU may be reciprocal, with each impacting the other.

It is also possible that the assessment measures used impacted the results. At earlier time points, mothers were given a list of words and reported the number of words their child spoke. However, at 54 months (T3), children's language was measured differently. Children were directly tested using a standardized subtest from an IQ test (WPPSI-III; Wechsler, 2002a) that looked at both receptive and expressive language. It is likely that this was a more appropriate measure, given that language was directly measured and provides a more comprehensive representation of language as a construct (i.e., expressive and receptive). This may explain why some significant relations were often found with early EU predicting language at the last time point (T3), whereas significant relations were found less frequently when looking at T1 EU and T2 language.

Emotion Understanding and Effortful Control Across Time

Another interesting finding was in regard to the relations between EC and EU. It was originally hypothesized that early EC would positively predict later EU because children who are able to regulate themselves may have additional opportunities to learn about emotions (Hoffman, 1982). Although there was some support for this relation in correlations between T2 EC and T3 EU, in regressions controlling for covariates including age, sex, SES and previous EU performance, there were no significant relations between early EC and later EU. These results suggest that early EC may not help children develop EU later, but the opposite may be true; early EU may help children develop EC. It was hypothesized that early EU would predict later EC. In fact, many positive relations were found between earlier measures of EU and EC in this study. This was found even while controlling for demographic variables, such as sex, age, and SES, and while controlling for earlier levels of EC. Because the early levels of EC are controlled for, we are able to look at changes in this construct over time and more accurately gauge the relations between variables. Thus, the research findings supported a positive relation between early EU and later EC. When children have a good understanding of emotions, and others' emotions, they may be better able to learn how and when to regulate themselves appropriately (Feshbach, 1983). For example, children's EU may help them think about how their behavior affects others' emotions, which prompts them to self-regulate.

Relations between Social-Cognitive and Language Variables

Overall, language was found to relate to the measures of social cognition in this study, although language appeared to relate to EU more consistently than to ToM.

Theory of Mind and Language

Language and ToM were hypothesized to be positively related within time. Correlations and regressions, however, revealed no significant relation between ToM and language concurrently. It was also predicted that early language would predict later ToM performance, with language at the earlier time point (T1) better predicting ToM than at the later time (T2). This hypothesis was somewhat supported. Although T2 language did not predict T3 ToM performance, language at 30 months (T1) did significantly relate to ToM, as found in correlations and a regression analysis. However, it should be noted that language at this time period related to ToM in the regression analyses when SES was *not* controlled for, but the two did not relate when SES was used as a covariate. This finding may indicate that the relation is mediated by environmental factors. For instance, it is possible that parents who are more highly educated use more sophisticated words (Fenson et al., 1994) and abstract vocabulary (e.g., related to others' thoughts) with their children, which impacts children's performance on both of these measures.

Emotion Understanding and Language

The relation of EU to language was also examined, testing the hypothesis that these variables are positively related within time. This was supported to some extent, with many significant, positive correlations between language and the measures of EU. Additionally, regression analyses at the earlier time points (T1, T2) found the basic EU measure, looking at both expressive and receptive EU, related to language within time. This can be considered a lower level type of EU measure. For the more complex measure of EU (using stereotypical puppet stories), a significant positive relation within time was found with language (using standardized expressive and vocabulary measures) when children were older – 54 months (T3).

It was clear that language and EU were related within time in this study, so to further analyze their relation, the variables were also studied across time. It was hypothesized that early language would predict later EU performance because language is theorized to be a tool that helps children understand mental states, such as emotions (Flavell, 2004; Saarni, 2001). Whereas language at 30 months (T1) positively correlated with all later measures of EU, language at 42 months (T2) did not correlate with later EU. The regression analyses (controlling for sex, age, SES, and earlier performance on EU) found fewer significant relations between early language and later EU in comparison to the correlations. T1 language predicted performance only on the basic EU task at T2. This finding

indicates that some of the covariates may account for significant variance in the relation between language and later EU. For instance, the correlation between T1 language and T2 stereotypical EU was significant, but the regression analysis between the two variables was not; in this case, SES accounted for significant variance in the relation. Taken together, the results suggested that there was some support for the predicted positive relation between early language and later EU. Because language at T1 better predicted EU performance at later time points than T2 language did, it may be interpreted that earlier language development, such as at 30 months, is important for developing EU skills. This pattern of findings supports other researchers' theory that language is a tool that helps children understand others' thoughts and emotions (Cassidy et al., 2003; Flavell, 2004).

Relations between Social-Cognitive and Effortful Control Variables

Social cognition was also found to relate to EC in this study. Similar as for language, EC appeared to significantly relate to EU more consistently than to ToM.

Theory of Mind and Effortful Control

It was also predicted that EC and ToM would relate positively within time. The reported, but not the observed, measures of T3 EC related to ToM at T3. However, it should be noted that this relation, when studied using regression analyses, was only significant when SES was not controlled for. This finding indicates that environmental variability impacts the relation between EC and ToM. It may be that parents' social class impacts their parenting practices, which

influences both EC and ToM development. For instance, parents from higher SES levels tend to use different parenting styles than those from lower SES; research has found that higher SES-parents tend to be more authoritative, accepting, and democratic in their style (Shaw, Criss, Schonberg, & Beck, 2004), which might impact children's development in different areas. The authoritative parenting style consists of both demandingness and responsiveness or warmth (Baumrind, 1991). As a part of parental responsiveness, communication and conversation are necessary components. It is possible that parent-child discussion encompasses many areas, including how a child's behavior impacts others' mental states. In addition, parents can coach children in appropriate ways to express themselves and cope with emotions (Gottman et al., 1997), which may impact their emotion regulation skills. Therefore, it may be that parents from higher SES levels tend to use parenting styles that foster communication and conversation that, in turn, encourage development of ToM and EC skills.

The tendency of early EC to predict later ToM was also of interest. It was hypothesized that early EC would be related to higher performance by children on later tasks of ToM. Although 42-month measures of EC were significantly related to 54-month ToM, EC at 30 months did not predict ToM at the later time point. It may be that children's mean level of EC at 30 months, especially observed EC, was low because of the difficulty of the tasks and the language demands. At 42 months, children's performance may be more representative of the construct of EU, with less effects of language due to complex verbal instructions. Also, 42-

month EC might be more relevant to ToM development, as that is when many children are approaching ToM skill mastery (Wellman et al., 2001). Thus, the general hypothesis that early EC would predict later ToM was supported when looking at later time points. This would suggest that children's ability to regulate themselves may help them to learn and understand about other's internal states, which is consistent with Flynn's (2004) finding that EC positively predicts later ToM performance.

Emotion Understanding and Effortful Control

EU and EC were expected to relate positively within time. A number of significant correlations and regressions supported this hypothesis. Positive relations were found within all time points, but there were a greater number of significant relations with measures within T2 and within T3, even when controlling for covariates such as age, sex and SES. As children's EU and EC are likely developing a great deal during the times observed – from 30 months to 54 months (Rothbart & Bates, 2006; Kochanska, Murray & Harlan, 2000) – it may be the case that the measures used are better suited for children at the later time points. As discussed earlier, across time this study found that earlier EU predicted later EC, whereas early EC did not predict later EU.

Relations between Emotion Understanding and Theory of Mind

The lack of relations found between the two aspects of social cognition in this study (i.e., EU and ToM) was unexpected. It was predicted that EU and ToM would be positively related within and across time. It was also expected that early

EU, compared to later time points would be more predictive of ToM performance. In correlations, the EU measures did not relate to ToM within the same time points or across time. Regressions controlling for age, gender, and SES did not reveal significant relations between EU and ToM. These findings were not consistent with findings from other studies looking at similar variables (Eggum et al., in press). It is likely that this is due to the limited nature of the ToM task used in this particular study – only one measure of ToM was utilized, and the scale it was scored on only had two levels: pass or fail. Thus, this task may not have been sensitive enough to detect small increments of development in ToM.

Combined Predictors

Relations of Language, Effortful Control, and Emotion Understanding with Theory of Mind

Because it was of particular interest to discover factors that jointly impact aspects of social cognition such as ToM, combined predictors were also used in this study. The combined predictors of language, EC and EU were examined in the prediction of ToM within and across time. This was done because all of these variables are developing during any given time in the early years and all may affect ToM development. The results showed a significant relation between the combined T2 predictors and T3 ToM; this was found on the second step of regression analyses, controlling for demographic covariates. Reported EC was significantly predictive in this relation with ToM. Observed EC, on the other hand, likely shared variance with the other T2 predictors, and was not as strong of

a unique predictor as reported EC. At the earliest time (T1, 30 months) and the later time point (T3, 54 months), the combined predictors did not significantly relate to T3 ToM. T1 language, significant as an individual predictor but not when combined with the measures of EC and EU, appeared to share variance with the other T1 predictors of T3 ToM. In general, analyses with the combined predictors of ToM found that reported EC was the most important factor and that language, observed EC, and EU did not provide unique prediction of ToM.

It is possible that the measures used were most accurately suited for children at 42 months (T2), as opposed to the other time points in which there may have been some floor or ceiling effects. For instance, at 30 months of age, mean performance on tasks of EU and observed EC was low, and at 54 months, children's mean performance approached the ceiling on these same measures. Taken together, the findings suggest that language, EC, and EU skills at 42 months may be important for the development of later ToM, but some of these skills (e.g., EC) may be more helpful in this development.

Relations of Effortful Control and Language with Emotion Understanding

EU was also studied in relation to the combined predictors of EC and language. Within each time point, significant positive relations were found with combined EC and language predicting EU performance in the second step of the regression analyses and controlling for demographic covariates. SES and language often accounted for much of the variance in the relations with EU. This suggests that language was a stronger predictor of EU than EC. However, at the

later time points (T2, T3), observed EC was also a unique predictor of EU within time.

Across time, relations between the combined EC and language predictors and later EU were also investigated. There was limited support that the individual variables of EC and language predicted later EU, and analyses with the combined predictors were congruent to this finding, with only one significant relation found across time. T1 combined EC and language (on the second step of the regression analysis) positively predicted the basic EU measure at T2, but SES and language were the significant predictors in this relation. These findings were obtained while controlling for earlier levels of EU, and they again suggest that language was a stronger predictor of EU than EC was. Although it is clear that language and EC together related to EU within time, it was also shown that language, early on, may be the more important skill in developing later EU.

Stability of Constructs

The main variables that were measured at multiple time points – EU, language, and EC – were all expected to remain stable in terms of individual differences over time. The measures of EU across the time points were positively correlated, so these measures showed stability in EU. This finding is congruent with work by Pons and Harris (2005) and Hughes and Dunn (1998), which showed that young children's emotion understanding is quite stable over time. The measures of language all positively related across time as well; this supported the hypothesis that language would remain stable in terms of individual

differences and supported previous research on language stability by Bornstein and colleagues (2004). The individual differences in language were stable despite the fact that different measures were used at each time point. Finally, composite measures of EC all had significant positive relations within and across time. This finding was expected, given research stating that EC is stable from the toddler years through the early school years (Kochanska & Knaack, 2003; Kochanska, Murray, & Coy, 1997). Overall, the stability demonstrated in these different variables shows us that children's development of these variables (i.e., EU, language, and EC) may occur very early. Additionally, individual differences may remain stable, and children's development occurs in a somewhat linear fashion.

Demographic Variables

The demographic variables of SES, age, and sex were examined in relation to the IVs in this study. SES, often seen in large part to be an environmental variable, was positively related to number of other variables: EU, language and EC. This is consistent with other studies also showing positive relations of SES with EU (Weimer & Guajardo, 2005), language (Garner et al., 2005) and EC (Valiente et al., 2003).

Because SES correlated with a number of variables, it was included as a covariate in the analyses in this study. Nonetheless, it was not always controlled for, so the impact of SES on the targeted relations between other variables could be ascertained. In fact, relations were found in which variables were only significantly related when SES was not controlled for; for instance, T1 language

was significantly predictive of T3 ToM, but only when SES was not a covariate. This may indicate that SES is a variable impacting both language and ToM performance.

As discussed before, children were studied in a laboratory setting close to the target age at each time point. Thus, children did not vary in age much, and age did not correlate with many variables. However, age was still controlled for in regression analyses in order to predict relations over and above age.

Additionally, mean levels of variables were studied to see if there was an effect of age. In fact, nearly all of he measures used at repeated time points had significant effects of age. This meant that older children, at the later time points, generally scored better on the measures of interest. This would be expected given that children are developing with time; for instance, EU develops a great amount between ages three and five (Fabes et al., 1991; Eisenberg et al., 1997), whereas EC develops significantly between 22 and 44 months of age (Rothbart & Bates, 2006; Kochanska et al., 2000; Eisenberg et al., 2004). Even the observed EC Waiting for Bow task had a significant effect of time or age, despite the fact that this task had a higher mean score at T1 than T2 (examining the first two minutes of the task); the mean score at T3 was significantly higher than both T1 and T2 scores, and the T1 and T2 scores did not differ significantly.

Congruent with many other findings, there were differences in task performance for boys and girls. Girls had higher mean scores than boys on some language, EU, and EC measures. Specifically, there were significant effects of sex

on both (reported, observed) measures of EU, reported EC, and two measures of observed EC (Rabbit and Turtle, Waiting for Bow). This is consistent with findings from other researchers who also found that sex relates to EU (Bosaki & Moore, 2004) and EC (Else-Quest, Hyde, Goldsmith, & Van Hulle, 2006).

Limitations and Summary

Although this study had a number of strengths, such as using longitudinal data as well as implementing both reported and observed measures, there were also a number of limitations. Notably, there were a number of measures that were not collected at all time points. For instance, language was measured at 30 months (T1) with the MCDI-II, which was no longer appropriate at 42 months (T2), so the MCDI-IV was used. Then, at 54 months (T3), yet another measure, subtests from the WPPSI-III IQ test (Wechsler, 2002a) were used. Thus, measurement of the constructs did not remain the same. In fact, receptive language was introduced at T3, whereas only measures of expressive language were used at earlier time points. This variation made analysis of the stability of constructs, as well as changes in them, difficult. Additionally, the differing measures may have impacted the relations found, especially if some measures were more sensitive or accurately representative of a construct than others.

Along the same lines, there was additional potential difficulty with one of the measures used in this study – the ToM false belief task. As discussed earlier, the measure is dichotomous, and only provides a score of “0” for failing and “1” for passing. As a result, the measure is likely not sensitive enough to detect

differences in development between individuals; there was no measure of an approach to passing the task. In addition, there was only one item on this task. Given the measurement for this task, there may be other types of analyses that might be more appropriate for a dichotomous variable than the multiple regression analyses used. For instance, logistic regressions are often helpful in the analysis of discrete variables (Tabachnick & Fidell, 2007).

Moreover, the measures used in this study may have had some overlap in constructs. Specifically, the EU tasks in this study likely required language skills. Children were asked to both receptively as well as expressively identify emotions. They were also shown vignettes in which the characters discussed the situations they were in. Thus, it is likely that some verbal ability would be required to understand and respond to the EU tasks, and this may have impacted the relations found between language and EU in this study.

Another limitation is in regards to the environment. Children are influenced by more than their abilities in a given area such as verbal ability or emotion regulation. In fact, the environment plays a large role in development, and this was only somewhat addressed in this study. While SES was used as a variable in this study, there are a number of other factors that may play a large role in some of the constructs of interest. For instance, parenting might greatly influence the development of social cognition (Eisenberg, Cumberland, & Spinrad, 1998), effortful control (Kochanska, et al., 2000), and language (Jaswal & Fernald, 2002; Bruner, 1977), but analysis of parenting practices was not

included in this study. Additionally, it is possible that the presence of older or younger siblings in a child's household relates to ToM or EU (Ruffman, Perner, Naito, Parkin, & Clements, 1998).

An additional potential problem with this study was that the measure of language might actually represent differences in IQ in children, as verbal ability is often highly correlated with intelligence. For instance, the technical manual for the WPPSI-III states that the test's Full Scale IQ score (a measure of *g*) is positively correlated with both the Expressive Vocabulary and Receptive Vocabulary subtests, *r*s = .80 and .77, respectively (Wechsler, 2002b). Factor Analyses have also found that many intelligence tests' verbal subtests have significant *g* factor loadings (Gignac, 2006), which indicates that some variance in individuals' general intelligence scores may be explained by their language performance. It is possible that language mediates the relation between IQ and other variables, such as EU or EC. On the other hand, it is also possible that that IQ mediates the relation between language and other variables; however, this relation could not be further examined in this study, because IQ was not directly measured.

Future Directions

Future studies can address a number of the difficulties found in this research project. For instance, it is important that researchers attempt to use the same measures of constructs over time whenever possible. It may be necessary to plan to use measures that have been created for a broader range of ages, so that

they can be used at multiple time points. Additionally, researchers studying ToM should seek to use multiple measures of false belief, or measures that allow for more responsive scoring than a simple "pass" or "fail." For instance, work by Fabricius and colleagues (2010), also examines children's reasoning during false belief tasks. Researchers may also focus on creating measures of EU that minimize verbal demands; this may help in measuring EU with greater accuracy, and possibly overlapping the construct with language.

In addition, future research can investigate the effects of environmental factors, such as parenting and family influences, on social cognitive variables. Also, further research can look at both IQ and language separately to determine which might play a larger role in the development of other constructs, such as EU or EC.

Morever, it would be interesting for future research to focus on clarifying the relation between some of the variables discussed in this study. For example, early EU was found to relate to later language, even though the opposite relation was expected. Additional research can help discover whether some of the findings in this study were due to varying measures or to actual relations in children's development. It is important to fully understand what variables help promote social cognition in children.

The findings from this study indicate that there are many factors that might impact the development of social cognition. Because language may enhance both EU and ToM, it may be beneficial for parents and teachers to

promote early language development in children. One way in which parents and teachers can attempt to promote children's language is through reading books with them and engaging in conversation about the content; this has been found to be effective with four-year-olds (Wasik & Bond, 2001). By promoting early language skills, children develop competence they may continue to build on (Hart & Risley, 1995).

Interventions may also directly focus on developing EU skills, which may help augment later EC and later language development. Additionally, helping to teach self-regulation skills may foster children's understanding of others, and promote later ToM development. Programs have been previously developed by researchers in an effort to promote both EU and emotion regulation. For example, a prevention program was created by Izard and colleagues (2004) entitled the Emotions Course. This program taught children about basic emotions as well as ways to regulate them, using lessons based on discussion and puppet vignettes. After children participated in this program, they had increased emotion knowledge and a decrease in expressed negative emotions. Other researchers have created preschool curriculum on emotions entitled Promoting Alternative Thinking Strategies curriculum (PATHS) to promote emotion awareness, self-control, positive peer relations, problem-solving skills, and positive classroom atmospheres (Domitrovich, Cortes, & Greenberg, 2007). Following the curriculum, children scored higher on emotion knowledge, were rated to be more socially competent, and were rated to be less socially withdrawn compared to

peers. Programs such as the Emotions Course or PATHS may be utilized for early prevention or intervention in preschool settings in an effort to promote both EU and EC.

Although language was not a strong unique predictor of ToM in this study, some significant relations were found between the two (e.g., a significant positive correlation and significant prediction in a regression between T1 language and T3 ToM). To promote the development of ToM, researchers have suggested that teachers can focus on social cognitive reasoning in the classroom and parents can discuss mental states with their children at home (Weimer & Guajardo, 2005).

Overall, this study has shown that there are many interacting factors that impact social cognition, and these provide many opportunities for adults to intervene and promote children's understanding of others. The use of screening (Walker, Kavanagh, Stiller, Golly, Severson, & Feil, 1998) and early intervention has been suggested (Raver, 2002), especially in promoting EU and EC skills. Schools may have success with interventions if they are implemented with fidelity, combine universal intervention with focused individual intervention, and incorporate family involvement (see Raver, 2002 for a review). Furthermore, it is important that schools or practitioners implementing any interventions – intended on promoting EU, EC, language, or ToM – ensure data are collected to monitor and evaluate effectiveness. Continued research can help hone interventions and give greater insight into the factors that relate to social cognition.

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APPENDIX A

TABLES

Table 1

Means and Standard Deviations of Study Variables

	30 months (*N* = 216)		42 months (*N* = 192)		54 months (*N* = 168)	
Construct	Mean	*SD*	Mean	*SD*	Mean	*SD*
Socioeconomic status	-.002	.91				
Sex	1.44	.50				
Age	29.77	.65	41.75	.65	53.89	.80
MCDI-II-language	71.32**	24.06				
MCDI-IV-language			35.98	10.17		
WPPSI expressive-language					11.34*	3.45
WPPSI receptive-language					11.14	3.11
Puppet expressive -EU	.92	1.58	4.36**	2.65		
Puppet receptive-EU	3.06	2.36	6.84	1.60		
Puppet stereotypical-EU	4.34*	4.23	11.32	4.12	14.49	1.89
Puppet nonstereotypical-EU			15.96	7.89		
False belief-ToM					.34	.48
M att. focus-EC	4.40	.77	4.55	.72	4.20	.69
M att. shifting-EC	4.78	.62	4.07	.61	4.69	.67
M inhibitory-EC	3.97*	.93	4.37	.73	4.73*	.76
C/T att. focus-EC	4.52	.83	4.66	.68	4.46	.70
C/T att. shifting-EC	4.85	.73	4.40	.79	4.70	.84
C/T inhibitory-EC	4.70	.99	4.69	.80	4.70	.88
Dinky toys-EC	2.29	.63	2.44	1.05	3.55	.80
Rabbit and turtle-EC	2.54	3.00	10.02	3.53	10.65	2.20
Waiting for bow-EC	1.56[+]	.68	1.50	.50	1.77	.29

Notes. MCDI = MacArthur Communicative Development Inventories; WPPSI = Wechsler Preschool and Primary Scales of Intelligence; EU = emotion understanding; ToM = Theory of Mind; M = Mother-reported; att. = attention; EC = effortful control; C/T = Caregiver/Teacher-reported.

Difference between means for males and females as determined by *t*-test, with females performing better than males * $p < .05$, ** $p < .01$.

[+] Waiting for Bow task at 30 mos. was originally measured with a maximum score of 3.00, M = 1.84, SD = .90, but this was scaled to correspond to later time points.

Table 2

Correlations of Variables at Time 1 (30 months)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 SES	-														
2 Age	-.12	-													
3 Sex	-.09	-.11	-												
Language															
4 MCDI-II	.17*	.01	.20**	-											
Emotion Understanding															
5 Puppet expressive	.26**	.11	-.01	.30**	-										
6 Puppet receptive	.33**	.01	.12	.22**	.43*	-									
7 Puppet stereotypical	.16*	.11	.19*	.19**	.33**	.36**	-								
Effortful Control															
8 M att. focus	.01	.04	.06	.13	.01	.01	-.01	-							
9 M att. shifting	-.04	.03	.10	.19**	-.03	-.04	-.04	.30**	-						
10 M inhibitory	.16*	.04	.16*	.20**	.16*	.21**	.05	.31**	.36**	-					
11 C/T att. focus	.02	.10	.02	-.09	.11	.06	.04	.01	-.06	-.03	-				
12 C/T att. shifting	.13	.13	.02	-.03	.06	.02	.17*	.18*	.16	.16	.53**	-			
13 C/T inhibitory	.25**	.06	.04	.07	.14	.08	.10	.15	.08	.30**	.45**	.53**	-		
14 Dinky toys	.06	-.03	.03	.04	.11	.06	.06	.04	.01	.17*	.10	.13	.10	-	
15 Rabbit and turtle	.13	-.10	.01	.08	.09	.10	.05	.18*	.03	.10	.08	.03	.08	.12	-
16 Waiting for bow	.29**	-.03	.12	.27**	.23**	.24**	.20**	.16*	.05	.25**	.07	.16	.27**	.29**	.21**

Notes. MCDI = MacArthur Communicative Development Inventories; M = Mother-reported; att. = attention; C/T = Caregiver/Teacher-reported.

* $p < .05$, ** $p < .01$

Table 3

Correlations of Variables at Time 2 (42 months) – Part 1

	1	2	3	4	5	6	7	8
1 SES	-							
2 Age	-.08	-						
3 Sex	-.09	-.03	-					
Language								
4 MCDI-IV	.10	.03	.10	-				
Emotion Understanding								
5 Puppet expressive	.28**	-.04	.21**	.26**	-			
6 Puppet receptive	.26**	-.03	.09	.20**	.38**	-		
7 Puppet stereotypical	.28**	.01	.12	.12	.51**	.52**	-	
8 Puppet nonstereotypical	.27**	.01	.07	.11	.41**	.40**	.80**	-
Effortful Control								
9 M att. focus	.14*	.02	.14	.06	.14	.04	.09	.10
10 M att. shifting	.10	-.04	-.07	-.01	.03	-.01	.03	.02
11 M inhibitory	.24**	-.02	.10	.19**	.08	.20**	.19**	.19*
12 C/T att. focus	.29**	-.11	.12	.09	.12	.13	.15	.15
13 C/T att. shifting	.07	-.01	.11	-.02	-.11	-.14	.01	.02
14 C/T inhibitory	.15	.03	.11	.09	.01	-.01	.09	.12
15 Dinky toys	.24**	.01	.05	.07	.27**	.20**	.25**	.22**
16 Rabbit and turtle	.28**	-.04	.13	.15*	.19**	.30**	.39**	.39**
17 Waiting for bow	.28**	-.16*	.14	.14	.32**	.26**	.31**	.33**

Notes. MCDI = MacArthur Communicative Development Inventories; WPPSI = Wechsler Preschool and Primary Scales of Intelligence; EU = emotion understanding; ToM = Theory of Mind; M = Mother-reported; att. = attention; EC = effortful control; C/T = Caregiver/Teacher-reported.

* $p < .05$, ** $p < .01$

Correlations of Variables at Time 2 (42 months) – Part 2

	9	10	11	12	13	14	15	16
1 SES								
2 Age								
3 Sex								
Language								
4 MCDI-IV								
Emotion Understanding								
5 Puppet expressive								
6 Puppet receptive								
7 Puppet stereotypical								
8 Puppet nonstereotypical								
Effortful Control								
9 M att. focus	-							
10 M att. shifting	.23**	-						
11 M inhibitory	.49**	.51**	-					
12 C/T att. focus	.16	-.02	.25**	-				
13 C/T att. shifting	.08	.05	.21*	.41**	-			
14 C/T inhibitory	.18*	.04	.39**	.68**	.65**	-		
15 Dinky toys	.14	.17*	.18*	-.01	.03	.02	-	
16 Rabbit and turtle	.12	.14	.23**	.10	-.01	.08	.32**	-
17 Waiting for bow	.16*	.14	.32**	.24**	.11	.25**	.37**	.46**

Notes. MCDI = MacArthur Communicative Development Inventories; WPPSI = Wechsler Preschool and Primary Scales of Intelligence; EU = emotion understanding; ToM = Theory of Mind; M = Mother-reported; att. = attention; EC = effortful control; C/T = Caregiver/Teacher-reported.

* $p < .05$, ** $p < .01$

Table 4

Correlations of Variables at Time 3 (54 months) – Part 1

	1	2	3	4	5	6	7
1 SES	-						
2 Age	-.06	-					
3 Sex	-.09	-.01	-				
Language							
4 WPPSI expressive	.36**	-.10	.17*	-			
5 WPPSI receptive	.41**	-.14	.09	.46**	-		
Emotion Understanding							
6 Puppet stereotypical	.24**	.08	.11	.38**	.32**	-	
Theory of Mind							
7 False Belief	.15	.01	.15	.08	.15	.07	-
Effortful Control							
8 M att. focus	.18*	-.01	.10	.14	.30**	.10	.13
9 M att. shifting	.10	-.09	.03	.21**	.14	.24**	-.02
10 M inhibitory	.20**	-.15	.15*	.27**	.36**	.24**	.16
11 C/T att. focus	.17*	-.01	-.05	.13	.32**	.14	.12
12 C/T att. shifting	.12	.05	.07	.16	.28**	.05	.25**
13 C/T inhibitory	.21**	-.02	.10	.21*	.27**	.06	.24**
14 Dinky toys	.07	-.01	.11	.16*	.27**	.22**	.20*
15 Rabbit and turtle	.07	.06	.14	.17*	.11	.20**	.03
16 Waiting for bow	.14	.09	.05	.18*	.18*	.20**	.01

Notes. WPPSI = Wechsler Preschool and Primary Scales of Intelligence; M = Mother-reported; att. = attention; C/T = Caregiver/Teacher-reported.

* $p < .05$, ** $p < .01$

Correlations of Variables at Time 3 (54 months) – Part 2

	8	9	10	11	12	13	14	15
1 SES								
2 Age								
3 Sex								
Language								
4 WPPSI expressive								
5 WPPSI receptive								
Emotion Understanding								
6 Puppet stereotypical								
Theory of Mind								
7 False Belief								
Effortful Control								
8 M att. focus	-							
9 M att. shifting	.21**	-						
10 M inhibitory	.56**	.53**	-					
11 C/T att. focus	.25**	-.08	.15	-				
12 C/T att. shifting	.15	.13	.25**	.39**	-			
13 C/T inhibitory	.32**	.13	.44**	.56**	.64**	-		
14 Dinky toys	.14	.09	.24**	.21*	.16	.25**	-	
15 Rabbit and turtle	.11	.07	.19*	.15	.07	.19*	.18*	-
16 Waiting for bow	.10	.17*	.20**	.01	-.03	.10	.25**	.21**

Notes. WPPSI = Wechsler Preschool and Primary Scales of Intelligence; M = Mother-reported; att. = attention; C/T = Caregiver/Teacher-reported.

* $p < .05$, ** $p < .01$

Table 5

Correlations of Variables Across Time – Part 1

	Language			Emotion Understanding				
	1	2	3	4	5	6	7	8
Language								
1 MCDI-II T1	-							
2 MCDI-IV T2	.70**	-						
3 WPPSI Composite T3	.29**	.30**	-					
Emotion Understanding								
4 Basic T1	.30**	.23**	.50**	-				
5 Puppet Stereotypical T1	.19**	.11	.25**	.41**	-			
6 Basic T2	.35**	.28**	.54**	.34**	.36**	-		
7 Puppet Stereotypical T2	.16*	.12	.45**	.33**	.26**	.61**	-	
8 Puppet Stereotypical T3	.20*	.09	.41**	.24**	.20**	.44**	.44**	-
Effortful Control								
9 ECBQ Composite (M+C/T) T1	.19**	.18*	.18*	.16*	.10	.05	.08	.13
10 CBQ Composite (M+C/T) T2	.19**	.13	.32**	.26**	.09	.09	.12	.14
11 CBQ Composite (M+C/T) T3	.15*	.17*	.40**	.27**	.17*	.26**	.33**	.23**
12 Observed T1	.19**	.09	.22**	.24**	.13	.11	.09	.13
13 Observed T2	.16*	.16*	.48**	.34**	.23**	.38**	.40**	.29**
14 Observed T3	.08	.10	.30**	.13	.13	.28**	.22**	.30**
Theory of Mind								
15 False Belief	.20*	.09	.14	.13	.10	.07	.13	.07

Notes. MCDI = MacArthur Communicative Development Inventories; WPPSI = Wechsler Preschool and Primary Scales of Intelligence; Basic EU = composite receptive & expressive EU, ECBQ = Early Childhood Behavior Questionnaire, CBQ = Childhood Behavior Questionnaire, M = Mother-reported, C/T = Caregiver/Teacher-reported.

* $p < .05$, ** $p < .01$

Correlations of Variables Across Time – Part 2

	Effortful Control					
	9	10	11	12	13	14
Language						
1 MCDI-II T1						
2 MCDI-IV T2						
3 WPPSI Composite T3						
Emotion Understanding						
4 Basic T1						
5 Puppet Stereotypical T1						
6 Basic T2						
7 Puppet Stereotypical T2						
8 Puppet Stereotypical T3						
Effortful Control						
9 ECBQ Composite (M+C/T) T1	-					
10 CBQ Composite (M+C/T) T2	.63**	-				
11 CBQ Composite (M+C/T) T3	.55**	.66**	-			
12 Observed T1	.26**	.28**	.23**	-		
13 Observed T2	.18*	.27**	.34**	.39**	-	
14 Observed T3	.14	.20*	.33**	.24**	.39**	-
Theory of Mind						
15 False Belief	.15	.26**	.21**	.04	.24**	.11

Notes. MCDI = MacArthur Communicative Development Inventories; WPPSI = Wechsler Preschool and Primary Scales of Intelligence; Basic EU = composite receptive & expressive EU, ECBQ = Early Childhood Behavior Questionnaire, CBQ = Childhood Behavior Questionnaire, M = Mother-reported, C/T = Caregiver/Teacher-reported.

* $p < .05$, ** $p < .01$

Table 6

Regression Analysis for Emotion Understanding with Theory of Mind

Predictors	*B*		*SEB*		ΔR^2		*F*Δ		*df*s
Predicting T3 False Belief ToM									
Step 1: Covariates					.05	(.02)	2.57	(1.86)	3, 154 (2, 155)
Sex	.15	(.13)	.08	(.08)					
Age	.01	(-.01)	.06	(.06)					
SES	.07		.04						
Step 2: Predictor T1 Basic (Receptive/Expressive) EU	.02	(.03)	.02	(.02)	.01	(.01)	.66	(2.02)	1, 153 (1, 154)
Step 1: Covariates					.05	(.02)	2.57	(1.86)	3, 154 (2, 155)
Sex	.14	(.13)	.08	(.08)					
Age	.01	(-.02)	.06	(.06)					
SES	.08		.04						
Step 2: Predictor T1 Stereotypical Puppets EU	.01	(.01)	.01	(.01)	.01	(.01)	.31	(.77)	1, 153 (1, 154)
Step 1: Covariates					.05	(.02)	2.46	(1.76)	3, 153 (2, 154)
Sex	.15	(.13)	.08	(.08)					
Age	.01	(-.02)	.06	(.06)					
SES	.08		.04						
Step 2: Predictor T2 Basic EU	-.01	(.01)	.02	(.02)	.01	(.01)	.02	(.23)	1, 152 (1, 153)

Predictors	*B*		*SEB*		ΔR^2		*F*Δ		*df*s
Step 1: Covariates					.05	(.02)	2.46	(1.76)	3, 153 (2, 154)
Sex	.14	(.13)	.08	(.08)					
Age	.01	(-.02)	.06	(.06)					
SES	.07		.04						
Step 2: Predictor									
T2 Stereotypical Puppets EU	.01	(.01)	.01	(.02)	.01	(.01)	1.05	(2.12)	1, 152 (1, 153)
Step 1: Covariates					.05	(.02)	2.61	(1.85)	3, 154 (2, 155)
Sex	.15*	(.14)	.08	(.08)					
Age	.02	(.01)	.05	(.05)					
SES	.08		.04						
Step 2: Predictor									
T3 Stereotypical Puppets EU	.01	(.01)	.02	(.02)	.01	(.01)	.04	(.44)	1, 153 (1, 154)

Step 1 of each regression analysis included covariates: age, sex, and SES. Each analysis was also run without SES as a covariate; these findings are reported in parentheses.

All beta values above refer to the values from Step 2.

* $p < .05$

Table 7

Regression Analysis for Language with Theory of Mind

Predictors	*B*		*SEB*		ΔR^2		$F\Delta$		*df*s
Predicting T3 False Belief ToM									
Step 1: Covariates									3, 153
					.05	(.02)	2.48	(1.74)	(2, 154)
Sex	.12	(.11)	.08	(.08)					
Age	.01	(.01)	.05	(.05)					
SES	.07		.04						
Step 2: Predictor									
T1 MCDI-II Language	.01	(.01*)	.01	(.01)	.02	(.03)	3.64	(4.45*)	1, 152 (1, 153)
Step 1: Covariates									3, 153
					.05	(.02)	2.50	(1.75)	(2, 154)
Sex	.15	(.14)	.08	(.08)					
Age	.02	(.01)	.05	(.05)					
SES	.08		.04						
Step 2: Predictor									
T2 MCDI-IV Language	.01	(.01)	.01	(.01)	.01	(.01)	.65	(1.06)	1, 152 (1, 153)
Step 1: Covariates									3, 154
					.05	(.02)	2.61	(1.85)	(2, 155)
Sex	.14	(.12)	.08	(.08)					
Age	.02*	(.02*)	.05	(.05)					
SES	.07		.05						
Step 2: Predictor									
T3 WPPSI Composite Language	.01	(.02)	.02	(.01)	.01	(.01)	.42	(2.15)	1, 153 (1, 154)

Step 1 of each regression analysis included covariates: age, sex, and SES. Each analysis was also run without SES as a covariate; these findings are reported in parentheses.

All beta values above refer to the values from Step 2.

* $p < .05$

Table 8

Regression Analysis for Emotion Understanding with Language Within Time

Predictors	*B*	*SEB*			ΔR^2		*F*Δ		*df*s
Predicting T1 Stereotypical Puppets EU									
Step 1: Covariates									3, 179
					.07	(.05)	4.47**	(4.35*)	(2, 180)
Sex	1.53*	(1.39*)	.62	(.62)					
Age	.96	(.78)	.50	(.50)					
SES	.65		.35						
Step 2: Predictor									
T1 MCDI-II Language	.02	(.03)	.01	(.01)	.02	(.02)	2.85	(3.81)	1, 178 (1, 179)
Predicting T1 Basic EU									
Step 1: Covariates									3, 179
					.13	(.01)	8.56**	(.58)	(2, 180)
Sex	.20	(.07)	.23	(.24)					
Age	.14	(-.02)	.19	(.19)					
SES	.58**		.13						
Step 2: Predictor									
T1 MCDI-II Language	.02**	(.02**)	.01	(.01)	.06	(.08)	12.37**	(15.76**)	1, 178 (1, 179)

Predictors	*B*		*SEB*		ΔR2		*FΔ*		*df*s
Predicting T2 Stereotypical Puppets EU									
Step 1: Covariates					.09	(.02)	6.00**	(1.33)	3, 174 (2, 175)
Sex	1.04	(.86)	.59	(.61)					
Age	.357	(.18)	.47	(.49)					
SES	1.22**		.33						
Step 2: Predictor									
T2 MCDI-IV									
Language	.04	(.05)	.03	(.03)	.01	(.02)	1.52	(2.71)	1, 173 (1, 174)
Predicting T2 Basic EU									
Step 1: Covariates					.13	(.04)	8.61**	(3.39*)	3, 174 (2, 175)
Sex	.65**	(.57*)	.24	(.25)					
Age	-.03	(-.11)	.20	(.20)					
SES	.53**		.14						
Step 2: Predictor									
T2 MCDI-IV									
Language	.05**	(.05**)	.01	(.01)	.07	(.09)	14.66**	(17.46**)	1, 173 (1, 174)

Predictors	*B*		*SEB*		ΔR^2		*F*Δ		*df*s
Predicting T3 Stereotypical Puppets EU									
Step 1: Covariates									1, 164
					.08	(.02)	4.74	(1.52)	(2, 165)
Sex	.21	(.17)	.27	(.27)					
Age	.32	(.32)	.17	(.17)					
SES	.15		.16						
Step 2: Predictor									
T3 WPPSI Composite Language	.27**	(.29**)	.05	(.05)	.12	(.17)	23.68**	(35.37**)	1, 163 (1, 164)

Step 1 of each regression analysis included covariates: age, sex, SES. Each analysis was also run without SES as a covariate; these findings are reported in parentheses.

All beta values above refer to the values from Step 2.

* $p < .05$; ** $p < .01$

Table 9

Regression Analysis for Language Predicting Emotion Understanding Across Time

Predictors	*B*		*SEB*		ΔR^2		$F\Delta$		*df*s
Predicting T2 Stereotypical Puppets EU									
Step 1: Covariates					.13	(.07)	6.52**	(4.13**)	4, 172 (3, 173)
Sex	.72	(.46)	.60	(.61)					
Age	.18	(-.03)	.47	(.48)					
T1 Stereotypical Puppets EU	.18*	(.21**)	.07	(.07)					
SES	1.11**		.33						
Step 2: Predictor									
T1 MCDI-II Language	.02	(.02**)	.01	(.01)	.01	(.01)	1.42	(2.64**)	1, 171 (1, 172)
Predicting T2 Basic EU									
Step 1: Covariates					.19	(.15)	9.76**	(9.75**)	4, 172 (3, 173)
Sex	.50*	(.41)	.25	(.25)					
Age	-.12	(-.20)	.19	(.20)					
T1 Basic EU	.21*	(.28)	.08	(.08)					
SES	.40**		.14						
Step 2: Predictor									
T1 MCDI-II Language	.02**	(.02)	.01	(.01)	.05	(.06)	11.16**	(11.89**)	1, 171 (1, 172)

Predictors	*B*		*SEB*		ΔR^2		*FΔ*		*df*s
Predicting T3 Stereotypical Puppets EU									
Step 1: Covariates					.23	(.21)	9.36**	(10.30**)	5, 160 (4, 161)
Sex	.17	(.11)	.28	(.28)					
Age	.15	(.12)	.17	(.17)					
T1 Stereotypical Puppets EU	.04	(.04)	.03	(.03)					
T2 Stereotypical Puppets EU	.17**	(.18**)	.04	(.03)					
SES	.28		.15						
Step 2: Predictor									
T1 MCDI-II Language	.01	(.01)	.01	(.01)	.01	(.01)	1.69	(2.21)	1, 159 (1, 160)
Step 1: Covariates					.23	(.21)	9.35**	(10.58**)	5, 161 (4, 162)
Sex	.22	(.16)	.27	(.27)					
Age	.17	(.14)	.17	(.17)					
T1 Stereotypical Puppets EU	.04	(.04)	.03	(.03)					
T2 Stereotypical Puppets EU	.18**	(.19**)	.04	(.03)					
SES	.29		.15						
Step 2: Predictor									
T2 MCDI-IV Language	.01	(.01)	.01	(.01)	.01	(.01)	.01	(.03)	1, 160 (1, 161)

Step 1 of each regression analysis included covariates: age, sex, SES. Previous performance on a DV was also included as a covariate when available.

Each analysis was also run without SES as a covariate; these findings are reported in parentheses.

All beta values above refer to the values from Step 2.

* $p < .05$; ** $p < .01$

Table 10

Regression Analysis for Emotion Understanding Predicting Language Across Time

Predictors	*B*		*SEB*		ΔR^2		*F*Δ		*df*s
				Predicting T2 MCDI-IV Language					
Step 1: Covariates					.49	(.49)	41.97**	(56.24**)	4, 172 (3, 173)
Sex	-1.21	(-1.25)	1.17	(1.15)					
Age	-.48	(-.50)	.91	(.90)					
T1 Language	.31**	(.31**)	.03	(.03)					
SES	.14		.64						
Step 2: Predictor									
T1 Stereotypical Puppets EU	.05	(.06)	0.14	(.14)	.01	(.01)	.14	(.16)	1, 171 (1, 172)
Step 1: Covariates					.49	(.49)	41.97**	(56.24**)	4, 172 (3, 173)
Sex	-1.19	(-1.19)	1.15	(1.14)					
Age	-.48	(-.49)	.91	.(90)					
T1 Language	.31**	(.31**)	.03	(.03)					
SES	.03		.67						
Step 2: Predictor									
T1 Basic EU	.24	(.24)	.38	(.36)	.01	(.01)	.39	(.46)	1, 171 (1, 172)

Predictors	*B*		*SEB*		ΔR^2		$F\Delta$		*df*s
Predicting T3 WPPSI Composite Language									
Step 1: Covariates					.31	(.14)	14.35**	(6.69**)	5, 160 (4, 161)
Sex	.66	(.41)	.38	(.42)					
Age	-.48*	(-.58*)	.23	(.25)					
T1 Language	.01	(.02)	.01	(.01)					
T2 Language	.05	(.05)	.03	(.03)					
SES	1.22**		.20						
Step 2: Predictor									
T1 Stereotypical Puppets EU	.09*	(.12*)	.05	(.05)	.02	(.03)	4.10*	(6.37*)	1, 159 (1, 160)
Step 1: Covariates									5, 160
					.31	(.14)	14.35**	(6.69**)	(4, 161)
Sex	.69	(.52)	.36	(.38)					
Age	-.47*	(-.55*)	.22	(.23)					
T1 Language	.01	(.01)	.01	(.01)					
T2 Language	.04	(.04)	.02	(.03)					
SES	.95**		.20	(.12)					
Step 2: Predictor									
T1 Basic EU	.59**	(.76**)	.12		.10	(.18)	25.36**	(41.79**)	1, 159 (1, 160)

Predictors	*B*		*SEB*		ΔR^2		$F\Delta$		*df*s
Step 1: Covariates					0.31	(.13)	17.92**	(8.28**)	4, 162 (3, 163)
Sex	.67	(.48)	.35	(.38)					
Age	-.50*	(-.59)	.22	(.23)					
T2 Language	.06**	(.07**)	.02	(.02)					
SES	1.04**		.20						
Step 2: Predictor									
T2 Stereotypical Puppets EU	.22**	(.29**)	.05	(.05)	.09	(.16)	24.39**	(36.66**)	1, 161 (1, 162)
Step 1: Covariates					.31	(.13)	17.92**	(8.28**)	4, 162 (3, 163)
Sex	.51	(.29)	.35	(.37)					
Age	-.36	(-.41)	.21	(.23)					
T2 Language	.04*	(.04*)	.02	(.02)					
SES	1.00**		.19						
Step 2: Predictor									
T2 Basic EU	.59**	(.75**)	.11	(.11)	.11	(.19)	30.64**	(45.26**)	1, 161 (1, 162)

Step 1 of each regression analysis included covariates: age, sex, SES. Previous performance on a DV was also included as a covariate when available.

Each analysis was also run without SES as a covariate; these findings are reported in parentheses.

All beta values above refer to the values from Step 2.

* $p < .05$; ** $p < .01$

Table 11

Regression Analysis for Effortful Control with Theory of Mind

Predictors	*B*		*SEB*		ΔR^2		*F*Δ		*df*s
				Predicting T3 False Belief ToM					
Step 1: Covariates									3, 153
					.06	(.03)	3.19*	(2.09)	(2, 154)
Sex	.15*	(.14)	.08	(.08)					
Age	-.02	(-.02)	.05	(.05)					
SES	.08		.04						
Step 2: Predictor									
T1 ECBQ EC	.08	(.11)	.07	(.07)	.01	(.02)	1.59	(3.03)	1, 152 (1, 153)
Step 1: Covariates									3, 154
					.05	(.02)	2.61	(1.85)	(2, 155)
Sex	.15*	(.14)	.08	(.08)					
Age	.02	(.01)	.05	(.05)					
SES	.08		.04						
Step 2: Predictor									
T1 Observed EC	-.01	(.02)	.06	(.06)	.01	(.01)	.01	(.15)	1, 153 (1, 154)
Step 1: Covariates									3, 153
					.05	(.02)	2.50	(1.75)	(2, 154)
Sex	.12	(.11)	.08	(.08)					
Age	.01	(.01)	.05	(.05)					
SES	.05		.04						
Step 2: Predictor									
T2 CBQ EC	.19**	(.22**)	.07	(.07)	.04	(.06)	7.06**	(9.71**)	1, 152 (1, 153)

Predictors	*B*		*SEB*		ΔR^2		$F\Delta$		*df*s
Step 1: Covariates									3, 153
					.05	(.02)	2.50	(1.75)	(2, 154)
Sex									
	.12	(.11)	.08	(.08)					
Age									
	.03	(.03)	.05	(.05)					
SES									
	.05		.04						
Step 2: Predictor									
T2 Observed EC	.13	(.15**)	.06	(.05)	.04	(.05)	5.95*	(8.79**)	1, 152 (1, 153)
Step 1: Covariates									3, 153 (2, 154)
					.05	(.02)	2.48	(1.74)	
Sex									
	.13	(.11)	.08	(.08)					
Age									
	.02	(.02)	.05	(.05)					
SES									
	.06		.04						
Step 2: Predictor									
T3 CBQ EC	.14	(.16*)	.07	(.07)	.02	(.04)	3.69	(5.78*)	1, 152 (1, 153)
Step 1: Covariates									3, 154
					.05	(.02)	2.61	(1.85)	(2, 155)
Sex									
	.14	(.13)	.08	(.08)					
Age									
	.01	(.01)	.05	(.05)					
SES									
	.08		.04						
Step 2: Predictor									
T3 Observed EC	.05	(.06)	.06	(.06)	.01	(.01)	.66	(1.20)	1, 153 (1, 154)

Step 1 of each regression analysis included covariates: age, sex, and SES. Each analysis was also run without SES as a covariate; these findings are reported in parentheses.

All beta values above refer to the values from Step 2.

* $p < .05$; ** $p < .01$

Table 12

Regression Analysis for Emotion Understanding with Effortful Control Within Time

Predictors	*B*		*SEB*		ΔR^2		*FΔ*		*df*s
				Predicting T1 Stereotypical Puppets EU					
Step 1: Covariates					.07	(.05)	4.41**	(4.26*)	3, 179 (2, 180)
Sex	1.80**	(1.62*)	.62	(.62)					
Age	.93	(.71)	.51	(.50)					
SES	.75*		.36						
Step 2: Predictor									
T1 ECBQ EC	-.06	(.17)	.53	(.52)	.01	(.01)	.01	(.11)	1, 178 (1, 179)
Step 1: Covariates					.07	(.05)	4.55**	(4.35*)	3, 180 (2, 181)
Sex	1.76**	(1.63**)	.61	(.61)					
Age	.97	(.80)	.50	(.50)					
SES	.69*		.35						
Step 2: Predictor									
T1 Observed EC	.43	(.60)	.46	.(46)	.01	(.01)	0.87	(1.68)	1, 179 (1, 180)
				Predicting T1 Basic EU					
Step 1: Covariates					.12	(.01)	8.30**	(.60)	3, 179 (2, 180)
Sex	.34	(.20)	.24	(.25)					
Age	.12	(-.06)	.19	(.20)					
SES	.62**		.135						
Step 2: Predictor									
T1 ECBQ EC	.19	(.38)	.20	(.21)	.01	(.02)	.88	(3.39)	1, 178 (1, 179)

Predictors	*B*		*SEB*		Δ*R*2		*FΔ*		*df*s
Step 1: Covariates									3, 180
					.13	(.01)	8.82**	(.69)	(2, 181)
Sex									
	.36	(.25)	.23	(.24)					
Age									
	.161	(.01)	.19	(.20)					
SES									
	.61**		.13						
Step 2: Predictor									
T1 Observed EC									1, 179
	.28	(.42*)	.18	(.18)	.01	(.03)	2.50	(5.37*)	(1, 180)
Predicting T2 Stereotypical Puppets EU									
Step 1: Covariates									3, 174
					.09	(.02)	6.01**	(1.33)	(2, 175)
Sex									
	1.08	(.83)	.60	(.61)					
Age									
	.40	(.25)	.47	(.49)					
SES									
	1.23**		.34						
Step 2: Predictor									
T2 CBQ EC	.24	(.80)	.58	(.58)	.01	(.01)	.17	(1.89)	1, 173 (1, 174)
Step 1: Covariates									3, 174
					.09	(.02)	6.00**	(1.33)	(2, 175)
Sex									
	.73	(.56)	.57	(.57)					
Age									
	.55	(.48)	.45	(.46)					
SES									
	.81*		.33						
Step 2: Predictor									
T2 Observed EC	1.62**	(1.95**)	.39	(.38)	.08	(.13)	16.99**	(26.84**)	1, 173 (1, 174)

Predictors	*B*		*SEB*		Δ*R*2		*FΔ*		*df*s
				Predicting T2 Basic EU					
Step 1: Covariates					.13	(.04)	8.61**	(3.39*)	3, 174 (2, 175)
Sex	.75**	(.63*)	.26	(.27)					
Age	.02	(-.05)	.20	(.21)					
SES	.60**		.15						
Step 2: Predictor									
T2 CBQ EC	-.01	(.27)	.25	(.25)	.01	(.01)	.01	(1.11)	1, 173 (1, 174)
Step 1: Covariates					.13	(.04)	8.61**	(3.39*)	3, 174 (2, 175)
Sex	.59*	(.51)	.25	(.25)					
Age	.08	(.05)	.20	(.20)					
SES	.41**		.14						
Step 2: Predictor									
T2 Observed EC	.66**	(.82**)	.17	(.16)	.07	(.12)	14.98**	(25.45**)	1, 173 (1, 174)
				Predicting T3 Stereotypical Puppets EU					
Step 1: Covariates					.08	(.02)	4.97**	(1.61)	3, 163 (2, 164)
Sex	.39	(.31)	.29	(.29)					
Age	.24	(.22)	.18	(.18)					
SES	.43**		.16						
Step 2: Predictor									
T3 CBQ EC	.56*	(.76**)	.27	(.26)	.02	(.05)	4.39*	(8.55**)	1, 162 (1, 163)

Predictors	*B*		*SEB*		Δ*R*2		*FΔ*		*df*s
Step 1: Covariates									3, 164
					.08	.02	4.74**	(1.52)	(2, 165)
Sex	.32	(.25)	.28	(.28)					
Age	.17	(.13)	.17	(.18)					
SES	.43**		.15						
Step 2: Predictor									
T3 Observed EC	.70**	(.80**)	.20	(.21)	.06	(.08)	11.88**	(14.91**)	1, 163 (1, 164)

Step 1 of each regression analysis included covariates: age, sex, SES. Each analysis was also run without SES as a covariate; these findings are reported in parentheses.

All beta values above refer to the values from Step 2.

* $p < .05$; ** $p < .01$

Table 13

Regression Analysis for Emotion Understanding Predicting Effortful Control Across Time

Predictors	*B*		*SEB*		ΔR^2		*F*Δ		*df*s
				Predicting T2 CBQ EC					
Step 1: Covariates									4, 172
					.41	(.39)	29.74**	(36.47**)	(3, 173)
Sex	.10	(.08)	.06	(.07)					
Age	-.07	(-.09)	.05	(.05)					
T1 ECBQ EC	.52**	(.54**)	.05	(.05)					
SES	.09*		.04						
Step 2: Predictor									
T1 Stereotypical Puppets EU	.01	(.01)	.01	(.01)	.01	(.01)	.06	(.37)	1, 171 (1, 172)
Step 1: Covariates									4, 172
					.41	(.39)	29.74**	(36.47**)	(3, 173)
Sex	.09	(.07)	.06	(.06)					
Age	-.08	(-.09)	.05	(.05)					
T1 ECBQ EC	.50**	(.52**)	.05	(.05)					
SES	.06		.04						
Step 2: Predictor									
T1 Basic EU	.04*	(.06**)	.02	(.02)	.02	(.03)	4.72*	(8.31**)	1, 171 (1, 172)

Predictors	*B*		*SEB*		ΔR^2		*F*Δ		*df*s
	Predicting T2 Observed EC								
Step 1: Covariates									4, 173
					.24	(.17)	13.52**	(11.66**)	(3, 174)
Sex	.17	(.13)	.10	(.11)					
Age	-.11	(-.14)	.08	(.09)					
T1 Observed EC	.35**	(.41**)	.08	(.08)					
SES	.22**		.06						
Step 2: Predictor									
T1 Stereotypical Puppets EU	.03*	(.03*)	.01	(.01)	.02	(.03)	4.24*	(6.36*)	1, 172 (1, 173)
Step 1: Covariates									4, 173
					.24	(.17)	13.52**	(11.66**)	(3, 174)
Sex	.18	(.14)	.10	(.10)					
Age	-.11	(-.14)	.08	(.08)					
T1 Observed EC	.34**	(.37**)	.08	(.08)					
SES	.17**		.06						
Step 2: Predictor									
T1 Basic EU	.10**	(.13**)	.03	(.03)	.04	(.07)	8.35**	(16.30**)	1, 172 (1, 173)

Predictors	*B*		*SEB*		ΔR^2		*F*Δ		*df*s
			Predicting T3 CBQ EC						
Step 1: Covariates					.54	(.53)	37.14**	(45.75**)	5, 159 (4, 160)
Sex	.02	(.01)	.06	(.06)					
Age	-.06	(-.06)	.04	(.04)					
T1 ECBQ EC	.18**	(.19**)	.06	(.06)					
T2 CBQ EC	.59**	(.61**)	.07	(.07)					
SES	.04		.03						
Step 2: Predictor									
T1 Stereotypical Puppets EU	.02*	(.02*)	.01	(.01)	.01	(.02)	.64*	(5.31*)	1, 158 (1, 159)
Step 1: Covariates					.54	(.53)	37.14**	(45.75**)	5, 159 (4, 160)
Sex	.04	(.03)	.06	(.06)					
Age	-.06	(-.06)	.04	(.04)					
T1 ECBQ EC	.19**	(.19**)	.06	(.06)					
T2 CBQ EC	.58**	(.58**)	.07	(.07)					
SES	.03		.04						
Step 2: Predictor									
T1 Basic EU	.03	(.03)	.02	(.02)	.01	(.01)	1.89	(2.89)	1, 158 (1, 159)

Predictors	*B*		*SEB*		ΔR^2		$F\Delta$		*df*s
Step 1: Covariates					.54	(.53)	37.14**	(45.75**)	5, 159 (4, 160)
Sex	.01	(.01)	.06	(.06)					
Age	-.07	(-.07)	.04	(.04)					
T1 ECBQ EC	.19**	(.19**)	.06	(.06)					
T2 CBQ EC	.58**	(.59**)	.07	(.07)					
SES	.01		.03						
Step 2: Predictor									
T2 Stereotypical Puppets EU	.04**	(.04**)	.01	(.01)	.06	(.07)	24.58**	(26.78**)	1, 158 (1, 159)
Step 1: Covariates					.54	(.53)	37.14**	(45.75**)	5, 159 (4, 160)
Sex	.01	(-.01)	.06	(.06)					
Age	-.05	(-.05)	.04	(.04)					
T1 ECBQ EC	.19**	(.19**)	.06	(.06)					
T2 CBQ EC	.59**	(.59**)	.07	(.07)					
SES	.01*		.03						
Step 2: Predictor									
T2 Basic EU	.06**	.(06**)	.02	.(02)	.03	(.04)	11.79**	(13.63**)	1, 158 (1, 159)

Predictors	*B*		*SEB*		ΔR^2		*F*Δ		*df*s
				Predicting T3 Observed EC					
Step 1: Covariates					.19	(.19)	7.50**	(9.43**)	5, 161 (4, 162)
Sex	.11	(.11)	.10	(.10)					
Age	.12	(.12)	.06	(.06)					
T1 Observed EC	.11	(.11)	.08	(.08)					
T2 Observed EC	.32**	(.32**)	.08	(.07)					
SES	.01		.06						
Step 2: Predictor									
T1 Stereotypical Puppets EU	.01	(.01)	.01	(.01)	.01	(.01)	.12	(.12)	1, 160 (1, 161)
Step 1: Covariates					.19	(.19)	7.50**	(9.43**)	5, 161 (4, 162)
Sex	.12	(.11)	.10	(.10)					
Age	.12	(.12)	.06	(.06)					
T1 Observed EC	.12	(.12)	.08	(.08)					
T2 Observed EC	.33**	(.34**)	.08	(.08)					
SES	.02		.06						
Step 2: Predictor									
T1 Basic EU	-.02	(-.02)	.03	(.03)	.01	(.01)	.32	(.27)	1, 160 (1, 161)

Predictors	*B*		*SEB*		ΔR^2		$F\Delta$		*df*s
Step 1: Covariates					.19	(.19)	7.50**	(9.43**)	5, 161 (4, 162)
Sex	.10	(.10)	.10	(.10)					
Age	.11	(.11)	.06	(.06)					
T1 Observed EC	.13	(.12)	.08	(.08)					
T2 Observed EC	.30**	(.30**)	.08	(.08)					
SES	-.01		.06						
Step 2: Predictor									
T2 Stereotypical Puppets EU	.02	(.01)	.01	(.01)	.01	(.01)	1.18	(1.20)	1, 160 (1, 161)
Step 1: Covariates					.19	(.19)	7.50**	(9.43**)	5, 161 (4, 162)
Sex	.08	(.08)	.10	(.10)					
Age	.12*	(.12*)	.06	(.06)					
T1 Observed EC	.13	(.13)	.08	(.08)					
T2 Observed EC	.27**	(.27**)	.08	(.08)					
SES	-.02		.06						
Step 2: Predictor									
T2 Basic EU	.06*	(.06*)	.03	(.03)	.02	(.02)	4.30*	(4.24*)	1, 160 (1, 161)

Step 1 of each regression analysis included covariates: age, sex, SES. Previous performance on a DV was also included as a covariate when available.

Each analysis was also run without SES as a covariate; these findings are reported in parentheses.

All beta values above refer to the values from Step 2.

* $p < .05$; ** $p < .01$

Table 14

Regression Analysis for Effortful Control Predicting Emotion Understanding Across Time

Predictors	*B*		*SEB*		ΔR^2		*F*Δ		*df*s
	Predicting T2 Stereotypical Puppets EU								
Step 1: Covariates					.12	(.06)	5.93**	(3.83*)	4, 172 (3, 173)
Sex	.78	(.52)	.60	(.61)					
Age	.25	(.07)	.48	(.49)					
T1 Stereotypical Puppets EU	.18*	(.21**)	.07	(.07)					
SES	1.10**		.34						
Step 2: Predictor									
T1 CBQ EC	.16	(.49)	.50	(.51)	.01	(.01)	.09	(.92)	1, 171 (1, 172)
Step 1: Covariates					.13	(.06)	6.23**	(3.96**)	4, 173 (3, 174)
Sex	.83	(.61)	.59	(.61)					
Age	.22	(.05)	.47	(.48)					
T1 Stereotypical Puppets EU	.18*	(.22**)	.07	(.07)					
SES	1.16**		.33						
Step 2: Predictor									
T1 Observed EC	-.17	(.11)	.44	(.45)	.01	(.01)	.15	(.06)	1, 172 (1, 173)

Predictors	*B*		*SEB*		ΔR^2		$F\Delta$		*df*s
Predicting T2 Basic EU									
Step 1: Covariates									4, 172
					.17	(.13)	8.72*	(8.85**)	(3, 173)
Sex	.64*	(.55*)	.25	(.25)					
Age	-.02	(-.08)	.20	(.20)					
T1 Basic EU	.27*	(.34**)	.08	(.08)					
SES	.41**		.15						
Step 2: Predictor									
									1, 171
T1 ECBQ EC	-.11	(-.02)	.21	(.22)	.01	(.01)	.28	(.01)	(1, 172)
Step 1: Covariates									4, 173
					.18	(.14)	9.57**	(9.59**)	(3, 174)
Sex	.66*	(.57)	.25	(.25)					
Age	-.06	(-.13)	.20	(.20)					
T1 Basic EU	.27**	(.35**)	.08	(.08)					
SES	.43**		.15						
Step 2: Predictor									
									1, 172
T1 Observed EC	-.09	(-.01)	.19	(.19)	.01	(.01)	.21	(.01)	(1, 173)

Predictors	*B*		*SEB*		ΔR^2		$F\Delta$		*df*s
Predicting T3 Stereotypical Puppets EU									
Step 1: Covariates					.23	(.21)	9.53**	(10.66**)	5, 160 (4, 161)
Sex	.22	(.15)	.27	(.27)					
Age	.11	(.09)	.17	(.17)					
T1 Stereotypical Puppets EU	.04	(.04)	.03	(.03)					
T2 Stereotypical Puppets EU	.18*	(.19**)	.04	(.03)					
SES	.29		.15						
Step 2: Predictor									
T1 ECBQ EC	.18	(.26)	.23	(.23)	.01	(.01)	.57	(1.29)	1, 159 (1, 160)
Step 1: Covariates					.23	(.21)	9.35**	(10.58**)	5, 161 (4, 162)
Sex	.20	(.15)	.27	(.27)					
Age	.19	(.17)	.17	(.17)					
T1 Stereotypical Puppets EU	.03	(.04)	.03	(.03)					
T2 Stereotypical Puppets EU	.18*	(.19**)	.04	(.03)					
SES	.25		.15						
Step 2: Predictor									
T1 Observed EC	.26	(.33)	.20	(.20)	.01	(.01)	1.75	(2.73)	1, 160 (1, 161)

Predictors	*B*		*SEB*		ΔR^2		*FΔ*		*df*s
Step 1: Covariates									5, 161
					.23	(.21)	9.35**	(10.58**)	(4, 162)
Sex	.19	(.13)	.27	(.27)					
Age	.16	(.14)	.17	(.17)					
T1 Stereotypical Puppets EU	.04	(.04)	.03	(.03)					
T2 Stereotypical Puppets EU	.18*	(.19**)	.04	(.03)					
SES	.26		.16						
Step 2: Predictor									
T2 CBQ EC	.18	(.29)	.26	(.26)	.01	(.01)	.46	(1.30)	1, 160 (1, 161)
Step 1: Covariates									5, 161
					.23	(.21)	9.35**	(10.58**)	(4, 162)
Sex	.17	(.11)	.27	(.27)					
Age	.20	(.20)	.17	(.17)					
T1 Stereotypical Puppets EU	.03	(.03)	.03	(.03)					
T2 Stereotypical Puppets EU	.16**	(.17**)	.04	(.04)					
SES	.23		.16						
Step 2: Predictor									
T2 Observed EC	.29	(.37)	.20	(.19)	.01	(.02)	2.09	(3.71)	1, 160 (1, 161)

Step 1 of each regression analysis included covariates: age, sex, SES. Previous performance on a DV was also included as a covariate when available.

Each analysis was also run without SES as a covariate; these findings are reported in parentheses.

All beta values above refer to the values from Step 2.

* $p < .05$; ** $p < .01$

Table 15

Regression Analysis for Language, Emotion Understanding, and Effortful Control with Theory of Mind

Predictors	*B*		*SEB*		ΔR^2		$F\Delta$		*df*s
Predicting T3 False Belief ToM									
Step 1: Covariates					.06	(.03)	3.05*	(1.98)	3, 152 (2, 153)
Sex	.12	(.10)	.08	(.08)					
Age	-.02	(-.03)	.05	(.05)					
SES	.07		.05						
Step 2: Combined T1 Predictors					.03	(.04)	1.13	(1.40)	5, 147 (5, 148)
T1 MCDI-II Language	.01	(.01)	.01	(.01)					
T1 Basic EU	.01	(.02)	.03	(.03)					
T1 Stereotypical Puppets EU	.01	(.01)	.01	(.01)					
T1 ECBQ EC	.08	(.10)	.07	(.07)					
T1 Observed EC	-.03	(-.01)	.06	(.06)					
Step 1: Covariates					.05	(.02)	2.50	(1.75)	3, 153 (2, 154)
Sex	.11	(.10)	.08	(.08)					
Age	.02	(.02)	.05	(.05)					
SES	.03		.04						
Step 2: Combined T2 Predictors					.07	(.10)	2.47*	(3.20**)	5, 148 (5, 149)
T2 MCDI-IV Language	.01	(.01)	.01	(.01)					
T2 Basic EU	-.03	(-.03)	.03	(.03)					
T2 Stereotypical Puppets EU	.01	(.01)	.01	(.01)					
T2 CBQ EC	.15*	(.16*)	.07	(.07)					
T2 Observed EC	.10	(.11)	.06	(.06)					

Predictors	*B*		*SEB*		ΔR^2		$F\Delta$		*df*s
Step 1: Covariates					.05	(.02)	2.48	(1.74)	3, 153 (2, 154)
Sex	.12	(.11)	.08	(.08)					
Age	.02	(.02)	.05	(.05)					
SES	.06		.05						
Step 2: Combined T3 Predictors					.02	(.04)	.92	(1.50)	4, 149 (4, 150)
T3 Stereotypical Puppets EU	.01	(.01)	.02	(.02)					
T3 WPPSI Composite Language	-.01	(-.01)	.02	(.02)					
T3 CBQ EC	.13*	(.15)	.08	(.08)					
T3 Observed EC	.01	(.01)	.06	(.06)					

Step 1 of each regression analysis included covariates: age, sex, and SES. Each analysis was also run without SES as a covariate; these findings are reported in parentheses.

All beta values above refer to the values from Step 2.

* $p < .05$; ** $p < .01$

Table 16

Regression Analysis for Effortful Control and Language with Emotion Understanding Within Time

Predictors	*B*		*SEB*		ΔR^2		*F*Δ		*df*s
Predicting T1 Stereotypical Puppets EU									
Step 1: Covariates									3, 178
					.07	(.05)	4.33**	(4.26*)	(2, 179)
Sex	1.52*	(1.35*)	.63	(.63)					
Age	1.03*	(.87)	.51	(.50)					
SES	.61		.36						
Step 2: Combined T1 Predictors									3, 175
					.02	(.03)	1.31	(1.79)	(3, 176)
T1 ECBQ EC	-.28	(-.13)	.54	(.54)					
T1 Observed EC	.46	(.56)	.48	(.48)					
T1 MCDI-II Language	.02	(.03)	.01	(.01)					
Predicting T1 Basic EU									
Step 1: Covariates									3, 178
					.12	(.01)	8.04**	(.50)	(2, 179)
Sex	.15	(.01)	.23	(.24)					
Age	.16	(.03)	.19	(.19)					
SES	.52**		.13						
Step 2: Combined T1 Predictors									3, 175
					.07	(.11)	5.08**	(7.52**)	(3, 176)
T1 ECBQ EC	.06	(.19)	.20	(.21)					
T1 Observed EC	.24	(.32)	.18	(.18)					
T1 MCDI-II Language	.02**	(.02**)	.01	(.01)					

Predictors	*B*		*SEB*		ΔR^2		$F\Delta$		*df*s
Predicting T2 Stereotypical Puppets EU									
Step 1: Covariates									3, 174
					.09	(.02)	6.00**	(1.33)	(2, 175)
Sex	.74	(.53)	.58	(.58)					
Age	.52	(.45)	.46	(.46)					
SES	.82*		.34						
Step 2: Combined T2 Predictors									3, 171
					.08	(.13)	5.81**	(9.06**)	(3, 172)
T2 CBQ EC	-.26	(-.01)	.57	(.57)					
T2 Observed EC	1.62**	(1.89**)	.41	(.40)					
T2 MCDI-IV Language	.02	(.02)	.03	(.03)					
Predicting T2 Basic EU									
Step 1: Covariates									3, 174
					.13	(.04)	8.61**	(3.39*)	(2, 175)
Sex	.57*	(.46)	.24	(.24)					
Age	.03	(-.01)	.19	(.19)					
SES	.41**		.14						
Step 2: Combined T2 Predictors									3, 171
					.12	(.18)	9.36**	(12.98**)	(3, 172)
T2 CBQ EC	-.26	(-.13)	.24	(.24)					
T2 Observed EC	.60**	(.74**)	.17	(.16)					
T2 MCDI-IV Language	.04**	(.04**)	.01	(.01)					

Predictors	*B*		*SEB*		ΔR^2		$F\Delta$		*df*s
Predicting T3 Stereotypical Puppets EU									
Step 1: Covariates									3, 163
					.08	(.02)	4.97**	(1.61)	(2, 164)
Sex	.16	(.12)	.27	(.27)					
Age	.27	(.27)	.17	(.17)					
SES	.15		.16						
Step 2: Combined T3 Predictors									3, 160
					.16	(.22)	11.01**	(15.27**)	(3, 161)
T3 CBQ EC	.03	(.07)	.27	(.27)					
T3 Observed EC	.57**	(.56**)	.21	(.21)					
T3 WPPSI Composite Language	.23**	(.25**)	.06	(.05)					

Step 1 of each regression analysis included covariates: age, sex, and SES. Each analysis was also run without SES as a covariate; these findings are reported in parentheses.

All beta values above refer to the values from Step 2.

* $p < .05$; ** $p < .01$

Table 17

Regression Analysis for Effortful Control and Language with Emotion Understanding Across time

Predictors	*B*		*SEB*		ΔR^2		*FΔ*		*df*s
Predicting T2 Stereotypical Puppets EU									
Step 1: Covariates					.13	(.07)	6.20**	(4.00**)	4, 171 (3, 172)
Sex	.67	(.36)	.61	(.62)					
Age	.19	(.01)	.48	(.49)					
T1 Stereotypical Puppets EU	.18*	(.20**)	.07	(.07)					
SES	1.09**		.34						
Step 2: Combined T1 Predictors					.01	(.02)	.63	(1.21)	3, 168 (3, 169)
T1 ECBQ EC	.18	(.42)	.52	(.53)					
T1 Observed EC	-.24	(-.05)	.45	(.46)					
T1 MCDI-II Language	.02	(.02)	.01	(.01)					
Predicting T2 Basic EU									
Step 1: Covariates					.17	(.14)	8.89**	(9.00**)	4, 171 (3, 172)
Sex	.48	(.38)	.25	(.25)					
Age	-.08	(-.14)	.20	(.20)					
T1 Basic EU	.20*	(.27)	.08	(.08)					
SES	.39**		.15						
Step 2: Combined T1 Predictors					.06	(.07)	4.48**	(4.60**)	3, 168 (3, 169)
T1 ECBQ EC	-.14	(-.07)	.21	(.21)					
T1 Observed EC	-.09	(-.03)	.19	(.19)					
T1 MCDI-II Language	.02**	(.02)	.01	(.01)					

Predictors	*B*		*SEB*		ΔR^2		*FΔ*		*df*s
Predicting T3 Stereotypical Puppets EU									
Step 1: Covariates					.11	(.06)	4.99**	(3.15*)	4, 161 (3, 162)
Sex	.27	(.17)	.30	(.30)					
Age	.17	(.15)	.19	(.19)					
T1 Stereotypical Puppets EU	.06	(.07*)	.03	(.04)					
SES	.43*		.16						
Step 2: Combined T1 Predictors					.02	(.04)	1.12	(2.09)	3, 158 (3, 159)
T1 ECBQ EC	.09	(.19)	.26	(.26)					
T1 Observed EC	.18	(.26)	.22	(.22)					
T1 MCDI-II Language	.01	(.01)	.01	(.01)					
Step 1: Covariates					.22	(.20)	11.35**	(13.47**)	4, 162 (3, 163)
Sex	.20	(.14)	.27	(.27)					
Age	.21	(.20)	.17	(.17)					
T2 Stereotypical Puppets EU	.17**	(.18**)	.04	(.04)					
SES	.22		.16						
Step 2: Combined T2 Predictors					.01	(.02)	.87	(1.60)	3, 159 (3, 160)
T2 CBQ EC	.11	(.18)	.27	(.26)					
T2 Observed EC	.30	(.37)	.21	(.20)					
T2 MCDI-IV Language	-.01	(-.01)	.01	(.01)					

Covariates for each analysis included age, sex, and SES. Previous performance on a DV was also included as a covariate when available.

Each analysis was also run without SES as a covariate; these findings are reported in parentheses.

All beta values above refer to the values from Step 2.

* $p < .05$; ** $p < .01$