

Sensitivity of Quantitative Narrative-Based Measures to Change Following English-Only
Treatment in Bilingual Children with Primary Language Impairment

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Abstract

Narrative assessment provides valuable information characterizing language abilities in monolingual and bilingual children, but there has been little research regarding whether treatment gains for bilingual children with Primary Language Impairment (PLI) are reflected in narrative measures. The purpose of this study is to determine whether quantitative narrative-based measures are sensitive to change in bilingual children with PLI following English-only therapy. The quantitative measures include number of clausal units (C-units), mean length of utterance (MLU), total number of words (TNW), number of different words (NDW), and grammaticality.

Researchers analyzed narratives in both languages from eight bilingual Spanish-English speaking school-aged children with PLI preceding and following English-only therapy. The Clinical Evaluation of Language Fundamentals, 4th edition, a standardized measure of language, was administered in Spanish (CELF-S) and English (CELF) to confirm delays in both of the participants' languages and to serve as a comparison measure of treatment efficacy. A wordless picture book served as the stimulus for eliciting the narrative samples, which researchers then analyzed for the five quantitative narrative-based measures using the Systematic Analysis of Language Transcripts (SALT) (Miller & Iglesias, 2010).

On a group basis, only the CELF in English demonstrated significant change. On an individual basis, however, two participants in English and three in Spanish showed gains of at least 10% on four or more of the six measures, the most frequent being CELF scores, number of C-Units, TNW, and NDW. However, decreased reliability of MLU for older children, the treatment of code switching, and the global nature of the grammaticality measure challenged the interpretation of the results. Future research addressing these issues is recommended.

Introduction

In an increasingly globalized world, bilingualism has become an especially pertinent issue. With an estimated 21% of the United States population over age five speaking a language other than English at home (U.S. Census Bureau, 2010), people who study language have had to reevaluate their perspectives on language use, development, and impairment. They have been faced with the challenge of adjusting of previous approaches to accurately measure and characterize language ability in bilingual individuals. If that were not enough, further challenges present themselves in diagnosing and treating bilingual individuals with language impairment. Researchers have postulated narrative assessment as one possible method for addressing these challenges. Though complex, narrative assessment provides a valuable approach to understanding the interaction between bilingualism and language impairment.

Bilingualism is not a one-size-fits-all term; rather, there is an enormous variety of developmental patterns for each language depending on the individual circumstances of each speaker (Bliss & McCabe, 2003; Kohnert, 2010; Thordardottir, 2010). The rate of acquisition of each language is tied to the level of exposure, among other factors, and cross-linguistic influence is evident as each language develops (Kohnert, 2010; Thordardottir, 2010). Bilingual development is further influenced by child rearing practices and influences from two cultures (Kohnert, Yim, Nett, Kan, & Duran, 2005; Thordardottir, 2010). Children who are bilingual will often exhibit uneven or distributed skills in each language. A child's language "dominance" is influenced by age, stage of development, the language's status in the larger community, and the specific skill tested. Therefore single-language measurements are insufficient for assessing overall language ability (Kohnert, 2010). This complexity in developing bilingualism makes assessing language ability a difficult task.

Language impairment further adds to the complexity of assessing language ability in bilingual individuals. Individuals with primary language impairment (PLI) exhibit language ability below that of typically developing peers in the absence of other cognitive, sensory, neurological, or motor disabilities that could account for the discrepancy. Subtle nonlinguistic deficits, such as reduced auditory pattern matching ability, also accompany PLI (Kohnert, Windsor, & Ebert, 2009). In bilingual children, PLI can affect each language to a different degree. Bilingual children with PLI tend to experience difficulties in the same general areas as monolinguals with PLI: lexical semantics, morphosyntax, written and social language, and discourse. They also have subtle weaknesses in working memory, sustained and selective attention, and speed of information processing as compared to their unaffected bilingual peers (Kohnert, 2010; Kohnert et al., 2009). Additionally, a first language (L1) that is the minority language within a larger community can be at risk for language attrition, particularly when treatment is provided only in the majority second language (L2) (Kohnert et al., 2005; Kohnert & Medina, 2009).

Expressive Narratives

Narratives are a valuable resource for assessing language skills in bilingual individuals with PLI. Wei and Moyer (2008) define narratives as “all types of discourse in which event structured material is shared with readers or listeners, including fictional stories, personal narratives, accounts and recounts of events (real or imagined)” (p.311). Narratives represent language use at a sophisticated level, the simultaneous integration of lexical, semantic, morphosyntactic, and discourse skills. Narrative skills have also been linked to later literacy development (Rollins, McCabe, & Bliss, 2000). Narratives may be a valuable tool for assessing language skills in diverse populations because every culture has some form of narrative, and

people frequently use narratives when socializing with one another. Across languages there are certain features that are common to all narratives; these features provide a basis for narrative analysis (Goldstein, 2004).

Though narratives contain common features, narratives from bilingual individuals are influenced by different linguistic and cultural factors (Bliss & McCabe, 2003; Centeno, Anderson, & Obler, 2007; Goldstein, 2004; Gutiérrez-Clellen & Quinn, 1993; Rollins et al., 2000; Silliman & Champion, 2002; Thordardottir, 2010). Due to the immense diversity within bilingualism, refraining from making generalizations while analyzing narratives is essential for minimizing bias (Bliss & McCabe, 2003; Thordardottir, 2010). That is, while the concept of narratives itself is universal, the qualitative narrative components: what constitutes a story, how to tell stories, their purpose, and their context, are not (Silliman & Champion, 2002).

A number of factors may influence narrative production skills. Specifically, contextual details such as the setting of the narrative elicitation, order of tasks by language, type and amount of examiner feedback, type of prompts, and comfort level with the examiner influence narrative production (Rollins et al., 2000; Wei & Moyer, 2008). Characteristics of the task itself such as audience and speaker roles, the child's background knowledge, preconceptions of the roles of interlocutors, and the setting of storytelling all influence narrative outputs (Goldstein, 2004; Gutiérrez-Clellen & Quinn, 1993; Silliman & Champion, 2002; Thordardottir, 2010). Developmental factors such as socioeconomic status and the child's educational experience and learning processes can also influence narratives (Silliman & Champion, 2002). Furthermore, second-language influence and code switching are important considerations for analyzing narratives from bilingual individuals (Bliss & McCabe, 2003; Centeno et al., 2007). These contextual, situational, developmental, and linguistic factors make collecting samples in both

languages and having a basis for within-child and cross-language comparison crucial for accurate assessment; using monolingual norms for this basis is not always appropriate (Kohnert, 2010; Silliman & Champion, 2002; Wei & Moyer, 2008).

Narratives from bilingual children may prove challenging to elicit and analyze, but the in-depth picture of language they provide make them valuable tools for characterizing typical language development as well as language impairment. Cleave, Girolametto, Chen, and Johnson (2010) investigated the use of narratives as an assessment tool. After comparing narrative recalls to the standardized test scores of monolingual and bilingual children with PLI, Cleave et al. (2010) concluded that narratives are an appropriate measure of language ability in bilingual children with PLI.

The first step in narrative assessment is to elicit narrative samples. Fiestas and Peña (2004) found that wordless picture book stimuli elicited longer, more complex narratives than static picture stimuli in each language of bilingual children. Once an adequate narrative sample has been obtained, the next step is analysis. Researchers analyze narrative samples for a number of quantitative and qualitative factors. The present study focuses exclusively on quantitative measures.

Quantitative Narrative-Based Measures

Examples of quantitative language productivity measures often used in analyzing narrative data include number of communication units (C-units), mean length of utterance (MLU), total number of words (TNW), number of different words (NDW), and grammaticality. A C-unit is a grammatical unit consisting of an independent clause and any conjoining subordinate clauses. For example, “in the morning, the boy walked to the tree.” Narrative transcripts are broken into C-units as a measure of productivity. MLU, counted in morphemes in

English, is used as a measure of language ability because it has been found to be sensitive to developmental changes in morphology and syntax (Rosenthal-Rollins, Snow, & Willet, 1996). MLU can be increased both by semantic and morphological development. TNW is another productivity measure, while NDW serves as a measure of lexical diversity. Klee (1992) showed that NDW and TNW exhibit developmental trends as well as significant differences between children with PLI and typically developing children. Finally, grammaticality serves as a measure of morphosyntax and has been shown to correlate with performance on standardized language tests (Bedore, Peña, & Ho, 2010; Wei & Moyer, 2008).

Bedore, Peña, Gillam, and Ho (2010) analyzed different measures for narrative productivity in conjunction with performance on the Bilingual English-Spanish Assessment (BESA). The BESA consists of equivalent, but not translated, measures in both Spanish and English that assess semantic, morphosyntactic, and sentence repetition abilities. Upon analysis, BESA scores correlated with MLU, NDW, and grammaticality in English, but only MLU and NDW in Spanish. While BESA scores did not correlate with number of utterances in either language, NDW correlated with number of utterances and MLU in both languages.

Further analysis revealed that English and Spanish grammaticality and English MLU accounted for most of the variance, making them the best measures of language ability. Though Spanish MLU correlated with language ability, it did not account for additional variance. Bedore et al. (2010) postulated that this result was either a reflection of a flatter typical MLU development curve in Spanish or an indication that MLU is simply more important during the early stages of language learning. The latter explanation is in agreement with the increased number of grammatical errors produced in English.

From diagnosis through intervention, narratives are relevant throughout clinical practice. They are significant for family members, educators, children, and clinicians. The depth of information provided by narrative assessment aids clinicians in characterizing language ability and individualizing therapy. Research on narrative assessment assists in educating clinicians about the cultural, linguistic, and procedural influences on narratives from bilingual individuals. However, more research is needed to refine narrative assessment to its optimal potential. Further research regarding its sensitivity to changes in language ability would help to establish narrative assessment as a useful tool in the evaluation of treatment efficacy. The present study examines the sensitivity of various quantitative narrative-based measures to change in bilingual Spanish-English speaking children following English-only treatment.

Research Questions

The overall goal of this study is to determine whether narrative assessment is sensitive to change following English-only treatment in bilingual children with PLI. Specifically, we ask are quantitative gains in narrative production skills evident in English, the treated language, as well as in Spanish, the untreated language, in bilingual school-age children with PLI?

Methods

Participants

The participants in this study were drawn from a larger study funded by the National Institutes of Health designed to investigate the differential effects of three distinct behavioral interventions on language and cognitive outcomes in bilingual children with PLI. Current study participants were eight Spanish-English bilingual children (four girls, four boys) with PLI between the ages of 6;2 and 9;6 (years; months). At the time of this study, these were the only

participants to have fully completed the English-only treatment in the larger study. This subset of participants all received the same behavioral intervention in English and attended one of three elementary schools within the Minneapolis Public School district: Green Central, Whittier, or Jefferson.

To recruit participants, speech-language pathologists (SLPs) in the Minneapolis Public School district distributed flyers and consent forms to the families of students on their caseload diagnosed with isolated language impairment. Phone interviews in Spanish were conducted with parents to determine the family/child interest in study participation. Participant consent was obtained following procedures approved by the University of Minnesota Institutional Review Board for the protection of human subjects in research and by the Office of Research for the Minneapolis Public School district. Prior to participation, parents completed written consent forms in Spanish, and children gave their oral assent to participate following approved procedures administered in Spanish and/or English.

The Minneapolis Public School district is a diverse, urban district in which 26% of students are classified as English language learners (ELLs). The percentage of children qualifying for free or reduced lunch, an indicator of fewer economic resources, at each of the three participating schools ranged from 61% to 89%. Furthermore, 14% of students at Green, 16% of students at Whittier, and 24% of students at Jefferson were enrolled in special education programs. The two participants who attended Jefferson school received academic instruction in Spanish as well as in English during their regular school day. For the other six participants all instruction during the regular school day was in English, although peers and classroom assistants often spoke in Spanish.

To confirm the bilingual status of participants, a Spanish-speaking liaison conducted phone interviews with parents. These parent interviews confirmed that all participants spoke either Spanish only or mostly Spanish with some English at home, and that all participants were exposed to English beginning at any time from birth to four years of age. All participants were previously diagnosed with language impairment and were receiving school-based speech-language services through the SLPs at their respective schools. In addition, the Clinical Evaluation of Language Fundamentals, 4th edition, a standardized measure of language, was administered in Spanish (CELF-S) and English (CELF) to confirm delays in both of the participants' languages and to serve as a comparison measure of treatment efficacy. The Test of Nonverbal Intelligence, 3rd edition (TONI-3: Brown, Sherbenou, & Johnsen, 1997) was administered to rule out frank cognitive delays. The results of these tests for each participant are shown in Table 1. Each participant also passed a pure tone hearing screening. For present purposes, the key measure administered to the participants was the narrative task, described in the following section.

Narrative Assessment

Dependent variables were quantitative language measures used to assess narrative production skills in Spanish and English, elicited at two time points: immediately prior to participation in an intensive English-only treatment, and again immediately following participation in this treatment. Of primary interest was the amount of change in narrative skills as a result of the prescribed treatment.

Narratives were elicited in Spanish and English on different days, by trained researchers fluent in the test language. The narrative task utilized the wordless picture book *Frog, Where Are You* by Mercer Mayer (1996). The language of administration (Spanish or English) was

counterbalanced such that every other child completed the task first in English, then on a following day in Spanish. The same procedure was followed for both Spanish and English narrative elicitations. The examiner first familiarized the child with the recording equipment as needed. When the child felt comfortable with the equipment, the examiner either turned at an angle or sat across the table while the child looked through all of the pictures in the book. This separation was designed to promote language production and minimize pointing. After looking through the pictures, the child was instructed to tell the story while looking at the pictures to avoid additional memory demands.

If the child began listing or pointing instead of telling the story, the examiner used minimal, open-ended prompts to encourage narrative production. Prompts such as “tell me more,” “you’re doing great,” and non-verbal prompts, such as nods of affirmation, were considered acceptable and used as necessary. Additionally, if the child began speaking in the non-target language, the examiner used prompts such as “tell me in English” or “dime en Español” to encourage target language productions. At least 80% of the words needed to be in the target language for the sample to be considered valid. Overly-specific prompts such as “what is he doing?” or “where is he?” that provided the child with answers or vocabulary words were not used by examiners because they potentially compromised the process of capturing the child’s true language ability. Each narrative was digitally recorded using a Sony IC Recorder model ICD-PX820. Refer to the appendix for an exact copy of the elicitation procedure.

Transcription, Scoring and Analysis of Narrative Samples

Research assistants proficient in Spanish and English were trained to complete word-by-word transcriptions of the recorded narrative samples. For each narrative, a second transcriber verified the raw narrative transcription. Following transcription, research assistants coded the

narrative samples for subsequent analysis using the Systematic Analysis of Language Transcripts (SALT) software for English and Spanish (Miller & Iglesias 2010). SALT is a software system designed to provide a series of standard analyses at the word, morpheme, utterance, and discourse level, and its reference database allows for comparisons between age-matched peers (Miller & Iglesias 2010). Using SALT, researchers performed a quantitative analysis of the narratives to measure MLU in morphemes (refer to Table 2 for codes), NDW, TNW, and productivity, or number of C-units. A C-unit was defined as a grammatical unit consisting of an independent clause and any conjoining subordinate clauses.

Furthermore, researchers judged each utterance to be either grammatical or ungrammatical, resulting in a percent grammaticality rating for each narrative. Grammatical utterances conform to the rules regarding subject-verb agreement, verb tense, pronoun and article use, gender, and all other grammatical areas of the target languages. Examples of grammatical utterances in English and Spanish include “the boy says ‘frog’” or “el niño dice, ‘rana’” respectively. Examples of ungrammatical utterances include “the boy say ‘frog’” or “el niño digo ‘rana.’” The content of mazes did not influence the grammaticality scores of utterances. A maze was defined as any false start, repetition, or reformulation, and was enclosed in parenthesis as per SALT transcription conventions (Miller & Iglesias 2010). For example, the utterance “(the boy walk to) the boy walked to the store” would still be considered grammatical, despite the ungrammatical portion in the maze. Researchers kept a count of utterances with unintelligible words, but excluded them from all analyses.

Code switching was considered grammatical as long as it did not conflict with the grammaticality of the target language. For example, “la boy” would be considered ungrammatical because the Spanish feminine article “la” requires a feminine noun, “girl.” The

phrase “el frog,” however, would be considered grammatical because the English word “frog” has no inherent gender and therefore does not conflict. This procedure was an attempt to create the most sensitive measure of grammaticality in these particular narratives. A more detailed discussion of the treatment of code switching can be found in the discussion section.

English Language (EL) Treatment

The independent variable of interest was participation in an intensive English-only treatment, four times per week in 75-minute sessions. The clinician to child ratio was 1:2 or 1:3. A combination of interactive and computer-based activities was used to improve language comprehension and production by practicing morphosyntactic constructions, expanding vocabulary, and improving children’s ability to follow oral directions. Narrative production or comprehension was not directly trained.

Treatment was conducted in afterschool programs at each of the three elementary schools. Three SLPs certified by the American Speech-Language-Hearing Association (ASHA) served as the clinicians for the therapy. Each SLP had a Master’s degree in Speech Language Pathology or the equivalent, and they each had years of experience working in pediatrics. Two of the clinicians were also doctoral students at the University of Minnesota, and one was an employee for the Minneapolis Public School District.

The EL treatment took place in three cycles, with each cycle lasting six to seven weeks. Researchers elicited narrative samples immediately preceding and following each cycle. Due to unexpected cancellations of the after school programs, only 22 to 24 out of the original 28 sessions took place each cycle, and the participants attended 17 to 24 of those sessions (see Table 1). Each session lasted 80 to 100 minutes (depending on the busing schedule of the afterschool programs), with 75 minutes devoted to intervention, and the rest consisting of transition times

and breaks. The 75-minute intervention time was divided into five, 15-minute-long activities so that each child participated in each activity with roughly equal frequency.

Each of the intervention activities was pilot tested in 2010, and necessary supplements were used as needed (see descriptions below). The activities included three computer games and three interactive games. For the interactive games, the children would sometimes play one-on-one with the clinician and sometimes play with the clinician and another participant. In this manner, they could both receive individual feedback from the clinician and benefit from peer modeling (Ebert, 2011). For ethical reasons, students continued their in-school services while participating in the experimental treatment in afterschool programs.

EL Computer Games.

The computer games included two games from Laureate Learning Systems and one from Earobics. *Adjectives and Opposites* (Wilson and Fox, 1997) from Laureate Learning Systems, focused on descriptive vocabulary. As one example, the children were presented with a circus scene and asked to identify the object corresponding to the target vocabulary, such as the big elephant. *Prepositions* (Wilson and Fox, 2008), also from Laureate Learning Systems, focused on comprehension of 10 prepositional phrases and spatial relationships. Pilot testing revealed that this game alone would not be challenging enough for the older students, so the supplement *Swim, Swam, Swum*, which focuses on morphosyntax, was also used.

From Earobics software, the game *Calling All Engines* (Earobics, 2006) was selected to focus on following directions of increasing complexity. Students were required to find one to four items in order with or without a gap between the instruction and its execution. Difficulty was adjusted automatically to match each child's level.

EL Interactive Games.

The interactive activities included three games from LinguiSystems Incorporated. *Category Card Games* (Anderson, 2004) encouraged vocabulary growth using semantic organization. The game consisted of cards falling into different semantic categories. Children needed to identify the categories, describe other members of the categories, or sort the cards into their respective categories. *Gram's Cracker: A Grammar Game* (Cole, 2000) dealt with morphosyntactic constructions in both receptive and expressive language modalities. The game focused on constructions for pronouns, plurals, possessives, negatives, and verb tenses. Finally, *Plunk's Pond: A Riddles Game for Language* (LinguSystems, 1998) worked to increase vocabulary and listening skills.

Treatment Fidelity.

Nineteen percent of intervention sessions were videotaped to ensure that the clinicians followed the prescribed treatment protocol. The videotapes were reviewed for the name of each activity, the length of each activity and transition time, and comments made by the clinicians. Clinician comments were categorized as Spanish, unrelated, redirect, and English traditional linguistic cueing, and they were kept on a participant specific basis. Reviews of the tapes demonstrated that the intervention sessions were consistent with the procedure described above.

Results

Results compared the pre- and post-intervention measures for the CELF and the five narrative-based measures (Grammaticality, C-Units, MLU, TNW, and NDW) in Spanish and English. Descriptive statistics prior to and immediately following treatment, including the mean, range, and standard deviation for these measures, are shown in Table 3. As expected, there was

considerable variation in participants' scores on each of these measures, resulting in wide ranges and standard deviations. To determine whether the selected quantitative narrative-based measures were sensitive to change following treatment, percent change was calculated for each dependent variable for each participant by taking the post-treatment value minus the pretreatment value, divided by the pretreatment value [(post-pre)/pre]. The results for percent change are shown in Figure 1. T-tests were performed to determine correlation and significant differences between pre- and post-treatment measurements. All of the pretreatment measure outcomes were correlated with the corresponding post-treatment measure outcomes. In terms of group performance, the only statistically significant improvements were observed in the English CELF composite scores ($p < .05$), while the Spanish CELF composite scores exhibited a clear trend ($p = .056$).

Changes in the narrative-based measures were not significant. Number of C-units, TNW, and NDW increased slightly in both languages. In contrast, MLU decreased by 5.2% in both languages, and grammaticality decreased in English, but increased minimally in Spanish. Specifically, grammaticality decreased by 10.15% in English, and increased .228% in Spanish. Number of C-units increased more in English than in Spanish, changing by 15.44% and 11.96% respectively. A similar pattern occurred in TNW, which increased by 14% in English and 7.47% in Spanish. Number of different words was the only narrative measure to increase more in the Spanish narratives (10.78%) than in the English ones (9.4%). Refer to Figure 1 for a graphic representation of the data described above.

Because the primary goal of speech therapy is improvement in individual children, pre- and post-intervention measures were also compared on an individual level and are shown in Table 4 and Table 5. The figure 10% was chosen for gain and loss calculations in an attempt to

create a sensitive measure of change despite the wide spread of the data and the high degree of variability in individual performance. For English, two of the eight participants demonstrated gains of at least 10% on four or more of the six measures. In Spanish, three out of the eight children exhibited such gains. All of the children who showed gains in at least four measures showed gains in CELF scores, number of C-units, TNW, and NDW. Interestingly, the children who exhibited this pattern of improvement in English were not the same children who showed such gains in Spanish, further testament to individuality in response to treatment. The measures most sensitive for change, defined here as those for which at least four children demonstrated gains of 10% or more, include the CELF scores in English and Spanish, and number of C-units, TNW, and NDW in Spanish.

Discussion

At first glance, the lack of statistically significant change in group performance on quantitative narrative-based measures coupled with the significant change found on standardized tests may limit the value of these measures in determining treatment efficacy for bilingual children with PLI. However, there are several factors which may have influenced the results. Data was taken from a small sample size ($n = 8$); a larger sample size may have produced statistically significant results. In addition to the limited number of participants, there was also considerable variability in age, with participants ranging from 6;2 to 9;6. Combined, the small sample size and age variability may account for the lack of statistically significant changes. Additionally, decreased reliability of MLU, the global nature of the coding scheme used to measure grammaticality, and the treatment of code switching may have led to an inaccurate portrayal of the results. These issues are discussed separately in the following sections.

MLU

MLU is used as a measure of language ability because it has been found to be sensitive to developmental changes in morphology and syntax (Rosenthal-Rollins, Snow, & Willet, 1996). However, there are several limits to using MLU. When analyzing a language sample, it can be unclear which specific morphemes and utterances to include. Also, different languages function differently in terms of morphological constructions. For example, MLU is conventionally counted in morphemes in English; in Spanish, a morphologically rich language, MLU counts in words have been found to be more sensitive (Jackson-Maldonado & Conboy, 2007). In addition to purely linguistic factors, social, communicative, and cognitive factors can also affect MLU, especially when analyzing specific populations, such as children with language impairment.

By simply counting the number of morphemes, MLU ignores structural complexity (Van Dijk & Van Geer, 2005). For example, the utterances *two boy* and *boys* both have two morphemes. The ambiguity between the addition of bound morphemes and the addition of modifiers means that different levels of linguistic sophistication are coded with similar MLU. In this sense, MLU fails to reflect individual differences in changing language ability because it does not distinguish between semantic and morphological learning (Rosenthal-Rollins et al., 1996). Furthermore, as children's linguistic skill increases, the complexity of their utterances increases in ways other than length, such as embedding. Because of this, MLU becomes less reliable as age and linguistic skill increases (Rosenthal-Rollins et al., 1996; Scarborough, Wyckoff, & Davidson, 1986). This characteristic of MLU could account for the decrease in MLU seen in the participants of this study. Despite the clinical diagnosis of PLI, MLU may have been a much less reliable indicator of change for the older participants. Because of this,

researchers analyzed additional narrative-based measures (TNW, TDW, C-Units, and grammaticality).

Speech intelligibility, or lack thereof, is another factor that affects MLU. Unintelligible segments of language samples can be discarded altogether or coded as one or multiple words depending upon the judgment of the transcriber, which introduces a source of bias into the analysis and can influence the results (Van Dijk & Van Geer, 2005). Speech intelligibility also poses difficulty when coding for grammaticality, which will be discussed below.

Grammaticality

Measures of grammaticality are often used to help identify language impairment. Indeed, grammatical factors such as tense markings, other verb morphological markers, and number of grammatical errors have been shown to distinguish between typical development and language impairment (Bedore & Leonard, 1998; Restrepo, 1998; Rice & Wexler, 1996). Grammaticality can be measured either by a global measure or a composite score. Global grammaticality analyzes the number of ungrammatical utterances compared to the number of grammatical utterances. Gillam and Johnston (1992) found that monolingual English-speaking children with Specific Language Impairment, referred to as PLI in this paper, produced more ungrammatical utterances than their typically developing peers. However, Gillam and Johnston focused on identifying language impairment in monolingual children, this study focused on measuring change from pre- to post-treatment in bilingual children already diagnosed with PLI. While a global grammaticality measure worked well for Gillam and Johnston, it produced many difficulties in this study.

Grammaticality can be especially difficult to determine in bilingual learners because of varying acquisition rates, cross-linguistic influences, and differing error rates. (Bedore & Leonared, 1998; Rice & Wexler, 1996). This study followed a global grammaticality procedure. All utterances were marked as either grammatical or ungrammatical. Grammatical utterances conformed to the rules regarding subject-verb agreement, verb tense, pronoun and article use, gender, and all other grammatical areas of the target languages. The content of mazes did not influence the grammaticality of utterances, and code switching was considered grammatical as long as it did not conflict with the grammaticality of the target language. Utterances with unintelligible words were counted, but excluded from analysis.

To maintain consistency in the treatment of utterances with unintelligible words, all of them were excluded from analysis, regardless of whether or not there was a prior grammatical error. For example, the utterance “the dog and the boy were XXX” and the utterance “the dog and the boy was XXX” were both excluded, even though the latter would be ungrammatical regardless of the content of the unintelligible portion of the utterance. The inclusion of these utterances would have led to lower grammaticality percentages.

In addition to the intelligibility of speech, there were several other factors which suggest that this method of coding for grammaticality was not the most sensitive for capturing change. For example, an utterance in which a child conjugated every verb correctly but used one wrong gender pronoun and an utterance in which a child made the same gender agreement error but conjugated every verb incorrectly were both marked ungrammatical. This gave children whose utterances were mostly correct the same grammaticality percentage as children whose utterances were mostly incorrect. Furthermore, some of the children seemed to be attempting more difficult grammatical forms in the post-treatment narratives than the pre-treatment ones. For example, one

child appeared to have switched from almost exclusively using the infinitive verb form, such as “el niño correr y gritar” (the boy to run and to scream), to conjugating verbs, such as “el niño corres y gritas” (the boy [you]-run and [you]-scream). Because the verbs were conjugated incorrectly, the utterances were still marked as ungrammatical. In this way, the global percentage of grammaticality failed to capture change following treatment.

Using a composite score of grammaticality may be useful in addressing the above concerns. Composite scoring codes the individual errors within an utterance instead of the overall grammaticality of the utterance as a whole. This makes it useful for coding multiple errors within an utterance, and it allows researchers to focus on certain types of errors (Bedore, Peña, Gillam, & Ho, 2010). For example, Rice and Wexler (1996) specifically examined the -s third person singular, -ed regular past, BE, and DO morphemes. Because composite scores allow for the coding of different types of errors, they are helpful in analyzing samples from bilingual children with PLI, who may have different difficulties in each of their languages (Bedore et al., 2010). Composite grammatical scores have also been successfully used to predict performance and to distinguish language impairment from typical development (Bedore & Leonard, 1998). Restrepo (1998) used composite scoring to obtain an error-per-utterance measure, which successfully identified language impairment in predominantly Spanish-speaking children. The increased focus offered by composite scoring may make it a more sensitive measure of change following treatment.

An additional consideration when coding grammaticality in narratives is the influence of the non-target language. Bedore et al. (2010) marked utterances as grammatical, ungrammatical, or influenced. An utterance would be marked influenced if it contains code switching or a dislocated subject (a subject that comes after the verb), and it would be excluded from analysis.

The high degree of code switching in the current study made the exclusion of such utterances impractical; however, the idea of marking utterances as influenced based on a dislocated subject has the potential to provide a more informative picture of grammaticality in these samples. There were several utterances in English that contained word orders that are only acceptable in Spanish. For example, the utterance “fell the boy out the window” would be considered influenced because it is ungrammatical due to the English language’s strict adherence to a subject-verb-object word order. However, if translated word-for-word into Spanish (“cayó el niño por la ventana”), it would be grammatical in Spanish. In this way, Spanish grammar is influencing production in English. Fiestas and Peña (2004) suggested that children maintained the complexity of their narratives in their L2, English, by using utterances influenced by their L1, Spanish. The inclusion of an influenced category in the current study would have provided informative data on these instances.

Code Switching in Grammaticality Measures

Code switching, or “the alternation of two languages within the discourse,” (Gutiérrez-Clellen, Cerejido, & Leone, 2009) is a natural part of bilingualism (Gutiérrez-Clellen, et al., 2009; Myers-Scotton, 1993). It is often distinguished from borrowing in that, in general, a borrowed word is phonologically and morphologically integrated into the other language, while a code-switched word is not (Gutiérrez-Clellen, et al., 2009; Myers-Scotton, 1993; Wei & Moyer, 2008). The current study did not make the distinction between code switching and borrowing, though the idea presents an interesting topic for discussion given that much of the code switching seemed to be due to distributed vocabulary.

Code switching is highly variable; it occurs for many reasons and manifests itself in a plethora of ways (Wei & Moyer, 2008). A bilingual speaker may “transpose a syntactic structure

from one language to another,” or may even pronounce a word taken from one language using the phonology of the language being spoken at the time (Wei & Moyer, 2008). Code switching can even take the form of expressions translated literally (Wei & Moyer, 2008). Code switching is rule-governed and thus subject to sociolinguistic constraints (Gutiérrez-Clellen, et al., 2009; Heredia & Altarriba, 2001; Lederberg & Morales, 1985; Myers-Scotton, 1993; Wei & Moyer, 2008). These regulations for code switching are developed along with all other aspects of language.

Code switching is typically judged unacceptable within word boundaries, and occurs where the grammars of the two languages coincide, not where they differ (Gutiérrez-Clellen, et al., 2009; Lederberg & Morales, 1985). There is some debate regarding the nature of the grammar of code switching. The term “code switching” implies that bilingual speakers merely switch from one grammar to the other, but some researchers have proposed that code switching represents the creation of a third grammar, while others argue that code switching represents the blending of the two original grammars (Lederberg & Morales, 1985; Myers-Scotton, 1993; Wei & Moyer, 2008). Regardless, caution is advised against interpreting bilingual speech as two clearly defined languages (Wei & Moyer, 2008). This makes the inclusion of code switching in grammaticality measures a complex process.

Gutiérrez-Clellen, Cereijido, and Leone (2009) studied the interaction between code switching and PLI. They found that, when other influencing factors, such as proficiency levels, were controlled, bilingual Spanish-English speaking children with PLI did not exhibit different numbers or patterns of code switching than typically developing children. There were no differences in the proportion of code switching by age or elicitation context, but the researchers

mentioned that children with PLI may demonstrate developmentally younger code switching (Gutiérrez-Clellen, et al., 2009).

Code switching tends to occur between two bilingual speakers of the same two languages, and it is influenced by speaker attitudes, proficiency levels, interlocutors, context, the status of each language, language dominance, language of testing, language of testing interaction, elicitation context, and other sociolinguistic factors (Gutiérrez-Clellen, et al., 2009; Wei & Moyer, 2008). These influential factors and the individual variability of code switching create a significant challenge when analyzing narratives from bilingual individuals. Because of this, utterances that include code switching are typically excluded from analysis (Gutiérrez-Clellen, et al., 2009). However, the high percentage of utterances that include code switching in the samples analyzed in the current study made their exclusion impractical. Excluding all utterances with incidents of code switching would have resulted in the exclusion of far too many utterances. The number of intelligible utterances containing code switching samples ranged from 0 to 71 per sample, accounting for anywhere from 0% to 88% of the intelligible utterances (refer to Table 6). Because they accounted for such a large percentage of the samples, utterances with code switching were included in the grammaticality measure in order to avoid potentially penalizing some children for exhibiting a natural aspect of bilingualism.

In terms of the present study, several factors may have influenced the amount of code switching. The narrative task presents a higher cognitive demand and therefore may have led to increased code switching in the weaker language (Fiestas & Peña, 2004). The educational nature of the task also may have made it easier to complete in English, resulting in more code switching in the Spanish narratives (refer to Table 6). Furthermore, the examiners who elicited the Spanish samples were bilingual Spanish-English speakers themselves. Being provided with monolingual

Spanish-only speaking interlocutors may have decreased the code switching in the Spanish samples. On the other hand, participants used both Spanish and English throughout their daily activities, and code-switching was a natural communicative behavior for many of them.

For grammaticality measurements in this study, code switching was considered grammatical as long as it did not conflict with the grammar of the target language. An initial informal observation led to the conclusion that the majority of the code switches were the result of distributed vocabulary (“el deer” for “el ciervo”). In these cases, the inserted word was treated as if it were a native word (as if “el deer” were Spanish for “deer”), and even “Spanglish” verbs often conformed to the grammar of the target language (“barkó”). Because of this, code switches that did not conflict were marked as grammatical. This approach was designed to create the most sensitive grammaticality measure. Additional research on this topic could help to create a more appropriate procedure for including code switching in grammaticality measures.

Meaningful Change

As evident by the results of the current study, different individuals exhibit different patterns of change. There is no such thing as the “average” child; a treatment that is appropriate for one child at one time may not be appropriate for another child or at another time (Wankoff, 2005; Weiss, 2010). Furthermore, the variability within bilingualism and within language impairment further adds to the effects of individual differences. Bilingual individuals, particularly within immigrant populations, vary in terms of amount of language exposure, family language use, dialect, and language of the larger community. Children with PLI may have deficits in one or many language domains, different maturational trajectories, and differing personal factors, such as home environment. Furthermore, narratives may differ based on differences in teaching methods for how to tell stories (Weiss, 2010). Because of this variability,

establishing a single, objective criterion for what constitutes a meaningful change presents a significant challenge.

The primary goal of language therapy is meaningful improvement in individual children, but what represents meaningful gains can be difficult to quantify. A clinician's measurements rarely correlate with the client's perceptions of whether they have improved, and changes that clinicians believe to be valuable are not necessarily those valued by the client (Manning, 2010). Furthermore, a client's attitudes, perceptions, and motivations can influence the efficacy of treatment. These combined influences lead to the definition of meaningful gains being the product of the client's and the clinician's decision making (Manning, 2010; Weiss, 2010). Because of this, Manning (2010) proposes the use of repeated self-reports by the client as a measure of change. However, obtaining reliable self-reports from clients who are young or who have mental disabilities may be difficult. Parental and child satisfaction surveys were distributed at the conclusion of the English-only treatment for this study; however, they were relatively uninformative as they were overwhelmingly positive.

Suggestions for what constitutes a numerically meaningful change vary and include a return to the norm, a change big enough to affect a standard score, a 5% change, a 10% change, movement in the mean score beyond that 10th percentile, and other criteria (Hasson & Botting, 2010; Manning, 2010; Washington, Warr-Leeper, & Thomas-Stonell, 2011). What is established as meaningful change tends to be established by those involved (e.g., clinicians, clients, family members). Given the current data, this study defined meaningful change on the individual level as a gain or loss of 10% or more. This figure was chosen in an attempt to create a sensitive measure of change despite the wide spread of the data and the high degree of variability in individual performance.

Conclusion and Suggestions for Further Research

Despite difficulty with MLU, grammaticality, and code switching, changes at the individual level still provide interesting points for discussion and directions for future research. While some participants exhibited losses, or little to no change, others improved in several measures. This indicates that these measures were sensitive to change on an individual level for at least some of the participants, despite the lack of significant changes on the group level. Additionally, the children who made gains in at least four out of the six measures in English were not the same children as those who exhibited the same improvement pattern in Spanish. This demonstrates the individual variation in changing narrative skills following treatment.

Future research involving a larger sample size could provide a more complete picture of the sensitivity of the quantitative narrative-based measures, as well as more information regarding patterns of change on each measure in each language. Additionally, research regarding the treatment of code switching in grammaticality measures and the sensitivity of global versus composite score grammaticality measures would assist in addressing some of the confounding factors in this study and contribute to further understanding the sensitivity of narrative assessment to change.

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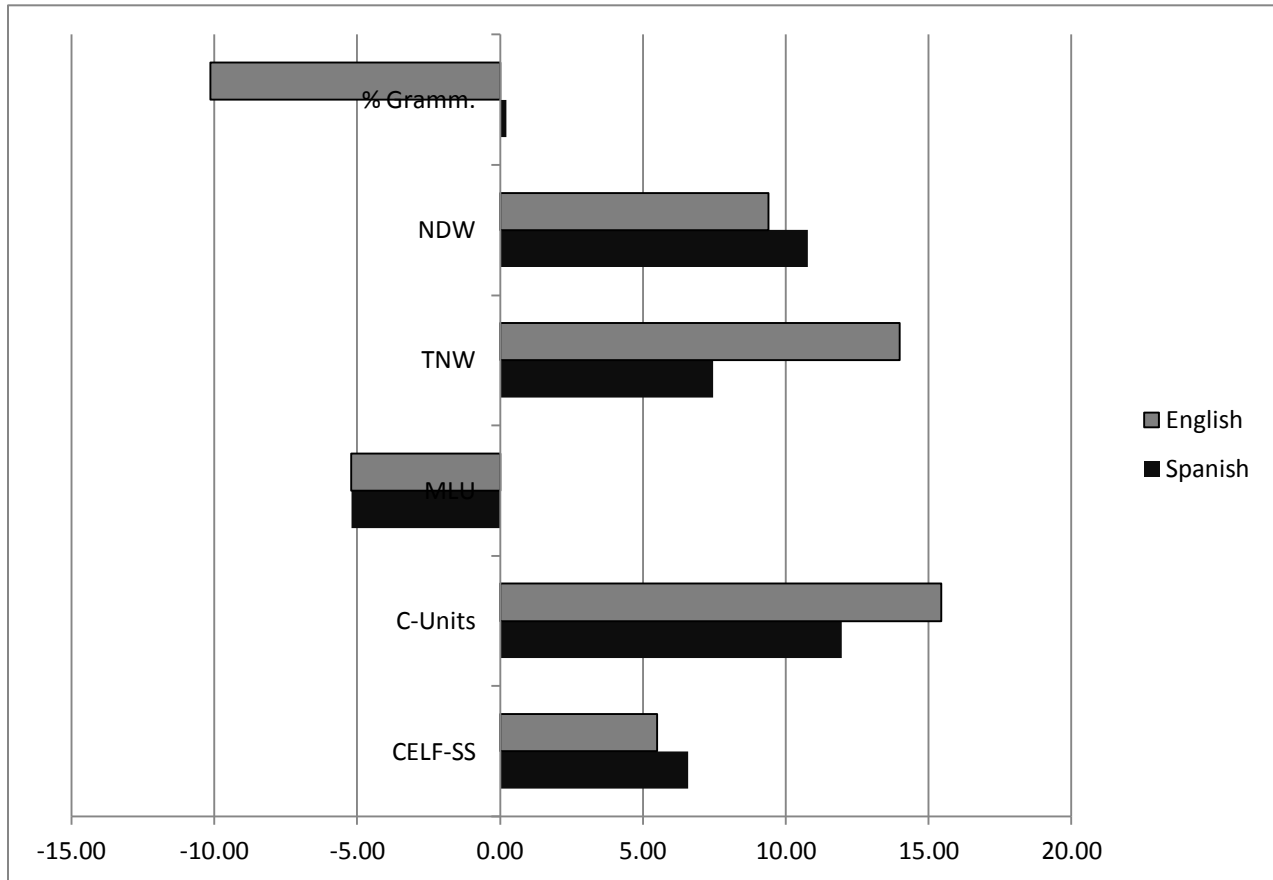


Figure 1: Group Percent Change in Scores from Pre- to Post- Treatment. This figure illustrates the group percent change following English-only treatment for the Clinical Evaluation of Language Fundamentals (CELF) scores as well as the five quantitative narrative-based measures: Percent Grammaticality (% Gramm.), Number of Different Words (NDW), Total Number of Words (TNW), Mean Length of Utterance (MLU), and Communication Units (C-Units).

Table 1

Participants

School	Participant	Gender	Age At start of study	# of Intervention Sessions Attended	CELF English	CELF Spanish	TONI
Green	104	F	9;6	19	66	62	97
Green	105	M	7;8	24	40	47	88
Green	106	M	6;2	24	40	62	115
Whittier	113	F	7;0	21	40	45	83
Whittier	114	F	8;6	23	67	83	84
Whittier	115	F	9;5	23	60	70	92
Jefferson	123	M	7;9	17	54	77	88
Jefferson	124	M	6;8	22	42	71	89

Table 2

SALT Coding for Morphemes

Morpheme	Language	Code	Example
Regular Plural Inflections	English and Spanish	/s	babies = baby/s ranas = rana/s
Possessives	English	/z	boy's = boy/z
Plural Possessives	English	/s/z	frogs' = frog/s/z
Third Person Singular Verb Inflections	English	/3s	Looks = look/3s
Progressive Inflection	English	/ing	Swimming = swim/ing
Regular Past Tense	English	/ed	Looked – look/ed
Contractions	English	/	He'll = he/'ll
Pronominal Clitics – counted as separate words	Spanish	+	Dámelo = da+me+lo

Table 3

Group Mean, Standard Deviation, and Range

Measure	Spanish			English			
	Mean	SD	Range	Mean	SD	Range	
T1	CELF SS	64.63	13.469	38	51.13	12.041	27
	C-Units	45	13.522	39	42.88	11.969	36
	MLU	5.24	1.140	3	6.13	1.713	4
	TNW	241	102.269	307	249.75	101.650	288
	NDW	73.13	27.331	73	78.38	26.549	81
	% Grammaticality	52.74	25.664	71	48.85	22.738	80
	# Unintelligible	6.875	5.939	16	3.88	6.999	19
T2	CELF SS	68.88	14.827	38	56.63	13.907	36
	C-Units	50.37	22.841	70	49.5	21.481	55
	MLU	4.97	1.066	2	5.81	1.38	3
	TNW	258.88	144.803	395	285	166.212	450
	NDW	81	40.627	127	85.75	39.82	120
	% Grammaticality	52.86	28.547	81	43.89	21.078	62
	# Unintelligible	5.63	4.926	13	2.13	2.295	6

Table 4

English Individual Change

Participant	CELF SS	C-Units	MLU	TNW	NDW	% Grammatical
GR 104	+	0	-	-	-	0
GR 105	+	-	+	-	-	-
GR 106	+	-	0	-	0	-
WH 113	0	-	0	+	+	-
WH 114	+	+	0	+	+	0
WH 115	-	+	-	0	0	+
JE 123	+	0	0	0	0	-
JE 124	+	+	0	+	+	0
+/total	6/8	3/8	1/8	3/8	3/8	1/8

Note: +: $\geq 10\%$ gain -: $\geq 10\%$ loss 0: gain or loss $\leq 9.9\%$

Table 5

Spanish Individual Change

Participant	CELF SS	C-Units	MLU	TNW	NDW	% Grammatical
GR 104	+	-	0	-	-	0
GR 105	0	-	-	-	-	+
GR 106	+	+	0	+	+	+
WH 113	0	+	0	+	+	-
WH 114	0	0	-	0	0	0
WH 115	+	+	0	+	+	0
JE 123	+	+	0	+	+	-
JE 124	-	0	0	0	0	0
+/total	4/8	4/8	0/8	4/8	4/8	2/8

Note: +: $\geq 10\%$ gain -: $\geq 10\%$ loss 10: gain or loss $\leq 9.9\%$

Table 6

Code Switching and Intelligibility

Participant	Narrative	Intelligible Utterances Containing Code Switching	Total Intelligible Utterances	Total Utterances	% Intelligible	% Intelligible with Code Switching
GR 104	S1	11	40	51	78.4	27.5
	S2	7	30	36	83.3	23.3
	E1	0	41	42	97.6	0
	E2	0	38	39	97.4	0
GR 105	S1	9	36	53	67.9	34.6
	S2	7	25	38	65.8	28
	E1	7	36	55	65.5	19.4
	E2	1	31	35	88.6	3.2
GR 106	S1	1	13	21	61.9	7.7
	S2	1	20	27	74.1	5
	E1	2	26	36	72.2	7.7
	E2	3	24	28	85.7	12.5
WH 113	S1	42	44	55	80	95.5
	S2	71	80	92	87	88.8
	E1	0	49	49	100	0
	E2	3	77	83	92.8	3.9
WH 114	S1	13	58	58	100	22.4
	S2	8	59	59	100	13.6
	E1	0	46	46	100	0
	E2	0	80	80	100	0
WH 115	S1	0	45	46	97.8	0
	S2	6	58	58	100	10.3
	E1	0	39	39	100	0
	E2	0	48	48	100	0
JE 123	S1	2	38	43	88.4	5.3
	S2	3	47	51	92.2	6.4
	E1	0	54	55	98.2	0
	E2	0	53	53	100	0
JE 124	S1	3	28	30	93.3	10.7
	S2	1	29	32	90.6	3.4
	E1	1	20	20	100	5
	E2	0	28	30	93.3	0
Total		202	1340	1488	90.1	15.1
Average	S1	10.1	37.8	44.6	83.5	25.5
	S2	13	43.5	49.1	86.6	22.4
	E1	1.3	38.9	42.8	91.7	4
	E2	.88	47.4	49.5	94.7	2.5

Note: S = Spanish, E = English, 1 = Pretreatment, 2 = Post-treatment

Appendix

3 Treatments for Bilingual Children with LI

p. 1

Narrative Story Retell

1. What materials are needed to elicit the samples?

- The wordless picture book entitled *Frog, Where Are You?* by Mercer Meyer, 1969.
- An audio recorder (*cassette or digital*) with a good external microphone.
- A quiet area with a table and two chairs.

2. Before You Begin

Sometimes it helps to talk with the child about the equipment and how it works. Interest in the recording equipment should quickly fade as the child focuses on retelling the story.

- Discuss what the recorder does and how it works.
- Record the child's name, date of birth, your name, today's date, etc., and play it back right away. This way, you have checked the recorder and have also let the child hear what the recording sounds like.

3. Steps

a) Sit next to the child at a table. The book, *Frog Where Are You?*, by Mercer Mayer should be on the table. The recorder should be checked and ready to be turned on.

b) Directions to the child (English):

Here is a book. This book tells a story about a boy [point to picture on the cover], a dog [point] and a frog [point]. First, I want you to look at all the pictures. Pay attention to each picture that you see and afterwards you will tell the story.

S [Aquí está un libro. Este libro se trata de un niño [señale/indique al dibujo en la portada del libro], un perro [señale/indique] y una rana [señale/indique]. Primero, quiero que veas todos los dibujos. Presta atención/Fíjate a cada dibujo que ves y después cuenta el cuento.

c) Leave the book with the child and move away – either at an angle facing the child or across the table. *Moving away from the child helps promote language and minimize pointing.* Turn on the recorder and instruct the child to tell the story back in the same language.

Directions to the child (English sample): *Okay, now I would like you to tell me the story.*

Directions to the child (Spanish sample): *Ahora, cuéntame lo que pasó en este cuento.*

Refer to the following section for a list of prompts that you may use while the child retells the story. Remember, all prompts should be in the target language.

d) After the child finishes telling the story, turn off the recorder and thank the child for telling his/her story.

Prompts

Use minimal open-ended prompts when eliciting the samples. Using overly-specific questions or providing too much information to the child compromises the process of capturing the child's true language and ability level. Open-ended prompts *do not* provide the child with answers or vocabulary. They *do* encourage the child to try or they let the child know it is ok to move on if needed. Use open-ended prompts/questions as necessary.

• Use open-ended prompts when the child:

- is not speaking
- says "I don't know.", "Cómo se dice?"
- starts listing (e.g., "boy", "dog", "jar")

• Acceptable verbal prompts (*in the target language*) include:

- Tell me more. Dime más.
- Just do your best. Haz lo mejor que puedas.
- Tell me about that. Dime sobre eso/esa.

3 Treatments for Bilingual Children with LI

p. 2

- You're doing great. Estás haciendolo muy bien.
- I'd like to hear more about that. Me gustaría oír más sobre eso/esa.
- Tell me what you can. Dime lo que puedas.
- That sounds interesting. Eso/Esa suena interesante.
- What else? ¿Qué más?
- Keep going. Siguele. Dale.
- Mhm.
- Uhhuh.

Acceptable nonverbal prompts include:

- Smiles and eye contact
- Nods of affirmation and agreement

Unacceptable prompts include:

- What is he doing? ¿Qué está haciendo (él)?
- Where is he? ¿Dónde está (él)?
- Pointing at scenes in the book while prompting
- What's this? ¿Qué es esto?
- What's happening here? ¿Qué está pasando/ocurriendo aquí?)
- Avoid asking the "wh" questions, who?, what?, when?, where? These often lead to obvious and limited responses/answers.

What if the child code switches?

If the child uses an occasional Spanish word in the English sample, just ignore it. However, if the child uses a lot of Spanish words or phrases, prompt the child with "in English, please" or "tell it to me in English" or "tell me the story in English."

Similarly, if the child uses a lot of English words in the Spanish sample, prompt the child with "en Español, por favor" or "dimelo en Espanol" or "dime el cuento en Español".

Direct the child to use the target language with minimal interruption of his or her story. But keep in mind that at least 80% of the words should be in the target language in order for the sample to be valid.

Suggestions for Eliciting a Good Sample

Children are more likely to converse if they believe others are really interested in what they have to say. If they doubt a listener's sincerity, younger children may simply refuse to cooperate; older children may cooperate but provide only minimal responses that do not reflect their language ability.

Be enthusiastic: Pay attention as if it were an adult interaction.

- Generate a friendly demeanor.
- Show interest with smiles, vocal inflection and eye contact.
- Give the child your undivided attention.

Be patient: Allow the child space and time to perform.

- Do not be afraid of pauses.
- Use open-ended prompts when necessary.

It is important to remember that these suggestions are relevant for all children regardless of their cultural, economic, or language background, or their cognitive, physical, or speech and language differences. The goal is to provide the child the maximum opportunity to communicate to the best of his/her ability. There is no substitute for experience in talking with children of various ages and ability levels. But even the most experienced examiner must guard against any possible behavior that would inhibit the child's performance.