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Mental State Verb Production in the Oral Narratives of English- and Spanish-Speaking Preadolescents: An Exploratory Study of Lexical Diversity and Depth

Belinda Fusté-Herrmann, Elaine R. Silliman, Ruth H. Bahr,
Kyna S. Fasnacht, and
Jeanne E. Federico

University of South Florida

As a preface to future studies on language impairment in bilingual children, an exploratory analysis of lexical diversity and depth in the production of mental state verbs was conducted on the oral narratives of 9- and 11-year-old children who differed by language status. English-only (EO), bilingual (Spanish-English), and Spanish-only (SO) preadolescents produced oral narratives based on a wordless video. Prior to narrative elicitation, participants completed a priming task on mental state verbs and were instructed to focus on what the characters were thinking, saying, and feeling as they engaged in their narrative formulation. Colored still frames from the video were also available to reduce the memory load on recall. The resulting narratives were analyzed for mental state verb use by category (motivational, experiential, and belief) and the influence of the language of production. Lexical diversity was determined by number of different words (normalized to type-token ratio, TTR), and lexical depth was analyzed through a descriptive analysis of variations in the meaning of the belief verb *think* with respect to the expression of certainty/uncertainty. Results indicated that the EO children used the greatest proportion of experiential and belief mental states, while motivational verb use did not differentiate the language groups. In contrast, the SO group had the greatest TTR. The descriptive analysis of the belief verb *think* revealed greater lexical depth in the EO participants. Findings are discussed in terms of cross-language similarities and differences and their applications to the mental state framework for differentiating among bilingual children who may be at enhanced academic risk because of undetected language impairment.

Hispanic students, ages 6–21 years, are the largest cultural and linguistic minority group in our nation's schools (National Center for Education Statistics [NCES] 2005a). Hispanic students are also disproportionately *overrepresented* in the learning disabilities category, while being disproportionately *underrepresented* in the speech and language impairment (LI) category (United States Department of Education, Office of Special Education Programs, 2002). The implications are that the language learning needs of many Hispanic children who are also English language learners may go beyond English-as-a-second-language programs and the provision of remedial reading interventions.

Currently, there is an absence of agreement on assessment protocols that might have the power to resolve the vexing educational and clinical problem of determining whether a bilingual child may also have a LI underpinning a reading disability (RD).[1] As a prelude to future studies with bilingual children who may have an undetected LI and a RD, we concentrate in this article on typically developing children and their concept of beliefs as realized through the semantic domain of mental state verbs. The intent is to explore how language status, that is, monolingualism or bilingualism, affects the frequency of mental state verb production. The focus is three groups of preadolescents who differ by language status: monolingual English-speaking (hereafter referred to as English only), bilingual (those whose home language is Spanish and for whom English is the second language), and monolingual Spanish-speaking (hereafter referred to as Spanish only). The reason for the emphasis on language status is that, regardless of home language, children's understanding of others' minds is made public through spoken language. As Nelson (2005) points out, a major precursor for becoming a member of a community of minds and being able to "enter into its 'mind exchange system'" (p. 32) is learning the metalanguage of the mind through a new representational system. To do so, children must develop the facility for using language itself to represent mental states more explicitly through the linguistic format of mental state expressions (Astington & Baird, 2005), an attainment that continuously evolves over the preschool and school-age years.

Requests for reprints should be sent to Elaine R. Silliman, Communication Sciences & Disorders, University of South Florida, PCD1017, Tampa, FL 33620. Electronic inquiries may be sent to silliman@cas.usf.edu.

WHAT DOES UNDERSTANDING OTHERS' MINDS MEAN FOR LANGUAGE AND LITERACY LEARNING

Consider a hypothetical reading assessment in which a 9-year-old Spanish-speaking student classified with a RD attempts to read orally a brief English story about Pam's Birthday and then answers a series of comprehension questions (Silliman et al., 2003).

> 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 . . . 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. Then Pam says to Dad, "OK, well I am going over to my friend's house". . . 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. Later Grandma (who knows the real present is a bike) comes over for the party . . . and asks Dad . . . , "What does Pam think you got her for her birthday?" (p. 251).

One of the major functions of language, both spoken and written, is to convey beliefs about the relative certainty or the truth value of what is communicated. A belief may be true, but conditionally so, or it might be false, but not necessarily so (Wilson & Sperber, 1993). Among the comprehension questions the student must answer are, "What does Pam think Dad got her for her birthday?" and the more complex "What does Dad say to Grandma?" To answer the second question, the struggling reader must coordinate the multiple perspectives of the protagonists, infer what each believes to be true, and reconcile their beliefs with what the child may know to be false. This type of social reasoning indexes more sophisticated belief reasoning, often called second-order beliefs (Wellman, 1990). This level of belief understanding requires a process of inferential comprehension in which situational knowledge and conceptual representation are integrated with linguistic knowledge (Wilson & Sperber, 1993). The outcome is that, as speakers, listeners, readers, and writers, children can now "generate and consider ideas and response possibilities which are different from ours" (Ruby & Decety, 2003, p. 2475) in both the social and cognitive realms.

Over the past 15 years, research has yielded robust results on children's developing understanding of mind as the source for the motivations, emotional states, and beliefs that characterize their own and others' mental universes. The progressive understanding of psychological states first emerges in the preschool years and, depending on theoretical frameworks, is variously referred to as (a) the landscape of consciousness (Bruner, 1986), (b) a theory of mind (Flavell, 2004; Wellman, 1990; Wellman & Cross, 2001), (c) mentalizing (Frith & Frith, 2003), (d) perspective-taking and perspective-shifting (Aksu-Koc & Tekdemir, 2004; Ochs, Kremer-Sadlik, Sirota, & Solomon, 2004; Reilly, Zamora, & McGivern, 2005; Ziegler, Mitchell, & Currie, 2005), and (e) entering into a community of minds (Nelson, 2005; Nelson et al., 2003). This accomplishment is also culturally mediated, shaped by the nature of children's sociolinguistic experiences at home and school (Cheung et al., 2004; Foote & Holmes-Lonergan, 2003; Jenkins, Turrell, Kogushi, Lollis, & Ross, 2003; Lee & Rescorla, 2002; Moore, Furrow, Chasson, & Patriquin, 1994; Ruffman, Slade, & Crowe, 2002; Tardif, Wellman, Fung, Liu, & Fang, 2005; Terwoget & Rieffe, 2003). These sociolinguistic experiences in turn affect how children learn to deploy the tools of literacy for new interactional purposes in the intellectual, social, and communicative worlds that constitute schooling.

For example, children's concepts about minds have been implicated in metacognition, specifically, how to use one's mind strategically for learning, "whether it is learning about people and minds, or beyond the social and mental worlds, learning about historical, biological, and mathematical phenomena" (Wellman & Lagattuta, 2004, p. 494). Preliminary evidence also points to a connection between children's early understanding of false belief at age 4 years and their emerging sensitivity to English phonemic structure (Farrar, Ashwell, & Maag, 2005). This relationship may reflect the cognitive and linguistic ability to deal with contradictory representations. For example, when children engage in the analysis of phonemic structure, then at the same time they must disregard meaning. Furthermore, proficiency in text comprehension has been related to children's knowledge of beliefs (Booth & Hall, 1994; Olson & Torrence, 1987), as well as their ability to benefit from the mental state discourse of stories that teachers read aloud in the classroom (Peskin & Astington, 2005).

Finally, it is noteworthy to mention that vigorous conflict exists about the causal or reciprocal role of language in children's developing concepts of intentionality, feelings, and beliefs (e.g., Astington, 2000; de Villiers, 2005; Farrar et al., 2005; Harris, de Rosnay, & Pons, 2005; Hughes et al., 2005; Peskin & Astington, 2005; Wellman & Cross, 2001). This debate is beyond our purpose and is not pursued further. Instead, we turn to the development of mental state verb knowledge and the implications for research on the bilingual-LI quandary.

MENTAL STATE VERBS: DEVELOPMENT IN ENGLISH-ONLY, BILINGUAL, AND SPANISH-ONLY CHILDREN

A major issue that must be initially addressed in any study on mental state verb development is to ascertain the category boundaries of the word meanings that denote mental states. This is not an easy task given the fluidity of word meaning, that is, "language expressions do not have meaning in and of themselves, but rather meaning potential . . . (depending on) the background knowledge of the participants" (Coulson & Oakley, 2005, p. 1522). Given this qualification, Hall and Nagy (1987) offer an instructive framework for mental state word meanings. Three subclasses of word meanings make up the mental state category: (a) those that encode motivations (intentions) and desires (e.g., *want to, have to try to, plan to, promise, can, will, may*); (b) those that convey meanings

about what is experienced, whether in the form of emotions (e.g., *happy, sad, fear, angry*), physiological reactions (such as, *hungry, tired, dizzy, thirsty*), or perceptions (e.g., *see, look, hear, notice, observe*); and (c) those that reference beliefs or cognitive states (e.g., *think, know, remember, guess, reflect, believe, figure out*).

However, in Hall and Nagy's analysis, the boundaries delineating these mental state expressions are ambiguous for at least two reasons. The first issue pertains to the relationship between lexical diversity and lexical depth. Lexical diversity typically refers to vocabulary size, which is an estimate of the number of different words (NDW) available in a lexicon, while the semantic richness of a lexicon is operationalized as lexical depth (McGregor, 2004; Ordóñez, Carlo, Snow, & McLaughlin, 2002). Included in the semantic richness rubric are literal word meaning, implied meanings, and the potential for multiple meanings (Ordóñez et al., 2002). To illustrate the multiple meaning potential, the same concept, such as *exaggerate*, can be expressed by other synonyms, for example, *overstate*, *embellish*, and *amplify*, as well as by idioms that convey figurative meaning (Hall & Nagy, 1987). For *exaggerate*, one can think of idiomatic meanings as "She always makes *a mountain out of a molehill*" or "He always *lays it on thick*."

The second concern that Hall and Nagy and others (Coulson & Oakley, 2005) present about the fuzzy boundary of mental state words relates to the influence of the local social (communicative) context on interpretation. For example, meanings that do not typically express mental states, such as *trapped*, can convey information about a mental state depending on people's shared frames of mind, for example, "She was *trapped* in her marriage." Similarly, cognitive state meanings, such as *know*, may assume a purely pragmatic function, again depending on the local social context, such as soliciting a response from a conversational partner in order to keep talk going ("Do you *know* what I did yesterday?"; Hall & Nagy, 1987, p. 170).

English-Only Children

In practice, the Hall and Nagy (1987) motivational, experiential, and belief categories parallel the developmental sequence for typically developing, English-only children.

1. *Typically developing children*: English-only children as young as age 2 years, including African American preschoolers (Curenton & Justice, 2004), show emerging evidence of the ability to understand and talk about their own desires and motivations (*want to[wanna], have to [hafta]*) and their experienced perceptions (*look, see, hear*) and feelings (*sad, happy, mad*) (Bartsch & Wellman, 1995; Gerhardt, 1991; Wellman, Phillips, & Rodriquez, 2000). Between the ages of 7 and 11 years, more complex emotional concepts relating to loneliness, anxiety, and embarrassment, among others, become elaborated (Aldridge & Wood, 1997). Belief verbs appear to be more cognitively and semantically complex for young children, suggesting that the depth of meaning relations for particular concepts requires extensive semantic elaboration (McGregor, 2004), likely through the slow mapping process of intensive and long-term experiences, with reading and writing as one primary vehicle. For example, Nixon (2005) found that belief verbs encoding degrees of relative certainty (e.g., "I *know* where the kitty is") were easier for 4 year olds than belief verbs encoding degrees of relative uncertainty, such as *wish*, *think*, and *consider*.

Only a few studies with school-age children have considered belief verbs. Schwanenflugel, Fabricius, and Noyes (1998) focused on the continuing development of the concept of mind in 9- and 11-year-old children ($N = 25$ in each group) and 25 adults residing in rural Georgia by examining changes in their semantic organization for verbs of *knowing*. The certainty–uncertainty continuum served as the basis for identifying clusters of *knowing* that represented lexical extensions in meaning: One cluster was an input or experiential cluster that contained verbs expressing more certainty, such as *see, observe, search,* and *examine*. Another cluster consisted of belief verbs that were "more uncertain (and) more inferential" (Schwanenflugel, Henderson, & Fabricius, 1998, p. 514), such as *guess, estimate, question, reason*, *understand,* and *think*. Major developments in lexical depth occurred between ages 9 and 11. The performance of the 9- and 11-year-old children closely approximated adult performance for the experiential verbs, suggesting that the concept of relative certainty was easier for them; however, the 11-year-old participants still did not approximate the adult patterns of performance for belief verbs; hence, relative uncertainty remained a more complex concept during the preadolescent years for this group.

A second study (Booth & Hall, 1995) specifically explored levels of meaning for *know*, in four groups of children: 3 year olds ($N = 19$), 6 year olds ($N = 21$), 9 year olds ($N = 25$), and 12 year olds ($N = 17$). Six different levels of meanings were proposed, from *know* as an act of perception (or experience), for example, "I *know* your story" ("I have heard your story" or "I perceived what you said"), to *know* as the expression of relative certainty (a belief), for example, "He guessed the answer, but I *know* it" (Booth & Hall, 1995, p. 532). Findings again support the view that learning to differentiate levels of meaning slowly evolves from the preschool years through the preadolescent years. Only the 12 year olds provided evidence of a hierarchically reorganized lexicon for the multiple meanings of *know.*

Of more than passing interest, these findings on children's continued development of motivational, experiential, and belief concepts parallel the criteria for proficient reading comprehension at grade 4 on the National Assessment of Education Progress (NAEP) (NCES, 2005b). Among the skills expected for proficiency are the abilities to: (a) recognize meaning of specialized vocabulary from context, (b) make inference to identify the intent of a description, (c) provide reason that explains feelings of a biographical subject, (d) provide

explanation of a character's feelings, and (e) identify the main theme of a story.

2. *English-only children with LI*: Only four studies since 1990 have explicitly investigated mental states in school-age children with LI. Comparisons across studies are difficult due to significant differences in conceptual frameworks, study purposes, sample selection (i.e., whether children were school-based or clinically based samples), diagnostic measures and criteria for verifying a LI, tasks administered, and statistical analyses. Participant ages in these four studies ranged from age 5 years (Miller, 2001, 2004) to 12 years (Norbury, 2005), with sample sizes varying from 12 to 52. Only one study (Greenhalgh & Strong, 2001) employed narrative retellings, based on the wordless picture book, *Frog, Where Are You*? (Mayer, 1969), a book used extensively in cross-linguistic research on narratives (Berman & Slobin, 1994). The outcome measure was the frequency of production of general mental and linguistic verbs, such as *thought, wished, called,* and *yelled.* No distinction was made between different potential meanings of the same word. Two studies (Miller, 2004; Ziatas, Durkin, & Pratt, 1998) focused more specifically on relationships between first-order false belief tasks and use of the belief verb *think.* First-order beliefs are commonly assessed in tasks where children must predict what another will do by comparing their own belief knowledge about object relocation with a character's uninformed (false) belief about changed location (Wellman, 1990). The third study (Norbury, 2005) examined links among metaphor comprehension, semantic knowledge, and first- and second-order false beliefs, which are beliefs about beliefs, such as implied in the Pam's birthday scenario. The metaphor task was designed as a cloze procedure, for example, *Sam's new dog is very big. It is a—* (Norbury, 2005, p. 399). Children were presented with four choices, three foils and the metaphoric choice, in the above example, *an elephant*.

On balance, outcomes from these studies suggest four patterns. First, as obtained from a narrative retelling, simple frequency counts of a global category, such as mental and linguistic verbs, seem not to be sensitive to possible differences between children with LI and age-matched peers (Greenhalgh & Strong, 2001). It should be noted that frequency counts are estimates of lexical diversity only and do not provide insight into lexical depth. Second, whether or not children with LI display difficulty with first-order false belief tasks may depend on their age (Miller, 2001, 2004; Ziatas et al., 1998). Third, interdependence between the ability to reason about first-order false belief concepts and the linguistic capability to process sentential complements that refer to cognitive verbs, for example, "*Where does the puppet think [that] the toy is*" (Miller, 2001, p. 82) cannot be ruled out as a factor in the difficulties that kindergarteners with LI encounter on first-order false belief tasks (see also de Villiers, 2005; de Villiers & de Villiers, 2000). Lastly, in regard to older children with LI, the depth of semantic knowledge as represented in metaphor comprehension appears essential for the consolidation of belief reasoning (Norbury, 2005). Hence, exploring links between lexical depth and belief understanding appears to be a promising research area for future studies in LI.

Spanish-Only and Bilingual Children

In terms of sociolinguistic variations in metalanguage development, only one study has directly examined the emerging development of mental state references in Spanish-only children. Adrian, Clemente, Villanueva, and Rieffe (2005), in a study conducted in Spain with 34 children ($M = 4.10$) and their mothers, analyzed the mental state expressions that the mothers produced during a picture book reading activity. These expressions included cognitive state terms (e.g., *think, know, remember*), desire state terms (e.g., *want, hope*), emotion state terms (e.g., *happy, sad, angry*), and perceptual state terms (e.g., *see, look, watch*). The frequency and diversity of cognitive state and emotion expressions correlated positively with children's performance on a first-order false belief task. The cognitive state association was expected, but not the emotion state relationship, based on findings from English-only mother–child dyads (e.g., Ruffman et al., 2002). Adrian et al. speculated that this latter association may be language specific, that is, Spanish may have more emotion references that also convey beliefs than does English.

Shifting to bilingual children in the United States, again, just one study has examined mental state concepts in school-age bilingual children (Silliman, Bahr, Brea, Hnath-Chisolm, & Mahecha, 2002). Among the goals of this latter study was to assess whether the level of English language proficiency of 28 children, aged 9–11 years, influenced the production of mental state concepts in English and Spanish narrative retells of wordless videos that highlighted mental states of cartoon characters. Based on school-administered measures of proficiency, participants were divided into two groups, emerging English proficiency ($n = 14$) and fluent English proficiency ($n = 14$). Findings indicated that the language of retelling, rather than the degree of English proficiency or age differences, influenced production of mental state concepts. For both groups, more variety, or lexical diversity, was produced in Spanish than in English, an outcome suggesting that, as groups, children were still operating with relatively separate, rather than overlapping, lexical systems.

These results are consistent with the bilingual model of Hernandez, Li, and MacWhinney (2005), which conceptualizes developing lexical organization as fashioned by simultaneous growth in the size of the lexicon (lexical diversity) and in representational richness (lexical depth). In this model, marked inequalities will be found in the lexicons of emerging bilinguals, not just in their knowledge of mental state references, because new second language (L2) words do not have a direct meaning link with the larger and richer first language (L1) lexicon. Instead, new meanings are only weakly associated with L1 forms. This may generate lexical interference, which then produces more errors in academic activities where children are asked to produce specific words in the L2 (Bedore, Peña, García, & Cortez, 2005). Interference may also reflect convergence, a phenomenon where, for example, the less stable and more vulnerable lexical system

becomes more similar to the stronger lexical system, due to cross-language contact (Montrul, 2004). At another point in time, depending on the particular cognitive and social complexity of an interaction, lexical interference could be a product of attrition. Köpke (2004) defines attrition as the selective loss of particular L1 linguistic features, which are influenced by transactions among a variety of complex cognitive and social factors, including the influence of new L2 vocabulary acquired through reading and writing.

The few large-scale studies on the oral language development of bilingual children, for example, the Miami project (Pearson, 2002; see also Miller et al., this issue), also employed the *Frog* book to obtain Spanish and English narrative retells. The purpose was to compare general syntactic development in each language and overall lexical diversity as assessed by the NDW. Mental state verbs were not a focus in the Miami project. It should be noted that, for English-only children, the NDW metric is considered an "effective indicator of developmental progress in (oral) vocabulary diversity" (Watkins & DeThorne, 2000, p. 240). However, a limitation of this measure, among others, is that it is an estimate of lexical variety only and not lexical depth. Two recent studies, however, have explored vocabulary depth in bilingual children who varied in their English proficiency (Bedore et al., 2005; Ordóñez et al., 2002). Both studies employed word definition tasks, although the nature of the tasks and scoring systems differed, as did the ages of the children in the studies. In general, relatively little research has been conducted on the English reading comprehension of bilingual children, including the crucial role of English vocabulary knowledge for inferential comprehension (Proctor, Carlo, August, & Snow, 2005).

To sum up, little is known about the capacity of bilingual children, and much less about bilingual children who may have a LI, to infer the less tangible psychological voices that express multiple perspectives and multiple meanings about motivations, experiences, and beliefs. In that regard, Cummins' (2000) distinction between conversational and academic language proficiency is relevant for the concept of schooling as a metalanguage journey. Although bilingual children may achieve social conversational proficiency, many may not attain a level of academic language proficiency that allows "access to and command of the oral and written academic registers of schooling" (Cummins, 2000, p. 67). August and associates (2003) report data estimating that, even in school systems with successful programs for English as a second language (ESOL), achieving social conversational proficiency requires 3–5 years, while academic language proficiency may take as long as 4–7 years. The conditionality of beliefs and its associated vocabulary are important aspects of academic language proficiency that have received minimal attention in narrative studies with either English-only or bilingual children who are at risk for reading failure.

Purpose

This exploratory study had three purposes. First, the study was designed to investigate whether encoding of mental states in oral narratives differed by language status. Few studies have examined this topic in Spanish-speaking children, whether they are bilingual or Spanish-only speakers. A particular point of interest is whether the language of production influences frequency of mental state verb use by category. Second, we sought to supplement this analysis with a descriptive analysis of the lexical depth of the belief verb *think*. The objective here was to explore how the linguistic and social contexts of the communicative event influenced children's lexical choices in encoding the concept of relative uncertainty. The last objective is more long-term. We sought to investigate on a preliminary basis whether the mental state framework motivating this study might be sufficiently sensitive for the ultimate prediction of reading comprehension difficulties in bilingual children whose reading struggles may be related to undetected LIs.

METHOD

Participants

Three different groups of typically developing 9- and 11-year-old children participated in the study: an English-only (EO) group, a bilingual (BI) (Spanish-English) group, and a Spanish-only (SO) group. The EO and BI groups all attended public elementary schools in an urban area of West Central Florida. The SO children lived and attended school in a rural area of Costa Rica. In accord with human subject protection requirements, written parental consent was obtained in English or Spanish, and all children gave written and verbal assent.

As displayed in Table 1, the 50 EO children consisted of 26 9 year olds; 18 were Caucasian, 7 were African American, and 1 was Hispanic American. Of the 24 11 year olds, 14 were Caucasian, 8 were African American, and 1 was Hispanic American. All children were from monolingual, English-speaking families and were speakers of Standard American English, according to their classroom teachers. Approximately 70 percent of the school population was eligible for the federal lunch program, and the school received Title I funds.

The 27 BI children came from primarily monolingual Spanish-speaking homes, as determined by a teacher questionnaire on language use in the classroom (based on Gutierrez-Clellen & Krieter, 2003). Of the 27, the majority ($n = 15$) were first-generation Hispanic Americans. The remaining children were born in México ($n = 8$), Cuba ($n = 3$), or Guatemala ($n = 1$). All were enrolled in ESOL programs in a variety of Title I schools. Although the ESOL programs varied in their focus and content, all emphasized transitioning to English.

The 29 SO children all lived in an urban area of Costa Rica and attended the same public school, with class sizes of approximately 30 children. According to information provided by the school, most students' mothers did not work, while most fathers held blue collar jobs. Also, high stakes achievement testing is not routine in the particular school. The Costa Rican government develops and implements a nationalized curriculum, but teachers have some latitude in curriculum adaptation to incorporate "the customs and culture

TABLE 1
Composition of the Three Language Groups: English Only (EO), Bilingual (Spanish-English) (BI), and Spanish Only (SO)

	EO	*Mean Age (Years:Months)*	*BI*	*Mean Age (Years:Months)*	*SO*	*Mean Age (Years:Months)*
9 year olds	26	9:5 (3.71)[a]	15	9:6 (2.9)	10	9:4 (.31)
	$F = 15$		$F = 8$		$F = 6$	
	$M = 11$		$M = 7$		$M = 4$	
11 year olds	24	11:3 (2.26)	12	11:4 (.26)	19	11:6 (.29)
	$F = 14$		$F = 8$		$F = 10$	
	$M = 10$		$M = 4$		$M = 9$	
Total	50		27		29	
	$F = 29$		$F = 16$		$F = 16$	
	$M = 21$		$M = 11$		$M = 13$	

F = Female; M = Male. [a]Standard deviations (*SD*) are shown in the parenthesis in months.

of their region" (Stough & Aguirre-Roy, 1997, p. 566). Of some note, Costa Rica has an estimated literacy rate of 92 percent, with females having more years of schooling (Avalos, 1987; Stough & Aguirre-Roy, 1997). Table 1 shows the composition of these three language groups.

Inclusion Criteria

To be included in the final sample, all children had to meet four basic inclusion criteria: (a) not eligible for or have previously received special education or related services; (b) have normal hearing sensitivity; as assessed by an audiometric screening; (c) perform within 1 standard deviation (*SD*; a standard score of 85–115) on either an English or Spanish vocabulary measure; and (d) pass a mental state verb priming task (see below). The BI participants also had to be receiving bilingual or ESOL educational services.

Teachers of the BI children assessed their Spanish language status in the classroom using a modified version of a questionnaire from Gutiérrez-Clellen and Krieter (2003). To be included in the study, children had to be rated by their teachers with a minimum Spanish language score of 3 (0 = *no use* to 4 = *use all the time*), and they had to be speaking Spanish in the classroom at least 20 percent of the time (Gutiérrez-Clellen & Krieter, 2003; Gutiérrez-Clellen, Calderon, & Ellis Weismer, 2004). From teacher surveys, it was also determined that none of the students had prior or current histories of speech, language, or other learning problems.

Hearing Screening

The hearing levels of the EO and BI children were screened in their school setting before other inclusion measures were administered. A Beltone Audio Scout audiometer, calibrated according to the American National Standards Institute (ANSI; 1996), was used for the audiometric screening. To pass, children had to respond to tones at 20 dB HL for 1,000, 2,000, and 4,000 Hz. For the SO group, hearing screenings were administered in a quiet classroom using the same procedure on a Win Book X2 laptop using audiometric software, *The Home Audiometer and Hearing Test,* Version 1.61 (Esser, 2004).

Vocabulary Measure

All children's breadth of vocabulary was assessed with one of two standardized measures. The *Peabody Picture Vocabulary Test* (PPVT-III; Dunn & Dunn, 1997) was administered to the EO children as a measure of their breadth of lexical knowledge. To be included in the study, children needed to score within ± 1 *SD* of the mean for their age ($M = 100, SD = +15$). Table 2 shows standard score means and *SD*s for the three language groups. Children in both the BI and SO groups were administered the same vocabulary measure, the *Expressive One-Word Picture Vocabulary Test-Spanish Bilingual Edition* (EOWPVT-SBE; Brownell, 2000). Examiners were fluent in Spanish. The EOWPVT-SBE was selected to provide a benchmark for lexical familiarity in Spanish. Consistent with the manual procedures for administration, children were allowed to answer in either Spanish or English; however, the bilingual examiner always probed for the Spanish response.

According to the technical manual (Brownell, 2000), the EOWPVT-SBE was originally normed on 1,050 bilingual children from 50 cities and 17 states in the United States. In selecting this measure for the SO children, differences had to be considered in vocabulary usage between the Costa Rican

TABLE 2
Vocabulary Scores for the Three Student Groups

	Age 9		*Age 11*	
	Mean	*SD*	*Mean*	*SD*
English only[a]				
$n = 26$	105.0	10.2		
$n = 24$			103.0	9.1
Bilingual[b]				
$n = 15$	112.6	14.2		
$n = 12$			107.7	8.7
Spanish only[b]				
$n = 10$	61.2	7.5		
$n = 19$			84.4	12.8

Note. Entries are standard scores ($M = 100$; $SD = 15$).

[a]Scores are from the *Peabody Picture Vocabulary Test* (PPVT-III; Dunn & Dunn, 1997).

[b]Scores are from the *Expressive One-Word Vocabulary Test–Spanish Bilingual Edition* (EOWVT-SBE; Brownell, 2000).

dialect and other Spanish dialects. For example, the Costa Rican dialect has been markedly influenced by English. For example, in Spanish, *lo siento* is a common way of expressing "sorry"; however in the Costa Rican dialect, this meaning is pronounced as *sorry* with a Spanish accent. To minimize the effect of possible dialectal variation on the performance of the Costa Rican children, two Costa Rican adults provided alternate vocabulary words for Costa Rican Spanish when possible conflicts in pronunciation occurred. Despite this modification, none of the 9 year olds scored within −1 *SD*, and only 9 of the 19 11 year olds' scores fell with 1 *SD* (see Table 2). A feasible reason for the discrepancy in performance is that this measure was not culturally appropriate for the Costa Rican participants. In other words, because the test was normed on bilingual North American children, in many cases the pictures did not adequately represent the experiences of Costa Rican children. As an example, one picture showed a number of monuments found in Washington, DC. The expected response was *monuments*. However, Costa Rican children likely would have a minimal schema for American monuments resulting in an incorrect lexical choice. Their most common response to *monuments* was *statues,* which are common objects in Costa Rica. This difference in situational knowledge strongly suggested that cultural factors contributed to their reduced scores, rather than a lack of vocabulary knowledge. The decision was made, therefore, to keep children in the study as long as they had passed the hearing screening and the mental state priming task, which is described next.

Mental State Verb Priming Task

All children engaged in a priming activity for two reasons: first, to ensure they were familiar with differences in meaning for verbs denoting cognitive, communication, and physical acts and, second, to establish a cognitive orientation that might increase the probability of mental state verb production in their narrative retellings. Verbs were selected in order to provide a clear contrast among (a) "things you do with your body (e.g., English: walk, push, drive; Spanish: *caminar* – to walk, *brincar* – to jump, *manejar* – to drive)," (b) "things you do with your mind (e.g., English: think, guess, study; Spanish: *creer* – to think, *mirar* – to look, *estudiar* – to study)," and (c) "different ways of communicating (e.g., English: demand, question, promise; Spanish: *decir* – to say, *explicar* – to explain, *pedir* – to ask."

The task, presented on 32 2" × 4" laminated cards with the priming verbs printed on them, consisted of 16 action verbs, 8 cognitive verbs, and 8 communication verbs. There were also three larger cards, each with a picture representing the category name (in English, body, mind, and communication; in Spanish, *cuerpo* – body, *mente* – mind, and *comunicación* – communication). Children were instructed in either English (the EO group) or Spanish (the BI and SO groups) to sort the cards into the three categories. The EO and Spanish groups read each card. However, for the BI group, the bilingual examiner read the verbs for the majority since they were not literate in Spanish. Before beginning the task, children were given examples of verbs of physical action, cognition, and communication.

To maintain attention to the task, children first compared cognitive verbs ($n = 8$) with physical action verbs ($n = 8$), and next compared communication verbs ($n = 8$) with a different set of physical action verbs ($n = 8$). Scripted prompts were employed as necessary, such as, "Tell me if that verb is something you do with your mind or your body." A maximum of 10 minutes was allowed to complete the task. Most children finished within 5 minutes without further instruction from the examiner. Inclusion in the study for all three language groups depended on appropriate sorting of the verbs into their categories. All children completed this task with 100 percent accuracy.

Procedure

Oral Narrative Elicitation

Oral narratives were elicited from all three language groups, in English for the EO children and in Spanish for the BI and SO children. An 11-minute, 41-second, textless video, *Frog Goes to Dinner* (Osborn & Templeton, 1985), a story rich in mental states, was used for this purpose. The story involves a boy who, unbeknownst to his family, takes his pet frog to dinner in an expensive restaurant. The frog wanders away from the boy, comes into contact with multiple characters in the restaurant, and, as a consequence, has numerous adventures that violate conventional social expectations before the boy finally finds him. Although the examiner was physically present during the video presentation, the examiner did not collaboratively watch the film, in order to reduce child assumptions about the examiner's familiarity with the story. A total of eight color still frames printed from the video were available to all children. The rationale for the inclusion of film frames, as well as the scripted prompts, was derived from Wellman, Cross, and Watson (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. An assumption, therefore, was that enhanced salience would also heighten the quality of the narrative through children's incorporation of mental state verbs. Additionally, the availability of the still frames served as a strategy for reducing possible verbal working memory demands that could compete with language formulation demands.

Instructions in both English and Spanish specified that to tell a good story "*You should talk about what's going on in the character's mind. You need to say what they might be thinking, saying, and feeling*." Scripted questions in both English and Spanish were also utilized as necessary as another form of guided assistance for two purposes: (a) to support children's interpretation of the characters' beliefs and their virtual dialogue and (b) to sustain their focus on the formulation of mental state references. Examples of these questions included: "*What was going on in the [characters'] minds*?/ *Qué tú piensas que está pasando en la mente de esos personajes (en qué piensan los personajes)? (What do you think is going on in the characters' mind?)*" and "*If I could listen to the characters talking, what would I hear?/ Si yo pudiera oír al personaje hablando, que yo oiría? (If I could listen to*

the characters talking, what would I hear?). The three language groups were also allotted a maximum of 10 minutes to produce their narratives.

Instrumentation

The video was presented on a Dell laptop to the EO and BI groups. In addition, all narratives were video recorded with a Panasonic 16× optical zoom/22× digital Palmcorder and audio taped with a Optimus CTR-117 audiocassette recorder using an Optimus 33–3013 tie-clip microphone. Because of technical issues**,** the narratives of the SO group were not video taped but were audio recorded with a Sharp ViewcamZ video camera.

Data Analyses

Transcription

The narratives of the three language groups were transcribed verbatim by their respective examiners. The EO transcriptions were rechecked for accuracy by another member of the research team. The BI transcriptions were cross-checked by a bilingual member of the research group, while SO transcripts were checked for accuracy by a graduate student in communication sciences and disorders who was also a native Costa Rican speaker. All transcripts were then divided into T-units (Hunt, 1965), which are clausal units, and entered into the software program, the Systematic Analysis of Language Transcripts (SALT; Miller & Chapman, 2004). Next, all transcriptions were analyzed for the occurrence of mental state verbs. Frequency data for each mental state verb appearing within a T-unit were tallied and converted into ratios that normalized the frequency count by the total number of T-units in the narrative.

Mental State Verb Coding

Mental state verbs were identified from research with children from the late preschool to preadolescent years (e.g., Astington, 1998, 1999, 2000; Bartsch & Wellman, 1995; Booth & Hall, 1995; Peskin & Astington, 2005; Schwanflugel et al., 1998). The result was a classification schema, based on Hall and Nagy (1987) as described earlier, and consistent with the concept of a developmental continuum. A total of 68 verbs in English and Spanish were subdivided into three categories: 24 motivational references, 33 experiential references, and 11 belief references. This schema was not an exhaustive one for either language, but represented potential examples that could possibly occur in the oral narrative productions of the three language groups. To determine the category that a particular verb fits best, the linguistic and social contexts in which the particular instance appeared was carefully examined.

1. *Motivational verbs*: In both English and Spanish, motivational mental states express desire, need, and intentionality (e.g., *want, querer; need, necesitar; try, tratar; promise, prometer*), including the intention to communicate (e.g., *say/tell, decir; ask, preguntar; complain, quejarse*).
2. *Experiential verbs*: Experiential mental states in both languages reference: (a) perceptions deriving from sight, hearing, taste, and touch (e.g., *see, ver; hear, oir; taste, gustar; smell, oler; feel, tocar*) and (b) situational emotions (Aldrich & Wood, 1997; Baron-Cohen, 1995) (e.g., *surprised, sorprendido; angry, enfadado)* that may be motivated by (c) physiological reactions to a mental state (e.g., *thirsty, sendiento/tener sed; hungry, hambriento/tener hambre)*. Although emotional and physiological states are often encoded syntactically as adjectives, for this study, occurrences were classified as verbs.
3. *Belief verbs*: Verbs encoding belief in the two languages index more conceptually complex understanding of others' minds by referencing the psychological processes that govern cognitive and verbal activities (Bartsch & Wellman, 1995; Hall & Nagy, 1987; Schwanflugel et al., 1998). Specifically, beliefs code degrees of relative certainty about the truth or falsity of ideas being expressed, such as *think, pensar; know, saber; guess, adivinar/creer*. Belief verbs in English may also variably co-occur with modal auxiliaries (Verstraete, 2001) and with adverbials that can serve to mitigate or increase the force of an interpretation (Quirk, Greenbaum, Leech, & Svartvik, 1985), for example, "Tom *thought* he *probably* [*absolutely*] *might have been* a good runner if he practiced more often."[2] It is at this level that English and Spanish begin to diverge because of the more flexible morphology of Spanish in expressing beliefs (Perez-Leroux, 1998, 2001).

General Lexical Diversity

Another metric for assessing the overall variety of words produced in a narrative sample is the NDW, a measure of lexical diversity. In SALT, NDW can be determined for both EO and Spanish-speaking children by calculating the number of different root words. For example, for the Spanish narratives, shared roots, such as the infinitive of a verb or the common denominator of a group of words were determined first. For instance, if a child produced *explicar, explico, explicas*, and *explicaba* in the narrative, then credit was assigned for one different word (because all of the words were derivatives of the root word *explicar*), but four words were added to the total number of words produced. Similarly, if the child produced *lo, la, los,* and *las*, credit was given for one different word and four words were added to the total number of words. According to Miller et al. (this issue), because NDW is determined by the word roots of English and Spanish, lexical diversity is measured in a comparable way for each language.

Descriptive Analyses

Database Comparisons

To compare findings for mental state verb use and NDW in the EO, BI, and SO groups to those from a different sample, transcripts were downloaded from the Child Language Data

Exchange System (CHILDES; 2003) for the Miami bilingual study (Oller & Eilers, 2002). A total of 10 transcripts were randomly selected from the EO 10–11 year olds, and an additional 10 transcripts were randomly chosen from the BI 10–11 year olds. Only Spanish narratives were selected for the BI transcripts. These transcripts were also examined for the occurrence of motivational, experiential, and belief verbs. It should be noted that narratives were elicited differently in the Miami project than in the current study. For example, the wordless picture book, *Frog, Where Are You?* (Mayer, 1969), served as the elicitation method for the Miami group (Pearson, 2002); therefore, the determination of clauses and clause length varied slightly from this study. However, from a descriptive perspective, there was sufficient similarity to warrant exploratory comparisons.

Lexical Diversity and Depth

Finally, to obtain a more refined picture of lexical diversity and depth, the distribution of different mental state verbs was examined, and a qualitative analysis conducted on a preliminary basis to examine the lexical depth of the belief verb, *think*. As modified from the Nordqvist (2001) study on Swedish children, aged 9, 12, and 15 years, variations in the meaning of *think* were examined in their specific social contexts. The purpose was to determine the extent to which the meanings of *think* in English and Spanish represented degrees of uncertainty and certainty.

Inter-Rater Agreement

English-Only Narratives

Inter-rater agreement for coding consistency was conducted for 16 narratives (32 percent of the total). The samples were randomly chosen, such that the two age groups were equally represented. The primary coder was a doctoral student in communication sciences and disorders. 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 the definitions guiding segmentation of the transcripts into T-units. Point-to-point inter-rater agreement for T-unit segmentation accuracy was 90 percent. Point-to-point agreement for classification of mental state verbs was 95 percent.

BI and SO Narratives

The same training procedures employed for the EO group were utilized for all inter-rater determinations. Thirty-three percent of the BI children's transcripts were randomly selected and independently coded by a second bilingual doctoral student in communication sciences and disorders for the accuracy of T-unit segmentation and the classification of mental state verbs. Point-to-point inter-rater agreement was 92.9 percent for T-unit accuracy and 92.3 percent for the categorization of mental state verbs.

The identical point-to-point agreement procedure was followed for the SO group. Again, 33 percent of the transcripts were randomly chosen and independently recoded by the same bilingual doctoral student for the accuracy of T-unit segmentation and assignment of the mental state categories. Inter-rater agreement for T-unit accuracy was 90 percent and 84 percent for the mental state categorization. This agreement percentage was lower than for the BI participants, but it was still considered to meet standards of adequacy.

RESULTS

Analyses of Mental State Verb Use

The primary purpose of this investigation was to determine if language status influenced the frequency of mental state verb production and if this varied by category. A three-way multivariate analysis of variance (MANOVA) was conducted considering age (9 vs. 11 years), verb type (mental state verb categories), and language status (EO, BI, SO). The results of the 3-way MANOVA revealed a significant interaction between verb type and language status, $F(4,198) = 2.731$; $p = .030$, partial $\eta^2 = .052$. Post hoc testing using the Bonferroni procedure revealed that 3 out of 9 planned comparisons were significant. As illustrated in Figure 1, the use of belief references was significantly greater in English than in Spanish. In addition, the EO group also used more experiential verbs than did the other two language groups. There was no difference across language groups in their use of motivational verbs.

The only other significant effects included the main effects for mental state verbs, $F(2,99) = 46.731$, $p < .001$, partial $\eta^2 = .486$ and for language, $F(2,100) = 12.074$, $p < .001$, partial $\eta^2 = .195$. Post hoc testing with the Bonferroni procedure revealed that the frequency of occurrence across the mental state verb categories was significantly different for all

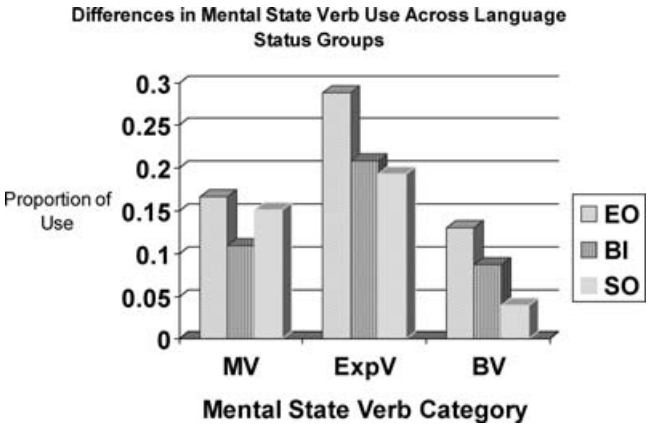

FIGURE 1 Differences in mental state verb use across language-status groups (MV = motivational verbs; ExpV = experiential verbs; BV = belief verbs).

TABLE 3
Comparison of the Mental State Verb Categories Produced by 10–11 Year Olds Across Languages and Databases

	No. of Participants	*Avg. No. T-Units*	*# Motivational Total*		*# Experiential Total*		*# Belief Total*		*Combined Mental State Average*
			N	*Ratio*	*N*	*Ratio*	*N*	*Ratio*	
EO (current study)	24	70.6	219	.13	491	.30	179	.11	.59
EO–Miami Transcripts (CHILDES Database)	10	29.3	50	.17	84	.29	5	.02	.52
BI (current study)	12	32.4	20	.07	80	.21	24	.08	.41
BI–Miami Transcripts (CHILDES Database)	10	33.6	18	.05	58	.16	42	.14	.35
SO (current study)	19	27.6	90	.17	121	.23	19	.05	.41

Note. The split cells in the mental state verb categories indicate total number of verbs in each category across all participants in the left column and, in the right column, a normalized ratio of frequency of mental state verbs as a product of T-units averaged over all participants. EO = English only group; BI = Bilingual group; SO = Spanish only (Costa Rican) group.

pairwise comparisons. Hence, experiential verb use was the greatest, followed by motivational verbs; belief verbs were used the least frequently. When the pairwise comparisons for language status were considered, EO children produced the greatest proportion of mental state verbs in their narratives, while SO and BI children evidenced a similar pattern of production.

To further analyze mental state verb production, the total number of mental state verbs by category in our sample was compared to mental state verb use in similar narrative constructions from the Miami (EO and BI) transcripts taken from the CHILDES Database. As illustrated in Table 3, experiential verbs were elicited the most frequently in the narratives of the 10–11 year olds (grade 5). The EO and BI groups from the Miami Database then differed in whether motivational or belief verbs were used the least often, with the BI-Miami group using more belief than motivational references. Our EO group was the most prolific in all mental state categories, but when the number of occurrences was normalized by the average number of T-units, the proportions suggested smaller group differences, with differences between motivational and belief proportions being greater in the Miami samples (both EO and BI) and our SO group.

Because the differences in normalized values across the mental state categories did not appear to demonstrate a consistent pattern attributable to language status, the values were collapsed across mental state categories, and a combined value for mental state verbs was created. These values were subjected to a univariate analysis of variance (ANOVA), which revealed a main effect for language group, $F(4,121) = 6.784$, $p < .001$, partial $\eta^2 = .183$. Post hoc testing with the Bonferroni procedure revealed that the EO group used more mental state verbs ($M = .588$ or approximately 6 out of every 10 T-units) than both BI groups and the SO group. The performance of the EO group was not significantly different from the EO-Miami group.

On the other hand, the BI groups and the SO group performed similarly to one another in their mental state verb use and these groups were not significantly different from the EO-Miami group (see Table 3 for aggregated normalized values). These results suggest that the EO group used more mental state references overall, but not significantly more than the EO-Miami group. These differences could be attributed to variations in language(s) used and/or dissimilarities in narrative elicitation procedures.

Analyses of Lexical Diversity and Depth

The next set of statistical analyses considered overall lexical diversity and lexical depth within our participants. A two-way ANOVA was run with age (9 vs. 11 years) and language status (EO, BI, SO) as the independent variables. The dependent variable was NDW converted to type-token ratio (TTR) to control for unequal sample length (i.e., NDW divided by the total number of words in the sample).

This analysis revealed only a main effect for language status for TTR, $F(2,100) = 7.444$, $p = .001$, partial $\eta^2 = .130$. Post hoc testing revealed that the SO group produced a significantly greater TTR than did the other two groups. The data (see Table 4) revealed that our SO group produced significantly more different words than did the other group, when sample length was controlled. One possible explanation for the vastly different performance by the SO group could be narrative style. It is possible that their preference, in comparison to the other groups, was to summarize more or "get to the point." The result would be shorter narratives with a greater variety of words. Because the complexity of their syntactic constructions was not analyzed, it is not possible to state that embedded constructions or elaborated noun and verb phrases contributed to the shorter length and higher TTR. Regardless, these findings are in direct opposition to the vocabulary test results, where few of the SO group were able to meet the inclusion criteria. Hence, the content, manner, and method of assessment can yield quite divergent results.

Belief verbs produced by the three language groups were also examined in their linguistic and social contexts in order to determine the construction of meaning in relation to the certainty–uncertainty continuum.

English-Only Group

The most frequent belief verb that the 9- and 11-year-old children produced was *think* (37 and 27 instances, respectively), followed by *know* (7 and 12 instances, respectively). Other

TABLE 4
Comparisons of Lexical Diversity for the 9 Year Olds in the Three Language Groups and for 10–11 Year Olds in the Three Language Groups and the Miami Database

Language/Sample	*Number of Participants*	*Age*	*Mean NDW*	*SD NDW*	*Mean TTR*	*SD TTR*
EO (current sample)	26	9	148.08	55.13	.33	.08
BI (current sample)	15	9	65.73	25.02	.34	.09
SO (current sample)	10	9	65.9	31.62	.38	.09
EO (current sample)	24	11	174.42	45.15	.29	.07
EO Miami Database[a] (Pearson, 2002)	40	10–11	98.0	23.0	—[d]	–
BI (current sample)	12	11	79.33	23.94	.31	.09
BI Miami Database (Pearson, 2002) – English immersion schools[b]	40	10–11	85.0	20.0	—[d]	–
BI Miami Database (Pearson, 2002) – Two-way schools[c]	41	10–11	94.0	22.0	—[d]	–
SO (current sample)	19	11	74.32	33.75	.39	.08

Note. EO = English only; BI = Bilingual (Spanish-English); SO = Spanish only; NDW = number of different words; TTR = type/token ratio.
[a]This database contains narratives from 5th graders (aged 10–11 years) (Pearson, 2002, p. 139).
[b]In English immersion classrooms, instruction was all in English with minor exception (Pearson, 2002, p. 138).
[c]In the two-way classrooms, 60 percent of instruction was in English and 40 percent in Spanish (Pearson, 2002, p. 138).
[d]These values were not available for the three Miami groups.

belief verbs included *realize, wonder, assume, believe*, and *plan*. The frequency of *think* is consistent with the Swedish data that Nordqvist (2001) reported for the frog narratives.

To determine the lexical depth of meanings, random samples were selected from the 11 year olds to examine variations in meaning for *think* that illustrated the relative certainty-relative uncertainty continuum. These examples are generally representative of variations within the group as a whole. Four of the five examples (b, c, d, and e) convey an understanding of relative uncertainty. Four of the examples (a, b, d, and e) also contain an implied or explicit sentential complement *that*, which is a syntactic hallmark of belief verb use (de Villiers, 2005), while a fifth example (c) shows the child's selection of an alternate mode of marking syntactic complexity, a nonfinite use of the verb *think*. Note also that, in the second example, the more complex modal *might* (Moore, Pure, Furrow et al., 1990) co-occurs with the belief verb, while the inclusion of the modal adjunct *probably* in the third example serves to reduce the force of the uncertainty (Quirk et al., 1985) in the child's interpretation.

a. "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 his pet frog in the dresser drawer and *decided* (was certain he wanted) to take the frog with him. The outcome of this decision was that the boy placed the frog in his pocket.
b. "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's quizzical facial expression suggested that he might have heard a strange sound emanating from the boy's pocket. The boy's facial expression registered uncertainty that the valet might realize he had a frog somewhere.
c. "He was *probably thinking* (*asking himself*) why would a boy bring a frog to a restaurant." In the parking valet situation just described, the valet's facial expression could be interpreted as registering *uncertainty* that he heard a croaking sound; thus, he might have been *asking himself* about the reality of what he heard.
d. "She *thought* (*had an opinion*) she was just exaggerating." In this event, a woman and man are dining at a table in the restaurant and the frog, which had jumped into the salad, was served to the woman. The woman's face indicates uncertainty that she has just seen a frog in her salad (because the frog quickly disappeared into the salad), leading her to *have an opinion* that she was just exaggerating (*imagining*) the situation.
e. "and he *thought* (*believed*) he had caught it with these three little bowls." In this scenario, the frog had made its way to the restaurant's kitchen and was being chased by the male kitchen staff. One of the men tried to capture the frog with three mixing bowls turned upside down, but he was *uncertain* about which bowl the frog might be under, based on his facial expression. However, he *believed* he had caught the frog underneath one of the bowls.

These patterns suggested that, by age 11 years, some EO children were aware of belief as a concept that represented a relative degree of uncertainty. Moreover, this understanding was communicated through the selection of lexical variations that revealed the multidimensional meanings of the belief verb *think,* while simultaneously expressing the child's stance in interpreting character perspectives.

Bilingual Group

The most frequently occurring belief verb was *creer/to believe* ($N = 15$), which also can mean *think*. Based on an analysis of the transcripts, three shades of meaning of *creer* were identified that reflected variations within this group as

well. All appeared to encode varied degrees of certainty, and all included sentential complementation.

a. "*El señor creyó que ya miró*" (*The man thought that he already saw it*). In this scene (see the EO group, items b and c), the parking valet *knew with some certainty* that he had already seen the frog.
b. "*Yo creo que no quiere estar alli dentro*" (*I believe that he did not want to be there inside*). Here, the narrator shifts perspective from the frog character to her own perspective to offer an opinion about the frog's desire not to be in the boy's pocket. (for a scene description, see the EO group, item a).
c. "*Yo creo que él sabia que la rana se fue*" (*I suppose that he knew that the frog left*). In this situation, this narrator also shifts perspective from the story to himself to state his *presumption* that the boy knew the frog had escaped, and was roaming around.

Spanish-Only Group

The most commonly produced belief verb in the Spanish-only group was the verb *pensar/to think* ($n = 14$), which also mirrored the frequency distribution for the EO and BI groups. Of the five variations found within the group, three were syntactically characterized by nonfinite verb choices (b, c, and e), and one by sentential complementation (d).

a. "*El niño piensa en llevar la rana a cenar* (*The boy thinks to take the frog to dinner*). In this situation, the boy has *decided* (with *certainty*) to take his pet frog with him to dinner because he put the frog in his pocket.
b. "*La señora estaba pensando, 'que rico'*" (The woman was *thinking*, 'how good.'"). The scene is one in which a woman dining with a male companion (see EO, item d) is preparing to eat her salad. From her positive facial expression, a possible inference is her *opinion* that her salad looked delicious.
c. "*Ella está pensando por cuando tiene el sapo en la cabeza*" (*She is thinking of when he has the frog on his head*). The same woman cited in (b) has just seen the frog on her companion's head. She therefore *knows* with fair *certainty* that what she views is true.
d. "*Y pensó que lo tenía debajo de la olla*" (*And he thought he had it under the pot*). In this situation, a kitchen staff member is trying to catch the frog using three different pots (see EO, item e). Again, from his facial expression connected with his actions, an inference might be that he *believes (with some certainty)* that he had caught the frog under the pot (subsequently, this belief proves false).
e. "*Los padres del niño estaban pensando en dónde estaba*" (*The boy's parents were thinking of where he was*). The boy's parents are reading their menus in this scene and suddenly realize that he is no longer sitting at the table. The parents then look at one another, *wondering* where their son has gone.

DISCUSSION

This study assessed the mental state verb production of three groups of typically developing, 9- and 11-year-old preadolescents who differed by language status. The overall aim was to determine if the language of production influenced the frequency of mental state verb use and whether frequency distributions varied by mental state category. A secondary aim was to explore the lexical depth of the belief verb *think* by analyzing both the linguistic context and the social situation that led children to assume the characters' perspective (beliefs) as a psychological expression of relative certainty or uncertainty. The final aim was future oriented: to lay the groundwork through this study for application of the mental state framework to bilingual children whose reading comprehension difficulties might be the product of an undiagnosed LI.

Cross-Language Similarities

Shape of Frequency Distributions

Results indicated that language status did influence mental state verb production in that EO children used the greatest number of mental state verbs across all three categories. This finding is qualified by a significant interaction of mental state verb use by language status:, the EO group used significantly more experiential and belief verbs than did the BI and SO groups, while all three groups selected a relatively equal proportion of motivational verbs. This finding is not surprising given that, at least for English, motivational verbs are the earliest developing.

The statistical analyses also indicated that experiential verbs were produced the most often by all three groups, while belief verbs were expressed the least frequently. This finding partially replicates Schwanenflugel et al. (1998), whose study was limited to just EO children. Again, this pattern may not be unusual, for two reasons that are not mutually exclusive. One influence speculated to account for the high frequency of experiential verbs is instructional experiences, at least for the EO group. During middle childhood and preadolescence, the English class of experiential verbs is expanding in scope and, most likely, in depth (e.g., Aldridge & Wood, 1997), due to the probable influence of the academic language register on vocabulary knowledge.

For example, one of the grade 4 reading passages from the 2005 NAEP (United States Department of Education, NCES, 2005b) requires a brief written response to a question following the reading of an autobiographical narrative about one of the first woman astronauts accepted into the U.S. space program. The passage is peppered with experiential verbs (and adjectives) that refer to perceptions and emotions, more so than motivational and belief verbs, for example, *loved, felt, look out and see, watch (look), surprised, disappointed,* and *enjoyed*. Prior research (Schwanenflugel et al., 1998) suggests that these meanings also express relatively more certainty, which is easier than evaluating whether a meaning might be expressing a misrepresentation. Thus, an underlying assumption is that, by grade 4, EO, as well as BI, children

must have a sufficient repertoire of meanings that refer to a multiplicity of experiences such that this knowledge can serve to scaffold their reading comprehension as exemplified in the NAEP passage.

A second reason for the high rate of experiential verbs across the EO, BI, and SO groups may be the response bias created by the use of a wordless video story, combined with the availability of eight colored still frames that highlighted the main episodes. Interpretation of events depended on how adequately children could infer meanings from the protagonists' facial expressions, as well as their postural and gestural cues. Hence, meaning potential was aligned with the ways in which children experienced the video in terms of their perspectives about the situational emotions that characters displayed, as well as the characters' physical reactions to these emotions. Thus, despite the instructions to attend to "*what the characters were thinking, saying, and feeling*," the very nature of a visual medium portraying real people in real time (albeit who did not talk), as well as the frog who did audibly croak, may have generated a bias toward the expression of a variety of meanings that coded the interpretation of others' feelings. The response bias account is mitigated by the fact that a lexical depth analysis was not conducted for either the motivational or experiential verb categories for any of the groups.

The Absence of Age Differences

The independent variable of age was not a factor in differentiating performance within groups. This finding aligns with previous research with EO (Booth & Hall, 1995; McGregor, 2004; Nixon, 2005; Schwanenflugel et al., 1998), Turkish (Aksu-Koc & Tekdemir, 2004) and Swedish children (Nordqvist, 2001). These cross-linguistic studies indicate that the ages between 9 and 12 years are a transitional period in which two intertwined developments emerge. First, lexical reorganization of mental state concepts occurs simultaneously with increasing sociocognitive competence in understanding relative uncertainty. Second, at the same time, children are becoming more linguistically adept at "attributing cognition to story characters and making them into experiencing subjects" (Nordqvist, 2001, p. 263) in the formulation of complex narratives that incorporate the shifting of perspectives. It can be anticipated, therefore, that individual variability in the rate at which children can coordinate the lexical restructuring of mental state concepts, especially belief notions, with the inferential demands of shifting multiple perspectives will be influenced by cognitive, cultural, and language-specific factors. As the descriptive analysis of the lexical depth of *think* indicated, individual children in the three groups of preadolescents were beginning to demonstrate greater richness in their semantic repertoire of beliefs, including the evaluation of relative uncertainty.

Regardless of the possibilities for the absence of age differences, the preliminary descriptive analysis of *think* indicated that meaning cannot be examined in a linguistic vacuum as the local social context was equally, if not more, critical for interpreting the multiple semantic extensions of *think*. In addition, group comparisons become more meaningful if the task is designed to elicit similar types of responses across individuals.

Cross-Language Differences

The Effect of Sociolinguistic Variations on Amount of Talk

The amount of talk that children produce is the basis for determining the frequency with which particular linguistic/discourse components are produced, whether formalized as the average number of T-units or NDW/TTR. For example, the loquaciousness of the EO group as evidenced by their average number of T-units (57.1 and 70.6 for the 9 and 11 year olds, respectively; see Table 3) can be attributed, in part, to three variables. These included their familiarity with this type of task in the classroom, their engagement in a video story, and the successful use of the scripted prompts in eliciting a minimum of 50 T-units, considered the minimum number for a representative sample of spoken narrative, including spoken narratives solicited from children with different cultural heritages (e.g., see Craig & Washington, 2006). The same set of elicitation procedures appeared to be less effective with the BI and SO groups; however, reduced effectiveness may not have the identical explanation for these two groups.

In the case of the BI group, all were still receiving ESOL services in English immersion programs. Information was not available on when individual children entered these programs, but it will be recalled that approximately 80 percent were born in the United States. Additionally, instructional variations in the ESOL programs for this group of children were unknown. Finally, comparison of their mental state verb productivity to the Spanish narrative retellings of a comparably aged group in the Silliman et al. (2003) study was difficult because of differences in how the two studies classified mental state verbs. Because these children were not asked to produce English narratives, the role of trade-offs in Spanish and English lexical knowledge, as predicted by the Hernandez et al. (2005) model, much less the effects of language convergence or attrition could not be considered, but should be the focus of future studies on LI in bilingual children. Nonetheless, reduced responsiveness of this group to the narrative elicitation procedures may have been the product of multiple sociolinguistic factors. These may have ranged from less familiarity with academic narrative retell situations in Spanish to less accessible Spanish lexical systems due to the dual influences of spoken English immersion and English reading, writing, and spelling.

In contrast to the BI group, it appears that the SO group was simply unfamiliar with this kind of task. It is not a significant part of their academic experiences, and it may not even be closely related to their narrative socialization history. Melzi (2000) reports that the narrative styles of Central American mothers emphasize the conversational aspects of oral storytelling rather than narrative plot and organization. In the situation where children were asked to tell a story and concentrate on the characters' mental states, they were essentially being asked to produce a monologic communicative

event, not a dialogic event, a seemingly unfamiliar task for the Costa Rican children.

Another sociolinguistic variation possibly shaping the amount of talk for both the SO and BI groups may relate to meaningful differences between Spanish and English in the category boundaries for mental state lexical knowledge. As Adrian et al. (2005) suggested in their mental state study with SO mother–child dyads, language-specific variations between Spanish and English in the multiple meanings of particular mental state categories are currently unknown. The fact that children in both the SO and BI groups passed the priming task where they had to sort verbs into cognitive, communicative, and action categories indicated that they had at least a literal understanding of Spanish mental state verbs. For example, they successfully classified experiential verbs, such as *notar* (to notice) and belief verbs as *pensar* (to think) and *estudiar* (to study). However, it cannot be ruled out for either group that more overlap in category boundaries for certain types of experiential and belief concepts affected how children interpreted the purpose of the narrative activity, which then influenced their amount of talk. Future research on children who are emerging bilinguals should consider whether cross-language variation in the experiential and belief categories selectively impacts their interpretation of mental states in the production of both Spanish and English narratives and, as an outcome, influences the amount of verbal output.

A Methodological Issue with Amount of Talk Measures

Quantitative analyses based on frequency measures may not reveal a true picture of capability in culturally and linguistically diverse populations. If only the scores on the two vocabulary measures administered as inclusion criteria had been considered as evidence of vocabulary breadth, then the SO group would have been at a disadvantage, because most of the 9 year olds and half of the 11 year olds scored below −1 *SD* of the mean. Yet, the preadolescents in the SO group evidenced the greatest TTR, suggesting greater lexical diversity in narrative formulation. In addition, the SO group demonstrated slightly more complex usage of the verb *think* than did the BI group. As a consequence, reliance on a particular quantitative measure to obtain a general estimate of lexical diversity might lead to a misrepresentation of the situation.

Our findings indicate that overall vocabulary size seems to play a role in the frequency and general complexity of mental state verb use, but there are factors that might restrict production, such as task familiarity, cultural aspects of the scenario (in this case, the video), and, as just cited, semantic, syntactic, and discourse differences across languages in multiple meanings and how they are expressed. A mixed method design that combines quantitative and qualitative components may be a more promising approach to unraveling some of the sociolinguistic conundrums related to the identification of LI in bilingual children. For example, qualitative analyses allow insight into interactions among the semantic, syntactic, and discourse systems, as opposed to the traditional quantitative emphasis on discrete aspects of the language system.

A final amount of talk issue that arose from the data analysis was the use of normalized values. Although it appears to be a good idea to temper frequency by some sort of equalizing value, it is possible that valuable information could be lost. In these data, the EO group produced many more mental state verbs and different words than the two comparison groups. This could be related to the fact that this group also produced many more T-units than the other groups. The reasonable action is to "normalize" the frequency counts by the number of T-units. However, this solution might actually be erasing more "error" from the frequency counts than researchers would desire (Hutchins, Brannick, Bryant, & Silliman, 2005). Selection of a mental state verb is a semantic-syntactic choice that does not necessarily occur because of more opportunity to talk. Thus, a larger number of T-units might result in greater frequencies of mental state verbs, but it is not a guarantee. This is a particularly important point for LI research with bilingual children. Again, one cannot dismiss the "error" due to task differences and cultural expectations in this phenomenon. A better solution to this problem would be to run larger groups of participants ($n > 24$) through protocols that elicited narratives of a prescribed length, such as a minimum of 50 T-units. Although this solution is not the best, it is one possible way to control variance appropriately (Hutchins et al., 2005), especially in future narrative studies that target links between the depth of belief concepts encoding relative uncertainty in the spoken domain and narrative text comprehension in bilingual children who are good and poor readers.

Future Directions on LI in Bilingual Children

The last issue to address is the applicability of the mental state framework for identifying LI in bilingual children who are struggling with reading comprehension. Based on the patterns from this study, our answer to this question is provisionally affirmative, with some modifications in procedure indicated. The reliance on spoken narratives produced from viewing a wordless video or book is likely an inadequate method by itself for assessing whether bilingual children who are good and poor readers are sensitive to subtle distinctions in the meaning of specific mental state verbs like *think*. The insufficiency of the oral narrative format is related to the point that whether or not children produce particular mental state meanings varying in lexical depth is optional and not obligatory. An alternate approach is one that centers on comprehension (e.g., Booth & Hall, 1995; Ziegler et al., 2005). Culturally appropriate, brief narrative scenarios can be designed that focus on a series of questions cueing perspective taking at different levels of meaning for belief verbs, followed by the solicitation of explanations that justify children's responses.

Astington's (1998) reflection is pertinent as a final comment. Schooling is more than "a literate activity; it is also a thoughtful activity" (p. 47). Promoting the robust development of an explicit metalanguage vocabulary for talking and reading about thinking is not only the foundation of academic language proficiency for all children but also is exceptionally critical for bilingual children's construction of the conceptual

representations that allow them to engage actively in critical inquiry.

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NOTES

1. As described elsewhere (Silliman, Wilkinson, & Danzak, 2004), our preference for LI, rather than specific language impairment (SLI), arises from the perspective that a LI reflects a dynamic multidimensional continuum of strengths and weaknesses in individual children, which will vary due to the influence of gene-brain-experience interactions on developmental outcomes (Gilger & Wise, 2004); hence, individual variability in linguistic/discourse ability will be the rule and not the exception. Some children's weaknesses at a given point in time may be primarily located in the grammatical system, which is the restrictive meaning of SLI, while others may display strengths in grammatical development but weakness in inferential comprehension, which would imply involvement of nonlinguistic processing systems.
2. In addition to the coding of mental state verbs, all modal auxiliaries in English, including more complex complement constructions, such as *might have been*, and the Spanish subjunctive, were coded; findings are not reported here, however.

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About the Authors

Belinda Fusté-Herrmann is a third-year doctoral student in Communication Sciences and Disorders at the University of South Florida. Her current research focuses on associations between idiom comprehension and reading comprehension in bilingual adolescents, a project that further extends her interest in the analysis of lexical depth and inferencing.

Elaine R. Silliman is a Professor of Communication Sciences and Disorders and Cognitive and Neural Sciences at the University of South Florida. Her research interests center on relationships between a concept of mind and academic language proficiency in children who are second-language learners or who have social dialect variations.

Ruth Huntley Bahr is an Associate Professor of Communication Sciences and Disorders and Cognitive and Neural Sciences at the University of South Florida. Her current research extends into three areas: a systems interaction approach examining prosody in discourse planning; motor planning difficulties in speech production; and phonological sensitivity, including spelling, in linguistically diverse children.

Kyna S. Fasnacht is a senior in Communication Sciences and Disorders at the University of South Florida with primary research interests in bilingualism. She is a student in the Honors College and participated in this project as part of her Senior Honors Thesis.

Jeanne E. Federico is a second-year doctoral student in Communication Sciences and Disorders at the University of South Florida. Her research interests center on social reasoning in autism.

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