ASHA American Speech-Language-Hearing Association

AJSLP

Research Article

Sentence Diversity in Spanish–English Bilingual Toddlers

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ARTICLE INFO

Article History:
Received May 6, 2022
Revision received September 1, 2022
Accepted November 26, 2022

Editor-in-Chief: Erinn H. Finke
Editor: Audra Sterling

https://doi.org/10.1044/2022_AJSLP-22-00149

ABSTRACT

Purpose: There remain few available tools to assess language development in Spanish–English dual language learner (DLL) toddlers in the United States. Of interest is the development of early sentences as children move from producing single words to producing multiword utterances. This study is the first to extend sentence diversity to the context of Spanish–English DLLs by describing development from 24 to 30 months of age in children with and without language delays (LDs).

Method: Spontaneous language samples were collected from Spanish-dominant DLL children and their mothers as they were observed during a free-play interaction. Existing sentence diversity protocols were adapted for the DLL context to describe children's flexibility in combining subjects and verbs to form utterances in Spanish and English.

Results: Children maintained an accurate separation in their grammars for subject–verb combinations in Spanish versus English. There was an overwhelming preference for Spanish subject–verb combinations with null subjects. The emergence of sentence diversity distinguished children with and without early LD unlike the emergence of word combinations.

Conclusions: Consistent with prior research, findings showed that DLLs did not confuse grammatical structures across languages. Instead, they showed a differential pattern of results in each language, such that the strongest grammatical skills were evinced first in the dominant language. Sentence diversity shows promise for assessment and progress monitoring in Spanish–English DLLs in the United States.

Spanish is the second most spoken language in the United States, making the population of Spanish–English dual language learners (DLLs) a large and growing group of children in the country. U.S. DLLs are typically defined as children learning the majority language (English) in addition to a second language at home. Most DLLs have parents who report speaking Spanish at home (59%; Park et al., 2017). Despite the size of this population, speech-language pathologists (SLPs) often report low confidence in delivering appropriate assessment and interventions in culturally and linguistically diverse populations from non–English-speaking contexts, including Spanish–English learners (e.g., Guiberson & Atkins, 2012; Williams & Mcleod, 2012). Practitioners point to a lack of access to measures and assessment tools that are validated for culturally and linguistically diverse populations, a dearth of data on developmental trajectories in diverse linguistic communities, uncertainty in selecting appropriate tools and guidance on bilingual assessment, and concern about the bias of existing measures as among those contributing to service delivery challenges including in DLL populations (Arias & Friberg, 2017; Guiberson & Atkins, 2012; Hardin et al., 2009; Kohnert et al., 2003; Kritikos, 2003; Roseberry-McKibbin et al., 2005). These service delivery challenges have real consequences for the lives of children and in part contribute to the inequitable service provision for children from Spanish-speaking backgrounds (Cycyk et al., 2022; Huerta et al., 2021). This study seeks to

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provide researchers and practitioners with a measure of early basic sentence structure that extends to Spanish–English DLLs with and without language delays (LDs).

Measures of Early Syntax

Children's early syntactic skills are an important domain of measurement for both practitioners and researchers given that deficits in the acquisition of sentence structure (i.e., syntax) are a core diagnostic feature of developmental language disorder (DLD; Bedore & Leonard, 1998; Bishop, 2017; Rice & Wexler, 1996), including among children who speak Spanish and English (i.e., Bedore & Peña, 2008; Restrepo & Kruth, 2000). Indeed, challenges with basic sentence structure are well documented in children with DLD from diverse language backgrounds (Leonard, 2014). However, there remains a need for measures that extend to Spanish-learning children in the United States. DLD is a neurodevelopmental disability that can emerge in early childhood as LD and often persists into adulthood. Our best estimates suggest that DLD is one of the most common neurodevelopmental disorders with a prevalence rate of 7% (Norbury et al., 2016; Tomblin et al., 1997), making it at least 3 times more likely than autism spectrum disorder (prevalence = 2.3%; Centers for Disease Control and Prevention, 2021). DLD is associated with increased risk of poor academic outcomes, as well as long-term employment placement and challenges across social, emotional, and behavioral domains (Conti-Ramsden & Durkin, 2012; Law et al., 2013; Tomblin, 2008; Yew & O'Kearney, 2013).

At present, a widely used measure of syntax in linguistically diverse children under 3 years of age captures the mean length of utterance (MLU) produced. At around 24 months of age, typical learners regularly produce two-word utterances, such that by the third birthday, they are combining three words (or morphemes) into a single utterance. Although MLU is helpful as a global measure of utterance length, it provides limited information about the underlying sentence structure and diversity of word combinations. Moreover, some recent evidence suggests that MLU has less reliability as a marker of grammatical development in Spanish speakers compared with English monolinguals (Baron et al., 2018) and is a weak measure of change in grammatical development among Spanish–English bilinguals (Bedore et al., 2020). *Sentence diversity* has been proposed as a complementary measure to MLU for describing development of basic sentence structure as children transition from one-word productions to multiword utterances (i.e., Hadley, 2020). For typical learners, the transition from one- to two-word utterances happens during the second year of life, whereas children with early LD often show significant delay in the emergence of word combinations (Rudolph & Leonard, 2016; Zubrick et al., 2007) in addition to low diversity in the types of combinations that they eventually produce (e.g., Hadley, 2020; Rispoli et al., 2018). However, as described below, sentence diversity has not been examined in Spanish-speaking children.

Sentence Diversity

Sentence diversity is intended to capture the increasing flexibility with which children combine subjects and verbs to produce utterances (e.g., Hadley, 2020). Thus, whereas MLU captures the average length of utterances, sentence diversity describes the emergence and flexibility of children's word combinations. Healthy language development involves increasing utterance length while also demonstrating the ability to combine the same verb with different subjects (e.g., "She wants X," "The teacher wants X"). In contrast, research shows that children with early LDs who are at greatest likelihood for DLD diagnosis demonstrate an overreliance on a few sentence frames during early toddlerhood (e.g., "I want X"; McKenna & Hadley, 2014). Sentence diversity describes the unique subject–verb combinations children produce as they transition from one to multiword sentence structures. Sentence diversity is calculated by counting the unique combinations of different subjects with different verbs. The measure informs our understanding of early sentence structures.

To the authors' knowledge, published peer-reviewed sentence diversity research has been entirely conducted in populations of monolingual English speakers from non-Latino/a and primarily White backgrounds from college-educated homes (e.g., Hadley, 2006, 2020; Hadley et al., 2016, 2017; Hsu et al., 2017; McKenna & Hadley, 2014; Rispoli et al., 2018). Within this population, a series of studies examining sentence diversity have demonstrated great promise for the measure in children with early LDs. Specifically, for assessment purposes, studies of English monolinguals have shown a developmental progression of sentence subjects, such that sentences with first-person subjects emerge before sentences with third-person subjects (Lee, 1974). Furthermore, children's growth in sentence diversity with third-person subjects is a significant predictor of growth in the emergence and productivity of tense and agreement morphemes (Hadley et al., 2017). For English monolinguals, capturing grammatical skill with tense and agreement morphemes is especially important for assessment and ongoing progress monitoring given that deficits in such morphosyntactic structures are hallmarks of DLD in this specific language community (Rice, 2003; Rice & Wexler, 1996; Rice et al., 1998, 2009). In particular, the tense and agreement morphemes that are especially difficult for English-speaking children with DLD include present third-person singular *–s*, past tense *–ed*, and both copula and auxiliary *BE* (*is*, *are*, *am*, *was,* and *were*).

The hypothesis is that diverse subject–verb combinations in early sentence production provide a foundation for learning language-specific grammatical rules about tense and agreement (Hadley et al., 2018; Rispoli & Hadley, 2011).

Prior studies have also provided developmental expectations for English monolinguals (Hadley et al., 2018): By 30 months of age, approximately 27% of utterances produced by English monolingual speakers were sentences, with a rate of approximately one unique subject–verb combination produced per minute. Sentence diversity was also positively correlated with MLU, such that sentences become longer while also increasing in diversity. Furthermore, in a retrospective study of children with a high likelihood of DLD at 36 months of age, McKenna and Hadley (2014) showed that, although these children were combining words (as indexed by MLUs > 1), there were clear challenges in sentence diversity as early as 30 months of age. Although further research is needed, this suggests that limited sentence diversity may support the identification of children with LD and who are more likely to have persistent challenges with language production and DLD.

Extensions of Sentence Diversity to Spanish–English DLLs

It is well established that deficits in sentence structure are a hallmark of DLD across languages (e.g., Leonard, 2014). Extensions of sentence diversity as a measure to other culturally and linguistically diverse communities are therefore warranted. However, there are several gaps that limit the applicability of extant findings to the Spanish–English DLL population. It would not be appropriate to extend prior research conducted in English monolinguals to DLLs, even when they are exposed to English in addition to another language. First, languages interact and influence each other in bilingual contexts. This means that English may show influence of Spanish and vice versa (Paradis & Genesee, 1996). Developmental trajectories describing sentence diversity must be refined and examined independently in Spanish–English DLLs as single-language milestones would lead to inappropriate comparisons across groups. Language interaction similarly influences production, such that bilinguals can produce word combinations in one or two languages. Research on monolinguals would therefore not provide information to describe how sentence diversity differs when produced in English only, in Spanish only, or in a code-switched context (i.e., with language alternation; mixed Spanish and English).

Second, the sentence diversity coding protocol was developed with the rules of English grammar. Recall that sentence diversity is calculated by counting the unique combinations of different subjects with different verbs. Applying this protocol without modifications and adaptations would undercount subject diversity in languages such as Spanish where null subjects are permitted. For example, in Spanish, the single word "*cantamos*" ("we sing") provides information about both the verb (*cantar;* "to sing") and the subject (*–amos* indicates a first-person plural subject). The morphemes appear in a single word. This is different from the English translation ("we sing"), which provides two separate words (one for each morpheme) to indicate the subject and the verb. Such differences in the grammars of Spanish and English would also influence the associations among different grammatical measures such as MLU. Adapting grammatical measures to accommodate null subjects in Spanish is consistent with extant approaches in older bilingual children for identifying DLD (Peña et al., 2020) and consistent with best practice for adaptation (Peña, 2007).

Third, the specific features, parameters, and characteristics of sentence diversity may differ in Spanish–English DLLs compared with English monolinguals. Whereas English monolingual children with DLD have specific difficulty with tense and agreement, Spanish-speaking children tend to have less difficulty with these structures (Bedore & Leonard, 2005). Instead, articles; clitics; and agreement among person, number, and gender are notably challenging for Spanish speakers (Anderson & Souto, 2005; Bedore & Leonard, 2001, 2005). In addition, the degree of difference in grammatical skills among typical learners and those with DLD from Spanish-speaking backgrounds may be smaller than those documented in the English monolingual group. Specifically, research shows that the difference in MLU between kids with and without language disorders is greater for children learning English compared with those learning Spanish (Bedore & Leonard, 2001; Hewitt et al., 2005; Jacobson & Schwartz, 2002; Klee, 1992; Leonard, 1998). That is, English monolingual children with DLD have lower MLU than their typically developing (TD) English monolingual peers, whereas this gap in MLU between DLD and TD groups is smaller in Spanish speakers.

Fourth, in addition to language and grammar differences, there are cultural contexts that differ between the White English monolingual population of children from college-educated homes and that of Spanish–English DLL children in the United States (e.g., Hoff, 2006). These cultural contexts may influence developmental trajectories as well as the nature of associations between parental input and child language outcomes. Indeed, cultural contexts influence parenting practices, including characteristics of the language environment and parent–child interactions (e.g., Prevoo & Tamis-Lemonda, 2017). In turn, child language trajectories are known to vary across cultures and languages (Frank et al., 2017), which necessitates research in culturally and linguistically diverse populations to understand similarities and differences across populations.

This Study

There are three primary research aims in this study. First, this study will describe the development of sentence diversity at 24 and 30 months of age in Spanish–English DLL children with and without LD. Prior research suggests that subject–verb combinations are reliably produced by 30 months of age in Spanish speakers (Clahsen et al., 2002; Montrul, 2004; Mueller Gathercole et al., 1999). Importantly, this study seeks to describe the relative development of sentence structures in each language (i.e., Spanish vs. English). In this way, this study will be the first to provide preliminary developmental expectations in order to examine the degree to which the available English monolingual research will apply to Spanish–English DLLs. We expect that the development of sentence diversity will indeed differ given that the hallmarks of DLD are also different across English monolinguals and Spanish–English DLLs. For example, growth trajectories in MLU are attenuated in Spanish versus English monolingual contexts given that Spanish permits null subjects among other morphemes when the context provides sufficient information, whereas English requires an overt subject as illustrated previously (Bedore, 2001; Gutiérrez-Clellen et al., 2000). Furthermore, the comparison across typical learners (TD) and those with LD will inform future studies examining assessment for DLL toddlers. We expect that those children with LD will show significantly weaker sentence diversity skills compared with their TD peers.

Second, this study aims to provide preliminary information about the utility of sentence diversity as a measure of early sentences in Spanish–English DLLs with and without LDs. MLU of age is a recommended measure in assessment as children with LDs demonstrate late emergence of word combinations. Indeed, late emergence of word combinations after 24 months of age is a better diagnostic marker of DLD than delayed onset of word production (Rudolph & Leonard, 2016). This suggests that measures of early morphosyntactic skill are indeed better for early identification. However, a significant proportion of children with DLD are not late word combiners or delayed word producers (Leonard, 2013). Furthermore, recall that MLU is less likely to differentiate children with and without language disorders in Spanish speakers compared with English speakers (Bedore & Leonard, 2001; Hewitt et al., 2005; Jacobson & Schwartz, 2002; Klee, 1992; Leonard, 1998). Similarly, growth trajectories in MLU are attenuated in Spanish versus English monolinguals and are less likely to show change over time (Bedore, 2001; Gutiérrez-Clellen et al., 2000). Sentence diversity may offer a complementary measure at early ages compared with length of word combinations (i.e., MLU). Sentence diversity provides detail about the earliest use and flexibility of word combination skills, which may therefore capture additional variability associated with LDs. This study will test this hypothesis in Spanish–English DLLs. We expect that the emergence of flexibility in early sentence structures (as measured by sentence diversity scores > 1) will be more closely associated with LD compared with the emergence of word combinations (as measured by MLU > 1).

Third, this study seeks to examine the associations between sentence diversity and other common measures of early language output. Such analyses provide a preliminary test of the construct validity of sentence diversity in Spanish–English DLLs. We expect to replicate prior English monolingual findings such that sentence diversity will be positively associated with other child outcome measures that are typically used in language assessment of toddlers, such as the number of different words (NDW) produced and MLU. Together, this research will support practitioners who report a lack of knowledge about development, assessment, and diagnosis of DLLs (e.g., Guiberson & Atkins, 2012).

Method

Participants

Children formed part of a larger longitudinal study of language development in Spanish–English DLLs. Children were required to have at least 20% exposure to Spanish since birth and have a mother who identified as Latina/x or Hispanic. Children who had developmental concerns or diagnoses for which communication was a secondary concern or that impacted other areas of development in addition to communication or language were excluded from participating (i.e., autistic children). A total of 52 children participated in this study (there were two sets of twins). A subgroup of children were invited to participate at 24 months of age and again 6 months later at 30 months of age (n = 35). An additional subgroup (n = 17) was invited to participate only at 30 months of age. The Center for Early Care and Education Research–Dual Language Learners (CECER-DLL) Child and Family Questionnaire was used to collect key demographic data about the children and their families (Hammer et al., 2020). The questionnaire was selected for this study, because it was systematically validated through an iterative process within the Spanish–English DLL population and represents one of the few available questionnaires for capturing key demographic information from such families (see Table 1).

Children were divided into groups based on the presence of LD. The LD group (n = 19; 24 months of age: n = 12, 30 months of age: n = 7) was composed of children who were receiving special education services for communication (n = 3) or had parental concerns for communication development (n = 16), which were corroborated by low vocabulary scores on the English and

Table 1. Child (N = 52) and family characteristics.

Variable	*n* (%)	*M* (*SD*)
Child characteristics		
Age in months		26.58 (2.86)
Sex		
Boy	23 (44%)	
Girl	29 (56%)	
Born in the United States	51 (98%)	
Developmental concerns[a]	20 (38%)	
Child language exposure[b]		
% Exposure to Spanish		77.83 (22.69)
% Exposure to English		22.69 (21.19)
% Exposure other language		0.62 (2.87)
Maternal characteristics		
Age in years		33.10 (6.23)
Ethnicity		
Mexican	39 (75%)	
Guatemalan	3 (6%)	
Colombian	1 (2%)	
Dominican	1 (2%)	
Salvadoran	1 (2%)	
Nicaraguan	1 (2%)	
Chilean	1 (2%)	
Argentine	1 (2%)	
Other	4 (8%)	
Education		
Less than high school	18 (35%)	
High school diploma or GED	16 (31%)	
Vocational training or some college	6 (12%)	
Associate's degree	1 (2%)	
Bachelor's degree	7 (13%)	
Master's or higher	4 (8%)	
Born in the United States	42 (81%)	
Annual family income		
< $10k	6 (12%)	
$10,001–$20,000	5 (10%)	
$20,001–$30,000	11 (21%)	
$30,001–$40,000	6 (12%)	
$40,001–$50,000	2 (4%)	
$50,001–$60,000	7 (13%)	
$60,001–$70,000	2 (4%)	
> $70,001	6 (12%)	
Unknown	7 (13%)	

Note. GED = General Educational Development.

[a]Refers to parent-reported concerns and/or participation in early intervention or early childhood special education. [b]Cumulative exposure from birth as measured by the Language Exposure Assessment Tool.

Spanish adaptations of the MacArthur–Bates Communicative Development Inventories Words and Gestures form (Inventario del Desarrollo de Habilidades Comunicativas Palabras y Enunciados; Fenson et al., 2007; Jackson-Maldonado et al., 2005). Consistent with best practices for assessment in DLL contexts, children showed a vocabulary delay across both languages (Spanish and English) with scores below the 20th percentile (M = 3.76, SD = 3.46). The remaining children made up the neurotypical learners with no identified LD and who were otherwise TD at the time of the study (n = 33; 24 months of age: n = 23, 30 months of age: n = 10).

Nearly all children were born in the United States (n = 51; one child born in Colombia). Across LD and TD groups, children had greater cumulative exposure (birth to present) to Spanish than English as measured on the Language Exposure Assessment Tool (LEAT; M_{Spanish} = 77%, M_{English} = 22%; De Anda et al., 2016). The LEAT was preferred as the measure of language exposure as it is the only language exposure questionnaire validated in Spanish–English toddlers in the United States. LEAT results showed that all children continued to have current exposure to Spanish at the time of data collection, and 90% had current English exposure (n = 47). A small group of children attended preschool or day care (n = 9), most of which were described by mothers as English monolingual environments (n = 5), as well as Spanish–English bilingual (n = 3) and Spanish monolingual (n = 1) language environments. The most common sources of Spanish input to children were mothers (n = 52), fathers (n = 44), and siblings (n = 44), followed by grandparents (n = 22), extended family (aunts, uncles, and cousins; n = 33), child care providers (n = 9), and friends (n = 5). All mothers identified as Latina/x or Hispanic. Most mothers had a high school education or higher (65%), were born outside of the United States (81%), and identified their ethnicity as Mexican (75%). All participants were recruited within the local radius of a metropolitan city in the Pacific Northwest of the United States. Table 1 provides additional detail on child and family characteristics. The methods of this study were approved by the institutional review board at the University of Oregon; all participants gave their informed consent to participate.

Measures

Language Sampling

Child spontaneous language production was collected through observation of mother–child free-play. A 10-min semistructured observation was recorded while dyads engaged with specific materials. Mothers and children had access to a standard set of toys to facilitate language production between dyads: (a) toy cookware and plastic food items, (b) farm animals and farmhouse or building blocks, and (c) the same book in Spanish and English. The observation is similar to the Three Bags Task commonly used in studying parent–child engagement (Tamis-LeMonda et al., 2004). Mothers were required to use all three sets of toys in any way that felt natural to them. No instruction was given regarding the use of English or Spanish. Instead, children and mothers were permitted to use one or both languages to the extent that this felt natural and typical to them. Language samples were transcribed and coded in their original languages by trained Spanish–English bilingual research assistants. All transcription and coding occurred using the software and

conventions of the Systematic Analysis of Language Transcripts (SALT; Miller & Iglesias, 2020). A second research assistant reviewed transcripts alongside the video of the dyad's language sample to ensure transcription and coding accuracy. In addition, SALT staff reviewed all coded transcripts to ensure accuracy and reconciled discrepancies through consensus with the first two authors.

Coding Variables

To capture child language output during the observation, three variables were extracted from the language samples as described below: NDW, MLU, and sentence diversity.

NDW and MLU. Both NDW and MLU measures were extracted from the Standard Measures Report for each child as calculated within SALT software. NDW is intended to capture lexical diversity in child production, whereas MLU in words (MLUw) describes the length of children's utterances in words. The use of words for calculating MLU was favored over the use of morphemes to ensure relatively comparable estimation across English and Spanish and following best practices (e.g., Gutiérrez-Clellen et al., 2000). It is also important to note that NDW and MLUw capture skills across Spanish and English as composite measures of children's skill given that the elicitation instructions for the language sample allowed children and mothers to use Spanish and English to any degree and in such a way that it was natural and typical for them. A random selection of 20% of the observations were transcribed and coded by a different research assistant to ensure acceptable reliability. Interrater reliability was determined by calculation of intraclass correlation coefficients based on a one-way random-effects models for NDW and MLUw. The intraclass correlation coefficient was .94 for NDW (95% CI [.82, .98]) and .95 for MLUw (95% CI [.82, .98]), indicative of excellent interrater reliability.

Sentence diversity. The third variable extracted from the coded language transcripts included sentence diversity. The published sentence diversity protocol was adapted to ensure validity for the present Spanish–English bilingual context (e.g., Hadley et al., 2018). Specifically, trained bilingual research assistants examined all of the child's productions to extract a subset of utterances that provided information about a subject or subject agreement as well as a lexical verb in a single utterance. The subject is the noun phrase in the preverb position of a subject–verb or subject–verb–object sentence. Subject noun phrases can be pronouns, nouns, or elaborated noun phrases (e.g., "it," "dog," and "the dog"). In English, subjects are obligatory or overt. In Spanish, agreement marking on the verb allows the subjects to be null. Therefore, utterances were included if a subject–verb or subject–verb–object sentence was produced (as required in English) or if the utterance had a null subject but provided at least a verb with subject agreement (as allowed in Spanish). All sentences that met these criteria were included in the analysis even if the child code-switched within the utterance. Tables 2 and 3 provide several examples of utterances and their analysis.

Having identified the subset of subject–verb combinations produced by the child, several variables were coded for these utterances only. First, to provide an overall sentence diversity score, research assistants counted the number of unique subject–verb combinations produced by the child as done in prior research. This means that lexical variations of the same noun were treated as a single type. Note that singular and plural nouns are treated separately and include unique instances consistent with the original sentence diversity coding protocol (e.g., Hadley et al., 2018). The use of the same subject–verb combination in a different language was counted as a unique production.

Second, for each unique subject–verb combination included in the sentence diversity score, research assistants applied study-specific codes to these utterances across several parameters to describe the nature of children's subject–verb combinations in Spanish and English and in mixed utterances. Assistants coded for (a) subject inclusion: This captured whether the subject was null or included in the noun phrase. Recall that we included utterances with overt or null subjects, because Spanish permits such sentence structures. Each utterance was also coded to describe the

Table 2. Examples of sentence diversity coding, adapted from Hadley et al. (2017).

Child utterance	Sentence?	Unique subject–verb combination?	Points
(a) Esto es doggie. (This is doggie)	Yes	Esto es	1
(b) Esto es tomate. (This is tomato)	Yes	*No, same as (a)*	0
(c) Se despertó. (He awoke)	Yes	Se despertó	1
(d) I want baby.	Yes	I want	1
(e) Ayuda. (Help)	No – no subject		0
(f) Look.	No – no subject		0
(g) Chico va aquí. (Boy goes here)	Yes	Chico va	1
(h) I want it.	Yes	*No, same as (d)*	0
(i) Abrimos. (We open)	Yes	(Nosotros) abrimos.	1
		Sentence diversity (total)	5

Table 3. Examples of possible utterances and their coded parameters.

Subject–verb utterance	Number	Person	Subject	Language
nosotras comemos (we eat)	First	Plural	Overt subject	Spanish
gato duerme (cat sleeps)	Third	Singular	Overt subject	Spanish
cantan (they sing)	Third	Plural	Null subject	Spanish
comí manzana (I ate apple)	First	Singular	Null subject	Spanish
tú cantas (you sing)	Second	Singular	Overt subject	Spanish
baby dance	Third	Singular	Overt subject	English
car sube (car climbs)	Third	Singular	Overt subject	Code-switch

subject's (b) person (first, second, or third) and (c) number (singular or plural) consistent with prior research. Last, in an approach unique to this study, each utterance was coded to describe the (d) language(s) used: This captured whether the utterance was produced entirely in English, entirely in Spanish, or with a mix of languages (i.e., code-switching). As with NDW and MLUw, a random subset of 20% of language samples were coded by a second research assistant and demonstrated strong interrater reliability (91.67%).

Procedure

Children and their mothers were invited to visit the lab to participate in this study. Bilingual research assistants interacted with mothers in their preferred language (English or Spanish). Prior to the visit, mothers reported on the child's language exposure history on the LEAT (De Anda et al., 2016) administered over the phone. Following consent, the child and mother were escorted to a private room where the toys for the Three Bags Task were available. The research assistant then clarified with the child's mother that they were required to use all three sets of toys during the 10-min observation in any way that felt natural to them. Recall that no instruction was given regarding the use of English or Spanish. After the mother–child language sample was collected, the child's mother completed the CECER-DLL questionnaire (Hammer et al., 2020). Given that the COVID-19 pandemic prohibited safe in-person data collection during the study, language samples were collected in the home for a subset of children ($n = 2$) through video chat software. Extant research suggests that child language production (as measured by MLU, NDW, grammatical errors, and child speech intelligibility) and parent input are comparable at home versus in an unfamiliar lab setting, including when collected via video chat (Bornstein et al., 2000; Manning et al., 2020; Stevenson et al., 1986).

Analysis Plan

We first sought to characterize the nature of children's sentence diversity productions over time as a function of key parameters (grammatical person, number, and language[s] used) to answer the first research question of interest aimed at describing the development of sentence diversity at 24 and 30 months of age in Spanish–English DLL children with and without LD. A series of analyses of variance (ANOVAs) examined each parameter separately (grammatical person, number, and language[s] used). Results from each parameter and model are presented in turn below. The results reflect all of the available data from the full sample of children ($N = 52$). The pattern of results did not change when compared with the subset of children with data at both 24 and 30 months of age ($n = 35$).

In accordance with the second aim of this study, we further examined how well the emergence of simple sentences (as indexed by sentence diversity) differentiated children with and without LD compared with using late word emergence at 24 versus 30 months of age. Fisher's exact test was used to examine whether there was a significant association between two categorical variables. Specifically, we evaluated the association between group (LD vs. TD) and the emergence of word combinations (MLUw > 1 vs. MLUw ≤ 1) given that this is a widely used marker of LD. For this analysis, MLUw was used as a categorical variable indicating whether a child has started combining words. As a point of comparison, we examined the association between group (LD vs. TD) and the emergence of simple sentences (sentence diversity score > 1 vs. sentence diversity score ≤ 1). To facilitate comparison with MLUw, sentence diversity was similarly examined as a categorical variable to describe the emergence of diverse subject–verb combinations.

Last, to answer the third research question and provide preliminary findings to validate sentence diversity as a measure in the present sample of Spanish–English DLLs, we evaluated how sentence diversity predicted measures that are expected to be associated based on extant research. Specifically, *t* tests were conducted to examine whether there were significant differences in NDW and MLUw as a function of the emergence of simple sentences (sentence diversity score > 1 vs. sentence diversity score ≤ 1). Correlations were not appropriate as the distribution of sentence diversity scores was not normally distributed.

Results

Table 4 provides descriptive statistics for DLL children on the measures of interest including NDW, MLU,

Table 4. Descriptive statistics for children (N = 52) on key lexical and syntax measures across groups at 24 and 30 months of age.

	M (*SD*)			
	24 months		30 months	
Variable	TD	LD	TD	LD
MLUw	1.16 (0.31)	0.94 (0.43)	1.44 (0.45)	1.21 (0.21)
NDW	19.48 (16.02)	5.33 (19.48)	28.61 (27.94)	9.25 (6.31)
SD	1.61 (2.73)	0.08 (0.277)	4.72 (6.85)	0.42 (1.16)

Note. TD = typically developing group; LD = language delay group; MLUw = mean length of utterance in words; NDW = number of different words; SD = sentence diversity total score.

and total sentence diversity. Both the TD and LD groups showed an improvement from 24 to 30 months of age across all variables, with the TD group noticeably demonstrating higher scores at each occasion. In addition, correlations revealed that children's total sentence diversity score at 24 months of age was strongly and positively associated with their sentence diversity score at 30 months of age, $r(33) = .85$, $p = .0004$. Table 5 disaggregates sentence diversity by several key characteristics, which are analyzed in detail below (i.e., person, number, and language with and without subjects).

Differences in Number, Person, and Language by Age

First, we evaluated the use of sentence diversity as a function of grammatical person (first, second, and third). An ANOVA with sentence diversity score as the dependent variable was conducted, with age (24 vs. 30 months), subject (null vs. included), and grammatical person (first, second, third) as repeated variables and group as a between-subjects variable. Results revealed no significant interactions but instead several significant main effects. Specifically, there

Table 5. Descriptives across sentence diversity parameters.

		M (*SD*)			
		24 months		30 months	
Parameter		TD	LD	TD	LD
Null subject					
Number					
Singular		1.26 (1.91)	0.08 (0.29)	2.72 (4.17)	0.42 (1.16)
Plural		0.04 (0.02)	0	0.11 (0.32)	0
Person					
First		0.43 (0.90)	0.08 (0.29)	0.61 (1.29)	0.17 (0.58)
Second		0.26 (0.54)	0	0.33 (0.84)	0.08 (0.29)
Third		0.61 (1.08)	0	1.89 (2.91)	0.17 (0.39)
Language					
English		0	0	0	0
Spanish		1.09 (1.83)	0.08 (0.29)	2.83 (4.19)	0.42 (1.16)
Mixed		0.09 (0.42)	0	0	0
	Total	1.30 (1.99)	0.08 (0.29)	2.83 (4.19)	0.42 (1.16)
Overt subject					
Number					
Singular		0.30 (1.26)	0	1.77 (4.71)	0
Plural		0	0	0.11 (0.32)	0
Person					
First		0	0	0.72 (2.37)	0
Second		0	0	0.50 (1.54)	0
Third		0.30 (1.26)	0	0.67 (1.64)	0
Language					
English		0.04 (0.21)	0	1.83 (5.01)	0
Spanish		0.17 (0.83)	0	0	0
Mixed		0.09 (0.42)	0	0.06 (0.24)	0
	Total	0.30 (1.25)	0	1.89 (5.02)	0

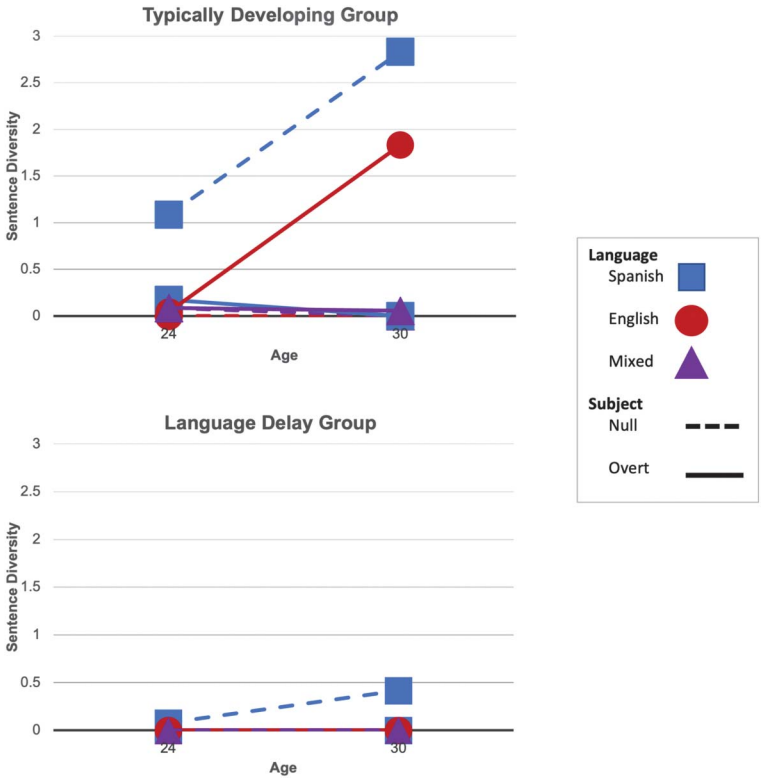
Note. TD = typically developing group; LD = language delay group.

was a significant within-subject effect of age, $F(1, 366) = 9.256$, $p = .003$; subject, $F(1, 366) = 4.338$, $p = .038$; and person, $F(2, 366) = 3.545$, $p = .03$, as well as a between-subjects main effect of group, $F(1, 366) = 14.986$, $p < .001$. The main effect of group and age indicates that sentence diversity differed across the TD and LD groups and over time, respectively, but the lack of a significant interaction suggests the gap between groups did not change over time. Furthermore, the main effect of subject and person indicates that children had a significant preference for null and first- and third-person person subjects, respectively (see Table 5).

Next, we evaluated the use of sentence diversity as a function of grammatical number (singular vs. plural subject). A second ANOVA with sentence diversity score as the dependent variable was evaluated, with age (24 vs. 30 months), subject (null vs. included), and number (singular vs. plural) as repeated variables and group as a between-subjects independent variable. Results showed a significant Group × Number interaction, $F(2, 244) = 3.688$, $p = .026$, indicating that the use of grammatical number differed between children identified with and without LD. As shown in Table 5, children generally showed a preference for singular compared with plural subjects, but this preference was attenuated in children with LD who produced fewer diverse subject–verb combinations compared with their TD peers. A Subject × Number interaction was also significant, $F(1, 244) = 3.976$, $p = .04$, showing that the use of grammatical number differed depending on whether the subject was null or overt in the noun phrase. Although first- and third-person person subjects were generally preferred, the relative degree of this preference changed depending on whether the subject was null. Results also showed main effects of group, $F(1, 244) = 8.486$, $p = .004$; age, $F(1, 244) = 5.24$, $p = .023$; and number, $F(2, 244) = 8.096$, $p < .001$. Furthermore, there was an overall preference for singular subjects across groups and an overall increase in the use of subjects from 24 to 30 months of age.

Last, the use of sentence diversity as a function of language(s) used (English vs. Spanish vs. mixed) was examined. A third ANOVA evaluated age (24 vs. 30 months), subject (null vs. included), and language (English vs. Spanish vs. mixed) as repeated variables and group as a between-subjects independent variable. A significant four-way Subject × Language × Group × Age, $F(2, 372) = 3.351$, $p = .037$, interaction was observed, indicating differences in the use of pronouns as subjects over time related to the language context across children with and without early LD. As shown in Figure 1, there was an overall preference for Spanish with null subjects in

Figure 1. Change in sentence diversity across groups, languages, and subjects.



the LD group, whereas the TD group additionally used English when a subject was included by 30 months of age. That is, by 30 months of age, the TD group relied on English or English mixed with Spanish to produce subject–verb combinations with a subject included, whereas they used only Spanish in producing null subjects.

Comparing Children With and Without LD

The next analysis evaluated how well the emergence of simple sentences differentiated children with and without LD compared with using late word combinations. Results revealed no statistically significant association between LD and the emergence of word combinations as a function of MLUw at 24 and 30 months of age (all ps > .07). As a point of comparison, we examined the association between group (LD vs. TD) and the emergence of simple sentences (sentence diversity score > 1 vs. sentence diversity score ≤ 1). Results revealed a statistically significant association between the LD group and the emergence of simple sentences at 24 (p = .034) and 30 (p = .024) months of age. As shown in Figure 2, there was a larger proportion of children who had not yet demonstrated the presence of sentence diversity compared with their TD peers at both ages.

Associations Between Child Language Output Variables

Here, t tests revealed that children demonstrating emergence of simple sentences (as indexed by sentence diversity) also produced greater diversity in their vocabulary (NDW) at 24, $t(7.01) = 4.68$, p = .002, and 30, $t(9.45) = 4.59$, p = .001, months of age compared with peers who did not demonstrate diverse subject–verb combinations. Similarly, children with sentence diversity skills had longer utterances (MLUw) at 24, $t(16.10) = 3.03$, p = .008, and 30, $t(10.40) = 3.943$, p = .003, months of age compared with peers who were not yet using diverse subject–verb sentences.

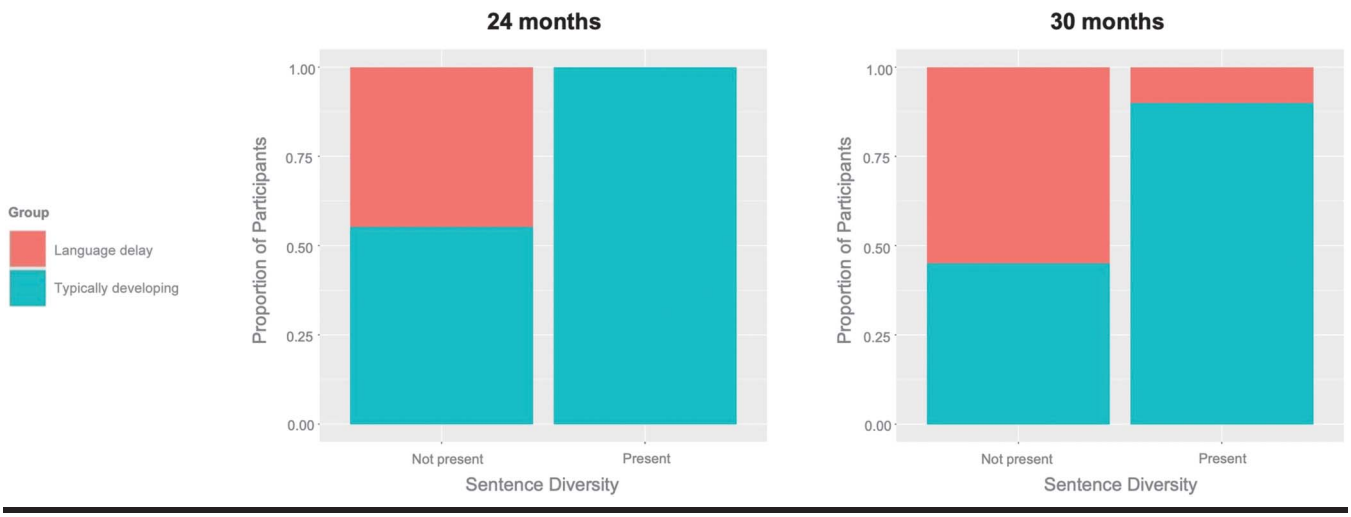
Discussion

This study was aimed at extending the measure of sentence diversity to the Spanish–English DLLs to increase understanding of language development in this population. Sentence diversity specifically was assessed by adapting existing protocols used in English monolingual contexts to develop a valid approach for describing the diversity of bilingual children's simple sentences as they move from one- to multiword productions around the second birthday. The first aim was to describe sentence diversity at 24 and 30 months of age in Spanish–English DLLs with and without early LDs. Given the need for research that supports early identification in linguistically diverse populations, the second aim was to provide preliminary evidence for the utility of sentence diversity for DLLs compared with the emergence of word combinations alone. The third aim investigated preliminary construct validity findings by examining the association between sentence diversity and other theoretically related measures of child language production (MLUw and NDW).

Descriptive Findings About Sentence Diversity

The first set of analyses described sentence diversity in the present group of Spanish–English DLLs. As a

Figure 2. Proportion of language delay and typically developing groups demonstrating sentence diversity or not at 24 and 30 months of age.



group, children were more likely to produce subject–verb combinations in Spanish and with null subjects compared with English or mixed Spanish–English subject–verb combinations with overt subjects. Furthermore, this pattern between language and subject inclusion differed significantly as a function of group. Specifically, children with early LDs produced all subject–verb combinations exclusively in Spanish and always with a null subject. That is, children with early LD never produced subject–verb combinations in English at 24 or 30 months of age. The LD group had subject–verb combinations produced in Spanish and as a single verb that included morphological markers indicating subject information. The TD group also showed a preference for Spanish and produced similar subject–verb combinations with a null subject. However, the TD group also used English or a mix of English and Spanish to produce subject–verb combinations that included a subject separate from the verb. Furthermore, as a group, children demonstrated a general preference for subjects in first or third person, with this preference attenuated in children with LD compared with their TD peers.

The pattern of findings across the TD and LD groups highlights several key implications. First, the preference for Spanish overall replicates the language dominance affects that are widely reported in DLLs. Indeed, the pattern of results can be explained by the fact that the present sample of children were primarily exposed to Spanish compared with English, and there was no difference in Spanish language exposure across groups (TD: M = 78%; LD: M = 78%). Children with greater exposure to one language over the other demonstrate different patterns of neural activity in response to words in the dominant versus nondominant language as early as 19 months of age (Conboy & Mills, 2006). Although dominance can shift over development and across language domains (Bedore et al., 2012), the present findings add to the large body of literature documenting differential proficiencies in the early expressive language abilities of bilingual toddlers consistent with the input patterns of the environment. Furthermore, children with LD relied more on the dominant language than their TD peers, such that toddlers with LD used subject–verb combinations in Spanish only whereas TD toddlers used English as well. This difference between groups in the relative reliance on the dominant language (Spanish) may reflect the less robust grammatical skills in toddlers with LD compared with TD toddlers. That is, when toddlers with LD were able to demonstrate subject–verb combination, this appeared first in their stronger language relative to their weaker language. It is likely that sentence diversity will therefore emerge later (after 30 months of age) in English for Spanish–English DLLs with LD, and this is a direction for future research. Last, it is important to note that although dominance effects are common in early bilingual first-language acquisition, the nature of sentence diversity outcomes may be different in children with more balanced exposure to Spanish and English or for children with English-dominant exposure.

In addition to demonstrating differences in Spanish versus English sentence diversity for children with and without LD, the findings show the differential use of overt and null subjects across Spanish and English even when an LD is present in Spanish-dominant DLLs. Specifically, the LD group produced subject–verb combinations in Spanish with null subjects despite having significant English language exposure where overt subjects are the rule and null subjects are not permitted. Similarly, the TD group produced null subjects in Spanish, whereas overt subjects were included for sentences in English or those that included both English and Spanish. Children could have also chosen to use overt subjects in all places across languages given that Spanish permits both overt and null subjects depending on the pragmatic context (Contreras, 1991; Ordóñez & Treviño, 1999), but instead, children maintained the well-documented preference for null subjects in Spanish (Frascarelli, 2007).

Although research is limited in Spanish–English bilingual toddlers in the United States with and without LDs, there is related work in TD children or bilinguals at older ages in the context of similar Romance languages that is consistent with the acquisition of subjects as shown in this study. For example, in one case study of a TD Spanish–English bilingual child, researchers reported a similar distinction in the use of null versus overt subjects across Spanish and English and as early as the second year of life (Silva-Corvalán & Sánchez-Walker, 2007). Similarly, school-age Spanish–English bilingual children continue to distinguish overt and null subject use across Spanish and English (Montrul & Sánchez-Walker, 2015). Although some studies show that simultaneous bilingual children overproduce overt subjects in null-subject languages compared with monolinguals throughout early childhood, this pattern is influenced by language dominance. Specifically, children will continue to demonstrate such cross-language interaction past early childhood if they are dominant in the overt-subject language (i.e., English; Serratrice, 2007; Sorace & Serratrice, 2009). Conversely, in this study, children were Spanish-dominant and therefore expressed a different pattern where null subjects were always used in Spanish and overt subjects were used when English was produced or used in combination with Spanish (during code-switched utterances). We only observed the production of overt subjects in Spanish in one child and only at 24 months of age. Our findings extend this literature base to the earliest stages of acquisition and to the clinical domain by showing that Spanish–English DLL toddlers with and without LD have the capacity to separate sentence structures across each language and can use null and overt subjects appropriately depending on the

language context and including during code-switching. Importantly, language dominance influences the acquisition of null and overt subjects across languages.

To summarize, children in this study showed differential use of subject–verb sentence structures across Spanish and English. These findings are consistent with a large body of literature showing that DLLs do not confuse both languages (e.g., Guiberson, 2013; Hoff & Core, 2015). Indeed, most of the world's children learn more than one language, and dual language exposure does not cause or exacerbate LDs (Paradis, 2016). It is well accepted that children with and without early LDs can distinguish and effectively deploy the grammars of their two languages (Rice, 2016). As such, families and clinicians should continue to support all of DLLs' languages, including when children demonstrate delays or disorders.

There were also differences in the development of sentence diversity in DLLs compared with monolinguals described in prior work. For example, Hadley et al. (2018) showed that TD English monolinguals at 30 months of age had an average sentence diversity score of 28 during a 30-min language sample compared with the average sentence diversity score of 4.1 during a 10-min language sample in the present DLL group. Even when controlling for differences in sample length (30 vs. 10 min), the rate of unique subject–verb production per minute is still different across the English monolinguals and the present group of Spanish–English bilinguals. In addition, Hadley et al. (2018) reported that all English monolinguals at 30 months of age produced at least two subject–verb combinations of both first- and third-person singular subjects. In the current group of Spanish–English DLLs at 30 months of age, only two children met this criterion. Taken together, these results show that English monolingual findings must be extended cautiously to linguistically diverse communities. Normative data in Spanish–English DLLs in the United States must be examined independently as an area of future research to develop criterion-referenced milestones specific to this population. However, there were some similarities between monolinguals and bilinguals: The overall earlier preference for singular subjects and first- and third-person subjects was observed in the Spanish–English learners consistent with English monolingual speakers (Hadley, 2020; Lee, 1974).

Associations With Sentence Diversity

This study sought to provide a preliminary evaluation of the construct validity of the measure adapted for Spanish–English DLLs in addition to providing a description of sentence diversity in this population. Sentence diversity scores were significantly correlated at 24 and 30 months of age, indicating that the measure captures individual variability as expected. Results also showed that sentence diversity was associated with MLUw and NDW. These findings point to acceptable construct validity in this population of children in sentence diversity is associated with theoretically related measures and consistent with extant research in monolingual groups. Together, these findings suggest that the adapted sentence diversity coding protocol captures variability as expected in Spanish–English DLLs. This demonstrates the value in the careful process of adaptation specific to the grammatical rules of the language of interest for developing measures that are responsive to linguistically diverse children.

The comparisons between sentence diversity and emergence of word combinations also point to promising utility for assessment in DLLs. Recall that the emergence of word combinations is a widely used diagnostic marker for identification of children with LDs and language disorders. In the present group of DLL toddlers, sentence diversity at 24 and 30 months of age was associated with LD status, such that there were significantly fewer children with LD showing an emergence of simple sentences (as indexed by sentence diversity) compared with their TD peers. Conversely, the emergence of word combinations was not significantly associated with LD. These findings are therefore encouraging in that they suggest that sentence diversity can distinguish those children with and without LD better than monitoring word combination emergence at 24 and 30 months of age. Given the dearth of available measures of early language in Spanish–English DLL toddlers (De Anda et al., 2020), sentence diversity is a promising measure that can be extracted from language samples in addition to other standard measures and assessments to triangulate diagnostic decisions and tracking change. Findings showed that those children who had begun using diverse subject–verb combinations had more diverse vocabulary (as measured by NDW) and longer utterances (as measured by MLU) compared with children who had not yet used diverse subject–verb productions. We reiterate the importance of collecting language samples and ensuring clinicians have sufficient training in their analysis. Language sampling in particular is a central part of the assessment toolbox of DLLs (e.g., Castilla-Earls et al., 2021).

Clinical Implications

Sentence diversity is a relatively efficient measure to calculate given that subject–verb combinations are emerging in the toddler period (at about one unique sentence per 1–2 min across DLLs and monolinguals), and language samples should be a routine part of clinical assessment (Hadley, 2020). The findings of this study provide preliminary support for the use of sentence diversity for descriptive purposes. Sentence diversity is most applicable to children who are beginning to demonstrate subject–verb

combinations. For typical learners, we expect multiword combinations to first emerge during the second year of life, but this will emerge later for children with LDs. Nevertheless, sentence diversity offers a sensitive measure of change as children expand both the length of their utterances and the diversity of simple sentences. If word combinations are an intervention target, or if grammar broadly is to be measured, sentence diversity should be assessed along with other key measures such as MLUw and NDW for a more precise characterization of syntax. Unfortunately, some findings suggest that language sampling is not regularly employed in assessment with Spanish–English DLLs ages 0–3 years (Huerta et al., 2021). The findings presented here reiterate the importance of using language samples and assessing both languages in DLLs, consistent with best practice (i.e., De Anda et al., 2020). Clinicians should monitor sentence structures separately in each language (see Baron et al., 2018, for a summary of age of acquisition of grammatical morphemes in Spanish monolinguals and bilinguals) and consider how language dominance and cross-language interaction influence acquisition. Notably, although we gave children credit for providing information about the subject in inflecting the lexical verb in Spanish, multiword productions are still necessary and must be evaluated as grammar develops.

Future Directions

There are several avenues for future research given the preliminary nature of this study. Future research will aim to determine the diagnostic accuracy of sentence diversity in DLLs as a marker of early LD. A diagnostic battery completed by an SLP to confirm language status at older ages will be needed to provide a retrospective examination of the markers that predict persistent delays and DLD diagnosis. Sentence diversity used in conjunction with other measures may yield strong sensitivity and specificity outcomes, thereby supporting practitioners who have few culturally and linguistically responsive diagnostic tools for Spanish–English DLLs at present. In addition, future investigations should examine sentence diversity as an intervention target for Spanish–English DLLs.

Future research should examine language samples of greater length and in larger samples beyond 30 months of age. Seminal studies of sentence diversity in English monolinguals typically use language samples of approximately 30 min in duration compared with the 10 min used in this study. Future research should examine whether the rate of unique subject–verb combinations per minute differs significantly when collecting language samples of 10 versus 30 min to maximize assessment efficiency for practitioners. Similarly, by examining larger samples beyond 30 months of age, developmental milestones and expectations can be developed for Spanish–English DLLs in the United States specifically. Toward that end, future research will require larger sample sizes with a population of Latino/a DLLs that represent greater variability in language exposure. Given the relative Spanish dominance of the present group of DLLs, future research must examine balanced bilinguals and those children with English language dominance as the pattern of cross-language interaction will likely influence the acquisition of subject use.

Last, this study sought to examine early sentence structures in each language separately. Future research should investigate the extent to which children use unique subject–verb combinations across languages and the best cross-language measures to describe their emergence. For example, further analyses may reveal whether children are using the same verbs and subjects across languages despite using different surface forms or whether they rely on relatively separate semantic representations when acquiring early sentences.

Conclusions

This study set out to extend sentence diversity measures to the Spanish–English DLL context. Findings show that the adapted protocol can be used to describe development of basic sentence structure in toddler-age Spanish–English DLLs. This adaptation gives credit to subject–verb morphology used across Spanish and English, even when surface forms differ. The differential pattern of results across Spanish and English shows that DLLs do not confuse the grammars of their two languages, including those children with early LDs. Furthermore, the preliminary findings suggest that the adapted sentence diversity coding demonstrates construct validity in that it is associated with measures of child output consistent with prior research in English monolinguals. Although further research is needed, sentence diversity shows promise as an additional measure to increase the validity and reliability of language assessment in Spanish–English DLLs with early delays.

Data Availability Statement

The data in support of this article can be made available upon reasonable request.

Acknowledgments

This work was supported in part by National Institute on Deafness and Other Communication Disorders Grant K23DC018033, awarded to Stephanie De Anda, and an American Speech-Language-Hearing Foundation grant, awarded to Lauren M. Cycyk. The content is solely the

responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

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