Use of Mazes in the Narrative Language Samples of Bilingual and Monolingual[1] 4- to 7-year old Children

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1. Introduction

The application of language sample analysis has been encouraged for use in assessing children from multicultural and bilingual backgrounds as a way of reducing bias (e.g., Stockman, 1996). Language sample analysis is considered a standard, quantitative method that evaluates productive language at all levels of performance, including vocabulary, syntax, semantics, and pragmatics (Leadholm & Miller, 1995). When researchers and clinicians can compare children's skills in the domains listed about to those of other typically developing children, language sample analysis can provide very valuable information. However, while there is a rich data base for English-speaking children but there are little normative data for bilingual children.

Children with language learning difficulties differ from their typically developing peers on a number of measures including length of utterances; number of grammatical errors such as omissions and substitutions of obligatory forms (e.g., omissions of past tense in English; omission or substitution of articles in Spanish); and presence of word finding difficulties as evidenced by over reliance on non-specific vocabulary, circumlocutions, or revisions (mazes). Such difficulties have been documented in English and Spanish as well as in other languages. For children learning English as a second language, research has demonstrated that the assessment of narrative language is predictive of academic performance (Jax, 1988) and could be used to enhance the diagnostic information used for English classroom placement. However, for determining of language learning difficulties more information is needed about the expected patterns of linguistic behaviors that might be observed in the language samples of bilingual children.

The measure of interest for the current study is the production of mazes. Children with language and learning difficulties tend to produce more mazes than do children with typically developing language skills. Children produce more mazes in contexts that are linguistically demanding such as the production of narratives (as opposed to conversational speech). Thus, the frequency and content of mazes produced during narration can be utilized in making diagnostic decisions regarding children who present with utterance formulation problems and word finding problems (Leadholm & Miller, 1995). Because mazes seem to be sensitive to the linguistic demands of the task it seems likely that this will be a potential source of difference between monolingual and bilingual children that could lead to misdiagnosis. Thus, it is important to document the types and proportion of mazes that children with abilities bilingual learning environments demonstrate to provide a point of comparison for this population.

1.1 Mazes

The *maze* has been defined as a series of words, initial parts of words, or unattached fragments which do not contribute meaning to the ongoing flow of language (Loban, 1976). Removed from an

[1] The children in the monolingual group are functionally monolingual, but have contact with both Spanish and English as described in the method.

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utterance, the remaining material constitutes a meaningful communication unit. Normal disfluencies, such as filled pauses (ex. "*um, uh* I saw it") and revisions (ex. "*The girl, I mean,* the lady left) occur to some extent in the speech of all individuals (deJoy & Gregory, 1985; Starkweather, 1987). Mazes are manifested in the speech of individuals when expressing an idea that is abstract, complicated or not yet fully developed (Leadholm & Miller, 1995).

In general, children's speech becomes more fluent as they mature (Starkweather, 1987). However, increases in the use of mazes should be expected when children attempts to express complex ideas for example, those concerning spatial, temporal, or causal relationships (Leadholm & Miller, 1995). Current research has demonstrated that only modest changes in frequency of disfluencies occur from kindergarten to high school (Starkweather, 1987). Contrary to what might be expected, the frequency of mazes remains consistent or increases with age, rather than decreases (Leadholm & Miller, 1995).

Loban (1976) proposed that computing the average words per maze and maze words as a percentage of total words would yield a measure of the subject's *linguistic uncertainty*. He followed three groups (High Language Proficiency, Low Language Proficiency, and Random) of participants longitudinally for 13 years. The High Language Proficiency group exhibited the lowest use of maze behavior. However, all groups maintained their initial (1st grade) proportion of maze words to total words, despite the fact that increasing chronological age produced increasing complexity in language.

More recent research on maze use has detailed the types of mazes used by speakers. Mazes have typically been grouped into categories such as *filled pauses, repetitions*, and *revisions* (deJoy & Gregory, 1985; Dollaghan & Campbell, 1992; Thordardottir & Weismer, 2002);. Revisions can be further classified as *grammatical revisions, lexical revisions,* and *phonological revisions* (Dollaghan & Campbell, 1992; Thordardottir & Weismer, 2002). Filled pauses and repetitions are considered more immature disfluencies, and are typically expected to decline with increased language development (deJoy & Gregory, 1985; Starkweather, 1987). Other types of disfluencies are more characteristic of adult speech, and therefore do not decline significantly as children's language matures (deJoy & Gregory, 1985). On the contrary, the emergence of more sophisticated types of disfluency can be noted to occur as language develops (Starkweather, 1987). Table 1 contains examples of each of these types of mazes in English and Spanish.

1.2 Mazes, language development, and language impairment

Starkweather (1987) observed that children's speech becomes increasingly fluent with maturation. The term *fluent* refers to speech that is produced with ease and rapidity. At times, the *demands* of language formulation combined with social demands language use can interfere with the speaker's *capacity* to plan and coordinate what s/he wants to say. When a child, or any individual, lacks the capacity to meet the demands for fluency, disfluencies will occur (Starkweather, Gottwald, & Halfond, 1990). Disfluencies can affect the production of sounds used in communication (the *speech* system), or they can affect the organization of words and grammatical structures to convey meaning (the *language* system). In some children, disfluencies in speech are manifested in stuttering behavior. In other children, disfluent language is characterized by an increase in the use of mazes, such as fillers or grammatical reformulations.

Fluent speech is dependent on self-monitoring. When mistakes occur, or when speakers decide to give more specific information, they may interrupt themselves to make a repair (Levelt, 1989). In fact, all vocalized disfluencies serve a correcting function, rather than being errors in speech production (Starkweather, 1987). Overt corrections can occur during the production of a lexical item, immediately following it, or one or more syllables after (Levelt, 1989). Speakers are more likely to notice errors that will change the content of their messages. Likely due to the influence on content, semantic revisions are the most common revisions observed Moreover, an increase in certain types (false starts) has been noted around fourth grade, which could be related to a linguistic developmental

Table 1. Maze types and examples from English and Spanish narratives.

Maze type	Description	Examples
Filled pause	Nonlinguistic vocalizations that occur at the beginning of utterances or between words.	(Um) he's in the water. *(oh) se lo tiró.* / [(oh) he threw it to him.]
Repetition	Sound, part-word, whole-word, or phrase repetition.	The (f*) frog jumped out the window. *Viendo (el ni*) el niño./* [Seeing (the bo*) the boy.]
Phonological revisions	Correction of phonological errors	And then (sikha) she got his nose. *Y el (nino) niño estaba cantando. /* [And the (poy) boy was singing.]
Lexical revisions	Correction of overt word choice errors; to add or delete lexical information.	And (they) he said goodbye. *Cuando él dijo (estaba ca*) que se quería meter aquí.* /[When he said (was ca*) that he wanted to put himself here.]
Grammatical revisions	Correction of overt grammatical errors.	And (the) he threw the dog off too. *Y (el) la señora allá estaba comiendo.* / [And (the-masculine) the-feminine lady was there eating.]
Connectors	Repetitive use of conjunctions or time markers at the beginnings of utterances.	(And then) the frog he's over there. *(Entonces) la rana se escondió allí.* / [(Then) the frog hid there.]

Note: Maze is in parentheses. Translations from Spanish are in brackets.

trend (Starkweather, 1987). Increased linguistic knowledge, without concurrent increases in language formulation and production abilities, may cause children to edit their speech, becoming more hesitant and correcting themselves more often, in which context mazes will occur.

Starkweather (1987) notes that demands for fluency come from both internal and external forces. Although a child's language capacities develop as s/he child develops, the demands placed on the child by listeners (including the child him/herself) are also increasing in tandem. In other words, with developing syntax, utterances become longer and more structurally complex. With increasing vocabulary, the uncertainty of each lexical item that will fall at each place in a sentence increases, theoretically making it more difficult to plan an utterance with in the time constraints of sentence production (Starkweather, 1987). Listeners will less readily accept disfluent speech from children who are able to produce structurally and/or lexically complex utterances.

Each entry in an individual's mental lexicon has a set of conceptual conditions that encompass the item's meaning. No two lexical items have the same core meaning; a lexical item should be retrieved only if its core conditions are satisfied by the concept to be expressed (e.g., tall vs. big). Furthermore, syntactic, morphological, and form specifications also exist for each lexical item (Levelt, 1989). Semantic fields contain sets of items in the lexicon with related meanings (e.g., high, large, elevated); morphological (e.g., tall and tallest) and phonological connections (e.g., tall, tale, talk, ball, fall) may also exist between and among items. Errors in language formulation and speech production demonstrate relations that exist among items in the lexicon. In this manner, an individual's lexicon serves to mediate between an idea's conceptualization and encoding for production (Levelt, 1989).

It has been demonstrated that disfluencies are affected by increasing length and complexity of utterance (Gaines, Runyan, & Meyers, 1991). Children may not exhibit disfluency at all until they begin to push the encoding capabilities of their language system (deJoy & Gregory, 1985). Although fluent speech is desirable, maze usage itself appears not to be stumbling block or tangle in oral language, but rather, a means to achieve fluency (Fagan, 1982; Starkweather, 1987).

Overall, typically developing children produce a significant number of mazes in conversation and narrative samples. Use of mazes increases in narrative contexts compared to conversational contexts, as well as when the child attempts to use longer utterances in either context in English and Spanish (Leadholm & Miller, 1995; Navarro-Ruiz & Rallo-Fabra, 2001). Data regarding development suggests

that English-learning between 4 and 5 years of age children's maze use ranges from approximately 19 to 22 percent of children's total utterances. These mazes are usually a single word and there is rarely more than one maze per utterance (Loban, 1976).

Maze usage has long been considered to be diagnostically significant for English speaking children if their frequency increases to more than 20-25 percent, if more than 3 to 4 words are included per maze, and if there are an increasing number of mazes per utterances. In addition, the position of mazes in utterances (multiple versus one, and placement prior to the verb phrase or elsewhere in the utterance) is also considered diagnostically important (Leadholm & Miller, 1995). Several recent studies have explored the nature of maze production in children with language impairment. In a group of Spanish-learning children with specific language impairment (SLI), Navarro-Ruiz and Rallo-Fabra (2001) noted that the same kinds of mazes were produced by each group of children but that children with language impairment were more likely to produce false starts and select simpler forms than to self-correct in order to produce complex forms. Thordardottir and Ellis Weismer (2002) compared the production of mazes and filled pauses in the language of children with SLI and children matched for mean length of utterance. Both groups of children produced more content mazes, consisting of lexical and syntactic revisions, than filled pauses. However, this difference was larger for the children with SLI. These findings highlight that content mazes are especially susceptible to processing factors and increasing with increased sentence length.

Models of bilingual language development and use emphasize that the linguistic knowledge of bilingual learners is not necessarily the same as that of a monolingual speaker (Grosjean, 1989) and that there are many possible configurations of language dominance patterns among bilingual speakers (Valdes & Figueroa, 1994). Bilingual learners, who demonstrate differences in linguistic knowledge attributable to their bilingual status, are at risk for being misclassified when tested for language or learning disabilities. Those who expect variation may err on the side of failing to identify problems when they exist because they give the child too much time to "catch up". Those who expect children to have comparable skills to monolingual children may over identify children by classifying language differences as disorders. In both cases, developmental information would be useful in increasing correct classification because it would help generate developmental information that can be used for objective analysis of language samples.

The current study focuses on maze production in bilingual children. Maze production is influenced by the speaker's linguistic knowledge and their language production skills. For a child who is in the process of acquiring their second language there may be mismatches between knowledge and production skills. The amount of language specific knowledge the child has will influence the ability to monitor and modify language production. Thus, the questions addressed in this study include:

1. Is the percentage of maze words over total words higher in typically-developing bilingual children than typically-developing monolingual children?
2. Do bilingual children use different types of mazes than monolingual children?
3. Do bilingual children use different types of mazes in L1 compared to maze usage in L2?

2. Methods

2.1 Participants

The participants for the current study consisted of 30 Mexican-American children, ranging in age from 4;6 to 7;2 (mean age 6;0) selected from a larger participant pool of 72 for this study. All of the participants were recruited from within two school districts in central Texas, both of which enroll large numbers of bilingual students.

Children selected for this study were those were reported to be typically developing according to parent and school reports and who had produced the story of interest ("Frog, where are you? (Mayer, 1969)) in one or both of their languages. None of these children were receiving speech and language services at the time of their participation in the study. The children demonstrated varying abilities in English and Spanish, and were classified accordingly into three groups: bilingual, English-dominant, and Spanish-dominant. The ten bilingual children (SEPB) for Spanish and English proficient

bilinguals) were selected by reason of comparable fluency in both English and Spanish (Mexican). Specifically, criteria for selection included at least two of the following three: (1) teacher proficiency rating of at least 3 on a 4 point scale in both Spanish and English (see Appendix A); (2) Idea Proficiency Test IPT-1 (Dalton, Amori, Ballard, & Tighe, 1991) classification as "Fluent" (for both Spanish and English); (3) parent proficiency rating of at least 3 on a 4-point scale in both Spanish and English and (4) 20% or greater home input in both Spanish and English which is consistent with previous work showing that children need at least 20% of exposure in order to use the target language (Gutierrez-Clellen & Kreiter, 2003; Pearson, Fenandez, Lewedeg, & Oller, 1997) The bilingual children were sequential bilinguals, and learned Spanish first in the home and were then exposed to more English in school, which is typical for U.S. bilinguals. On average, the bilingual children had 63% input in Spanish and 37% input in English. These children were age-matched with children who were functionally English-dominant monolinguals or EM (<20% input in Spanish) and functionally Spanish-dominant monolinguals SM (<20% exposure to English). The term functional monolingual is applied here because although the children may have some exposure to both languages, they were expressively functional in only English or Spanish. In other words, they would not have been able to tell a story in both languages. The mean ages for the SEB children were 72.4 months, and the mean ages for the age-matched SM and EM were 73.2 and 72.0 months respectively.

2.2 Procedure

Two narratives were elicited on different days from the bilingual children (SEPB) randomly in each language and one narrative in English or Spanish from the monolingual children (SM and EM) using the wordless picture book "Frog, Where are you?" (Mayer, 1969) over a two to four week period. The narratives were collected at the children's schools in a quiet room (set aside for this purpose). Each session was conducted in one language, and children were asked to generate a narrative in the target language. The order of testing was random and testing in English and in Spanish always took place on different days. In order to elicit the narrative, the children were given a copy of the book to look at in the presence of the examiner, and when the child was finished looking at the book, the child retold the story and used the story pictures to help generate the story. Code-switching was allowed; however, examiners continued prompting in the language in which the child had begun telling the story. The following prompts were used by the examiners when eliciting the narratives (based on (Berman & Slobin, 1994)).

Prompt #1: Before looking at the story, the examiner stated, "We're going to look through all the pages of this book and think about what's happening in the story." In Spanish, examiners said, "Vamos a mirar el libro juntos primero."

Prompt #2: After looking through the book with the child, the examiner said, "Now you tell me the story," or "Ahora, quiero que me lo cuentes tú."

Prompt #3: If the child was only describing the scene and not telling a story, the examiner said, "What's going on here?" or "¿Qué está pasando aquí?"

Prompt #4: "Yes", "Go on", "Sí" and "Sigue" were used throughout the story to encourage the child.

Prompt #5: At the end of the story, the examiner asked, "Is that all you wanted to tell me?" For narratives elicited in Spanish, the examiner asked, "¿Hay algo más que pasa en el cuento o es todo?

2.3 Transcription

Trained research assistants transcribed and coded the narratives. Narratives were transcribed using the Systematic Analysis of Language Transcription (SALT) program (Miller & Chapman, 1984). The entirety of the narratives was transcribed for analysis. Utterances were segmented into communication units (C-units), following the guidelines for spoken narrative production outlined by Loban (1976). Narratives averaged 35 utterances in length. Words and morphemes were coded according to the SALT guidelines for analysis of English and Spanish transcripts. Mazes were also marked in the children's utterances according to SALT guidelines as well as those outlined by Loban (1976).

Mazes were coded for the different types of speech and language behavior they contained. Six different codes were used to analyze the content of the mazes produced by the children. Maze content was coded for filled pauses [FP], repetitions [REP], connectors [CON], grammatical revisions [GREV], lexical revisions [LREV], and phonological revisions [PREV]. See Table 1 for a detailed description and examples of each type of code.

2.4 Reliability

Reliability checks were performed by two other trained research assistants. One assistant checked the accuracy of the initial transcriptions. The second assistant made minimal changes to the checked transcripts; a third assistant listened to the recordings once again to make decisions regarding any discrepancies in the transcripts. Complete and intelligible utterances were included in the analysis; abandoned utterances and partially or completely unintelligible utterances were excluded from the analysis.

Questionnaires. A research assistant re-scored 10 percent of the exposure and use ratings on the parent questionnaires. Reliability for calculation of percentage of exposure and use of English and Spanish at home was 95%.

Narratives. A bilingual research assistant re-transcribed and re-coded 10 percent of the narrative transcripts evenly distributed between English and Spanish, according to the procedures outlined above. Reliability for the transcription and segmentation was 90% and 97% respectively. Maze calculation was 91% reliable for English and Spanish.

3. Results

In order to address the questions regarding levels of maze production and distribution of maze production across the groups of participants each group's mazes were calculated and divided by types. Total number of words in mazes were calculated as percentages because children's narratives varied in length. The frequency of specific maze types are reported in Table 2.

Table 2. Means and standard deviations of bilingual and functionally monolingual children's percentage of maze words over total words and the frequency of maze types.

Maze types	**Spanish monolingual SM**	**Spanish bilingual SPB**	**English bilingual EPB**	**English monolinugal EM**
Filled Pauses	2.30 (4.57)	2.40 (2.91)	3.70 (2.58)	3.90 (3.04)
Repetitions	5.20 (4.85)	10.60 (6.88)	11.40 (7.44)	5.90 (1.26)
Phonological Revisions	0.40 (0.70)	0.30 (0.48)	0.20 (0.42)	0.30 (0.48)
Lexical Revisions	2.20 (2.15)	2.90 (2.08)	4.60 (2.99)	3.60 (2.07)
Grammatical Revisions	1.30 (1.42)	2.50 (1.90)	0.70 (0.82)	0.70 (0.82)
Connectors	11.30 (10.09)	14.60 (10.33)	12.70 (11.39)	12.90 (7.43)
Overall % Maze words	14.50 (9.78)	16.70 (6.29)	20.20 (7.24)	14.20 (6.76)

3.1 Percentage of maze words—bilingual vs. functionally monolingual

The first research question was whether the percentage of overall maze words over total words used was higher in typically-developing bilingual children than in typically-developing functionally monolingual Spanish and English-speaking children. This question was addressed by calculating the percentage of maze words over the total number of words per story. Using a univariate mixed model treating subject as a random effect (which controls for the non-independence of the repeated Spanish and English scores of the bilinguals), the bilingual and functionally monolingual groups were compared. As depicted in Figure 1, there was no significant difference between the percentage of words in mazes as a percentage of total words used by the functionally monolingual group (*M*=14.2%) as compared to the bilingual group (*M*=20.2%) [t (28)= 1.48, p = 0.152].

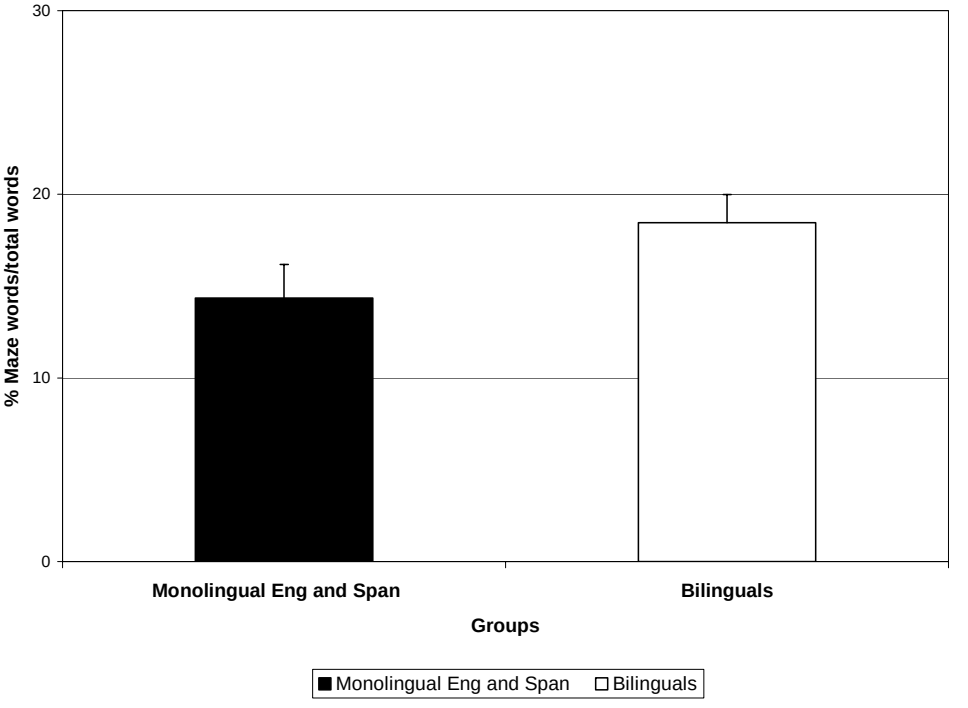
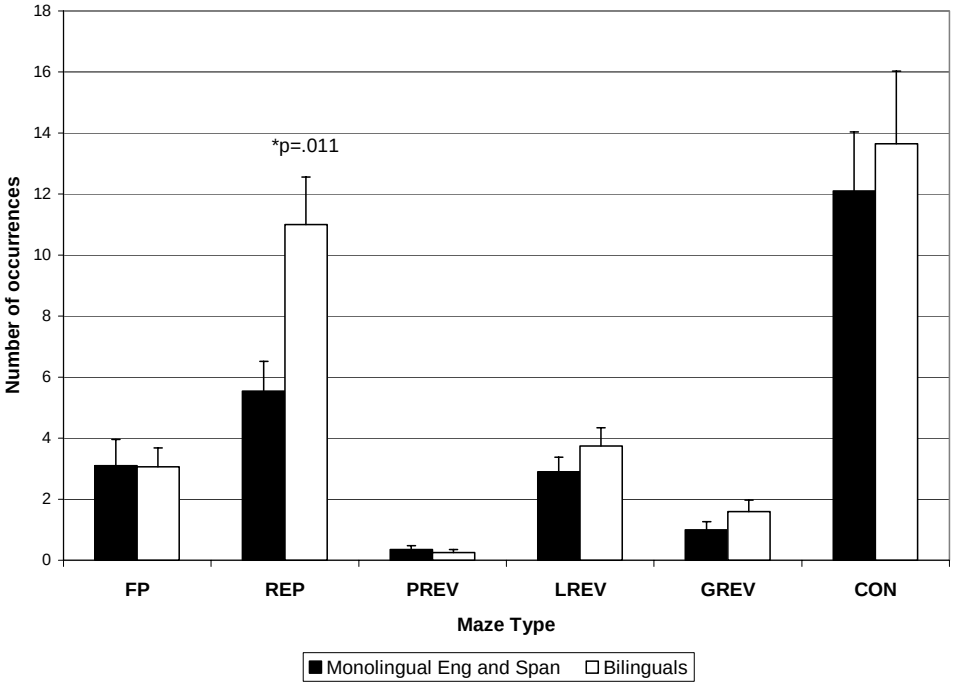


Figure 1. Percentages of maze words over total words. The graph plots the percentages of maze words in the language samples of the monolingual and bilingual children. Narrative samples were collected in both Spanish and English for bilingual participants.

3.2 Patterns of maze types—bilingual vs. functionally monolingual

The second research question was whether bilingual children used the same frequency and types of mazes as functionally monolingual children. This question was addressed by calculating the frequency of each specific maze type for each story. The patterns of maze types are illustrated in Figure 2. The



bilingual children used nearly twice as many repetitions [REP] (*M*=11.40) than the functionally monolingual children, which was significantly more (*M*=5.90) [t (28)= 2.72, p = .01]. Both groups of children used similar numbers of filled pauses [FP]; bilingual (*M*=3.05) and functionally monolingual (*M*=3.10), connectors [CON]; bilingual (*M*=13.65) and functionally monolingual (*M*=12.10), and phonological revisions [PREV]; bilingual (*M*=0.25) and functionally monolingual (*M*=0.35). The bilingual children used more grammatical revisions [GREV] (*M*=1.60) and more lexical revisions [LREV] (*M*=3.75) than the functionally monolingual children [GREV] (*M*=1.00) and (LREV] (*M*=2.90), although there was no significant difference between these comparisons.

3.3 Patterns of maze usage across languages—bilingual participants

The third research question was whether bilingual children demonstrate the same pattern of maze usage in L1 as compared to L2. These results are depicted in Figure 3. Using a paired samples t-test to compare the means between the bilingual children's maze use in English as compared to Spanish, we found the following patterns of results. The bilingual children used significantly more grammatical revisions [GREV] in Spanish (*M*=2.50) than in English (*M*=0.70) [t(9)= 3.04, p = .014]. Although not significantly different, the children also used more connectors [CON] in Spanish (*M*=14.50) as compared to (*M*=12.70). In English, the children used more lexical revisions [LREV] (*M*=4.60) than in Spanish (*M*=2.90), more filled pauses [FP] (*M*=3.70) as compared to (*M*=2.40), and more repetitions [REP] (*M*=11.40) compared to (*M*=10.60), although these differences were not significant. The bilingual children used comparable phonological revisions [PREV] in each language; English (*M*=0.20) and Spanish (*M*=0.30).

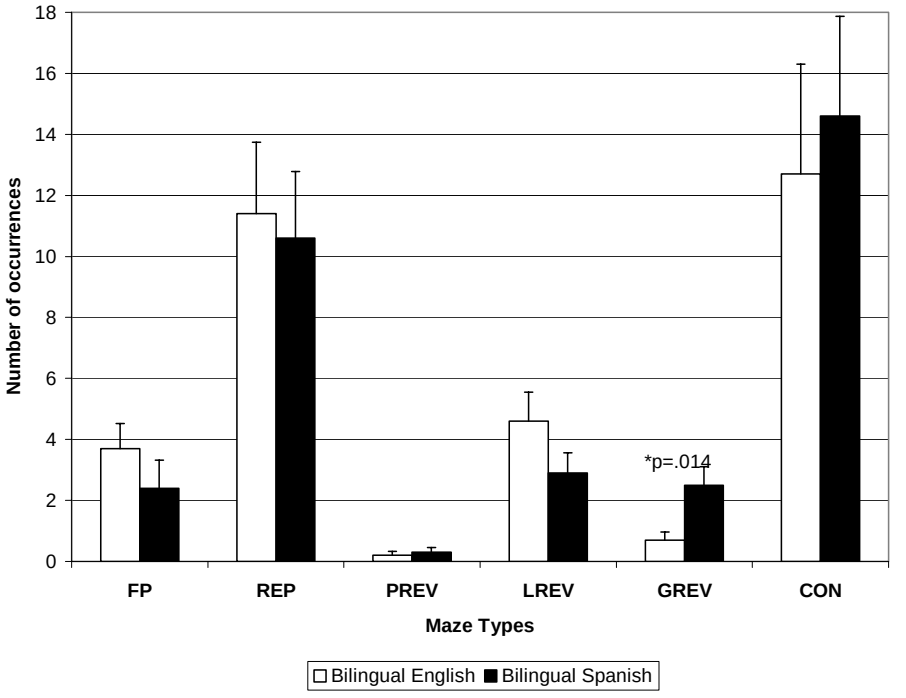


Figure 3. Use of maze types across language, bilingual participants.

4. Discussion

Mazes are considered a medium by which one may view the internal processes of language formulation (Fagan, 1982; Leadholm & Miller, 1995; Loban, 1976). The current study analyzed the use of mazes among monolingual and bilingual subject groups in order to make comparisons regarding use of overt correction methods in the spoken language of monolingual and bilingual children. The results suggested that the slightly higher percentage of overall maze words as a percentage of total words used by the bilingual children as compared to the monolingual children was not statistically significant. Quantitatively, a difference in the types of mazes used by bilingual and functionally monolingual children was demonstrated in these results. Furthermore, although bilingual children's overall percentage of maze use was relatively consistent in both of their languages, there was a quantitative difference in the types of mazes used in the Spanish and English narratives. Results suggest that 1) bilinguals and monolinguals may employ different processing strategies and 2) bilingual L2 learners monitor and repair differently in Spanish and English in order to formulate the language required for narrative discourse.

The first question addressed in the study was whether the percentage of maze words over total words was higher in typically-developing bilingual children than in typically-developing functionally monolingual children. The bilingual children who participated in this study were in the process of acquiring English, and were accommodating a second language. Therefore, there is a strong likelihood that their underlying linguistic knowledge of L2 was still developing and expectations about these children's ability to monitor and correct their discourse in both languages might be different from functionally monolingual children who are using mainly one language.

In the present study, bilingual and functionally monolingual children used comparable percentages of mazes as reflected by the number of maze words over the number of total words. In other words, there was not a statistically significant difference in the bilingual and the monolingual children's overall percentage of corrections and repairs in their narrative discourse telling of the same story. Although the bilingual children's maze use was slightly higher than the functionally monolingual

children's, this difference was not as great as the difference which has been reported between children with typically developing language skills and children with language impairment. This tentatively suggests that the bilingual children studied here did not have special difficulties with language production.

Our second question was whether bilingual children might use different types of mazes than monolingual children. Results demonstrated that the bilingual children used twice the number of repetitions as the functionally monolingual children. The repetitions were scored as repetitions in the sound, part-word, whole-word and phrase. A repetition could indicate a level of linguistic uncertainty at the phonological, lexical and semantic level. Perhaps the repetitions serve as a process to allow for a second opportunity to employ audition to monitor speech output. Increases in certain types of mazes have been noted during periods of increasing linguistic knowledge during childhood and with increased development in general language skills (deJoy & Gregory, 1985; Starkweather, 1987). For example, increases in false starts, or revisions at the beginnings of utterances, have been noted around 4th grade in monolingual English-speaking children, which could be related to growth in the child's linguistic system, and therefore may be a developmental trend (Starkweather, 1987). Evans (1985) found that monolingual second-graders more frequently repeated and corrected their own words than kindergarteners during sessions of show and tell. Yet, as a child's language system is still developing, and as a child begins to use more complex language, it is likely that filled pauses and repetitions may be present in a child's speech. The higher frequency of repetitions may reflect the fact that these children are undergoing rapid language growth.

The third research question was whether bilingual children use different types of mazes in L1 compared to maze usage in L2. The results demonstrated that bilingual children do not show variability in the overall percentage of mazes used in their narrative samples, but that they do employ particular maze types with differing frequencies in English and Spanish. In Spanish, children used more grammatical revisions than when narrating in English. As has been stated earlier, overall exposure to English was less than overall exposure to Spanish for the bilingual children. The higher number of grammatical revisions in Spanish may indicate a greater metalinguistic awareness of the grammatical rules in Spanish as compared to English, and therefore increased ability to monitor Spanish grammaticality.

Results also suggested that children used more lexical revisions in English. As has been stated earlier, overall exposure to English was less than overall exposure to Spanish for the bilingual children, suggesting more difficulty with English semantics than syntax or phonology. This also suggested a higher amount of difficulty coming up with appropriate words to express meaning in English than in Spanish. In this manner, use of mazes in English, specifically revisions, may somewhat resemble that of children with true word-finding deficits (Leadholm & Miller, 1995). However, it is important to keep in mind that lexical revisions are common even in adult speakers and have been reported to be the most common revision type in L2 learners (Kormos, 1999). Entries in the mental lexicon are retrieved only if the conditions are satisfied by the concept to be expressed (Levelt, 1989). Perhaps the concepts included in the narrative sample elicitation stimuli had stronger connections to the children's Spanish lexicon, making word choice a more efficient process in Spanish as compared to English.

Mazes have been considered an important variable to investigate and identify problems with the underlying formulation of speech and language. The maze profiles of sequential bilingual children appear to be different from dominant English and Spanish speaking children, and different across both languages of the bilinguals. Thus, the capacity and demand of acquiring and using two languages may result in language processing that is somewhat different from the monolingual speaker. Bilinguals may employ unique processing strategies in each language, specifically in the formulation, monitoring and repair of language in order to meet the demands of storytelling. Therefore, a cautious interpretation of maze usage for the identification of language formulation deficits should be used when assessing the narrative language samples of bilingual children.

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ISB4: Proceedings of the 4th International Symposium on Bilingualism

edited by James Cohen, Kara T. McAlister, Kellie Rolstad, and Jeff MacSwan

Cascadilla Press Somerville, MA 2005

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ISBN 978-1-57473-210-8 CD-ROM
ISBN 978-1-57473-107-1 library binding (5-volume set)

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