Journal of Fluency Disorders 77 (2023) 105988

Contents lists available at ScienceDirect

Journal of Fluency Disorders

journal homepage: www.elsevier.com/locate/jfludis

A cross-sectional investigation of disfluencies in typically developing Spanish-English bilingual children

Raúl Rojas [a,*], Farzan Irani [b], Svenja Gusewski [c], Natalia Camacho [d]

[a] *Department of Speech-Language-Hearing: Sciences and Disorders, University of Kansas, Dole Center, Room 3001, Lawrence, KS 66045, United States*

[b] *Department of Communication Disorders, Willow Hall 249, Texas State University, Round Rock, TX 78665, United States*

[c] *Department of Communication Disorders, Southern Connecticut State University, 400 Fitch Street St, HHS 228, New Haven, CT 06515, United States*

[d] *Department of Speech, Language, and Hearing, University of Texas at Dallas, 1966 Inwood Road, Dallas, TX 72353, United States*

A R T I C L E I N F O

Keywords:
Disfluencies
Bilingual children
Language sample analysis
Narratives
Stuttering

A B S T R A C T

Purpose: This study examined the language skills and the type and frequency of disfluencies in the spoken narrative production of typically developing Spanish-English bilingual children.
Method: A cross-sectional sample of 106 bilingual children (50 boys; 56 girls) enrolled in kindergarten through Grade 4, produced a total of 212 narrative retell language samples in English and Spanish. A specialized fluency coding system was implemented to index the percentage of total (%TD) and stuttering-like disfluencies (%SLD) in each language. Large-scale reference databases were used to classify children's dual language proficiency profiles (balanced, English dominant, Spanish dominant) based on language sample analysis measures of morphosyntax and lexical diversity.
Results: The bilingual Spanish-English children in this study did not demonstrate significant cross-linguistic differences for mean %TD or %SLD. However, the mean %TD and %SLD in both languages exceeded the risk threshold based on monolingual English-speaking norms. English dominant bilingual children demonstrated significantly lower %TD in English than Spanish. Spanish dominant children demonstrated significantly lower %SLD in Spanish than English.
Conclusions: This study included the largest sample size of bilingual Spanish-English children investigated to date from a fluency perspective. The frequency of disfluencies was found to be variable across participants and change dynamically as a function of grade and dual language proficiency profiles, indicating the need for studies that employ larger sample sizes and longitudinal designs.

1. Introduction

According to the US Census Bureau (2020), 18.7% of the US population is Hispanic or Latino, and languages other than English are reported to be spoken in more than 20% of US households. Approximately 33% of children under the age of five are emerging bilingual children, that is children exposed to their heritage language and English to varying degrees (Migration Policy Institute, 2021). Some bilingual children who enter US public schools may be designated, following English proficiency testing, as English learners (ELs). ELs

* Corresponding author.
E-mail address: raul.rojas@ku.edu (R. Rojas).

https://doi.org/10.1016/j.jfludis.2023.105988
Received 1 October 2022; Received in revised form 9 June 2023; Accepted 9 June 2023
Available online 15 June 2023

are bilingual children who are deemed not to possess the requisite English proficiency to be academically successful in monolingual English-speaking classrooms. ELs represent over 10% of the school-aged population, with the majority (75%) speaking Spanish. Further, nearly 15.5% of the total EL students were identified as students with disabilities in 2019 (National Center for Education Statistics, 2022). Clinical misidentification of bilingual children (EL designated or not), particularly in terms of speech and language impairment, has been a well-documented phenomenon over the past two decades (Bedore et al., 2018; Castilla-Earls et al., 2020; Morgan et al., 2016; Paradis & Crago, 2000). Furthermore, as noted by Byrd et al. (2016), for a period of time, bilingualism was incorrectly considered a risk factor for stuttering, and parents were encouraged to raise their children as monolingual speakers (Au-Yeung et al., 2000; Howell et al., 2009; Karniol, 1992; Travis et al., 1937).

Based on the current demographic data, it is clear that most speech-language pathologists (SLPs) will work with bilingual children at some point in their career. However, the majority of practicing SLPs report feeling underprepared to provide clinical services to bilingual clients (see Santhanam & Parveen, 2018, for a review) and clients who stutter (Beita-Ell & Boyle, 2020; Brisk et al., 1997). Specifically for bilingual clients who stutter, there is a high risk of SLPs recommending parents restrict the use of their heritage language based on older reports of a higher prevalence of stuttering in bilingual populations (Au-Yeung et al., 2000; Howell et al., 2009; Karniol, 1992; Travis et al., 1937) that are not supported by recent studies (e.g. Bedore et al., 2006; Eggers et al., 2020; Rojas & Irani, 2020). Recommending restricted use of heritage language, contradicts evidence-based practice. In fact, restricting use of the heritage language is detrimental to the overall social, linguistic, and cognitive development of the child and their relationships with family, particularly family members of different generations, in the absence of a common language (Berry et al., 2006; Kohnert et al., 2022; Tseng & Fuligni, 2000).

Several studies and systematic reviews have identified major barriers in bilingual service delivery such as the lack of least biased-assessment instruments and a lack of developmental norms for bilingual speakers (Guiberson & Atkins, 2012; Kohnert et al., 2003; Kritikos, 2003; Roseberry-McKibbin et al., 2005; see Santhanam & Parveen, 2018, for a review). The current study addresses each of these barriers in three ways. First, this study exemplifies best practice in the assessment of culturally and linguistically diverse populations (Castilla-Earls et al., 2020) by using database-referenced language sample analysis based on narrative production in English and Spanish of bilingual children. Second, this study includes a large-scale cross-sectional sample of 106 bilingual children with typical development from kindergarten to grade 4, contributing to the overall small corpus of data on speech disfluencies in Spanish-English bilingual children, who are at higher risk of being misdiagnosed with stuttering (Byrd, 2018; Byrd et al., 2015; Byrd et al., 2015; Eggers et al., 2020; Gahl, 2020; Werle et al., 2019). Finally, this study examines the contribution of a range of factors, including academic grade and dual language proficiency profile, to the variance observed in disfluencies in both languages.

1.1. Normal disfluency and stuttering

Most children experience disfluent speech as part of typical development between the ages of 2–6 years (Guitar, 2019). During this period of development, children experience primarily normal (or typical) disfluencies (NDs) and occasional stuttering-like disfluencies (SLDs). NDs are composed of disruptions in the forward flow of speech that include the repetition of multisyllabic whole words, repetitions of phrases, phrase revisions, or filled pauses/interjections (Guitar, 2019). These have a high degree of overlap with mazes (word or utterance production difficulties) and are understood to reflect linguistic uncertainty in the speaker (Bedore et al., 2006; Eggers et al., 2020; Rojas & Irani, 2020). SLDs are composed of silent blocks, prolongation of a sound, or repetition of a part of a word or a monosyllabic whole word. SLDs occur more frequently at the beginning of words, phrases, and utterances and can be associated with tension in the speech mechanism reflected in an increase in loudness and/or pitch. SLDs when present in the speech of individuals who do not stutter are typically brief (duration and iterations <2), not associated with tension/struggle, and do not exceed 3% (Guitar, 2019).

In monolingual English-speaking children, the presence of more than 3% of stuttering-like disfluencies or more than 10% of total disfluencies in a representative speaking sample is generally considered a diagnostic indicator for childhood-onset stuttering (Ambrose & Yairi, 1999; Guitar, 2019) and often used as an inclusion/exclusion criteria for research studies (Bloodstein et al., 2021). However, normative data does not exist for bilingual children, and emerging literature based on primarily small sample sizes ($N < 60$ children) suggests that the occurrence of disfluencies in the speech of bilingual children is higher relative to monolingual norms (Byrd et al., 2015; Coalson et al., 2013; Eggers et al., 2020; Rojas & Irani, 2020). This lack of data, coupled with the generally narrow age/grade range reported in most studies (notable exceptions include Eggers et al., 2020; Rojas & Irani, 2020), limits our understanding of how fluency in each language develops dynamically over time as the child's proficiency in each language changes. Examining cross-sectional differences in fluency would provide further evidence for the language dominance shift many bilingual children experience associated with changes in language exposure (Castilla-Earls et al., 2019). When bilinguals are gradually and systematically exposed to more English in the academic setting, they can experience a gradual shift from heritage language dominance towards English dominance (Kohnert et al., 2022).

1.2. Previous studies on disfluent speech in bilingual children

Diagnosis of communication disorders in bilingual children is further complicated by the dynamic nature of bilingual language acquisition (Kohnert et al., 2022). Bilingual children may be exposed to both languages very early on (simultaneous bilingualism) or be exposed to a second language at around preschool age or later (sequential bilingualism). A child's proficiency in each of their languages may change as their exposure to each language changes, which is often associated with the language(s) of academic instruction (Bedore et al., 2018; Castilla-Earls et al., 2015; Castilla-Earls et al., 2019). Furthermore, bilingual language skills are not evenly distributed across linguistic domains and languages. For instance, one bilingual child may have strong lexical and morphosyntactic skills in both languages, whereas another child may have stronger lexical skills in language A and stronger morphosyntactic skills in language B (Bedore et al., 2012; Su et al., 2022). Changes in proficiency may also appear as increased disfluencies, or mazing, in the less proficient language for children (Eggers et al., 2020; Lim et al., 2008) and even adults (Lim et al., 2008).

Earlier literature regarding disfluencies in bilingual children arguably contributed to the potential for misdiagnosis, suggesting a higher occurrence of stuttering and a reduced likelihood of recovery in bilinguals (Au-Yeung et al., 2000; Howell et al., 2009; Karniol, 1992; Travis et al., 1937). However, more recent work has moved beyond former methodological shortcomings and suggests that bilinguals typically produce higher rates of disfluencies compared to monolinguals (Bedore et al., 2006; Byrd et al., 2015; Eggers et al., 2020; Rieger, 2003; Rojas & Irani, 2020). Recent studies, albeit based on small sample sizes, found that the majority of typically-developing bilingual (Spanish-English; Yiddish-Dutch) children in their samples exceeded the 3% threshold for stuttering like-disfluencies (SLDs) as well as the 10% threshold for total disfluencies in both languages, increasing the likelihood of a misdiagnosis of stuttering (Byrd et al., 2015; Eggers et al., 2020). An in-depth analysis of disfluency types in conversational language samples produced by 59 Yiddish-Dutch bilingual children ages 6–10 years revealed that the majority of SLDs were monosyllabic word repetitions with no tension or dysrhythmic phonation and could thus be indicative of linguistic uncertainty (Eggers et al., 2020).

A recent exploratory study by Rojas and Irani (2020) did not replicate previous findings of exceeding the diagnostic criteria of 3% SLDs; however, most children in their cross-sectional sample of 29 Spanish-English bilingual children exceeded the 10% threshold of total disfluencies in both languages, with a higher rate of disfluencies in Spanish. They indicated that a possible reason for the difference between their data compared to Byrd et al. (2015) could be the methodology. Rojas and Irani used narrative retell language samples whereas Byrd et al. used a combination of retell and tell narrative samples, where the latter have been found to be more linguistically demanding. Furthermore, Byrd et al.'s findings were based on a sample of 18 kindergarteners (5 years; 6 months to 6 years; 7 months) whereas Rojas and Irani's findings were based on a sample of 29 children from prekindergarten through grade 4 (4 years; 11 months to 10 years; 2 months), effectively capturing age-based changes in fluency that might be correlated with growth in language proficiency.

These preliminary studies suggest that bilingual children may produce more disfluencies than their monolingual counterparts, placing them at risk for misdiagnosis in the absence of comprehensive normative and diagnostic criteria. Based on recent findings (Byrd et al., 2015; Eggers et al., 2020; Rojas & Irani, 2020), it appears that the majority of disfluencies, even those counted as stuttering-like (specifically monosyllabic word repetitions), are likely linguistic in nature and may be associated with the time course of typical dual language development, further augmenting the need for cross-sectional, or preferably longitudinal studies.

1.3. Current study

The current study expanded on the findings from a previous exploratory study (Rojas & Irani, 2020) by reporting on a larger, cross-sectional sample of typically developing Spanish-English bilingual children and examining the impact of child-based factors on total and stuttering-like disfluencies (SLD), including the role of dual language proficiency profiles. This study addressed two primary research aims:

1.3.1. Aim 1

Examine cross-linguistic differences in the mean percentage of total and stuttering-like disfluencies in the English and Spanish narrative production of 106 typically developing bilingual school-age children.

1.3.2. Aim 2

Examine the impact of dual language proficiency profiles on the mean percentage of total and stuttering-like disfluencies in the English and Spanish narrative production of typically developing bilingual school-age children.

In line with previous research (Byrd et al., 2015; Eggers et al., 2020; Rojas & Irani, 2020), we expected that typically developing bilingual children in English immersion settings would demonstrate more disfluencies in Spanish. Furthermore, dual language proficiency profiles were expected to affect the frequency of disfluencies. Thus, Spanish-dominant children were expected to produce more disfluencies in English, while English-dominant children were expected to produce more disfluencies in Spanish.

2. Method

2.1. Participants

This study examined the speech disfluencies of typically developing Spanish-English bilingual children using a cross-sectional sample of 132 children enrolled in kindergarten through grade 4. Parental consent was obtained for all the participants, and the reported procedures were administered as part of a protocol with institutional review board (IRB) approval. Participants were recruited by posting IRB-approved bilingual (Spanish and English) recruitment flyers in grocery stores, community centers, and public libraries, as well as by the first author providing presentations to parents in Spanish and English. The majority of bilingual children (75%) in this study were academically instructed in transitional bilingual education classrooms (instruction provided in the heritage language and English), and the others (25%) were instructed in English immersion classrooms. None of the parents reported prior or present concern for speech and/or language impairments including stuttering. Parents reported no prior or present special education history, and none of the children had been retained in any academic grade. All participants were asked to produce one narrative retell language sample in

English and another sample in Spanish.

The following inclusionary criteria were applied to the participants and samples in English and Spanish: (a) each participant produced one retell sample in English and anther in Spanish; (b) each sample contained no more than 50% of code switched words to include samples produced primarily in each target language; (c) each sample contained at least 85% complete and intelligible utterances; (d) lexical diversity or morphosyntax measures (later described) in at least one of their languages were within 1 *SD* of the large-scale Bilingual Spanish and English Story Retell Databases from the Systematic Analysis of Language Transcripts Software (SALT; Miller & Iglesias, 2020); and (e) the proportion of total and stuttering-like disfluencies (SLD) were within 1 *SD* of this study's final sample. A total of 26 participants from the original sample of 132 children were excluded from the final data set, including 18 children who did not produce retells in both languages, and an additional 8 children whose percentage of total disfluencies exceeded 1 *SD* of the study's final sample. The final sample for this study included 106 typically developing bilingual children (50 boys and 56 girls) enrolled in kindergarten through grade 4 between the ages 5 years; 4 months to 10 years; 6 months. Descriptive data per grade level can be found in Table 1.

2.2. Procedure and materials

Narrative language sample analysis (LSA) is considered best practice in the assessment of functional language production in linguistically diverse populations (Castilla-Earls et al., 2020; Rojas & Iglesias, 2019). Each child was asked to provide a narrative retell language sample in English and another in Spanish using one of four wordless picture 'frog' storybooks by Mercer Mayer: *Frog, Where Are You?* (Mayer, 1969), *Frog On His Own* (Mayer, 1973), *Frog Goes to Dinner* (Mayer, 1974), and *One Frog Too Many* (Mayer, 1975). Story and language order were counterbalanced. Participants retold a different story in the other language within a seven-day window of their first retell. For further information regarding the advantages of this narrative retell protocol for indexing disfluencies in speech production as well as its overall methodological integrity, please see Rojas and Irani (2020).

The retells were audio-recorded, securely uploaded to a cloud storage system, and orthographically transcribed and coded in SALT (Miller & Iglesias, 2020) by bilingual and biliterate Spanish-English research assistants using conventions developed for bilingual oral language samples (Rojas & Iglesias, 2019). Interrater reliability of transcription and disfluency coding accuracy was conducted across 20% of the samples in both languages following the procedures outlined in Heilmann et al. (2008), which resulted in word-by-word agreement ($M_{\text{TranscriptionAgrmt.}} = 97\%$, $SD = 2.7\%$) and disfluency production coding agreement ($M_{\text{CodingAgrmt.}} = 81.3\%$, $SD = 15.1\%$).

Expanding on Rojas and Irani (2020), a specialized fluency coding system was developed to extend the standard SALT coding conventions for bilingual language samples (Rojas & Iglesias, 2019). First, mazes were coded according to standard SALT transcription-entry conventions: any filled pause, false start, repetition, reformulation, or a combination thereof was marked by enclosing that part of the utterance in parentheses. When the content(s) of mazing is excluded from the utterance, the remaining words can stand alone. Consequently, most language production measures in SALT exclude maze content by default. The overall content of mazes, however, can be independently analyzed by SALT. The fluency coding system developed for this study was designed to (a) differentiate typical (interjections, and multisyllabic word repetition) from stuttering-like disfluencies (monosyllabic word repetitions, sound/syllable/part-word repetitions, prolongations, and blocks); and (b) to calculate the number of iterations and or the duration of each disfluent event. To illustrate, the sound repetition code [FLRSnd:repetition:seconds] captured the number of times a sound was repeated as well as its total duration. Additional fluency code details along with examples of their implementation are provided in Table 2.

Table 1
Descriptive statistics for participants ($N = 106$) including academic grade, chronological age (CA) in months, gender, and narrative language sample measures in English and Spanish.

Variable	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Mean Totals
Participants	22	24	18	24	18	
CA in months	74.3 (4.1)	83.5 (5.2)	98.4 (4.6)	109.1 (5.5)	118.8 (4.6)	
Boys; girls	12; 10	11; 13	6; 12	12; 12	9; 9	
NTW-English	217.77 (70.95)	247.08 (75.72)	294.33 (52.25)	312.79 (55.66)	307.11 (76.56)	273.47 (76.39)
NTW-Spanish	230.73 (86.79)	269.17 (87.38)	282.89 (74.73)	316.08 (73.01)	303.83 (129.09)	280.03 (94.24)
MLUw-English	6.47 (1.14)	7.14 (1.20)	7.78 (1.65)	7.68 (0.97)	8.27 (1.15)	7.42 (1.34)
MLUw-Spanish	6.48 (1.15)	7.30 (1.13)	7.40 (1.65)	8.15 (1.64)	7.86 (2.26)	7.43 (1.66)
MANDW-English	8.59 (0.43)	8.64 (0.34)	8.88 (0.23)	8.74 (0.27)	8.85 (0.21)	8.73 (0.33)
MANDW-Spanish	8.99 (0.33)	9.03 (0.26)	9.07 (0.21)	9.12 (0.22)	9.16 (0.16)	9.07 (0.25)
WPM-English	71.12 (23.68)	73.20 (21.15)	92.77 (19.42)	88.40 (25.41)	96.67 (32.92)	83.57 (26.33)
WPM-Spanish	65.90 (19.27)	75.39 (20.11)	83.92 (15.47)	84.88 (19.01)	77.56 (26.25)	77.38 (21.00)
%MzWds-English	0.21 (0.09)	0.22 (0.09)	0.20 (0.08)	0.18 (0.07)	0.14 (0.04)	0.19 (0.08)
%MzWds-Spanish	0.22 (0.08)	0.20 (0.07)	0.21 (0.06)	0.20 (0.07)	0.17 (0.07)	0.20 (0.07)
SI-English	1.15 (0.19)	1.29 (0.17)	1.35 (0.21)	1.32 (0.15)	1.43 (0.22)	1.30 (0.21)
SI-Spanish	1.25 (0.21)	1.34 (0.17)	1.34 (0.30)	1.47 (0.23)	1.39 (0.44)	1.36 (0.28)

Note. CA = chronological age; NTW = number of total words; MLUw = mean length utterance in words; MANDW = moving-average number of different words; WPM = words per minute; %MzWds = percentage of total words that were mazed; and SI = subordination index.

Table 2
Specialized fluency coding system.

Disfluency type	Fluency Code	Example Utterance	Explanation
Multisyllabic word repetition	[FLRM:repetitions]	The (bunny) bunny[FLRM:1] jump/ed.	The word *"bunny"* was repeated one time.
Repetition of a monosyllabic word	[FLR:repetitions: seconds]	The (boy boy) boy[FLR:2:1] is chase/ ing the dog.	The word *"boy"* was repeated two times and the event duration was one second
Repetition of a sound	[FLRSnd:repetitions: seconds]	The (b* b* b* b*) b[FLRSnd:4:2]oy laugh/ed.	The sound */b/* was repeated four times and the event duration was two seconds.
Repetition of a syllable	[FLRSyl:repetitions: seconds]	The (bi* bi*) bi[FLRSyl:2:3]cycle was big.	The syllable *"bi"* was repeated two times and the event duration was three seconds.
Prolongation	[FLP:seconds]	There are m[FLP:04]any people.	The sound */m/* was prolonged for four seconds.
Silent block	[FLB:seconds]	She is fun[FLB:03]ny.	A three-second block occurred in the middle of the word "*funny*".
Interjection	[FLI:iterations]	I want to (like um like um um[FLI:5]) eat more cake.	The child produced five interjections.

2.3. Language sample analysis measures

A total of seven language sample measures were calculated by SALT to provide a representative context for the children's language and disfluency production in English and Spanish. Language production descriptive data are provided in Table 1, and disfluency production data are provided in Table 3 (*see Section 3 Results)*.

Mean length utterance in words (MLUw): Calculated by dividing the total number of words (excluding mazed and omitted words) by the total number of complete and intelligible utterances. MLUw, a gross morphosyntax measure, is preferred over MLU in morphemes in Spanish-English bilingual language samples because it allows for more accurate cross-linguistic comparisons of utterance formulation skills (Gutiérrez-Clellen et al., 2000).

Moving-average number of different words (MANDW): Calculated by averaging the number of different words for a series of windows of predetermined length. This study used a moving window size of 10 based on the lowest NDW produced by the participants in either language. MANDW is considered a robust indicator of lexical diversity that is directly interpretable and controls for differences in sample length (Covington & McFall, 2010; Fergadiotis et al., 2015).

Words per minute (WPM): Calculated by dividing the total number of words produced (including words in mazes, except part words) by the total time elapsed in the language sample. WPM is a measure of verbal facility and productivity (Rojas & Iglesias, 2013).

Percentage of total mazed words (%MzWds): Calculated by dividing the total number of mazed words by the total number of words (including words and part words in mazes) produced in the language sample. Mazing is an indicator of utterance formulation difficulties (Miller et al., 2015).

Subordination index (SI): Calculated by dividing the total number of clauses by the number of utterances. SI is a measure of syntactic complexity that captures syntactic development in monolingual and bilingual children (Alt et al., 2016; Su et al., 2022).

Percentage of stuttering-like disfluencies (%SLD): Calculated by dividing the total number of disfluencies classified as stuttering-like (monosyllabic word repetition, sound/syllable/part-word repetitions, prolongations, and silent blocks) by the total number of words in the language sample. Words were preferred over syllables to allow for direct comparison with related studies (e.g., Byrd et al., 2015; Eggers et al., 2020; Rojas & Irani, 2020). Stuttering-like disfluencies were further examined by calculating the percentage of specific disfluency types relative to the total number of words produced: (a) monosyllabic word repetitions (%MSWR); (b) sound and syllable repetitions; and (c) prolongations and blocks. This was done to determine whether one particular type of disfluency was more prominent than the rest (Eggers et al., 2020). Based on monolingual norms, the production of 3% or more stuttering-like disfluencies is indicative of childhood-onset stuttering (Guitar, 2019).

Table 3
Descriptive statistics for disfluency measures in English and Spanish for participants ($N = 106$) per grade level.

Variable	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Mean Totals
English %SLD	5.63 (3.78)	5.82 (4.23)	4.78 (3.35)	4.34 (2.62)	3.01 (1.72)	4.79 (3.40)
%MSWR	4.76 (3.57)	4.61 (3.97)	3.98 (2.93)	3.48 (2.17)	2.36 (1.53)	3.90 (3.09)
%SSW	0.83 (0.70)	1.15 (1.16)	0.71 (0.65)	0.66 (0.63)	0.59 (0.52)	0.80 (0.80)
%PB	0.04 (0.12)	0.07 (0.19)	0.08 (0.21)	0.19 (0.35)	0.05 (0.13)	0.09 (0.23)
%TD	16.67 (10.54)	18.10 (11.83)	16.13 (7.51)	14.14 (6.82)	10.19 (3.24)	15.23 (9.00)
Spanish %SLD	5.05 (3.05)	5.15 (3.25)	4.83 (2.70)	4.29 (2.36)	3.59 (3.06)	4.61 (2.90)
%MSWR	4.02 (2.50)	3.57 (2.60)	3.62 (2.05)	3.12 (1.66)	2.03 (2.02)	3.31 (2.26)
%SSW	1.00 (1.21)	1.56 (0.95)	0.96 (0.65)	1.05 (1.07)	1.40 (1.32)	1.20 (1.07)
%PB	0.02 (0.10)	0.02 (0.11)	0.26 (0.40)	0.12 (0.24)	0.16 (0.32)	0.11 (0.26)
%TD	19.30 (10.34)	16.36 (8.52)	17.67 (6.15)	15.76 (6.65)	13.98 (7.27)	16.65 (8.05)

Note. %SLD = percentage of stuttering-like disfluencies; %MSWR = percentage of monosyllabic word repetitions; %SSW = percentage of sound/ syllable repetitions; %PB = percentage of prolongations or blocks; and %TD = percentage of total disfluencies.

Percentage of total disfluencies (%TD): Calculated by dividing the total number of all disfluencies (SLD and normal disfluencies) by the total number of words produced in the language sample. Normal disfluencies included those coded as multisyllabic word repetitions, interjections, and any mazes coded as revisions or phrase repetitions. Based on monolingual norms, producing 10% or more total disfluencies is indicative of childhood-onset stuttering (Guitar, 2019).

2.4. Dual language proficiency profiles

Each narrative sample was profiled against the large-scale Bilingual Spanish and English Story Retell Reference Databases from the SALT software (Miller & Iglesias, 2020) to determine whether each participant was (a) Spanish dominant, (b) English dominant, or (c) balanced. For example, a Spanish dominant participant is more proficient in Spanish than in English, whereas a balanced participant has relatively equal proficiency in Spanish and English. We selected the SALT reference database (Context: Narrative, Subgroup: FWAY) with the largest number of participants (2070 samples) and the widest age-range (5 years to 9 years; 9 months) and conducted all comparisons based on the entire transcript. We used the recommended age-match criterion of 4 months, a standard deviation interval of 1 *SD*, and a database comparison set of at least 35 samples as recommended by Tucci et al. (2022). For 9 of the children in grade 4, who were slightly older than the oldest children in the database, the age-match criterion was increased to either 6 (n = 5), 9 (n = 2), or 12 (n = 2) months to allow for an appropriately sized comparison set. On average, 258 narrative retell samples comprised the comparison set from the Spanish Story Retell Reference Database, while 260 narrative retell samples comprised the English comparison set.

We profiled the participants' MLUw, SI, and MANDW using the quick look feature from the database comparison tool in SALT, which allowed us to classify lexical and morphosyntactic production as either a strength, performance within normal limits (WNL), or a weakness in each language. Once each participant's sentence length (MLUw), sentence complexity (SI), and lexical diversity (MANDW) were classified as strength, normal, or weakness in comparison to the database, we determined their relative language proficiency by subtracting the English from the Spanish average. This resulted in 24% of children (n = 26) across kindergarten to grade 4 classified with balanced Spanish-English dominance, 40% (n = 42) classified with English dominance, and 36% (n = 38) classified with Spanish dominance.

3. Results

This study used descriptive statistics to provide an overview of participant characteristics (academic grade, chronological age, and gender) and of their narrative language sample production in English and Spanish (see Table 1). In addition, paired samples *t*-tests were used to address the research aims of this study, which are detailed below.

As outlined in Table 3, across all children and grades (212 total narrative retell samples; 106 produced in each language), the mean percentages of total disfluencies (%TD) and stuttering-like disfluencies (%SLD) in each language surpassed the respective thresholds (10% for TD and 3% for SLD) to indicate risk for stuttering in monolingual English-speaking children. Specifically, the mean %TD was 15.23% (*SD* = 9%) in English and 16.65% (*SD* = 8.05%) in Spanish; the mean %SLD was 4.79% (*SD* = 3.4%) in English and 4.61% (*SD* = 2.9%) in Spanish. It is important to note that monosyllabic word repetitions were the majority of SLDs and independently exceeded the 3% threshold (for all SLDs combined) in each language: the mean percentage of monosyllabic word repetitions (%MSWR), as a function of total words, was 3.9% (*SD* = 3.09%) in English and 3.31% (*SD* = 2.26%) in Spanish. The percentage of prolongations and blocks combined (as a function of total words) was on average below 0.5% for all grade levels in both languages.

Additionally, in both languages, the number of iterations was calculated for the monosyllabic word repetitions as well as sound and syllable repetitions. Duration was calculated for prolongations and blocks in both languages. A detailed breakdown of the percent of disfluencies with the number of iterations or duration (in seconds) is provided in Table 4. For English, the mean number of iterations for monosyllabic word repetition was 1.18 (*SD* = 0.51); for sound repetition was 1.05 (*SD* = 0.23); and for syllable repetition was 1.02 (*SD* = 0.16). The average duration for prolongations was 1.58 s (*SD* = 0.84) and for blocks was 1.43 s (*SD* = 0.79). For Spanish, the mean number of repetitions for monosyllabic word repetition was 1.18 (*SD* = 0.47); for sound repetition was 1.09 (*SD* = 0.3); and for

Table 4
Proportions of disfluencies containing 1–6 iterations (repetitions) and duration of 1–6 s (blocks/prolongations) for stuttering-like disfluencies in English and Spanish (N = 106).

Language	Disfluency Type	Number of Iterations/Duration (seconds)					
		1	2	3	4	5	6
English	Monosyllabic Word Repetition (iterations; n = 1072)	86.5%	10.5%	2.2%	0.6%	-	0.2%
	Sound Repetition (iterations; n = 151)	94.7%	5.3%	-	-	-	-
	Syllable Repetition (iterations; n = 76)	97.4%	2.0%	-	-	-	-
	Prolongations (duration; n = 19)	57.9%	31.6%	5.3%	5.3%	-	-
	Blocks (duration; n = 7)	71.4%	14.3%	14.3%	-	-	-
Spanish	Monosyllabic Word Repetition (iterations; n = 972)	85.4%	12%	1.9%	0.6%	-	-
	Sound Repetition (iterations; n = 181)	91.7%	7.7%	0.6%	-	-	-
	Syllable Repetition (iterations; n = 179)	95.5%	2.8%	1.7%	-	-	-
	Prolongations (duration; n = 27)	88.9%	0.3%	-	-	-	-
	Blocks (duration; n = 6)	100%	-	-	-	-	-

syllable repetition was 1.06 ($SD = 0.3$). The average duration for prolongations was 1.11 s ($SD = 0.32$) and for blocks was 1 s ($SD = 0$).

3.1. Language profile and disfluency types

The first research aim was to examine cross-linguistic differences in the mean percentage of total and stuttering-like disfluencies in the English and Spanish narrative production of 106 typically developing bilingual school-age children (kindergarten to grade 4). A series of paired samples *t*-tests determined whether there were significant differences in the number of disfluencies produced between the two languages. At the whole group level, no significant differences were found for %TD, $t(105) = -1.55$, $p = .13$, or %SLD, $t(105) = 0.56$, $p = .58$, between the two languages.

The second research aim was to examine the impact of dual language proficiency profiles on the mean %TD and %SLD in the English and Spanish narrative production of bilingual school-age children. Due to uneven and relatively small sample sizes (*n* range = 4 – 12) per grade when subdivided by language dominance profile, statistical comparisons were made for each dual language profile, collapsing the data across grade levels. Table 5 outlines a series of paired samples t-tests conducted for each dual language proficiency profiles (balanced and English or Spanish dominant).

Bilingual children classified with a balanced proficiency profile (n = 26) did not demonstrate significant differences in the percentage of total disfluencies (%TD) in English compared to Spanish nor for the percentage of stuttering-like-disfluencies (%SLD) in English compared to Spanish at any grade level. Bilingual children classified as English dominant (n = 42) demonstrated significantly lower %TD in English ($M = 13.47\%$; $SD = 7.034\%$) than %TD in Spanish ($M = 18.27\%$; $SD = 8.58\%$), $t(41) = -3.48$, $p < .05$, $d = 8.94$. It is important to note that this %TD difference across languages far surpassed Cohen's *d* effect size threshold (≥ 0.41) established by Ferguson (2009) to indicate clinical significance.

Bilingual children classified as Spanish-dominant (n = 38) demonstrated significant %SLD differences in English versus Spanish. Specifically, the %SLD in English ($M = 5.54\%$; $SD = 3.91\%$) of Spanish-dominant children was significantly higher than their %SLD in Spanish ($M = 4.474\%$; $SD = 2.56\%$), $t(37) = 2.27$, $p < .05$; $d = 2.9$. This difference was of large magnitude and clinically significant.

4. Discussion

Clinical decision making in stuttering for bilingual children continues to be guided by our knowledge of fluency development in monolingual English-speaking children due to the sparse research evidence regarding fluency development in typically developing bilingual children (Byrd et al., 2015). The current study aimed to contribute to our understanding of the nature and development of fluency in bilingual children by analyzing narrative retell samples from a relatively large-scale, cross-sectional sample of 106 typically developing bilingual (Spanish-English) children from kindergarten through grade 4. A total of 212 speech samples (106 in English and 106 in Spanish) were coded in SALT for specific disfluency types to determine not only the frequency but also the types of disfluencies prevalent in each language as a function of grade and language proficiency.

Overall results support findings from previous studies and add new, important insights that form the basis of future exploration. First, data from this larger cross-sectional sample confirmed that typically developing bilingual children do, on average, surpass the recommended threshold of 3% stuttering-like disfluencies (%SLD) and 10% total disfluencies (%TD) for monolingual-English speakers. The findings of this study aligned with those of Byrd et al. (2015) and Eggers et al. (2020) in terms of monosyllabic word repetitions being the most prevalent stuttering-like disfluency type. Whether these should be counted as stuttering-like disfluencies has been questioned (e.g., Howell, 2013). Based on our findings and those of previous studies, it appears that for typically developing bilingual children, these monosyllabic word repetitions might be representative of normal disfluencies. Excluding monosyllabic word repetitions from the stuttering-like category reduces the average stuttering-like disfluencies to below 1% in English and 1.5% in Spanish, consistent with Rojas and Irani (2020). Consequently, considering monosyllabic word repetitions as typical linguistic disfluencies would reduce the risk of misdiagnosis in bilingual children.

Second, both grade and language were important factors influencing the overall frequency of disfluencies. Our results demonstrate a clear trend of the overall mean of disfluencies decreasing with grade (inversely proportional); however, this trend was not statistically significant possibly due in part to the small sample sizes (18–24 children) per grade and large variability (see *SD* values in Table 3). Although bilingual children with balanced dual language proficiency profiles did not demonstrate significant cross-linguistic differences in the frequency of disfluencies (see Table 5), the opposite was true for bilingual children with either English or Spanish

Table 5
Cross-linguistic pairwise comparisons for percentage of stuttering-like disfluencies (%SLD) and total disfluencies (%TD) in English (E) and Spanish (S) as a function of dual language proficiency profile.

Comparison	Balanced (N = 26)	English Dominant (N = 42)	Spanish Dominant (N = 38)
%SLD E-%SLD S *p*	.425 (*d*=2.64)	0.656 (*d*=3.74)	0.029* (*d*=2.9)
Mean (SD) English	4.04 (2.4)	4.58 (3.38)	5.54 (3.91)
Mean (SD) Spanish	4.46 (7.21)	4.84 (3.33)	4.47 (2.56)
%TD E-%TD S *p*	.196 (*d*=8.13)	0.001* (*d*=8.94)	0.079 (*d*=9.5)
Mean (SD) English	14.15 (1.4)	13.47 (7.03)	17.91 (11.32)
Mean (SD) Spanish	16.27 (9.16)	18.27 (8.58)	15.13 (1.03)

Note. *d* = Cohen's *d* effect size values ($\geq$ 0.41 considered clinically relevant; Ferguson, 2009).
* $p < .05$.

dominant proficiency profiles. Spanish dominant children produced more %SLD in English, while English dominant children produced more %TD in Spanish. These disfluency patterns might be reflective of word finding and sentence formulation difficulties in the less proficient language that may change over time due to changing demands in the academic setting (Byrd, 2018; Kohnert et al., 2022). Unfortunately, the sample size for each grade level was insufficient to determine grade-level differences. Most academic contexts for bilingual children have the goal of gaining sufficient English skills to be successful in mainstream English-only classrooms, resulting in increased exposure to English and reduced exposure to the native language in the academic setting (Francis et al., 2019). The question of whether language proficiency profiles would impact disfluency production in the less proficient language differently at each grade level warrants further investigation in longitudinal samples with a larger *n* at each grade level.

The findings of this study extend prior investigations with similar findings of more disfluencies in the less dominant language in school-age, typically developing bilingual children. Specifically, this overall pattern has also been found in smaller-scale studies including a study with 15 bilingual children (ages 5;6–6;7) by Byrd et al. (2015) and a study with 59 bilingual children (ages 6;2–9;9) by Eggers et al. (2020). This study of 106 bilingual children (ages 6;2–9;9) provides further confirmation of more frequent disfluencies in the less dominant language, highlighting important clinical implications for appropriately working with bilingual children such as the need to evaluate performance in both languages and to consider the role of language dominance.

4.1. Clinical implications

The current study emphasizes the clinical relevance of evaluating bilingual children in both languages and, by extension, the importance of evaluating multilingual children in *all* their languages to decrease the risk of misdiagnosis. Non-contemporary research indicated, inaccurately, a higher prevalence of stuttering in bilingual populations (Howell et al., 2009; Travis et al., 1937), thereby implicating bilingualism as a factor in stuttering persistence. This increased the likelihood of speech-language pathologists making recommendations to restrict exposure to non-instructional language (e.g., Karniol, 1992) as a remedy and depriving the child of the social, linguistic, and cognitive benefits of bilingualism (Kohnert et al., 2022). Our findings do not support this notion, as they provide evidence based on the largest sample size of bilingual Spanish-English children investigated to date from a fluency perspective, which indicates that it is typical for bilingual children to experience a high frequency of disfluencies in both languages, which can fluctuate dynamically based on children's dual language dominance profile.

Consequently, in keeping with existing research, SLPs must carefully evaluate disfluencies in bilingual children in *both* languages and further examine specific disfluency types (e.g., Byrd et al., 2015; Eggers et al., 2020; Rojas & Irani, 2020), taking dual language proficiency profiles into account. Using monolingual norms as a comparison base for bilingual children is not appropriate as bilingual children exceed the threshold of 10% total disfluencies that is used for monolingual English-speaking children (Guitar, 2019; Byrd et al., 2015). They also exceed the threshold of 3% stuttering-like disfluencies, *if* including monosyllabic word repetitions. We caution against blindly categorizing monosyllabic word repetitions as stuttering-like disfluencies and encourage future research to explore the role of monosyllabic word repetitions in language development and formulation. Additionally, our work supports the notion that language dominance profiles impact the frequency and type of disfluencies bilingual speakers experience. Thus, it is of utmost importance that SLPs working with preschool and young school-age bilingual children utilize a comprehensive language and disfluency analysis in *both* languages to make an informed decision rooted in our current best evidence.

4.2. Limitations and future directions

The primary limitations of this study are inherent to its cross-sectional design and sample size. As a cross-sectional study, the sample size of 106 children (212 speech samples) was distributed across different grades, with 18–24 children (36–48 language samples) in each grade. While this is a significant improvement from previous research, the sample size for each grade continues to be restricted and does not easily generalize to the population at large. A larger sample of bilingual children per grade level would be expected to provide additional and more nuanced insights. Additionally, cross-sectional designs do not allow us to account for individual differences in children at each grade level across development. However, this study provides important insights on the dynamic nature of fluency development in bilingual children considering differences in grade level and dual language proficiency. These insights need to be supported by future studies that employ larger sample sizes and ideally, also longitudinal data.

An additional limitation of this study is the use of audio-recorded speech samples. Due to the nature of silent blocks and tense pauses, they may not always be readily apparent through an audio sample. It is possible that some children may have experienced silent blocks that were undetected during the coding process. While a video recording is preferable, all children were screened and found to be typically fluent (not CWS) prior to their inclusion in this study, and therefore, it is not likely that results would have been substantively different if video recording had been employed.

4.3. Conclusion

The findings from this cross-sectional investigation of disfluencies in the narrative samples of 106 typically developing Spanish-English bilingual children from kindergarten through grade 4 confirm and extend findings from previous investigations (Byrd et al., 2015; Eggers et al., 2020; Rojas & Irani, 2020). Bilingual children exceeded the stuttering diagnostic norms used for monolingual English-speakers for both total and stuttering-like disfluencies. The majority of stuttering-like disfluencies produced by bilingual children were monosyllabic word repetitions, potentially representative of linguistic uncertainty. Cross-linguistic differences in the frequency of disfluencies were present and changed dynamically as a function of language proficiency profile. Future research utilizing larger sample sizes per grade and longitudinal data is recommended to confirm and expand on these findings.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data Availability

Data will be made available on request.

Acknowledgements

We would like to thank the participating children, families, and teachers as well as undergraduate and graduate research assistants at the University of Texas at Dallas and Texas State University. This research has been supported in part by an American Speech-Language-Hearing Association Multicultural Activities grant awarded to Raúl Rojas and Farzan Irani; Grant 13180 by an anonymous donor awarded to Raúl Rojas; and Grant GA-2013-016 from the Jerry M. Lewis, M.D. Mental Health Research Foundation awarded to Raúl Rojas.

References

Alt, M., Arizmendi, G. D., & DiLallo, J. N. (2016). The role of socioeconomic status in the narrative story retells of school-aged English language learners. *Language, Speech, and Hearing Services in Schools, 47*(4), 313–323. https://doi.org/10.1044/2016_LSHSS-15-0036

Ambrose, N. G., & Yairi, E. (1999). Normative disfluency data for early childhood stuttering. *Journal of Speech, Language, and Hearing Research, 42*(4), 895–909. https://doi.org/10.1044/jslhr.4204.895

Au-Yeung, J., Howell, P., Davis, S., Charles, N., & Sackin, S. (2000). UCL survey of bilingualism and stuttering. *Journal of Fluency Disorders, 25*(3), 246. https://doi.org/10.1016/S0094-730X(00)80321-6

Bedore, L. M., Fiestas, C. E., Peña, E. D., & Nagy, V. J. (2006). Cross-language comparisons of maze use in Spanish and English in functionally monolingual and bilingual children. *Bilingualism, 9*(3), 233–247. https://doi.org/10.1017/S1366728906002604

Bedore, L. M., Peña, E. D., Anaya, J. B., Nieto, R., Lugo-Neris, M. J., & Baron, A. (2018). Understanding disorder within variation: Production of English grammatical forms by English language learners. *Language, Speech, and Hearing Services in Schools, 49*(2). https://doi.org/10.1044/2017_LSHSS-17-0027

Bedore, L. M., Peña, E. D., Summers, C. L., Boerger, K. M., Resendiz, M. D., Greene, K., Bohman, T. M., & Gillam, R. B. (2012). The measure matters: Language dominance profiles across measures in Spanish-English bilingual children. *Bilingualism: Language and Cognition, 15*(3), 616–629. https://doi.org/10.1017/s1366728912000090

Beita-Ell, C., & Boyle, M. P. (2020). School-based speech-language pathologists' perceived self-efficacy in conducting multidimensional treatment with children who stutter. *Language, Speech, and Hearing Services in Schools, 51*(4). https://doi.org/10.1044/2020_LSHSS-20-00044

Berry, J. W., Phinney, J. S., Sam, D. L., & Vedder, P. (2006). Immigrant youth: Acculturation, identity, and adaptation. *Applied Psychology, 55*(3), 303–332. https://doi.org/10.1111/j.1464-0597.2006.00256.x

Bloodstein, O., Ratner, N. B., & Brundage, S. B. (2021). *A handbook on stuttering* (7th). Plural Publishing.

Brisk, D. J., Healey, C. E., & Hux, K. H. (1997). Clinicians' training and confidence associated with treating school-age children who stutter: A national survey. *Language, Speech, and Hearing Services in Schools, 28*, 164–176.

Byrd, C. T. (2018). Assessing bilingual children: Are their disfluencies indicative of stuttering or the by-product of navigating two languages? *Seminars in Speech and Language, 39*(4), 324–332. https://doi.org/10.1055/s-0038-1667161

Byrd, C. T., Bedore, L. M., & Ramos, D. (2015). The disfluent speech of bilingual Spanish– English children: Considerations for differential diagnosis of stuttering. *Language, Speech, and Hearing Services in Schools, 46*, 30–43. https://doi.org/10.1044/2014

Byrd, C. T., Haque, A. N., & Johnson, K. (2016). Speech-Language pathologists' perception of bilingualism as a risk factor for stuttering. *Journal of Communication Disorders, Deaf Studies & Hearing Aids, 2016*(2). https://doi.org/10.4172/2375-4427.1000158

Byrd, C. T., Watson, J., Bedore, L. M., & Mullis, A. (2015). Identification of stuttering in bilingual Spanish–English-speaking children. *Contemporary Issues in Communication Science and Disorders, 42*, 72–87.

Castilla-Earls, A., Bedore, L., Rojas, R., Fabiano-Smith, L., Pruitt-Lord, S., Restrepo, M. A., & Peña, E. (2020). Beyond scores: Using converging evidence to determine speech and language services eligibility for dual language learners. *American Journal of Speech-Language Pathology, 29*(3), 1116–1132. https://doi.org/10.1044/2020_AJSLP-19-00179

Castilla-Earls, A., Francis, D., Iglesias, A., & Davidson, K. (2019). The impact of the Spanish-to-English proficiency shift on the grammaticality of English learners. *Journal of Speech, Language, and Hearing Research, 62*(6), 1739–1754. https://doi.org/10.1044/2018_jslhr-l-18-0324

Castilla-Earls, A. P., Restrepo, M. A., Pérez-Leroux, A. T., Gray, S., Holmes, P., Gail, D., & Chen, Z. (2015). Interactions between bilingual effects and language impairment: Exploring grammatical markers in Spanish-speaking bilingual children. *Applied Psycholinguistics, 37*(05), 1147–1173. https://doi.org/10.1017/s0142716415000521

Coalson, G. A., Pena, E. D., & Byrd, C. T. (2013). Description of multilingual participants who stutter. *Journal of Fluency Disorders, 38*(2), 141–156.

Covington, M. A., & McFall, J. D. (2010). Cutting the Gordian Knot: The Moving-Average Type–Token Ratio (MATTR). *Journal of Quantitative Linguistics, 17*(2), 94–100. https://doi.org/10.1080/09296171003643098

Eggers, K., Van Eerdenbrugh, S., & Byrd, C. T. (2020). Speech disfluencies in bilingual Yiddish-Dutch speaking children. *Clinical Linguistics and Phonetics, 34*(6), 576–592. https://doi.org/10.1080/02699206.2019.1678670

Fergadiotis, G., Wright, H. H., & Green, S. B. (2015). Psychometric evaluation of lexical diversity indices: Assessing length effects. *Journal of Speech, Language, and Hearing Research, 58*(3), 840–852. https://doi.org/10.1044/2015_JSLHR-L-14-0280

Ferguson, C. J. (2009). An effect size primer: A guide for clinicians and researchers. *Professional Psychology: Research and Practice, 40*(5). https://doi.org/10.1037/a0015808

Francis, D. J., Rojas, R., Gusewski, S., Santi, K. L., Khalaf, S., Hiebert, L., & Bunta, F. (2019). Speaking and reading in two languages: On the identification of reading and language disabilities in Spanish-speaking English learners. *New Directions for Child and Adolescent Development, 166*, 15–41. https://doi.org/10.1002/cad.20306

Gahl, S. (2020). Bilingualism as a purported risk factor for stuttering: A close look at a seminal study (Travis et al., 1937). *Journal of Speech, Language, and Hearing Research, 63*(11), 3680–3684. https://doi.org/10.1044/2020_JSLHR-20-00364

Guiberson, M., & Atkins, J. (2012). Speech-language pathologists'preparation, practices, and perspectives on serving culturally and linguistically diverse children. *Communication Disorders Quarterly, 33*(3), 169–180. https://doi.org/10.1177/1525740110384132

Guitar, B. (2019). Stuttering: An integrated approach to it's nature and treatment (5th ed.). Wolters Kluwer.
Gutiérrez-Clellen, V. F., Restrepo, M. A., Bedore, L., Peña, E., & Anderson, R. (2000). Language sample analysis in Spanish-speaking children: Methodological considerations. *Language, Speech, and Hearing Services in Schools, 31*(1). https://doi.org/10.1044/0161-1461.3101.88
Heilmann, J., Miller, J. F., Iglesias, A., Fabiano-Smith, L., Nockerts, A., & Andriacchi, K. D. (2008). Narrative transcription accuracy and reliability in two languages. *Topics in Language Disorders, 28*, 178–188. https://doi.org/10.1097/01.TLD.0000318937.39301.76
Howell, P., Davis, S., & Williams, R. (2009). The effects of bilingualism on stuttering during late childhood. *Archives of Disease in Childhood, 94*(1), 42–46. https://doi.org/10.1136/adc.2007.134114
Howell, P. (2013). Screening school-aged children for risk of stuttering. *Journal of Fluency Disorders, 38*(2), 102–123. https://doi.org/10.1016/j.jfludis.2012.09.002
Karniol, R. (1992). Stuttering out of bilingualism. *First Language, 12*, 255–283.
Kohnert, K., Ebert, K.D., & Pham, G.T. (2022). Language Disorders in Bilingual Children and Adults (3rd Edition). Plural Publishing, Inc.
Kohnert, K., Kennedy, M. R. T., Glaze, L., Kan, P. F., & Carney, E. (2003). Breadth and depth of diversity in Minnesota. *American Journal of Speech-Language Pathology, 12*(3), 259–272. https://doi.org/10.1044/1058-0360(2003/072)
Kritikos, E. P. (2003). Speech-language pathologists' beliefs about language assessment of bilingual/bicultural individuals. *American Journal of Speech-Language Pathology, 12*(1), 73–91. https://doi.org/10.1044/1058-0360(2003/054)
Lim, V. P., Lincoln, M., Chan, Y. H., & Onslow, M. (2008). Stuttering in English-Mandarin bilingual speakers: The influence of language dominance on stuttering severity. *Journal of Speech, Language, and hearing research: JSLHR, 51*(6), 1522–1537.
Mayer, M. (1969). Frog, where are you? The Dial Press.
Mayer, M. (1973). Frog on his own. The Dial Press.
Mayer, M. (1974). Frog goes to dinner. The Dial Press.
Mayer, M., (1975). One frog too many. The Dial Press.
Migration Policy Institute. (2021). U.S. Young Children (ages 0 to 5) by Dual Language Learner Status: National and State Sociodemographic and Family Profiles [data tables]. National Center on Immigrant Integration Policy. https://www.migrationpolicy.org/sites/default/files/datahub/us-dll-children-profiles-age0–5_final.xlsx.
Miller, J.F., Andriacchi, K., & Nockerts, A. (2015). Assessing language production using SALT software: A clinician's guide to language sample analysis (2nd ed.). SALT Software.
Miller, J.F., & Iglesias, A. (2020). Systematic Analysis of Language Transcripts (SALT). Research Version 20 [Computer software]. Middleton, WI: SALT Software, LLC.
Morgan, P. L., Hammer, C. S., Farkas, G., Hillemeier, M. M., Maczuga, S., Cook, M., & Morano, S. (2016). Who receives speech/language services by 5 years of age in the United States? *American Journal of Speech-Language Pathology, 25*(2). https://doi.org/10.1044/2015_AJSLP-14-0201
National Center for Education Statistics. (2022). English Learners in Public Schools. Condition of Education. U.S. Department of Education, Institute of Education Sciences. Retrieved December 2022 from https://nces.ed.gov/programs/coe/indicator/cgf.
Paradis, J., & Crago, M. (2000). Tense and temporality: A comparison between children learning a second language and children with SLI. In Journal of Speech, Language, and Hearing Research (Vol. 43, Issue 4). https://doi.org/10.1044/jslhr.4304.834.
Rieger, C. L. (2003). Repetitions as self-repair strategies in English and German conversations. *Journal of Pragmatics, 35*(1). https://doi.org/10.1016/S0378-2166(01)00060-1
Rojas, R., & Iglesias, A. (2013). The language growth of Spanish-speaking English language learners. *Child Development, 84*(2), 630–646. https://doi.org/10.1111/j.1467-8624.2012.01871.x
Rojas, R., & Iglesias, A. (2019). Assessing the bilingual (Spanish/English) population. In J. F. Miller, K. Andriacchi, & A. Nockerts (Eds.), *Assessing Language Production Using SALT Software: A Clinician's Guide to Language Sample Analysis* (3rd ed..,, pp. 115–127). SALT Software.
Rojas, R., & Irani, F. (2020). Classifying disfluencies in preschool- and school-age Spanish–English bilinguals who do not stutter: An exploratory study. *Perspectives of the ASHA Special Interest Groups, 5*(1), 119–130. https://doi.org/10.1044/2019_persp-19-00164
Roseberry-McKibbin, C., Brice, A., & O'Hanlon, L. (2005). Serving English language learners in public school settings. *Language, Speech, and Hearing Services in Schools, 36*(1), 48–61. https://doi.org/10.1044/0161-1461(2005/005)
Santhanam, S. P., & Parveen, S. (2018). Serving culturally and linguistically diverse clients: A review of changing trends in speech-language pathologists' self-efficacy and implications for stakeholders. *Clinical Archives of Communication Disorders, 3*(3), 165–177. https://doi.org/10.21849/cacd.2018.00395
Su, P. L., Rojas, R., & Iglesias, A. (2022). Dual language profiles in Spanish-speaking English learners. *Journal of Speech, Language, and Hearing Research, 65*(7), 2608–2628. https://doi.org/10.1044/2022_JSLHR-21-00447
Travis, L. E., Johnson, W., & Shover, J. (1937). The relation of bilingualism to stuttering: A survey of the East Chicago, Indiana, schools. *Journal of Speech Disorders, 2*(3), 185–189.
Tseng, V., & Fuligni, A. J. (2000). Parent-adolescent language use and relationships among immigrant families with East Asian, Filipino, and Latin American backgrounds. *Journal of Marriage and Family, 62*(2), 465–476. https://doi.org/10.1111/j.1741-3737.2000.00465.x
Tucci, A., Plante, E., Heilmann, J. J., & Miller, J. F. (2022). Dynamic norming for systematic analysis of language transcripts. *Journal of Speech, Language, and Hearing Research, 65*(1), 320–333. https://doi.org/10.1044/2021_JSLHR-21-00227
Werle, D. R., Byrd, C., & Coalson, G. (2019). Description of multilingual participants who stutter: An update 2011-2018. *Communication Disorders Quarterly*. https://doi.org/10.1177/1525740119870772

Raúl Rojas, Ph.D., CCC-SLP, Professor, Department of Speech-Language-Hearing: Sciences & Disorders, University of Kansas. Dr. Rojas' research focuses on child language from a longitudinal and processing perspective, specifically dual language development in typically developing children and in children with language impairments. He has provided bilingual (Spanish-English) speech-language pathology services in multiple settings, including schools and early intervention.

Farzan Irani, Ph.D., CCC-SLP, Professor, Department of Communication Disorders, Texas State University. Dr. Irani's research focuses on childhood-onset stuttering, specifically on therapy outcomes, cortical dynamics, and the development of fluency and stuttering in children who are multilingual.

Svenja Gusewski, Ph.D., CCC-SLP, Assistant Professor, Communication Disorders Department, Southern Connecticut State University. Dr. Gusewski received her doctoral degree in Communication Sciences and Disorders at The University of Texas at Dallas. Her research focuses on bilingual language and literacy development. She is also interested in establishing research-practice partnerships in the New Haven Community.

Natalia Camacho, B.S., Doctoral Student, Department of Speech, Language, and Hearing, University of Texas at Dallas. Her research interests are bilingual language acquisition and language disorders in Spanish-English speaking children. She aims to improve assessment methods and services in this population.