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Oral/written contrast of mental state references in older children

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ORAL/WRITTEN CONTRAST OF MENTAL STATE REFERENCES IN OLDER
CHILDREN

by

Jeanne E. Federico

A thesis submitted in partial fulfillment
of the requirements for the degree of
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Oral/Written Contrast of Mental State References in Older Children

Jeanne E. Federico

ABSTRACT

The purpose of this study was to determine differences in the use of mental state references by typically developing 9- and 11-year-old children. Following a priming task that emphasized distinctions between physical and mental acts, children watched an 11-minute textless video and then were asked to generate an oral and a written story that focused on the mental states of the multiple characters. Narratives were transcribed, and all mental state references were classified into motivational, experiential, and belief categories. Specific mental state references were also analyzed to determine levels of semantic complexity. The study attempted to answer: 1) whether 9- and 11-year-old typically developing children differed in their ability to use more complex mental state references and 2) whether this ability varied as a function of the oral versus the written modality.

The sample consisted of 26 children, ages 9;0-9;11 (15 females, 11 males), and 24 children, ages 11;00-11;11 (14 females, 10 males). The total sample (N=50) consisted of 32 Caucasian children, 15 African-American children, 2 Hispanic children, and 1 Asian-American. All children were selected from one urban elementary school located in West Central Florida, were from monolingual, English-speaking homes, and were speakers of Standard American English.

A statistical analysis was conducted via a 3-way MANOVA, specifically, 2 (age 9 vs. age 11) x 4 (mental state categories) x 2 (oral versus written modality). In addition, a qualitative analysis was completed to compare the frequency, complexity, and lexical depth of different types of mental state verbs produced in the oral and written narratives.

Results revealed an unexpected lack of variability in age in the production of mental state references, possibly due to the close age interval of participants. However, there was substantial variability in production across the three mental state categories for both age groups. Across the two modalities, results provided evidence for increasing lexical diversity, complexity, and depth in the production of mental state references by the older children, especially for belief verbs. Future research directions are presented to investigate relationships between more advanced theory of mind development and the lexical depth of mental state references.

Chapter 1

Literature Review, Purpose, and Research Questions

In the last 15 years, children's development of a theory of mind has become an important research area, including how theory of mind relates to autism spectrum disorder (e.g., Baron-Cohen, 1995; Happe, 1994, 1995; Silliman et al., 2003). Simply put, theory of mind is an understanding of the mind of self and others as an active agent. Arriving at some sort of understanding of the mind is an important accomplishment for children, because it is central to understanding the social world. Children learn that internal mental states, such as beliefs and desires, influence the actions of themselves and others. They learn to differentiate between intended and accidental behavior, between wishes and reality, and between truth and deception. A concept of mind leads to understanding human behavior, which is an important tool for navigating the intricacies of human communication, including the language of schooling.

Theory of mind is often described as the understanding of one's own and others' mental states, such as thinking and knowing (German & Leslie, 2000). It is also described as awareness of one's own and others' emotions, desires, and intentions (Astington, 2001). This mental landscape, which Bruner (1986) calls the "landscape of consciousness," gives meaning to actions and events. To assign meaning to the actions of others, children must consider the mental processes involved. When children become aware of this mentalism, they have acquired a basic theory of mind. Beyond a basic framework of theory of mind, children also develop more specific conceptual structures and more complex levels of meaning for cognitive processes over the course of their

development (Booth & Hall, 1995; Wellman, 1990). In effect, theory of mind is how children think about thinking.

Most studies on children's development of theory of mind have concentrated on the preschool and early elementary age years. In addition, few studies have examined changes in the complexity of children's use of mental state references that denote the understanding of motivation, actions, and beliefs. Finally, most studies concerned with mental state references have focused on children's performance in the oral domain, with minimal attention paid to how the modality of expression (oral versus written) affects the complexity of mental state terms.

This review of the literature is organized to address the relationship between theory of mind development and children's developing use of mental state references. The first section presents a general overview of theory of mind frameworks, specifically two theoretical perspectives that attempt to account for development of a theory of mind. The social and academic relevance of a theory of mind is also addressed. In the next section, the linguistic aspect of theory of mind is discussed, focusing on the relationship of mental state referencing to theory of mind development. Earlier phases of development are contrasted with more advanced phases with an emphasis on cognitive verbs that express ways of knowing. The limited research on mental state development as assessed through writing is also overviewed, including the few studies with children having a language learning disability (LLD). The final section presents the purpose of this study, which investigates similarities and differences in the mental state referencing of 9-and-11-year children in an oral-written contrast paradigm.

Theory of Mind: A General Overview

Theory of mind is necessary in order to have a psychological concept of others (Wellman, Phillips, & Rodriguez, 2000). In other words, theory of mind allows one to see people in terms of their psychological states, in addition to their physical entities. It is the tool by which children attribute mental states to people, such as their thoughts, desires, beliefs, and intentions. Most critically, a well-developed concept of mind leads to the understanding that people are motivated by their desires, intentions, beliefs, and emotions (Wellman, 1990). Additionally, children with advancing concepts of mind develop the insight that their own or another person's beliefs may not be true, and that a person can have a false belief (Astington, Harris, & Olson, 1988). As a result, children's theory of mind underlies their understanding of human behavior.

There are two major contrasting views of theory of mind development in children, the constructivist, or theory-theory, model and the modularity, or mechanism, view. The constructivist, or theory-theory, model suggests that children acquire knowledge about the mind between the ages of 2 and 5 years old by means of actively constructing and refining a "scientific theory" about mental states. The modularity, or mechanism, view purports that children are born with an innate mechanism, or specialized module, that leads to the development of theory of mind. Each of these mentalistic theories is reviewed briefly.

The Theory-Theory View

Gopnik and Wellman (1982) proposed that children's understanding of mental states developed through a process of theory construction and modification. Children develop theories about the mind and use these theories to explain human behavior.

Others, such as Astington (1998a), view this process similarly. From ages 2 to 5 years, children develop concepts of how things and people work. To understand another person's behavior, children must become aware of the fact that people act based on their thoughts, desires, and feelings. Children must become aware of this mental processing before they can interpret the behavior of other people.

In a similar theory-theory vein, Perner (1995) considers theory of mind acquisition as an important intellectual change that begins around 4 years of age, when children usually master an explicit concept of false belief. This explicit understanding, whereby children predict what a character will do based on specific knowledge of the character's false belief, is typically assessed with a task that involves a displaced object scenario. For example, Wimmer and Perner (1983) developed the Maxi task in which the character, Maxi, places a piece of chocolate in the kitchen cupboard and leaves the room to play. While Maxi is out of the room, his mother moves the chocolate from the cupboard to a drawer. The child is then asked where Maxi will look for the chocolate when he returns. The correct response ("in the drawer") depends on the child's ability to understand that Maxi's behavior depends on his beliefs about object location rather than on the real situation (the displaced object). In other words, relative to the formation of an initial or first order concept of mind (Bartsch & Wellman, 1995), the child must be able to predict that, in this kind of situation, another can accept a false belief as true. Perner (1995) refers to this insight as the "understanding of *aboutness*," or the realization that a proposition is *about* a world, whether real or pretend, and must be evaluated against that world in order to determine if it is true or false. For example, when presented with the statement "Maxi believes that the chocolate is in the original cupboard," the proposition

“the chocolate is in the original cupboard” must be evaluated against Maxi’s world in order for the child to determine if Maxi’s belief is true or false. One speculation is that children acquire this primary knowledge about the contents of others’ minds through an ongoing process of conceptual discovery.

The Modularity View

A competing theory is the modularity view. For example, German and Leslie (2000) reject the theory-theory view and, instead, propose a mechanism, or modular, view, which is borrowed from the “big modularity” strand of generative linguistics. A module is designed for the specialized processing of an input, in this case, the cognitive processing of the mind’s contents.

Fodor’s (1981, cited in de Villiers, 2003, p. 428) concept of modularity is that, “processing is fast, mandatory, not accessible to introspection, and most importantly, encapsulated (i.e., impervious to the influence of general knowledge or other cognitive processes)”. In terms of a theory of mind module, the speculation is that children are born with innate concepts that allow them to attend to mental states (German & Leslie, 2000). These specialized attentional mechanisms then allow learning about mental states to take place. The ability to attend to beliefs becomes more flexible over time and thereby increases success with false belief problems. Eventually, children develop competent reasoning skills when assessing mental states. The modularity concept has been seriously criticized, most recently by Thelen and Bates (2003), who make the case that modularity is not a developmental theory about how mind and language emerge continuously over time. Instead, modularity is a biologically deterministic view that fails to explain

adequately cognitive or language development, much less individual differences in developmental trajectories.

Regardless of the theoretical perspective, it appears that, at least for Western cultures, middle-class children typically develop a concept of mind at about the same time. Wellman, Cross, and Watson (2001) conducted a meta-analysis of 178 separate child studies on theory-of-mind development. Their findings indicated that children's understanding of belief, and, therefore, their understanding of the mind, underwent great conceptual change in the preschool years. Wellman et al. (2001) also argued against early competence explanations, claiming, as do German and Leslie (2001), that apparent basic theory of mind development between the ages of 3 and 5 years of age is masked by overly difficult tasks variables. Rather, Wellman et al. found that the development of these insights was consistently evident across different tasks and different Western cultures, suggesting that such a conception of the mind's contents is a natural and universal way for children to understand people's intentions and actions.

From a social interactional perspective, little is known about the contribution of variations in family socialization practices to individual differences in theory of mind development (Lillard, 1998). However, there is some information about the relevance of a well-integrated theory of mind for social and academic success.

Social and Academic Relevance of a Theory of Mind

Social interaction is dependent on theory of mind because children's social lives depend on perspective taking or the shared reciprocity of thoughts, desires, feelings, and plans. For example, Gopnik and Astington (1988) see social relevance in the ability of children to attribute false beliefs to themselves and others because this ability is

necessary to understand what drives the otherwise incomprehensible behavior of another person. These authors believe that children actually learn to understand changes in their own mental states through evaluation of differences between their own mental states and those of others. To illustrate, it may be difficult for children to examine their own contradictions, but it is not so easy to overlook contrary claims imposed by an older sibling.

Moreover, how children “think about thinking and communicating” even affects their critical thinking skills and, therefore, their success in school in a variety of content areas (Astington, 1998b). Critical thinking depends on the ability to consider one’s own beliefs, recognize one’s false beliefs, and take another’s perspective, including authors’ perspectives. When children are exposed to literature during their school-age years, development of perspective taking is a necessary element in order to understand the intentions of characters and historical actions of individuals. The ability to coordinate the multiple perspectives of several characters in a book is speculated as leading to successful reading comprehension (Donahue & Foster, 2004). Development of perspective taking also leads to the evolving social competence that contributes to academic success (Astington, 2003).

In sum, theory of mind and perspective taking are intertwined, as both are central to achieving the shared community of minds that characterizes the understanding of one’s self and others (Nelson, 2004). Because communication is “social interaction that activates mental processes of perspective taking” (MacWhinney, in press, p. 27), perspective taking and shifting are central to communication. Therefore, there is evidence

that an increasingly coordinated theory of mind is essential for children's successful cognitive, social, and language development.

An important question concerns the role of language in theory of mind development. The majority of research on linkages has concentrated on the contributions of syntactic development to perspective taking. Less work has examined the semantic domain, specifically, the development and elaboration of mental state references.

The Language Connection to Theory of Mind Development

Direction of the Relationship

An initial study on theory of mind-language connections was conducted by Bretherton and Beeghly (1982). A total of 30 middle-class mothers and their children were seen at home and in laboratory sessions at 10, 13, 20, and 28 months of age. The mothers were asked to listen to the child's speech and to note the use of 73 internal-state words, divided into categories of perception, physiology, affect, volition/ability, cognition, and moral judgment/obligation. Findings led to the interpretation that young children's mental state development and language development were interrelated, emerging with the onset of communicative intentions.

A second perspective is that language competence leads to theory of mind development. For example, based on their study of children from 8- to 11-years-old, Astington and Jenkins (1999) argued that children's theory of mind development was predicted by their general syntactic competence. Astington (2001) also stressed the importance of language in the development of false-belief understanding. She stated that false belief is central to theory-of-mind development, due to the fact that it is a strong indicator of mentalistic understanding.

A third perspective is that theory of mind development is made public through language, and children's everyday conversations demonstrate their awareness of other people's mental states (Wellman et al., 2000). However, this public display should not be confused with language as the generator of conceptual change in theory of mind development. Wellman et al. (2001) argued that changes in the conceptual knowledge base drive the language of beliefs and false beliefs rather than linguistic elements, such as the ability to produce "tensed complements," serving as a bootstrap for beliefs about the mind. de Villiers and de Villiers (2000) made the opposite case. Because sentences with mental state verbs often require complements, children must possess the ability to engage in false complement processing, such as the processing of "Dad thought *that* he forgot the birthday present (when the child knows he did not forget)" (Silliman et al., 2003, p. 239) before they can provide an adequate mental explanation for two contradictory perspectives.

Regardless of the perspective taken, children's use of mental state references provides a fairly reliable indicator of their level of theory of mind development. Children begin to demonstrate acquisition of a theory of mind around age 2 years, as evidenced by their use of mental state references indicating their own desires (e.g., "want"). They continue to demonstrate theory of mind development throughout the school-age years, as evidenced by an increasingly varied and complex vocabulary of mental state references.

Semantic Development of Mental States Meanings

Early development. Bartsch and Wellman (1995) acknowledge that, when children learn to talk, their conversations provide a window into their understanding of people's minds. Although individual children will differ in their onset of referring to

mental states, Bartsch and Wellman found that children's talk about the mind developed in three phases. The earliest phase begins around the age of 2 years, when very young children talk about desires, mainly wants and likes, in many different contexts, such as their desires for objects and actions. Even 2-year-olds do not limit the expression of desires to items, such as toys and food. Their desire expressions also include action (e.g., the desire to run) and changes in state (e.g., the desire to be asleep).

The second phase, beginning around the age of 3 years, occurs when children begin to talk about thoughts and beliefs, as well as desires. Even when children first begin to talk about these more cognitive concepts, Bartsch and Wellman (1995) found that their mental state expressions were not confined to talking of thoughts alone, whether real or imaginary. They also talked about beliefs (a thought that something is so) and false beliefs (a thought that something is so, when it is not). However, children in this phase continue to talk about desires more frequently than thoughts and beliefs, and, typically, their explanations for a person's actions are based on their interpretation of a person's desires.

In the third phase, beginning around the age of 4 years, thoughts and beliefs begin to play a larger role in children's understanding of relationships between the intentions and actions of others (Bartsch & Wellman, 1995). They refer more often to thoughts and beliefs (e.g., "think," "know"), and they take in account a person's beliefs, both true and false, to explain their actions. In this phase, children appear to understand that people not only have thoughts and beliefs, but also that thoughts and beliefs are important elements in explaining why people do things. For example, children understand that people's

desires are shaped by their beliefs, and that false beliefs, rather than the reality of a situation, can determine a person's actions.

Bretherton and Beeghly (1982) also found that an emerging ability to attribute internal states to one's self and others becomes evident with the onset of communicative intention. Based on their naturalistically obtained data, they discovered that children begin to speak about mental states late in their second year, and that this skill becomes more fully developed in the third year. Although the children in their study tended to speak of their own mental states before those of other people, only a small minority of mental state words were produced that referred exclusively to themselves. In fact, the results indicated that 2-year-old children interpreted their own and other people's mental states, commented on their own or others' expected or past experiences, and discussed how their own or another person's mental state came about or might be changed. Three-year-old children demonstrated the ability to analyze the goals and motives of others, as these related to the child's own goals and motives.

Astington (1999) also found that children begin to express mental states almost as soon as they begin to talk. Children used words to anticipate and describe their own and others' actions. They also produced references like *will* and *gonna* to refer to their own and others' future actions. According to Astington, children's acquisition of these references leads to their developing understanding of intention, which then influences and increases their understanding of intentionality. Moreover, Jenkins and Astington (1996) found a strong positive correlation between false-belief understanding and general syntactic ability in children between 2 years 11 months and 5 years 5 months.

While middle-class preschool age children are capable of talking about mental states and generally use the mental state references that are used most often in the home (Jenkins, Turrell, Kogushi, Lollis, & Ross, 2003; Meins et al., 2002; Ruffman, Slade, & Crowe, 2002), certain categories of mental state verbs appear to be more cognitively and semantically complex for young children (Nixon, 2005). For example, Nixon found that mental state verbs encoding degrees of certainty (e.g., *know*) were easier for 4 year olds to produce than mental state verbs encoding degrees of uncertainty, such as *wish*, *think*, and *consider*. Nixon (2005) concluded that whether or not verbs referring to the certainty-uncertainty continuum were used depended on “their inherent semantic, cognitive, and syntactic complexity (p. 35).”

Later development of a theory of mind. Wellman (1990) found evidence of additional development of theory of mind in the years beyond age 6 years. Children get progressively better at considering other people’s thinking. Their proficiency at identifying other people’s beliefs and desires increases, as well as the ability to predict and explain others’ actions on the basis of their beliefs and desires. They move from a more concrete level to a more inferential level of interpretation of the actions of others. For example, younger children see themselves and others in concrete categories such as their address and physical appearance, while adolescents use more abstract descriptions such as personal beliefs and motivation. In addition, there is a substantial developmental change after age 7 years in the use of trait explanations to justify the actions of themselves and others (e.g., “he’s stubborn,” “she’s shy”). During this time, children also develop a stronger and more insightful self-concept, which includes the concept that one’s “self” is reflected by one’s mind. Wellman (1990) believed that each phase of

theory of mind development built on the achievements of the previous phase, and that more complex development of a theory of mind is probable beyond age 6 years.

Older children also become better at implicitly understanding the concept of someone thinking about thinking, specifically, when others' false beliefs are not explicitly stated. Perner and Wimmer (1985) identified this further development in conception as the acquisition of second-order beliefs, and Flavell (1999) called it metacognition, which includes "knowledge about the nature of people as cognizers" (p. 21).

Later development of mental state references. Despite Wellman's (1990) prediction that theory of mind development becomes more sophisticated after the age of 6 years, there have been few studies investigating advances. Similarly, children's increasingly sophisticated development of mental state references during the school-age years has not been pursued in other than a limited way, an important omission given Nixon's (2005) findings that the production of particular kinds of mental state verbs are influenced by their semantic and cognitive complexity. Two studies involving older children are of interest here.

One study, conducted by Schwanenflugel, Fabricius, and Noyes (1996), examined the continuing development of theory of mind in 8 to 11 year old children through their changes in the organization of cognitive or mental state verbs of knowing, such as *thinking*, *guessing*, and *knowing*. Results indicated that older children constructed a semantic organization of mental verbs according to the certainty aspects of mental processes, and that this semantic organization became more complex and fine-tuned with further development. Older children and adults were remarkably similar in their semantic

organization of these verbs, and, consistent with Nixon's (2005) results with 4 year olds, older children placed greater emphasis on the certainty aspects of mental activity, as evidenced by their increased understanding of the mental state verbs *know*, *think*, and *guess*. For example, "know," "think," and "remember" were ordered as more certain than "guess," "estimate," and "compare." In contrast, preschool-age children demonstrated a more absolute, or "true/false," view of certainty. Schwanenflugel et al. (1996) speculated that the conceptual and semantic knowledge of older children evolved to a "degrees of certainty" perspective due to subjectively experienced feelings of uncertainty. The more that children have experiences with uncertainty, the more that they come to understand this concept as relative.

The second study was conducted by Booth and Hall (1995), who also investigated the understanding of the cognitive verb *know* in 3-, 6-, 9-, and 12-year-olds. Booth and Hall compared younger and older children's understanding of six different levels of meaning of the cognitive verb *know*: 1. Perception (e.g. "I heard your story"); 2. Recognition (e.g., "I know that face"); 3. Recall (e.g., "I know his phone number"); 4. Understanding (e.g., "I know why he did that"); 5. Metacognition (e.g., "Pretending can be fun"); and 6. Evaluation (e.g., "He guessed the answer, but I know it"). Children were presented video-taped skits involving interactions between two hand-held puppets in one scenario and audio-taped stories in another scenario. The skits and stories required answers for the six levels of meaning for the cognitive *know*.

Results showed that the depth of children's knowledge about the multiple meanings of *know* increased with age due to conceptual reorganization. For example, hierarchical knowledge of the cognitive verb *know* became more differentiated with

development, with 3-year-olds having the most restricted levels of meanings and 12-year-olds having the most flexible levels of meaning. Younger children encountered difficulty differentiating between mental acts, such as *knowing*, and physical acts, such as *doing*. In contrast, older children realized that to *know* something, one had to mentally manipulate information. Consistent with these patterns, 3-year-olds exhibited understanding of the least number of levels of meaning, 6- and 9-year-olds demonstrated understanding of a moderate number of levels of meaning, and 12-year-olds had the most distinctions among the six levels of meaning. This pattern resulted in a more differentiated and hierarchical mental state verb lexicon in older children.

Developmental Continuum: Oral-Literate Contrasts

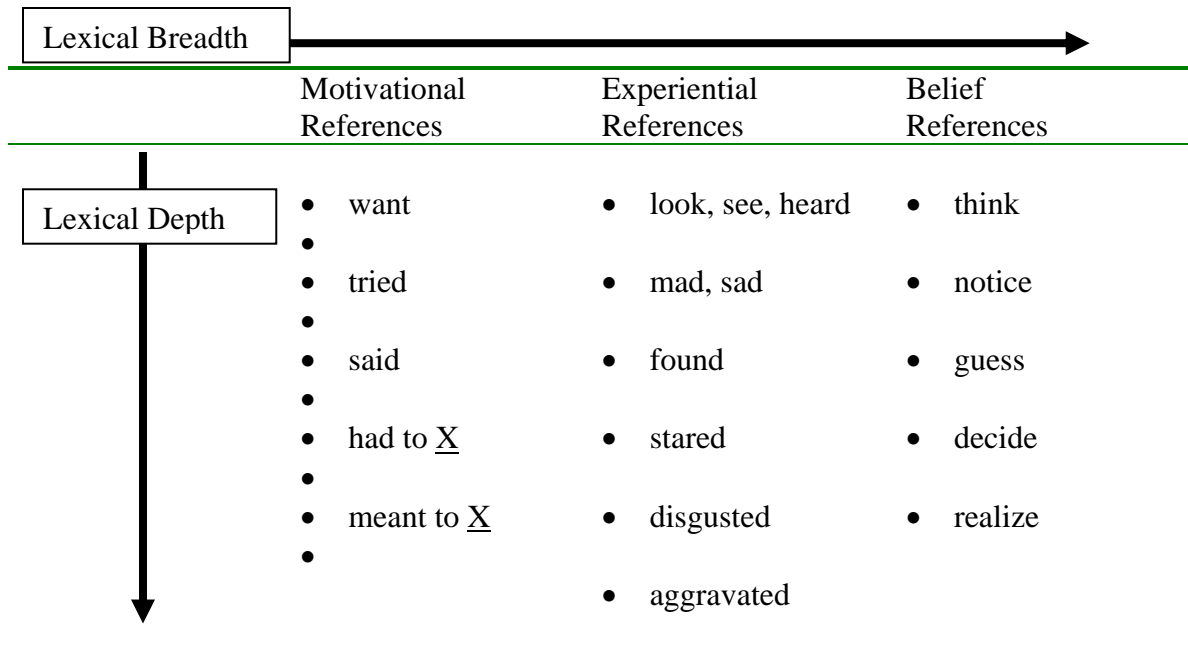
Children develop language skills over an oral-literate continuum. They continually add new vocabulary words and apply new language concepts (e.g., semantic, syntactic, and pragmatic concepts) to their oral language knowledge, and they initially write like they talk. However, during the early school years, features of oral and written language converge – “write like talk” combines with “talk like books” (Rubin, 1987). Beginning around age 9 years, writing becomes increasingly differentiated from speaking, with more complex forms of language expressed in writing than in speech (Scott, 1999).

Similarly, children’s mental state references appear to emerge over a general developmental continuum. Based on the literature, motivational references (e.g., “want”) appear first, experiential references (e.g., “see”) appear next, and belief references that index degrees of uncertainty (e.g., “think) appear last. In addition, these mental state references demonstrate greater lexical depth over time in the evolution of related and

unrelated meanings (Nixon, 2005). For example, a child may say, “I *see* a dog” at age 3 years and “I *see* what you mean” at age 10 years.

McGregor (2004) refers to this process of increasing lexical depth as “slow mapping.” Children develop initial “maps” of word meanings. This process is known as “fast mapping,” or incidental learning, based on children’s implicit exposure to a multitude of word meanings. With multiple experiences with these meanings over time, including the critical influences of reading and writing, children continue to refine those meanings. One slow mapping process that McGregor (2004) describes is semantic elaboration, which allows words to assume multiple meanings (e.g., dogs bark, but bark also grows on trees). A second slow mapping process is the development of a categorically organized semantic network, which affords greater ease in lexical access because meanings are related in a superordinate-subordinate structure. Figure 1 displays this continuum of development for mental state categories in their scope or breadth and depth.

Figure 1. Proposed developmental continuum with examples for three categories of mental state references in terms of their lexical breadth and depth



Despite the growing interest in the semantic development of school-age children, only three studies have explicitly used the oral-written contrast design. Two investigations, Scott and Windsor (2000) and Fey, Catts, Proctor-Williams, Tomblin, and Zhang (2004), employed methodology in which children’s oral narratives were contrasted with their written narratives. Scott and Windsor (2000) assessed the general language performance of school-age children with and without language learning disabilities through spoken and written narratives. The primary focus was morphosyntactic integrity of inflectional morphemes. Fey et al. (2004) also compared the oral and written narratives of typically developing children and children with language impairment for lexical and grammatical complexity, in addition to story content, organization, and overall quality. As previously noted, mental state references in either oral or written narratives were not examined in either study.

Only a Swedish study of children, adolescents, and young adults, ages 9, 12, 15, and 20 years (Nordqvist, 2001) explicitly examined patterns of mental state verb production in oral and written narratives. A wordless picture book frequently used in cross-linguistic research on narratives served as the elicitation method for both the oral and written modes. Nordqvist established two categories of cognitive verbs. The first was cognitive verbs having a syntactic framing, or complementizer, function, e.g., “The boy thought *that* the frog was lonely.” The second category included four types of verbs that did not have the complement, or syntactic framing, function: a) those that expressed motivation (such as “intends”); b) those that conveyed reflection, as in “She is *thinking* about the frog” or “They *wondered* about the frog”; c) those that communicated experiences, like “The boy *thinks* he hears something”; and d) those that expressed having an opinion or belief, such as “He *thinks* the frog is lost.” All four age groups produced a greater number of non-framing verbs. In addition, a general trend for the three oldest age groups was that all cognitive verbs were “expressed to a greater extent in writing than in speaking” (Nordqvist, 2001, p. 263).

In general, a small number of cognitive verbs were generated across age groups ($N=132$; $n = 53$ spoken, $n = 79$ written). Three variables may have influenced the frequency of cognitive verb production, whether framed or unframed. The first is the relatively small sample size of each group ($N = 15$). Second, a wordless picture book designed for younger children may not be as appealing to older children, adolescents, and young adults. Finally, the instructions to the participants did not emphasize cognitive states. Participants were informed only to look first through the picture book and “Then tell what is happening in the pictures” (Nordqvist, 2001, p. 120).

Summary

As noted earlier, the majority of previous studies on theory of mind development have focused on children from ages 2 to 5 years. The first studies of theory of mind investigated development in young children. Leslie (1987) found that children typically engage in pretend play by two years of age, adopting the perspectives of other people or characters. Around 2 ½ years of age, most children use the mental state terms of “want” and “know” in everyday speech (Bartsch & Wellman, 1995). By age 3 years, children have developed some concept of desires and intentions (Wellman, 1990). Between the ages of 2 ½ and 4 years, children begin to reason about other people’s beliefs, can predict or explain actions based on false beliefs, and can actively deceive other people (Bartsch & Wellman, 1995).

Most recent studies have consisted mainly of two types of tasks: false belief tasks and tasks eliciting the use of mental state verbs. These studies have focused on young children’s awareness that someone can have a false belief (Astington & Jenkins, 1999) and their understanding of mental states as evidenced by their use of mental state verbs, such as “think” and “know” (Bartsch & Wellman, 1995). Mental state verbs are evidence of children’s awareness of multiple perspectives, indicating other people’s states of mind and emotions (Dunn, 1999), other people’s intentions and desires (Wellman et al., 2000), and other people’s knowledge, perceptions, and beliefs (Schwanenflugel et al., 1996).

Minimal research has examined the knowledge and organization of specific mental state verbs in preadolescents, such as *think*, *know*, and *guess* (Booth & Hall, 1995; Nordqvist, 2001; Schwanenflugel et al., 1996). Evidence of more complex use of these

belief references over time would suggest the continued development of a theory of mind throughout the school years.

Problem, Purpose, and Research Question

Many researchers have different theories on theory of mind. It has been speculated that theory of mind plays a role in social interaction skills and academic success. However, the majority of research to date has focused on the development of theory of mind in younger children. The empirical focus has been the initial acquisition of theory of mind, neglecting the further development of theory of mind in the later elementary years.

The purpose of this study was to assess the continuing development of theory of mind in 9- and 11-year old children as suggested by the use of more complex mental state terms. Oral and written narratives were contrasted to assess the use and complexity of mental state references in both modes. Oral narratives are stories expressed verbally, and written narratives are stories expressed in writing.

Many researchers have been interested in what children's use of mental states terms reveals about children's developing theory of mind. However, these production studies have focused solely on the oral domain (Bretherton & Beeghly, 1982; Hyter & Westby, 1996; Wellman et al., 2000). Little data exist on the continuing acquisition and complexity of the mental state lexicon of older children or the influence of narrative modalities (i.e., oral vs. written) on the complexity of mental state references. Previous research has examined the organization and knowledge of mental state verbs in older children (Booth & Hall, 1995; Schwanenflugel et al., 1996), but has not compared the complexity of the mental state verb lexicon across oral and written narratives. Only the

Swedish study by Nordqvist (2001) examined mental state references in older children using an oral-written contrast design. Since there is evidence that children develop language skills over an oral-literate continuum, a difference would be expected between the complexities of mental state verbs in oral versus written narratives.

The overall question was: Is acquiring theory of mind a developmental process that continues during the school age years as evidenced by the use of more complex mental state verbs? Two questions were addressed: 1) whether 9- and 11-year-old typically developing children differed in their ability to use more complex mental state verbs, and 2) whether this ability differed as a function of the oral versus written modality.

Chapter 2

Method

Inclusion Criteria

All participants were selected from one urban elementary school located in West Central Florida. To be included in the study, 9- to 11-year-old children were typically developing in accord with four inclusion criteria. These were: (1) not eligible or not previously eligible for special education or related services; (2) hearing sensitivity within normal limits; (3) age-appropriate vocabulary recognition according to performance on the *Peabody Picture Vocabulary Test-3rd edition (PPVT-III)* (Dunn & Dunn, 1997); and (4) passing of a logical and/or a social second order false belief task (Silliman, Diehl, Hnath-Chisolm, Bahr, Zenko, & Friedman, 2003).

Hearing screening. Children's hearing was screened before the testing session began. A Beltone Audio Scout audiometer calibrated to ANSI 1989 was used for an audiometric screening. Participants responded to screening levels of 20dB HL at 1000, 2000, and 4000 Hz in order to pass the hearing screening.

PPVT-III. The PPVT-III (Dunn & Dunn, 1997) was administered as a measure of general vocabulary familiarity. The start item for the 9-year-old participants was item #73, set 7, while the start item for the 11-year-olds was item #85, set 8. According to the PPVT-III technical manual, the start item is the first item in the appropriate set of test questions designated for the test taker's age. These starting items were derived so that test takers in the middle 50% of any age group would meet the basal set criterion. The basal set is the lowest set of items administered containing one or no errors. The ceiling set is the highest set of items administered containing eight or more errors. Testing was

discontinued as soon as the ceiling set was established. To be included in the study, a participant's score needed to be within ± 1 standard deviation of the mean for each age group ($M = 100$, $SD = \pm 15$). Table 2 in Appendix A contains the PPVT-III scores for all participants.

Second-order false belief tasks. It is assumed that a more advanced theory of mind is associated with more complex reference to mental states in both oral and written narratives. Therefore, two second-order, implicit, false belief tasks (Silliman et al., 2003), a logical inferencing task and a social inferencing task, were used to assess more advanced concepts of mind characteristic of the 9-year to 11-year age span. To be included in the study, participants had to pass at least one of the two tasks. Scores obtained on the false belief tasks are also presented in Table 2 in Appendix A.

The first implicit false belief task required logical inferencing and was adapted from Sullivan, Zaitchik, and Tager-Flusberg (1994) (see Appendix B). In this logical second-order false belief task, the false beliefs about characters' actions were not explicitly stated. For example, a father buys his daughter a birthday present other than what she is expecting and hides the present; however, unknown to the father, the daughter saw what he got her for her birthday before the father gave her the gift. The father remains unknowing when Grandma asks him what he thinks the daughter believes he got her for her birthday. The implicit false belief question would then be: "What would Dad say (to Grandma)?" Silliman et al. (2003) defined this task as one requiring logical inferencing because it is primarily premised on cause-effect inferencing. Cause-effect inferences necessitate that the child predict the missing information, in the case of the

above example, the result of the explicitly stated cause or the effects of the conflicting beliefs of the father and daughter that were the product of their different actions.

The second implicit false belief task, a social inferencing task, focuses on more inner-directed perspectives that are motivated by affective states (see Appendix B). Silliman et al. (2003) describe this mode of reasoning as social reasoning, which represents a category of feeling/attitude inferences (Johnson & von Hoff Johnson, 1986). For example, a child does not want a surprise birthday party because he becomes embarrassed when he is the center of attention; instead, he wants to go to a baseball game for his birthday. However, his father is planning a surprise birthday party because he does not know that his son gets easily discomfited. The father thinks that a surprise birthday party would make his son happy, even when the son tells the father he wants to go to a baseball game for his birthday. The father remains unknowing about his son's self-consciousness when Grandma asks the father how her grandson will feel about having a surprise birthday party. The second-order implicit false belief question would be: "What would Dad say (to Grandma)?" In this task, the beliefs reconstructed derive from the father and son's inner-directed "feelings and attitudes" that motivate their actions.

Participants

A total of 55 children were assessed. Of the 55, 50 met the inclusion criteria. The final sample consisted of 26 children ages 9;0-9;11 ($M = 9;5$, Range 9;0-9;11) and 24 children ages 11;00-11;11 ($M = 11;3$, Range 11;0-11;9). Of the 26 children in the 9-year-old group, 15 were female and 11 were male, 18 were Caucasian, 7 were African-American, and 1 was Hispanic. Of the 24 children in the 11-year-old group, 14 were female and 10 were male, 14 were Caucasian, 8 were African-American, 1 was Hispanic,

and 1 was Asian-American. All children were from monolingual, English-speaking homes and speakers of Standard American English, according to classroom teachers. Approximately 70% of the school population was eligible for the federal lunch program, and the school received Title I funds. The 9-year-old children were in third and fourth grade classes, and the 11-year-old children were in fifth grade classes. Table 2 in Appendix A contains a summary of the demographic data for the 50 participants.

Materials

Second-order false belief tasks. Both second order false belief tasks were displayed in a binder containing illustrations depicting the two different scenarios and scripted questions for both scenarios. The logical inferencing scenario consisted of 15 colored illustrations, and the social inferencing scenario consisted of 12 colored illustrations. Protocol sheets were used to record all responses (see Appendix C for sample).

Mental state verb priming task. A mental state and communication verb priming task was given first. This task was administered based on the assumption that children would show a preference for using mental state verbs and communication verbs when these verbs were primed prior to the narrative task, which comprised the major portion of the study.

The priming task consisted of two parts. In the first part, 16 3x5 cards with verbs printed on the front of each card were presented. A total of 8 cards had action verbs (e.g., *run, play, jump*) printed on the front, and 8 cards had mental state verbs (e.g., *think, know, guess*) printed on the front. The second part of the priming task consisted of an additional 16 3x5 cards with verbs printed on the front of each card. A total of 8 cards

had action verbs (*climb, crawl, push*) printed on the front, and 8 cards had communication verbs (e.g., *discuss, beg, complain*) printed on the front (see Appendix D for a complete list of the priming verbs by category.) During piloting of the study, children had difficulty separating the three categories at the same time in one task. Therefore, the priming tasks were presented as two separate tasks, one task for mental state verbs and one task for communication verbs, to make the task simpler.

Three headings printed on three different index cards were designed to assist children in separating the cards during the priming task. One card had a header with the word *body* printed on it and a picture of a child running next to the word. Another card had *mind* printed on it with a picture of a child sitting at a desk with an inquisitive expression on his face. The last card used as a header had the word *communication* printed on it with a picture of someone orating in front of a podium next to the printed word.

Narrative tasks. Both the oral and written narratives were elicited from an 11-minute, 41-second, textless film, *Frog Goes to Dinner* (Osbourn & Templeton, 1985) in CD-ROM format, based on the book by Mercer Mayer (1975). The multi-character story is about a boy who takes his pet frog to dinner in an expensive restaurant, unknown to his family. The frog wanders away from the boy and comes in contact with many different characters and has numerous adventures in the restaurant before the boy finally finds him. These adventures create conflicts in which beliefs about conventional social expectations for how to behave in a restaurant are violated.

The film consisted of 13 episodes. An episode is the basic structure of a narrative that, at a minimum, must consist of an Initiating Event (IE) or Goal (G), Action (A), and

Outcome (O) (Westby, 1999). An episode analysis was conducted in order to estimate the amount of opportunities for mental state occurrences within each episode. (A detailed analysis of the episodes and possible mental state occurrences is located in Appendix E.)

Eight still frames from the film were used during the elicitation of the narratives in order to reduce the working memory load on the participations while formulating their oral and written narratives (see Appendix F for descriptions of the eight frames included). The same three headers described under the priming task were also used during the narrative task to reduce working memory demands and help children stay focused on the task directions. Lined writing paper and pencils with erasers were provided for the written mode of the narrative task.

Procedure

Prior to administration of the experimental tasks, completed consent forms describing the task procedures were obtained from the parents. Children signed assent forms as a prerequisite for their individual participation (see Appendix G for consent/assent form).

The participants were tested in the fall and early spring of the 2002-2003 school year. All testing was administered by one of two examiners, both of whom were Master Degree students in speech-language pathology. Testing, including the hearing screening, administration of the PPVT-III (Dunn & Dunn, 1997), second-order false belief tasks, and narrative elicitations, was accomplished in two sessions approximately one week apart and lasting approximately 45 minutes per session, for a total time that did not exceed 90 minutes. Testing occurred in a quiet room on the school campus. Breaks were provided as needed. Pencils and stickers were provided as rewards for participation.

Second-order false belief tasks. Before administration of the logical and social inferencing tasks, a brief set of instructions were read, including a purpose for the task. Children were told that their help was needed to determine what the characters in the picture scenarios were thinking and feeling. The illustrated binders were then presented to each child.

Following the procedures of Sullivan et al. (1994) and Silliman et al. (2003), six scripted questions accompanied each scenario (see Appendix B for the complete set of questions). These questions were: (1) a first order question, (2) a reality question, (3) a linguistic contrast question, (4) an ignorance question, (5) the second order question, and (6) a justification question. The last question was included to ascertain children's rationale for their response to the second order question. If the second-order question was not answered, assistance was provided using a cloze procedure. For example, Dad says, "Pam thinks I got her _____." The purpose of the cloze procedure, a form of guided assistance (Silliman et al., 2003), was to reduce the complexity of language formulation that might be competing with access of the underlying concept.

Responses to the six questions were recorded on data sheets. Points were assigned as follows to the second order questions for each task: 2 = correct answer without assistance, 1 = correct answer using the cloze procedure, 0 = incorrect answer or no response. Each participant was required to obtain a score of at least 1 on the second order question (i.e., question #5) for either the logical or the social inferencing task in order to meet the passing criteria for the task.

Mental state verb priming task. The purpose of the priming task was to maximize familiarity across participants about the difference among communication, cognitive, and

physical action verbs. Although mental states can be verbs, adjectives, or adverbs, only verbs were selected to provide a clear contrast among “things you do with your body,” “things you do with your mind,” and “different ways of communicating.”

The task required children to differentiate between two types of verbs and consisted of two parts. The first part of the priming task asked children to differentiate between action verbs and cognitive verbs. The second part of the priming task asked the children to differentiate between action verbs and communication verbs. Examples of each type of verbs were individually printed on index cards, and participants were asked to separate the cards into two piles: one pile of cognitive verbs and a second pile of physical action verbs for the first part of the task, and one pile of communication verbs and a second pile of physical action verbs for the second part of the task. Before beginning the task, children were given examples of physical action verbs, cognitive verbs, and communication verbs.

The first part of the task was introduced as follows:

“We’re going to play a game. I’m going to show you some verbs written on cards. Verbs are words that express what you can do with your body or with your mind. For example, you can use your mind to think and use your body to run. We’re going to separate the two kinds of verbs into two piles. One pile will be things you can do with your mind, and the other pile will be things you can do with your body.”

Following this introduction, participants will be instructed as follows:

“Now it’s your turn. Put all the verbs about things you do with your mind in this pile, and all the verbs about things you do with your body in this pile.”

Scripted prompts were used as necessary, such as, “Tell me if that verb is something you do with your mind or your body.” Participants were allowed a maximum of 10 minutes to complete the task.

The second part of the task was introduced as follows:

“We’re going to play another game. Now I’m going to show you some more verbs written on cards. These verbs are words that express what you can do with your body or words that express different ways of communicating or talking. For example, you can discuss when you communicate. We’re going to separate the two kinds of verbs into two piles. One pile will be different ways of communicating or talking, and the other pile will be things you can do with your body.”

Following this introduction, participants were instructed as follows:

“Now it’s your turn. Put all the verbs that express different ways of communicating in this pile, and all the verbs about things you do with your body in this pile.”

Scripted prompts were used as necessary, such as, “Tell me if that verb describes a way of communicating or something you do with your body.” Participants were allowed a maximum of 10 minutes to complete the task, although all of the children completed the task within 3 to 5 minutes.

Oral and written narrative tasks. The oral and written narratives were elicited using the 11 minute, 41 second wordless CD-ROM, *Frog Goes to Dinner* (Osborn & Templeton, 1985) and were presented on a laptop computer. It should be noted that, although the film is considered to be wordless, one vocal utterance is said by the boy, a

major character (upon entering the kitchen, the boy sees a chef preparing to cook the frog and yells, “No!”).

The examiner was present during the presentation of the film to maximize the child’s focus on the landscape of consciousness and to increase the encoding of mental state references. However, the examiner did not collaboratively watch the film with the children in order to reduce child assumptions about familiarity. Both the oral and written narratives were counterbalanced. A two-phase set of instructions, including a purpose, were provided as follows:

“I’m writing a book and need some help coming up with a good story to go with the video I’m going to show you. This video has many different characters. There is a boy, a frog, a mom, a dad, a cook, a waiter, and some other people. Your teacher told me that you’re a good storyteller. I need you to help me make up a good story to go with the video. Let’s watch the video together.”

After the introduction, the following instructions were given before both the oral and written tasks:

“I want you to make up the best story that you can to go with the video. Remember that to tell/write a good story, you should talk about what’s going on in the character’s minds. You need to say what they might be thinking, saying, and feeling. Tell me what you think they might be thinking, feeling, and saying. Here are some pictures from the story to help you remember.”

A maximum of eight still frames printed from the film were available to the child following both the oral and written elicitations as a strategy to reduce possible verbal working memory demands that could compete with language formulation demands (see

Appendix H). Scripted questions were used as necessary as another form of guided assistance to support children's interpretation of the characters' beliefs and their virtual dialogue, as well as to maintain attentional focus on the formulation of mental state references and quoted dialogue. Examples of scripted questions included:

- (1) What was going on in the characters' minds?
- (2) What else could be going on in the characters' minds?
- (3) What might this character have been saying?
- (4) Tell me how the characters are using their minds?
- (5) Why do you think that character did that?
- (6) How does the character feel?
- (7) If I could listen to the characters talking, what would I hear?

(See Appendix I for complete scripts of the priming task and elicitation of narratives.)

The rationale for the inclusion of film frames and scripted prompts derived from Wellman et al. (2001), who found that enhancing the salience of mental states was a significant variable for improving children's performance on false belief tasks regardless of age. Therefore, an assumption was that enhanced salience would also heighten production of mental states in oral and written narratives.

The oral and written conditions were presented in random order to minimize a mode order effect. Participants were allowed a maximum of 10 minutes to respond in the oral mode and 20 minutes to respond in the written mode. Depending on the school accommodations, the writing task was sometimes administered as a small group task.

Equipment

Both audio and video recordings were used to maximize accurate data transcription. All of the sessions were video recorded with a tripod using a Memorex SM1000 video recorder and audio recorded using an Optimus CTR-117 audio cassette recorder. An Optimus 33-3013 tie-clip microphone was also used to ensure high quality sound. The wordless video film was presented in CD-ROM format on a Dell Sx-700 laptop computer.

Data Reduction

All participants were assigned a numerical code to ensure anonymity. Individual oral and written narratives were identified only with this numerical code.

Segmentation of oral and written narratives. The oral narratives were transcribed and divided into T-units (terminable unit) and then entered into the Systematic Analysis of Language Transcripts (SALT; Miller & Chapman, 1984). A T-unit is defined as a main clause plus all subordinate clauses or non-clausal structures that are embedded within the main clause (Hunt, 1965). All clauses that began with a coordinating conjunction (e.g., and, but) were considered separate clauses except when there was co-referential subject deletion (Scott, 1988), for example, *Mary got in her car and (she) went to the store*. The written narratives were also divided into T-units in the same manner.

Occurrence and classification of mental state references. All transcriptions were analyzed for the presence of mental state terms. Possible mental states references, including verbs, adjectives, and adverbs, compiled from previous research with children from the late preschool to preadolescent years served as the basis for classification (Astington, 1998a, 1998b; Bretherton & Beeghly, 1982; Ely & McCabe, 1993;

Schwanflugel et al., 1996). This classification schema consisted of 68 terms: 24 motivational references, 33 experiential references, and 11 belief references (see Appendix E). It should be noted that this schema was not exhaustive, but represented potential examples that could possibly occur during the oral and written narrative elicitation.

Consistent with the concept of a developmental continuum, mental state references were classified into motivational, experiential, and belief categories. Motivational mental states express desire, need, and intentionality (e.g., *want, need, try*), including the intention to communicate (e.g., *say, tell, ask, complain*). Other types of motivational mental references express the aspect of possibility as an intentional state (e.g., *can, will, might*). Experiential mental states typically consist of perception references referring to sight, hearing, taste, and touch (e.g., *see, hear, taste, smell, feel*) and situational emotion references (Baron-Cohen, 1995) that may be motivated by physiological reactions to a mental state (e.g., *thirsty, angry, hungry, happy*).

Finally, belief mental states index broader conceptual and multidimensional understanding of others' minds in terms of the mental processes that govern cognitive and verbal activities (e.g., *know, guess, explain, realize, wonder, promise*) (Bartsch & Wellman, 1995; Bretherton & Beeghly, 1982; Schwanflugel et al., 1996). Specifically, beliefs refer to a continuum of degrees of uncertainty to degrees of certainty. Belief verbs may also be constructed with modals to express uncertainty, for example, "Tom *thought* that he *might have been* a good runner if he practiced more often." As such, belief references may reflect a more literate conceptual understanding of mental states and occur more often in the written register of schooling than in the oral register typical of

everyday conversation. (See Appendix G for coding of the mental states and examples.) If any additional mental states were found in the data, they were included if the examiners agreed on the classification.

Qualitative analyses of belief verbs: Diversity, complexity, and depth. Mental state references were also analyzed qualitatively. One analysis examined lexical diversity of mental state references between the two age groups in the oral and written modes. A second analysis sought to discern patterns of most frequent and more complex production of belief verbs only. One criterion for determining complexity was age specific. Belief verbs not used by the 9 year old group in either condition but produced only by the 11 year old group were interpreted as more complex.

A second complexity criterion was based on Beck, McKeown, and Kucan (2002). These authors categorized words into three levels of word tiers, with Tier 1 representing high frequency, or commonly used, words, such as *baby*, *happy*, and *walk*. On the other hand, Tier 2 meanings are more literate meanings consistent with the written language register (whether this register is used orally or in writing), such as *comment*, *vicissitudes*, and *inquiry*. These meanings are generally slow mapped, or elaborated with experience, as opposed to the fast mapping of more commonly used words. Tier 3 meanings are specific to subject domains, such as mathematics, geography, literary analysis, etc., for example, *algebraic*, *peninsula*, and *deconstruction*. The analysis of more complex belief verbs drew on Tier 2 meanings.

A final qualitative analysis was conducted on a preliminary basis to examine the lexical depth of *think*. As modified from Nordqvist (2001), variations in the meaning of

think were examined in their specific social contexts. The purpose was to determine the extent to which the meaning of *think* represented degrees of uncertainty and certainty.

Examiner Agreement

Two graduate students in speech-language pathology served as raters for the oral and written samples. Prior to analyzing the data, the students formulated a coding system for classification of mental state references into three categories (i.e., motivational, experiential, belief). The examiners reached 90% agreement when coding sample responses that were not included in the study. Any disagreement as to classification of a particular mental state reference was resolved by discussion. Based on the piloting of the coding system, modifications were made before the system was actually applied to the study's data.

Intercoder agreement for coding consistency using an independent coder was conducted for 16 narratives from the oral and written samples (16% of the total). The samples were randomly chosen, such that the two age groups and two conditions (oral versus written) were equally represented (i.e., four 9-year-old oral narratives, four 9-year-old written narratives, four 11-year-old oral narratives, and four 11-year-old written narratives). The primary coder was a doctoral level student in Speech-Language Pathology. Training was accomplished by explaining and identifying mental state references in practice narratives not included in the sample.

Prior to coding, consensus was reached on how to divide the transcripts into T-units. Intercoder agreement was then calculated in a series of steps. First, percentage agreement for whether a T-unit contained one or more mental state references was determined. The coders obtained 92% agreement for identification of T-units containing

mental state references. Next, in those instances in which a T-unit contained one or more mental state references, the references were coded as motivational verb, experiential adjective or verb, or belief verb. Cohen's kappa was used to determine the consistency of response coding of the mental state references. The resulting kappa for mental state references was $k = .95$. This represents a high level of consistency for coding categories (Bakeman & Gottman, 1997).

Chapter 3

Results

This study was designed to determine the existence of differences in the use of mental state references by 9- and 11-year-old typically developing children. Quantitative and qualitative analyses were conducted to answer two questions:

1. Did 9- and 11-year-old typically developing children differ in their use of mental state references?
2. Did this ability differ as a function of the oral versus written modality?

Data Analysis

Statistical analyses were conducted first to determine whether T-unit distributions differed according to age group and narrative condition. Then, differences were examined as related to among age group, the frequency of mental state references by category, and narrative condition. A three-way MANOVA was conducted for this purpose, specifically, 2 (Age 9 versus Age 11) x 4 (mental state categories) x 2 (oral versus written modalities). For this analysis, the independent variables were age of participants (9 and 11 years), type of narrative (oral versus written), and type of mental state reference (motivational verbs, experiential verbs and adjectives, and belief verbs). The dependent variable was frequency of mental state code responses.

Raw data frequencies were normalized by dividing the number of specific mental state references by the total number of T-units. Post-hoc tests were run as appropriate. In addition, qualitative analyses were conducted to examine the variety, complexity, and depth of belief verbs in the oral and written narratives for both 9 year olds and 11 year olds.

Results are organized as follows. First, the MANOVA results of T-units are reported. Next, MANOVA results that address the two research questions are presented. An additional qualitative analysis of belief verb complexity is then provided, followed by a summary of the important findings.

T-unit Analysis

All narratives were transcribed and divided into T-units (Hunt, 1965). Next, the transcripts were entered into the software program *Systematic Analysis of Language Transcriptions* (SALT; Miller & Chapman, 1984). SALT produced type and frequency data for the mental state references.

A descriptive analysis was conducted to determine the average number of T-units, the number of words used, and the average T-unit length per narrative in the oral and written contrasts for both the 9- and 11-year olds. As seen in the Table 1 summary, the 9 year olds produced an average of 57.1 T-units in the oral modality and 26.0 T-units in the written modality, while the 11 year olds produced an average of 70.6 T-units in the oral modality and 36.4 T-units in the written modality. The range in T-units for each age group indicates the wide variability between individuals. Average T-unit length for participants in the 9-year-old group was 9.9 in the oral modality and 9.1 in the written modality; average T-unit length for participants for the 11-year-old group was 9.4 in the oral modality and 10.2 in the written modality.

Table 1. Descriptive Data for 9 and 11 year olds in the Oral and Written Domains.

	<i>Average # of T- units: Oral Narratives</i>	<i>Average # of T- units: Written Narratives</i>	<i>Average T-unit length: Oral Narratives</i>	<i>Average T-unit length: Written Narratives</i>
9 year olds	57.1 (Range = 20-154)	26.0 (Range = 8-68)	9.9	9.1
11 year olds	70.6 (Range = 23-148)	36.4 (Range = 9-56)	9.4	10.2

Three separate multivariate ANOVAs (MANOVAs) were conducted to determine differences attributable to age group and/or narrative condition (oral vs. written). The MANOVA for number of T-units revealed significant main effects for condition, $F(1,48) = 52.399, p < .001, \eta^2 = .522$, and group, $F(1,48) = 4.589, p = .037, \eta^2 = .087$. The interaction between narrative condition and age group was not significant, $F(1,48) = .117, p = .733, \eta^2 = .002$. These findings suggest that the 11-year-olds produced more T-units overall and that both age groups produced more T-units in the oral condition. The effect sizes suggest that the finding for the narrative condition (oral vs. written) was a stronger finding than the group difference, which was of minimal significance.

The second MANOVA considered the influence of age group and narrative condition on the number of words produced. Like the previous MANOVA, there were significant main effects for condition, $F(1,48) = 55.138, p < .001, \eta^2 = .535$, and age group, $F(1,48) = 7.610, p = .008, \eta^2 = .137$. The interaction between narrative condition and age group was not significant, $F(1,48) = .023, p = .879, \eta^2 = .000$. These findings

support the previous findings, both in significance and effect size calculations, in that the 11-year-old group produced more words than the 9-year-old group and that more words were produced in the oral condition than in the written condition.

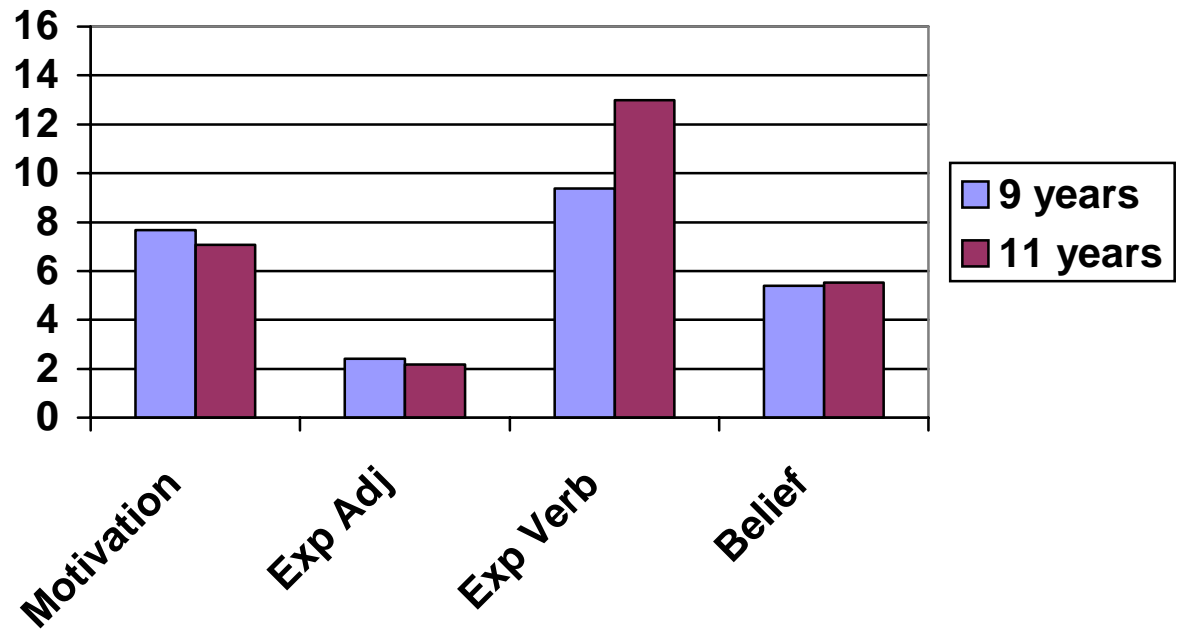
The third MANOVA for differences in T-unit length revealed somewhat different findings. In this case, none of the findings were significant. This suggests that there is no difference between age groups or between narratives conditions for T-unit length. In other words, T-unit lengths were comparable across groups and conditions.

Analysis of Mental State References

The results of a three-way MANOVA revealed a significant interaction between age and reference type, $F(3,144) = 4.999$; $p = .007$, partial $\eta^2 = .094$. Post hoc testing using the Bonferroni procedure revealed that one paired comparison was significant. As illustrated in Figure 1, this significant difference was attributed to the experiential verb category. The use of experiential verbs was significantly greater for the 11 years olds than the 9 year olds. However, the partial η^2 indicated that this interaction explained very little (9%) of the variance between these factors, so this age difference is of minor importance. This effect size interpretation is further substantiated by the lack of a significant main effect for age, $F(1,48) = .942$, $p = .341$. This finding suggested that the two age groups did not significantly differ in the number of occurrences of mental state references. Therefore, both age groups appeared to use each mental state reference category with equal frequency.

The significant two-way interaction between reference type and modality, $F(3,109) = 11.407$; $p < .001$; partial $\eta^2 = .192$, is the primary finding in this MANOVA. The partial η^2 accounted for 19% of the variance between these factors.

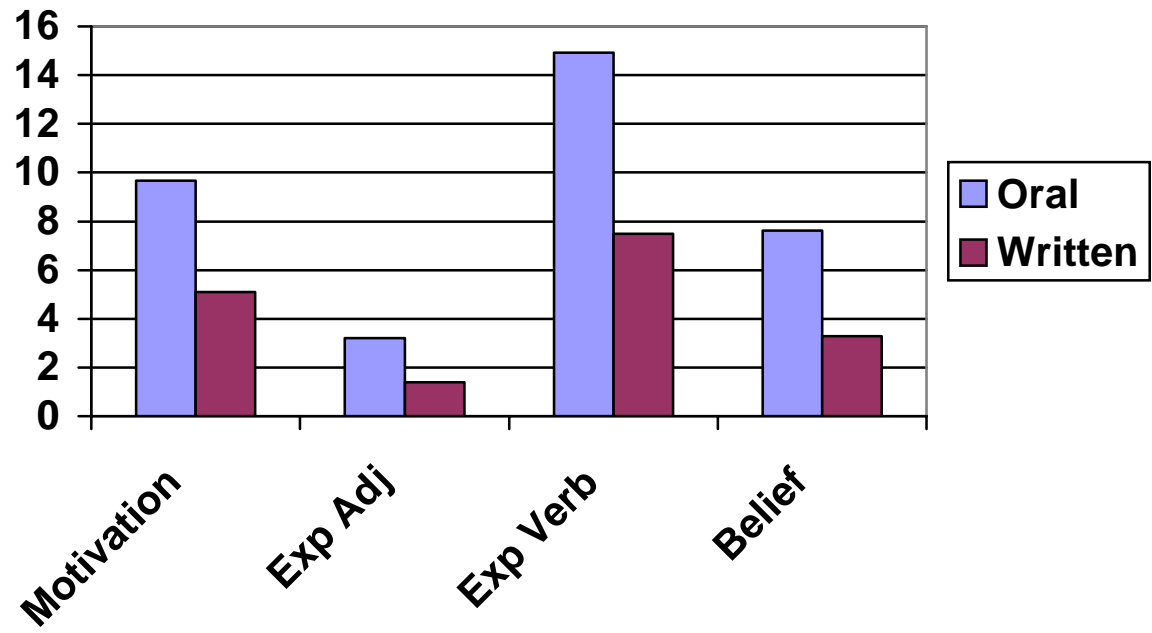
Figure 1. Frequency of Use of Mental State References by Age.



When paired samples t-tests with a Bonferroni correction were conducted to evaluate comparisons across reference types within modalities, 11/12 pairwise comparisons of interest were significant ($p < .001$). As illustrated in Figure 2, the non-significant comparison was between the belief and the motivational references in the oral modality. In this case, there was no significant difference in the oral use of these two verb types. The experiential verb category occurred with the greatest frequency, followed by motivational references, then belief references, and finally experiential adjectives. Paired samples t-tests with a Bonferroni correction revealed that the frequency of mental state references was always greater in the oral condition.

It should also be noted that the main effects for modality, $F(1,144) = 60.913$, $p < .0001$, partial $\eta^2 = .558$, and reference type, $F(3,144) = 72.92$; $p < .0001$; partial $\eta^2 = .603$ were significant. The significant main effect for modality indicated that mental state references were produced more frequently in the oral narratives for both age groups. The significant main effect for reference type suggested that the reference categories occurred with different frequencies. Experiential verbs were produced most frequently in both modalities, with motivational verbs, belief verbs, and experiential adjectives occurring less frequently in that order for both modalities.

Figure 2. Differences Noted by Reference Type and Modality.



Qualitative Analyses

Qualitative analyses were completed to compare the diversity, complexity, and depth of mental state references in the oral and written narratives between the two different age groups. Belief verbs were chosen for this analysis because they were best suited to show different levels of lexical complexity.

Diversity. Table 2 displays the diversity of belief verbs produced. The 9 year olds produced a total of 194 belief verbs, with 134 verbs in the oral modality and 60 verbs in the written modality; the 11 year olds produced a total of 196 belief verbs, with 122 verbs in the oral modality and 74 verbs in the written modality.

In terms of variation, the 9 year olds produced 29 different belief verbs in the oral condition and 22 different belief verbs in the written condition, while the 11 year olds produced 27 different belief verbs in the oral condition and 25 in the written condition. As the frequencies indicate, variations of “think,” including “think,” “thinks,” “thought,” and “thinking,” were most common for both age groups in both modalities. For the 9 year olds, the next most frequently occurring belief verbs were “notice,” “know,” and “find out” in the oral modality and “know,” “decided,” and “notice” in the written modality. For the 11 year olds, the next most frequently occurring belief verbs were “know,” “notice,” and “forget” in the oral modality and “notice,” “check,” and “decide” in the written modality.

Table 2. Diversity of Belief Verbs Produced by the 9 and 11 Year Old Participants as Displayed in Order of Frequency for the Oral and Written Narratives (Number in Parenthesis Reflects the Frequency of the Verb).

	9 year olds (<i>n</i> =26)	11 year olds (<i>n</i> = 24)
Oral Narratives	Think (37)	Think (27)
	Notice (9)	Know (12)
	Know, find out (7)	Notice (11)
	Search (5)	Forget (8)
	Check, decide, feel, forget, realize (4)	Realize (7)
	Wonder (3)	Feel, find out (5)
	Figure out, guess, like, love (2)	Decide, remember, wonder (3)
	Allow, assume, discover, figure, hope, let, mind, remember, want, wish (1)	Check, guess, like, make sure, search (2)
	Believe, check on, enjoy, exaggerate, figure out, plan, pretend, see (1)	
Written Narratives	Think (14)	Think (18)
	Know (5)	Notice (9)
	Decide, notice (4)	Check, decide, realize (4)
	Find (3)	Forget, know (3)
	Check, figure out, forget, search (2)	Like, worry (2)
	Discover, felt, find out, guess, had an idea, like, mind, propose, realize, saying in his mind (1)	Believe, bet, explore, find out, guess, have no clue, hope, love, mind, remember, see, wonder (1)

Complexity. Table 3 shows the most frequently used belief verbs, as well as the more complex belief verbs, that each age group produced alone. The use of more complex belief verbs demonstrates the understanding of more complex cognitive processes. As Table 3 indicates, the 11 year olds demonstrated greater semantic complexity in their production of belief verbs, such as *believe, exaggerate, plan, pretend,* and *worry*. These verbs refer to the certainty-uncertainty domain.

Table 3. Most Frequent Use and More Complex Use of Belief Verbs as Produced in the Oral and Written Narratives.

	Most Frequent Use	More Complex Use
9 year olds (n = 26)	Oral modality – <i>think, notice, know, find out</i> Written modality – <i>think, know, decide, notice</i>	(References not used by 11 year olds) Oral modality – <i>assume, discover</i> Written modality – <i>propose</i>
11 year olds (n = 24)	Oral modality – <i>think, know, notice, forget</i> Written modality – <i>think, notice, check, decide</i>	(References not used by 9 year olds) Oral modality – <i>believe, exaggerate, plan, pretend</i> Written modality – <i>explore, worry, wonder</i>

In summary, the 9 year olds were capable of generating mental state verbs, such as “assume,” “discovered,” and “wish” in the oral mode and “proposed” in the written mode. The 11 year olds did not produce these verbs. In contrast, the 11 year olds generated more tokens of complex belief verbs than did the 9 year olds.

Lexical depth. When analyzing children's use of *think* in context to determine lexical depth, Nordqvist (2001) differentiated between "think as experience" versus "think as having an opinion." However, there is no consensus on procedures for analyzing lexical depth; therefore, to attempt a finer differentiation of meanings of the same word, random samples of the 11 year olds' narratives were selected to examine variations in meaning of the belief verb *think* according to their specific social contexts. As a result of this preliminary analysis, five belief variations emerged that indicated degrees of certainty or uncertainty. The variations included "think as decide," think as realize," "think as ask oneself," "think as have an opinion," and "think as believe." An example of each variation follows:

- 1) "He *thought (decided)* he would bring the frog with him." In this situation, the boy was preparing to go to dinner with his parents; he saw the frog in the dresser drawer and *decided (was certain)* he wanted to take the frog with him.
- 2) "and the boy looks worried that the guy might *think (realize)* that he has a frog with him.:" Here, as the boy was getting out of the car at the restaurant, the parking valet heard the frog croak. The boy's face registered *uncertainty* that the valet might *realize* he had a frog.
- 3) "He was probably *thinking (asking himself)*, why would a boy bring a frog to a restaurant." In the same valet situation, just described, the valet's facial expression could be interpreted as registering *uncertainty* that he heard a sound akin to a frog's croaking; thus, he might have been *asking himself* about the reality of what he heard.

- 4) “She *thought (had an opinion)* she was just exaggerating.” In this event, a woman and a man were dining at a table and the frog, which had jumped into the salad, was served to the woman. The woman appeared *uncertain* because she thought that she saw a frog in her salad, but then the frog disappeared, leading her to *have an opinion* that she was just exaggerating [imagining] the situation.
- 5) “and he *thought (believed)* he had caught it with these three little bowls.” In this scenario, the frog had made his way to the kitchen and was being chased by the kitchen personnel. One of the men tried to capture the frog with three upside-down mixing bowls, but then was *uncertain* about which bowl the frog might be under. However, he *believed* he had caught the frog underneath one of the bowls.

The results from this preliminary analysis indicate that by age 11 years, some children are aware of different levels, or depths, of meaning for belief references. In addition, they are able to demonstrate their understanding of these levels through selecting variations that reveal the multidimensional aspects of the meaning of a word, such as *think*.

Summary of Findings

Contrary to expectations, there were no significant differences between the 9 year old and 11 year old participants in their frequency of use of mental state references in the oral and written narratives. The results of this study did indicate that experiential verbs were used most frequently and experiential adjectives were used least frequently in both the oral and written modalities. Motivational and belief verbs were used relatively

equally in the oral domain and motivation references were used more frequently than belief in the written domain. Both age groups also produced more mental state references in the oral mode than in the written mode.

A qualitative analysis of the belief verb category suggested the possibility of a transitional shift, in terms of both breadth and depth, from more oral to more literate lexical knowledge. This trend was evident more so for the 11 year olds than the 9 year olds. The 11 year old children in this study generated narratives in both the oral and written modes that contained belief verbs reflecting more diversity, complexity, and lexical depth than did the 9 year old children. Although this developmental transition was slight, it was also noted by Nordqvist (2001).

Chapter 4

Discussion

Prior studies have primarily investigated continuing theory of mind development in older children by focusing on the organization of specific mental state verbs (i.e., *know*) (Booth & Hall, 1995; Schwanenflugel, Fabricius, & Noyes, 1996). With one exception, the Swedish study by Nordqvist (2001), previous studies have not investigated different types of mental state references using an oral-written contrast paradigm. Thus, the results from this study do not have a rich comparative framework. To interpret the results, three methodological factors and two conceptual issues are discussed initially. Then, directions for future research, including clinical implications, are presented.

Methodological Issues

At least three methodological issues impacted on the quantity and quality of the narratives in both modalities. These issues were: a) sample representativeness; b) the influence of the priming task, instructions, and elicitation method on performance; and c) the age interval of the two groups in the study.

Sample Representativeness

A major question is whether the study's procedures solicited a representative sample of children's knowledge of mental state references. One source of evidence for representativeness was the average number of T-units. The general rule of thumb for the oral domain is that a minimum of 50 T-units is needed to meet a representative criterion, especially when lexical diversity is a focus (e.g., Watkins, Kelly, Harbers, & Hollis, 1995). Both age groups in this study exceeded the 50 T-unit minimums. The 9 year old

group produced an average of 57.1 T-units, while the 11 year old group produced an average of 70.6 T-units.

The criterion for representativeness is less clear for writing, for example, whether formal units or specific time intervals should serve as the method for obtaining a representative sample. Some (e.g., Hughes, McGillivray, and Schmidek, 1997) suggest that 50 to 60 T-units should be collected, while others (Apel, Masterson, & Niessen, 2004) recommend a minimum of 50-100 words. However, there are minimal data to support that 50-60 T-units or 50-100 words are sufficient for analysis purposes in writing.

The average written T-unit length collected in this study was 26.0 for the 9 year olds and 36.4 for the 11 year olds. Hence, as might be predicted, the older group was capable of generating more information than was the younger group. A qualification is in order as the children in this study were given only 20 minutes to plan and write their written narratives. If given more time, it is possible that they would have produced a greater number of T-units in the written modality.

In view of the absence of normative T-unit data for writing, a conservative conclusion is that the writing samples were representative of children's abilities in general and their capability to produce mental state references specifically. What seems most relevant for representativeness, however, is that children's knowledge production was assessed in both the oral and written domain.

Influence of the Priming Task, Instructions, and Elicitation Method on Performance

Influence of the priming task. One difference between the present study and the study by Nordqvist (2001) was the implementation of a priming task to familiarize participants with the difference between cognitive verbs, communication verbs, and

action verbs. The advantage of this priming procedure was that the children had recent experience with categorizing mental state references previous to generating their oral and written narratives, and, therefore, may have been less inclined to focus on only the actions in the video. An issue, however, is that children's exposure to various cognitive and communication verbs prior to narrative generation may have led to a high incidence of the verb *think*, a finding that will be addressed shortly. Despite this possibility, both groups of children also generated numerous mental state references, including belief verbs, that were not used for the priming task.

Influence of the instructions and elicitation method. One methodological factor that may have increased the participants' engagement in the narrative activities was the presentation of a purpose prior to initiating either the oral or written conditions. Specifically, children were asked for their help in writing a book to go with the video, and knowledge of a meaningful purpose may have been contributed to their interest and engagement.

In addition, the elicitation methods for both oral and written narratives included an emphasis on what the characters in the video were thinking, feeling, and saying, which appeared to encourage a sharing and coordination of character perspectives. Instructions explicitly stated that "To tell/write a good story, you should talk about what's going on in the character's minds. You need to say what they might be thinking, saying, and feeling." Furthermore, the eight still frames presented to the children during production of the narratives were also chosen for the various facial expressions, reflecting different moods, thoughts, and feelings of the characters. From an observational point of view, most children utilized the frames to some extent in their story generations.

The combined effects of these methodological factors, including the priming task, explicit directions with purpose, and still frames from the video, are unknown. However, one viable conclusion is that each contributed support to the quantity and richness of the narratives obtained. The issue of presentation format, including modality differences, remains important for both educational and clinical purposes (Schneider & Dube, 2005).

The Age Interval

There was an unexpected lack of variability in age in the production of mental state references. In retrospect, a study limitation was the participants' age interval. The particular ages chosen for the study, 9 and 11 years, were selected because these are the ages when typical children become immersed in more literate language use in the school setting, including vocabulary, reading, and writing.

Results showed substantial variability in production across the three mental state categories for both age groups, suggesting that differences within and between the ages were great. At some level, this variability is consistent with the transition from less oral to more literate language expression during the preadolescent years (Rubin, 1987; Scott, 1999), when children begin to shift from "talk like books" to "write like books." Because of this transition, and the marked variability in individual difference that seems associated with it, an expanded age interval appears necessary for any follow-up study. As an example, Nordqvist's (2001) study showed greater differences in the lexical diversity and depth of mental state verb production between 9 year olds and 15 year olds than between the 9 year old and the 12 year old groups. Therefore, future research in this area should further explore lexical diversity, complexity, and depth in children with greater age intervals than the two age groups included in this study.

Conceptual Issues

Lexical Diversity and Complexity

A critical conceptual question is whether the patterns of results support a continuum of development for mental state references. The increasing lexical diversity and complexity demonstrated by the 11 year olds, as opposed to the 9 year olds, would appear to indicate progression along a developmental continuum. This progression may provide evidence of a developmental shift from more oral to more literate uses of vocabulary, depending on the situation. Evidence of a developmental shift was also acknowledged by Nordqvist (2001).

The qualitative analyses provided evidence for increasing lexical diversity and complexity in the production of mental state references by the older children, as compared to the younger group. The 11 year olds generated more instances, or greater diversity, of more semantically and cognitively complex mental state references, especially in the belief category. Six examples of the greater scope of complexity follow. Specifically, the 9 year old children produced less complex meanings denoting the characters' certainty about key story events (examples 1 and 2) versus those produced by the 11 year old group (examples 3 – 6):

1. “And the lady got the frog with the salad.
But at first she doesn't *know*” (9 year old oral narrative)
2. “And then he finally *noticed*...” (9 year old written narrative)
3. “And he *realized* that the frog wasn't there” (11 year old oral narrative)
4. “But they just *pretended* that it was nothing” (11 year old oral narrative)
5. “But the boy *is unaware*” (11 year old written narrative)

6. "...his frog got out of his pocket *unnoticed*" (11 year old written narrative)

According to Beck et al. (2002), the belief references produced by the 11 year old children would be examples of more literate use of Tier 2 words, or meanings more characteristic of the written language register. These "written register" meanings significantly contribute to a richly elaborated semantic network, which may not be evident until grade 6 for many children (McGregor, 2004).

Examples 4, 5 and 6 are especially interesting because all three are derived meanings; that is, they all have a prefix (*pre-*, *un-*) attached to the root words as the lexical mechanism for expressing more complex thinking about the absence of awareness in others. Examples of derivations were seldom found in the 9 year old transcripts. One conclusion is that individual 11 year old children appeared to be advancing in their second order coordination of the multidimensional relationships that index states of consciousness in others, especially those states that reflect degrees of certainty or factivity. An individual profile analysis in future research would aid in comparing group and individual differences.

Lexical Depth

In regard to revealing lexical depth, the coding of the belief verbs may have been an issue, since only the verb itself was considered based on the classification protocol. Unlike some previous studies (Booth & Hall, 1995; Schwanenflugel et al., 1996), belief verbs, such as *think* and *know*, were not interpreted along the certainty-uncertainty continuum. Also, variations in meaning (see Nordqvist, 2001), such as the difference between "think as experience" versus "think as having an opinion," were not fully analyzed in their syntactic or social contexts of occurrence. However, a preliminary

analysis revealed five variations in meaning for the belief verb, *think*. Four of the five variations referred to uncertainty, while three of the four co-occurred with sentential complementation, either the marked or unmarked form, e.g.,

“And the boy looks worried that the guy might think *that* he has a frog with him (marked form).”

“She thought [*that*] she was just exaggerating (unmarked form).”

Thus, it appears that, in accord with Nixon’s (2005) findings on preschoolers, even during preadolescence, “syntactic constraints and cognitive complexity” (p. 34), combined with inferences about the social situation, continue to influence the emergence of the varied meanings of belief verbs.

The findings from the extended examination of these meanings suggest that children’s progressive understanding of others’ minds will require an analysis of both the linguistic and social contexts in which mental state references are expressed. This interpretation is consistent not only with the findings from Booth and Hall (1995) but also with a recommendation from Montgomery (2005). More valid assessment of theory of mind will require “broadening the range of words and visual and situational cues employed in (theory of mind) tasks” (Montgomery, 2005, p. 119).

Future Research Directions

The oral-written contrast paradigm demonstrated the quantity and richness of narrative production possible from typically developing preadolescent children. Future research should focus on the inclusion of explicit priming tasks and explicit directions to assess their relevance in soliciting greater scope and depth of mental state references. In addition, drawing on children’s situational knowledge of social contexts in which

thoughts and beliefs are attributed to other people also seems beneficial in encouraging children to express the mental state references they are typically capable of producing. Finally, subsequent work should focus on standards for a representative writing sample, comparing whether number of words, number of T-units, or time intervals are the most reliable units.

Most importantly, analyzing belief verbs such as *think* and *know* in their linguistic and social contexts to determine significant variations in meaning would seem imperative in order to reveal the nuances of lexical depth not evident by categorization alone. Since “belief” is an abstract concept (you can’t see a belief, much less degrees of certainty or uncertainty), how children assimilate and express their evolving understanding of such abstract concepts throughout their childhood is relevant to their understanding of others’ behaviors and their skills with social interactions. Being aware of the subtleties of meaning inherent in mental state references is an indication of more advanced cognitive, lexical, and, potentially, syntactic growth. Analyzing different levels of meaning for cognitive verbs of uncertainty may be a powerful way to paint a more complete picture of developmental differences in the semantic lexicon of older children.

A second area of research concerns Autism Spectrum Disorder (ASD). Past research on children with ASD indicates that this particular developmental disorder is characterized by significant limitations in theory of mind development (Baron-Cohen, 1995). Communication and social interactions with others are hampered when children with autism are unable to attribute mental states to other people or predict the behavior of others’ based on their interpretation of mental states. Previous studies have not attempted to elicit mental state references from children with autism using a priming task or via an

oral-written contrast paradigm. Since there is wide variability in lexical, syntactic, and discourse skills across the autistic spectrum, initial studies in this area should focus on higher functioning children, such as those with Asperger's syndrome.

Conclusion

In summary, the results of this study suggest evidence of children's progress on a developmental continuum in the acquisition of more complex mental state references, such as belief verbs, indicating that theory of mind development continues to advance in preadolescent children. Although only a slight developmental shift was evident in the production of mental state references between the ages of 9 and 11 years, future research with broader age intervals may reveal more evidence of a developmental continuum that continues to progress in complexity and flexibility throughout adolescence and young adulthood. These results also offer evidence of the length of time required to acquire more intricate lexical knowledge. In this view, theory of mind development is not simply an acquisition that stops in the preschool years, but is an ongoing transformation of mind sharing and perspective taking that enrich social interactions with others throughout our lives.

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Appendices

Appendix A: Table 2. Age, Gender, Ethnicity, and Results of Inclusion Criteria Measures
for the 50 Participants.

Age	Gender	Grade	Ethnicity	PPVT-III	Logical Task	Social Task
9;0	Female	3 rd	Caucasian	85	2	0
9;0	Male	3 rd	AA	89	1	0
9;1	Female	3 rd	Caucasian	85	2	2
9;1	Female	4 th	Caucasian	115	2	2
9;1	Male	3 rd	AA	121	2	2
9;3	Male	4 th	Caucasian	99	2	2
9;4	Male	4 th	AA	100	2	2
9;4	Male	4 th	AA	118	2	2
9;4	Female	3 rd	Caucasian	115	2	2
9;5	Female	4 th	AA	114	2	2
9;5	Male	4 th	Caucasian	106	2	2
9;5	Female	3 rd	Caucasian	112	2	2
9;6	Female	4 th	Hispanic	108	2	2
9;6	Male	3 rd	Caucasian	102	2	2
9;6	Female	3 rd	Caucasian	94	0	2
9;7	Male	4 th	Caucasian	103	2	2
9;7	Female	4 th	Caucasian	115	0	2
9;8	Female	4 th	Caucasian	107	2	2
9;9	Male	3 rd	Caucasian	109	2	2
9;9	Female	4 th	Caucasian	104	2	2
9;10	Female	4 th	Caucasian	99	2	2
9;11	Female	4 th	Caucasian	103	2	2
9;11	Female	4 th	Caucasian	91	2	2
9;11	Female	4 th	Caucasian	110	2	0
9;11	Male	3 rd	AA	106	2	2
9;11	Male	3 rd	AA	120	2	2
11;0	Female	5 th	Hispanic	99	2	2
11;1	Female	5 th	Caucasian	93	2	2
11;1	Male	5 th	Caucasian	108	2	2
11;2	Female	5 th	Caucasian	107	2	2

Appendix A: (Continued)

Age	Gender	Grade	Ethnicity	PPVT-III	Logical Task	Social Task
11;2	Female	5 th	AA	89	2	0
11;2	Female	5 th	AA	105	2	2
11;2	Male	5 th	Caucasian	124	2	2
11;2	Female	5 th	AA	103	2	2
11;3	Female	5 th	Asian	94	2	2
11;3	Female	5 th	Caucasian	114	2	2
11;3	Male	5 th	Caucasian	111	2	2
11;3	Male	5 th	Caucasian	114	2	0
11;3	Female	5 th	Caucasian	111	2	2
11;3	Male	5 th	AA	107	2	2
11;3	Male	5 th	AA	103	2	2
11;4	Female	5 th	AA	103	2	2
11;4	Female	5 th	Caucasian	89	2	2
11;5	Male	5 th	AA	87	2	2
11;5	Male	5 th	Caucasian	93	2	2
11;5	Male	5 th	AA	105	2	2
11;5	Male	5 th	Caucasian	110	2	2
11;8	Female	5 th	Caucasian	99	2	2
11;8	Female	5 th	Caucasian	98	2	2
11;9	Female	5 th	Caucasian	108	2	2

Appendix B: Second-Order False Belief Tasks

Logical Inferencing Scenario:

1. Implicit False Belief: (modified from Sullivan et al., 1994)

This is a story about Pam and her Dad. Today is Pam's birthday and she's having a big party tonight. Dad is surprising her with a new bike that he has hidden in the living room. See? Here is the surprise bike. Pam and Dad are in the kitchen talking about her birthday. Pam says, "Dad, I really want a new bike for my birthday." Now remember, Dad wants the bike to be a surprise, so he says, "Sorry, I didn't get you that. I got you roller blades instead."

First Order Question: What does Pam think Dad got her for her birthday? (*If necessary,*

Fill in: Pam thinks Dad got her ____.)

Reality Question: What did Dad really get her for her birthday? (*If necessary, Fill in:*

Dad really got Pam ____.)

Then Pam says to Dad, "O.K., well I'm going over to my friend's house. I'll be home later. On her way out, Pam goes into the living room to get her umbrella because it's raining. In the living room, she finds her new bike! She thinks to herself, "Yes! Dad did not get me roller blades. He really got me a bike. Dad does not see Pam go into the living room and find the bike.

Linguistic Contrast Question: Does Dad know that Pam saw her bike in the living room?

Later, Pam's grandmother comes over for the party. Grandma asks Dad, "Does Pam know what you got her for her birthday?"

Appendix B: (Continued)

Ignorance Question: What does Dad say? (*If necessary, Fill in: Dad says ____.*). Now remember, Dad does not know that Pam saw what he got her for her birthday. Then Grandma asks Dad, “What does Pam think you got her for her birthday?”

Second Order Question: What does Dad say? (*If necessary, Fill in: Dad says, “Pam thinks I got her ____.”*).

Justification Question: Why does Dad say that?

Social Inferencing Task:

2. Implicit False-Belief:

This is a story about Frank and his Dad. Today is Frank’s birthday. Frank wants to go to a baseball game for his birthday. He does not want a surprise party for his birthday. Frank hates surprise parties. He gets embarrassed when everyone looks at him and yells “Surprise!” Frank’s Dad is giving him a surprise birthday party. Dad bought Frank balloons and a birthday cake and hid them in the living room. Dad does not know that Frank gets embarrassed at surprise parties. Dad thinks Frank would be glad to have a surprise party. Frank and Dad are in the kitchen talking about his birthday. Frank says, “Dad I really want to go to a baseball game for my birthday.” Now remember, Dad wants the party to be a surprise, so he says, “Frank, that’s a good idea. I will think about it.”

First Order Question: What does Frank hope that Dad will do for his birthday? (*If necessary, Fill-in: Frank hopes that Dad will ____.*).

Appendix B: (Continued)

Reality Question: What did Dad really do for Frank's birthday? (If incorrect, say: "*But remember, Dad wants to surprise Frank with the party.*" If necessary, Fill-in: Dad really ____).

Then Frank says to Dad, "Great, I'm going to tell my friend next door, I'll be home later." On his way out, Frank sees the balloons and cake hidden in the living room. He thinks, "Oh no! Dad is giving me a surprise party; we are not going to the baseball game." Remember, Dad does not see Frank go into the living room and find the balloons and cake.

Linguistic Contrast Question: Does Dad know that Frank is disappointed? (*If necessary, Fill in: n/a*).

Later, Frank's grandmother comes over for the party. Grandma asks Dad, "Does Frank like surprise parties?"

Ignorance Question: What does Dad say? (*If necessary, Fill-in: Dad says ____*).

Now remember, Dad does not know that Frank gets embarrassed at surprise parties. Then Grandma asks Dad, "How will Frank feel about having a surprise party?"

Second Order Question: What does Dad say? (*If necessary, Fill-in: Frank will be ____*).

Justification Question: Why does Dad say that?

Appendix C: Score Sheet for False Belief Tasks

Name: _____

Date: ___ - ___ - ___

School: _____

Gender: M F

Ethnicity: _____

Grade: _____

Birthday: ___ - ___ - ___

Age: _____ months

Introduction: I am writing some stories for little children. I want you to tell me if you think little children would like these stories. I am going to read two stories to you. Then I will ask you questions about the stories. I want you to look at the pictures and listen carefully. If you have any questions, you can ask me.

Logical Inferencing Scenario:

Implicit False Belief: (modified from Sullivan et al., 1994)

This is a story about Pam and her Dad. Today is Pam’s birthday and she’s having a big party tonight. Dad is surprising her with a new bike that he has hidden in the living room. See? Here is the surprise bike. Pam and Dad are in the kitchen talking about her birthday. Pam says, “Dad, I really want a new bike for my birthday.” Now remember, Dad wants the bike to be a surprise, so he says, “Sorry, I didn’t get you that. I got you roller blades instead.”

First Order Question: What does Pam think Dad got her for her birthday? (*If necessary,*

Fill in: Pam thinks Dad got her ____.)

2 = Correct answer without assistance.

1 = Correct answer with cloze procedure.

0 = Incorrect answer or no response.

Child’s answer: _____

Correct answer: Rollerblades

Appendix C: (Continued)

Reality Question: What did Dad really get her for her birthday? (*If necessary, Fill in:*

Dad really got Pam ____.)

2 = Correct answer without assistance.

1 = Correct answer with cloze procedure.

0 = Incorrect answer or no response.

Child's answer: _____

Correct answer: A bike.

Then Pam says to Dad, "O.K., well I'm going over to my friend's house. I'll be home later. On her way out, Pam goes into the living room to get her umbrella because it's raining. In the living room, she finds her new bike! She thinks to herself, "Yes! Dad did not get me roller blades. He really got me a bike. Dad does not see Pam go into the living room and find the bike.

Linguistic Contrast Question: Does Dad know that Pam saw her bike in the living room?

2 = Correct answer without assistance.

1 = Correct answer with cloze procedure.

0 = Incorrect answer or no response.

Child's answer: _____

Correct answer: No.

Ignorance Question: Later, Pam's grandmother comes over for the party. Grandma asks

Dad, "Does Pam know what you got her for her birthday? What does Dad say? (*If*

necessary, Fill in: Dad says ____.)

Appendix C: (Continued)

2 = Correct answer without assistance.

1 = Correct answer with cloze procedure.

0 = Incorrect answer or no response.

Child's answer: _____

Correct answer: No.

Second Order Question: Now remember, Dad does not know that Pam saw what he got her for her birthday. Then Grandma asks Dad, "What does Pam think you got her for her birthday? What does Dad say? (*If necessary, Fill in: Dad says, "Pam thinks I got her ____."*).

2 = Correct answer without assistance.

1 = Correct answer with cloze procedure.

0 = Incorrect answer or no response.

Child's answer: _____

Correct answer: Rollerblades.

Justification Question: Why does Dad say that?

2 = Correct answer without assistance.

1 = Correct answer with cloze procedure.

0 = Incorrect answer or no response.

Child's answer: _____

Correct answer: Because he doesn't know that Pam saw the bike.

Appendix C: (Continued)

Social Inferencing Task:

Implicit False-Belief:

This is a story about Frank and his Dad. Today is Frank’s birthday. Frank wants to go to a baseball game for his birthday. He does not want a surprise party for his birthday. Frank hates surprise parties. He gets embarrassed when everyone looks at him and yells, “Surprise!” Frank’s Dad is giving him a surprise birthday party. Dad bought Frank balloons and a birthday cake and hid them in the living room. Dad does not know that Frank gets embarrassed at surprise parties. Dad thinks Frank would be glad to have a surprise party. Frank and Dad are in the kitchen talking about his birthday. Frank says, “Dad I really want to go to a baseball game for my birthday.” Now remember, Dad wants the party to be a surprise, so he says, “Frank, that’s a good idea. I will think about it.”

First Order Question: What does Frank hope that Dad will do for his birthday? (*If necessary, Fill-in: Frank hopes that Dad will _____*).

2 = Correct answer without assistance.

1 = Correct answer with cloze procedure.

0 = Incorrect answer or no response.

Child’s answer: _____

Correct answer: He hopes he will take him to a baseball game.

Reality Question: What did Dad really do for Frank’s birthday? (*If incorrect, say: “But remember, Dad wants to surprise Frank with the party.” If necessary, Fill-in: Dad really _____*).

Appendix C: (Continued)

2 = Correct answer without assistance.

1 = Correct answer with cloze procedure.

0 = Incorrect answer or no response.

Child's answer: _____

Correct answer: He is going to throw him a surprise party.

Then Frank says to Dad, "Great, I'm going to tell my friend next door, I'll be home later." On his way out, Frank sees the balloons and cake hidden in the living room. He thinks, "Oh no! Dad is giving me a surprise party; we are not going to the baseball game." Remember, Dad does not see Frank go into the living room and find the balloons and cake.

Linguistic Contrast Question: Does Dad know that Frank is disappointed? (*If necessary, Fill in: n/a*).

2 = Correct answer without assistance.

1 = Correct answer with cloze procedure.

0 = Incorrect answer or no response.

Child's answer: _____

Correct answer: No.

Ignorance Question: Later, Frank's grandmother comes over for the party. Grandma asks Dad, "Does Frank like surprise parties?" What does Dad say? (*If necessary, Fill-in: Dad says __*).

2 = Correct answer without assistance.

1 = Correct answer with cloze procedure.

Appendix C: (Continued)

0 = Incorrect answer or no response.

Child's answer: _____

Correct answer: Yes.

Second Order Question: Now remember, Dad does not know that Frank gets embarrassed at surprise parties. Then Grandma asks Dad, "How will Frank feel about having a surprise party?" What does Dad say? (*If necessary, Fill-in: Frank will be ____*).

2 = Correct answer without assistance.

1 = Correct answer with cloze procedure.

0 = Incorrect answer or no response.

Child's answer: _____

Correct answer: He will like it.

Justification Question: Why does Dad say that?

2 = Correct answer without assistance.

1 = Correct answer with cloze procedure.

0 = Incorrect answer or no response.

Child's answer: _____

Correct answer: Dad does not know that Frank gets embarrassed at surprise parties.

Appendix D: List of Priming Verbs

Mental State Verbs

Think

Know

Guess

Understand

Decide

Notice

Concentrate

Study

Action Verbs

Run

Play

Swim

Fall

Eat

Jump

Walk

Hit

Communication Verbs

Explain

Question

Complain

Demand

Beg

Remind

Promise

Discuss

Action Verbs

Climb

Crawl

Cut

Draw

Push

Brush

Ride

Drive

Appendix E: Episode Analysis of Frog Goes to Dinner

Episode 1

The boy is in his bedroom getting dressed for dinner.

He *hears* the frog croak.

He gets the frog out of the drawer.

He *hears* the car horn honk and runs out of the room.

He comes back for the frog and puts him in his pocket.

He leaves in the car with his mom and dad.

Episode 2

They arrive at the restaurant.

The valet is waiting to park the car.

The frog croaks, and the valet *hears* him.

The boy and the valet *look* at each other.

The boy looks *surprised* and *scared*.

He is *afraid* the valet will *say* something.

He runs into the restaurant after his mom and dad.

Episode 3

The boy and his parents are sitting in the restaurant *looking* at menus.

The frog jumps out of the boy's pocket, but the boy doesn't *know* it.

A band is playing music.

The frog climbs up on the stage and jumps into the saxophone.

The musician blows the saxophone, and the frog flies out.

Appendix E: (Continued)

He lands in the lobster tank.

Episode 4

The boy *checks* his pocket and *realizes* the frog is gone.

He looks *worried*.

His parents are still *looking* at the menus.

He sneaks under the table and goes to *look* for the frog.

Episode 5

The frog swims to the side of the tank and is *trying* to get out.

A lobster is swimming toward him with his pincers out.

Will the frog get out in time?

He climbs out of the tank before the lobster gets him.

Episode 6

The frog jumps into a bowl of salad.

The waiter serves the salad to a couple at the table.

They look *hungry*.

They start eating the salad, and they *like* it.

Then the lady *finds* the frog in her salad.

She *looks* up and appears *shocked*.

When she *looks* down again, the frog is gone.

Then she *sees* the frog on the man's head.

She looks *horrified* and points to the man's head.

The man gets *excited* and *tries* to get the frog off his head.

Appendix E: (Continued)

The frog jumps in a water pitcher that a waiter is carrying.

The man's toupee flies into a lady's soup bowl at another table.

The lady at the other table looks *surprised*.

The couple with the salad run out of the restaurant.

Episode 7

The waiter does not *see* the frog in the water pitcher.

He pours the frog into a water glass at a table where a man and a woman are holding hands.

The couple at the table get *mad* and leave the restaurant.

Episode 8

The boy's parents look up from their menus and *realize* he is missing.

They look *concerned*.

The boy is still *searching* for the frog.

Episode 9

The frog jumps on a souffle being served at a table.

The souffle collapses.

The people at the table *see* the frog and look *disgusted*.

The frog jumps onto a tray of dirty dishes.

Episode 10

The dishwasher *sees* the frog in the kitchen on a plate.

He catches the frog under a bowl.

He can't *figure out* which bowl the frog is under.

Appendix E: (Continued)

The frog is still under a bowl and is getting away.

The dishwasher *tries* to catch him.

The pastry chef trips over him and falls into a cake.

A waiter comes into the kitchen and also trips, dropping his tray.

Another waiter *sees* the chaos and *decides* not to go into the kitchen.

Abbreviated Episode 11

The boy's parents are still walking around the restaurant and *looking* for the boy.

They appear *worried*.

Episode 12

The cook *sees* the big mess in the kitchen and then *sees* the frog.

The cook *looks* really *mad*.

He catches the frog and *looks* at him.

He holds up a big knife.

The boy runs in and *yells*, "Stop!"

Episode 13

The boy and his parents arrive at home.

The boy is *worried* that he is in trouble.

The boy goes upstairs.

The parents look at each other and start to *laugh*.

The boy turns around and *sees* his parents *laughing*.

He *knows* he is not in trouble.

The boy is in his room and starts to *laugh*, too.

Appendix F: Description of the Eight Still Frames

Frame 1

The boy comes back to his room to get his frog.

Frame 2

The valet hears the frog croak and looks questioningly at the boy.

Frame 3

The frog is about to jump out of the boy's pocket unknown to the boy.

Frame 4

The boy sneaks under the table to look for the frog.

Frame 5

A woman is staring at the frog on a man's head and looks horrified.

Frame 6

The dishwasher catches the frog under a bowl.

Frame 7

The boy's parents are looking for him and appear worried.

Frame 8

The parents look at each other and start to laugh.

Appendix G: Consent Form

1. General Information of the Research Study:

Your child is invited to participate in a research study called “Talking and Writing about Thinking: Children’s Use of Special Meanings.” Children use special words to talk and write about thinking, for example, *think, know, guess, remember, want to, mean to, and can*. Children learn that other people also think in these ways. This is when children learn to see other people’s points of view. Our purpose is to see if 9- and 11-year children differ in their ability to use these types of words when talking or writing. This study is being conducted by faculty and students in the Department of Communication Sciences and Disorders at the University of South Florida (USF). Your county’s school district and the administrators and teachers at your child’s school have allowed us to do this study. We are asking for permission to include your child. We hope to have 100 children in grades 4 and 6 participate in the study.

2. Description of the Research Study:

This study will include 9-year-old and 11-year-old children. The initial part of the study will consist of a hearing screening and administration of a general vocabulary test. Two tasks that draw on children’s ability to reason about physical and social consequences will also be administered. These tasks require understanding of other people’s beliefs, including false beliefs. The children will then be shown a 12-minute film, *Frog Goes to Dinner*. The children will be asked to talk and write about the events in the film, focusing on the thoughts and feelings of the characters. Children find this type of activity to be fun. Testing will be accomplished in two sessions no longer than 45 minutes each.

3. Benefits of the Study:

The results of this study will help educators by leading to a better understanding of how oral language skills relate to reading and writing abilities. Story telling and reading comprehension often require the ability to take other perspectives or points of view. We assume that, if a child is able to understand the perspectives of different characters in a story, there will be a corresponding increase in reading comprehension. This study is the first step of further research that will benefit children who are struggling with reading and writing.

4. Volunteering for the Study:

Your decision to allow your child to participate in this research study is completely voluntary. You are free to allow your child to participate in this research study or to withdraw him/her at any time. If you choose not to allow your child to participate, or if you withdraw him/her, there will be no penalty to you or your child. Neither refusal to participate nor the results obtained from the study will in any way affect your child grades or eligibility for a special program in Hillsborough County. You or your child will not be paid or receive special considerations for participation in this study. There are no known risks to participants.

5. Confidentiality of Your Child’s Records:

During this study, all students will be videotaped and audiotaped; however, all videotapes, audiotapes, and test results will be kept confidential to the extent of the law.

Appendix G: (Continued)

Authorized research investigators, agents of the Department of Health and Human Services, and the USF Institutional Review Board may inspect records from this project. While the results of this study may be reported at professional meetings, published in professional journals, or used for training graduate students in Communication Sciences and Disorders, your child's anonymity will be maintained. Each child's individual data will be coded by number without the child's name and school. All data will be kept in a locked language laboratory in the Department of Communication Sciences and Disorders at the University of South Florida. The room also has an electronic security system for additional security.

6. Instructions:

Please read and sign the consent form (printed on the back) and promptly return it to your child teacher by _____. You may also return the consent form or get additional information from Dr. Elaine Silliman at the USF Department of Communication Sciences and Disorders. We would greatly appreciate your help in allowing your child to be a part of this important study. If you have additional questions, please call Dr. Silliman at (813) 974-9812. Once the study is completed, we will be happy to provide a summary of results to any parent or guardian who requests a copy. If you or your child have question about your child's rights as a person who is taking part in a research study, you or your child may contact a member of the Division of Research Compliance of the University of South Florida at (813) 974-5638.

Child's Name _____
D.O.B. _____
Teacher's Name _____

Your Consent – By signing this form I agree that:

- I have fully read or have had read and explained to me in my native language this informed consent form describing a research project.
- I have had the opportunity to question one of the persons in charge of this research and have received satisfactory answers.
- I understand that I am being asked to allow my child to participate in research. I understand the risks and benefits, and I freely give my consent to allow my child to participate in the research project outlined in this form, under the conditions indicated on it.
- I have been given a signed copy of this informed consent form, which is mine to keep.

Signature of Parent of Participant Printed Name of Parent Date

Appendix G: (Continued)

Child's Assent Statement

The research study called *Talking and Writing about Thinking* has been explained to me. I agree to be in this study.

Signature of Child Printed Name of Child Date

Signature of Parent Printed Name of Parent Date

Signature of Investigator Printed Name of Investigator Date

Signature of Witness Printed Name of Witness Date

By signing this form I agree that: Participants have been provided with adequate information relative to the study. A phone number has been provided in case of questions.

Signature of Investigator Printed Name of Investigator Date

Institutional Approval of Study and Informed Consent

This research project/study and informed consent form were reviewed and approved by the University of South Florida Institution Review Board for the protection of human subjects. This approval is valid until the date provided below. The board may be contacted at (813) 974-5638.

Approval Consent Form Expiration Date: _____

Revision Date: _____

Appendix H: Eight Still Frames



Appendix H: (Continued)



Appendix H: (Continued)



Appendix H: (Continued)



Appendix I: Script for Priming Task and Narrative Task

Priming Task

Introduction 1 (mind vs. body):

“We’re going to play a game. I’m going to show you some verbs written on cards. These verbs can express something you can do mostly with your body or mostly with your mind. For example, you mostly use your mind to think and you mostly use your body to run. We’re going to separate the two kinds of verbs into two piles. One pile will be things you do mostly with your mind, and the other pile will be things you mostly do with your body.”

Instructions 1: “Now it’s your turn. Put all the verbs you do mostly with your mind in this pile, and all the verbs you do mostly with your body in this pile.”

Scripted prompt 1: “Tell me if that verb is something you do mostly with your mind or mostly with your body.”

Introduction 2 (communication vs. body):

“We’re going to play another game. I’m going to show you more verbs written on cards. These verbs can express what you do mostly when communicating or something you do mostly with your body. For example, you can communicate or talk with a yell or a whisper and you can use your body to crawl. We’re going to separate the two kinds of verbs into two piles. One pile will be things you do mostly when you are

Appendix I: (Continued)

communicating, and the other pile will be things you mostly do with your body.”

Instructions 2: “Now it’s your turn. Put all the verbs you do mostly when you communicate in this pile, and all the verbs about things you mostly do with your body in this pile.”

Scripted prompt 2: “Tell me if that verb is something you do mostly when you communicate or mostly with your body.”

Narrative Task

Introduction: “I’m writing a book and need some help coming up with a good story to go with the video I’m going to show you. This video has many different characters. There is a boy, a frog, a mom, a dad, a cook, a waiter, and some other people. Your teacher told me that you’re a good storyteller. I need you to help me make up a good story to go with the video. You can watch the video while I do some work over here.”

Instructions: “I want you to make up the best story that you can to go with the video. Remember that to tell/write a good story, you should talk about what’s going on in the character’s minds. You need to say what they might be thinking, saying, and feeling. Tell me what you think they might be thinking, feeling, and saying. Here are some pictures from the story, to help you remember.”

Appendix I: (Continued)

Scripted questions (as needed):

- (1) What was going on in the characters' minds?
- (2) What else could be going on in the characters' minds?
- (3) What might have this character been saying?
- (4) Tell me how the characters' are using their minds.
- (5) Why do you think that character did that?
- (6) How does the character feel?
- (7) If I could listen to the characters talking, what would I hear?

Scripted questions for frames:

- 1a. What is going on in the little boy's mind?
- 1b. If I could listen to the boy talk, what would I hear?
2. This is the guy that parked the car. What's going on in his mind?
3. What's going on in the frog's mind?
4. What's going on in the little boy's mind?
5. Look at her face. What's going on in the lady's mind?
6. I wonder what he's doing. What's going on in the chef's mind?
- 7a. There are the parents. What's going on in the parents' minds?
- 7b. If I could listen to the parents talking, what would I hear?
- 8a. What is going on in the parents' minds?
- 8b. If I could listen to the parents talking, what would I hear?

Appendix I: (Continued)

If the written narrative is not readable, the following script will be employed:

“Okay, I want to make sure that I have this right. Could you read it to me out loud so that I can tape record it?”