Research Article

Rates of Typical Disfluency in the Conversational Speech of 30-Month-Old Spanish–English Simultaneous Bilinguals

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Purpose: The aim of this study was to investigate the typical disfluency rates at 30 months old in a large group of simultaneous bilingual children and also investigate the relationships between disfluency rates and linguistic complexity (mean length of utterance in words [MLU-W]), vocabulary diversity (VocD), and speaking rate (utterances per unit time).

Method: Fifty-three typically developing children who had been exposed to Spanish and English from birth participated in this descriptive study. The average percent input at home was 46% in English and 54% in Spanish. Outside the home, the children averaged 9 hr of exposure per week in each language. Spontaneous speech samples in both languages were obtained during play sessions between the children and a parent.

Results: Nonparametric tests revealed a significant difference in typical disfluency rates across languages, with more

children being disfluent in English and with a larger range of disfluency rates in English. The effect size for this difference was small. The children had significantly higher MLU-W in English; there were no differences in VocD or speaking rate between the 2 languages. Typical disfluency rate in Spanish was not significantly correlated with MLU-W, VocD, or speaking rate. Typical disfluency rates in English were correlated with MLU-W and VocD, but not with speaking rate.

Conclusion: This article described the typical disfluency rates of a large group of simultaneous Spanish–English bilingual children at 30 months of age. The typical disfluency rates reported here are lower than those reported in the literature for monolingual children of similar ages. Clinical implications of these findings are addressed.

Typical disfluencies are “phenomena that interrupt the flow of speech and do not add propositional content to an utterance” (Fox Tree, 1995, p. 709). Typical disfluencies have been studied in the speech of monolingual children for many years and are important because they are correlated with young children’s language growth and development (Gordon & Luper, 1989; Rispoli, Hadley, & Holt, 2008; Tumanova, Conture, Lambert, & Walden, 2014; Yaruss, Newman, & Flora, 1999). Linguistic variables such as sentence length and complexity, vocabulary knowledge and expression, and speaking rates have all been shown to influence typical disfluency rates in predictable ways in the speech of monolingual children, giving us insights into how language develops. Typical disfluencies

also shed light on the child’s developing metalinguistic awareness (Clark, 1978). We know far less about the rates of typical disfluencies and the influence of linguistic variables on these disfluency rates in bilingual children. This is unfortunate given that people of Hispanic origin are the largest and fastest growing racial/ethnic minority in the United States (U.S. Census Bureau, 2017). Furthermore, over half of the world’s population is estimated to be regular users of more than one language (Grosjean, 2010). Thus, there is a need to quantify the disfluency rates and linguistic influences on them in bilingual children. The purpose of this article is to investigate the type and frequency of typical disfluencies in the speech of 30-month-old Spanish–English simultaneous bilingual children.

Typical Disfluencies in Children

Typical disfluencies appear at times of rapid language growth (Colburn & Mysak, 1982a; Wexler, 1982; Yairi, 1981) and therefore are often studied in preschool-aged children. Typical disfluencies in the speech of preschool-aged children are most often reported in two types of studies. The first are those that study linguistic influences on typical disfluency

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Editor-in-Chief: Sharon Millard

Editor: Nathan Maxfield

Received November 17, 2017

Revision received May 13, 2018

Accepted August 8, 2018

https://doi.org/10.1044/2018_AJSLP-ODC11-17-0200

Publisher Note: This article is part of the Special Issue: The 11th Oxford Dysfluency Conference.

Disclosure: Shelley B. Brundage received financial compensation as a co-investigator on NIH 1R01HD068421 to Florida Atlantic University (PI: Hoff). Hannah Rowe has no conflicts to disclose.

rates. The second are those that use children who do not stutter as control groups for children who stutter in research studies (e.g., Ambrose & Yairi, 1999). There are many types of speech disfluencies that interrupt the continuity, rate, and rhythm of speech production. Although there is controversy in the literature regarding what behaviors constitute a “typical” disfluency and which are more indicative of stuttering-like disfluencies (SLDs; Wingate, 2001; Yairi, Watkins, Ambrose, & Paden, 2001), the most frequently reported typical disfluencies include revisions (sometimes referred to as false starts), filled pauses, silent pauses, phrase repetitions, and multisyllabic word repetitions (Bloodstein & Bernstein Ratner, 2008; Manning & DiLollo, 2017; Yaruss, 1997).

Table 1 presents information from four studies of preschool-aged monolinguals in languages other than English. Some of these (e.g., Carlo & Watson, 2003) studied older children as well; only the younger group is reported in the table. Although all of these studies report frequencies for individual disfluency types, not all studies include the same types of typical disfluencies in their counts. Making matters more challenging, some disfluency types are not defined, such as “interrupted utterances” (Natke, Sandrieser, Pietrowsky, & Kalveram, 2006). Some of the studies combine typical disfluency and SLD rates in the total disfluency counts, making it difficult to calculate a total rate for typical disfluency only. Even with these caveats, a review of Table 1 reveals significant variation in typical disfluency rates across these four studies.

There are relatively more studies on the typical disfluency rates of monolingual English-speaking children. Table 2 presents information from eight studies that measured typical disfluency rates in monolingual English-speaking preschool-aged children. Here, again, we see the variability in the reported rates of typical disfluencies in the speech of monolingual preschool-aged children, as has been noted in the literature (Ambrose & Yairi, 1999; Colburn & Mysak, 1982b; DeJoy & Gregory, 1985). Underlying reasons for this variability include different sampling methods and language skills of the participants. There is variation in what behaviors are reported across studies and how they are reported. As in the monolingual studies in other languages noted above, SLDs and typical disfluencies are sometimes added together when reporting total disfluency rates (e.g., Yairi, 1981; Yairi & Lewis, 1984), and some researchers measure disfluency rates in syllables, whereas others measure in words. Language variables also influence typical disfluency rates, and we turn to these variables next.

Linguistic Influences on Typical Disfluency Rates in Monolingual English-Speaking Children

Syntactic complexity, lexical diversity, and speaking rate influence typical disfluency rates in young monolingual children. Of these three linguistic variables, the effects of sentence length and syntactic complexity on typical disfluency rates are the most studied. A consistent finding is that monolingual children exhibit increased typical disfluency rates with increases in the length and syntactic complexity

of utterances (Bernstein Ratner & Sih, 1987; DeJoy & Gregory, 1985; Gordon & Luper, 1989; Haynes & Hood, 1978; McLaughlin & Cullinan, 1989; Rispoli & Hadley, 2001; Yaruss et al., 1999). In a study of 2- to 3-year-olds, Colburn and Mysak (1982b) found that revisions were most prevalent when children were using utterances that consisted of emerging linguistic structures. As the child’s mean length of utterance (MLU) increased, the relative frequency of revisions on semantic–syntactic structures also increased. These authors theorized that the cost of cognitive effort exerted in learning syntactic structures was reflected in systematic changes in speech disfluency. Similarly, studies by Zackheim and Conture (2003) and Ryan (2000) demonstrated that typical disfluencies were more likely to occur on long and complex utterances for both children who stutter and those who do not stutter. Taken together, these findings suggest that syntax has a powerful influence on the frequency of typical disfluencies in the speech of young children, particularly when they are learning a language.

There also appear to be lexical influences on typical disfluency rates. Rispoli (2018) found that increased lexical diversity increased the number of revisions in the speech of 27-month-olds. Children with lower expressive vocabulary scores (Tumanova et al., 2014) and lower receptive vocabulary scores (Westby, 1974) exhibit higher typical disfluency rates. Finally, Silverman (1972) found that both children who stutter and who do not stutter were more likely to be disfluent on longer words.

Much of the research on speaking rates and typical disfluencies has been conducted with adults, and it is difficult to generalize these findings to children because children typically produce shorter utterances and pause more often (Starkweather, 1987). Nevertheless, some researchers who studied adults have extrapolated their findings to children. Howell and Sackin (2000) found that, when they asked fluent speakers to speak faster, the frequency of typical disfluencies increased. Although their study was performed with adults, the authors subsequently proposed a theory pertaining to both adults and children, stating that disfluencies occur when one tries to execute speech faster than their planning processes permit. Logan, Byrd, Mazzocchi, and Gillam (2011) found evidence for this proposal in their study of 6- and 9-year-olds; in their study, faster speaking rates led to more disfluencies than slower rates did.

The studies above provide strong evidence that typical disfluencies are correlated with language skills and growth. Typical disfluency rates are influenced by the language skills of the speaker. This evidence is further strengthened by findings that typical disfluency rates are frequent in children with language deficits (Boscolo, Bernstein Ratner, & Rescorla, 2002; Hall, Yamashita, & Aram, 1993).

Typical Disfluencies in Bilingual Children

In contrast to studies of monolinguals, there are relatively few studies on the disfluencies in the speech of young bilingual children (DeHouwer, 2011). Although a number of longitudinal case studies of individual bilingual children

Table 1. Frequency (standard deviation) of typical disfluencies reported in monolingual children who do not stutter speaking languages other than English.

Citation	Language	N	Age ^a	Word or syllable	% Filled pauses/ interjections	% Silent pause/ hesitation	% Phrase revision	% Phrase repetition	% Multisyllable word repetition	Total typical disfluencies
Natke et al. (2006)	German	24	2–5 years	Syllable	0.74 (0.58)	NR	1.32 (0.70)	0.32 (0.29)	0.09 (0.11)	2.59 ^b (1.14)
Carlo & Watson (2003)	Spanish	15	3;5–4 years	Syllable	0.76 (0.47)	0.59 ^c	0.75 (0.43)	0.36 (0.34)	0.33 (0.31)	—
Leclercq et al. (2018)	French	50	4 years	Word	3.6 (2.18)	NR	2.56 (1.48)	1.48 (0.98)	0.17 (0.25)	7.89 (3.09)
Rathika et al. (2012)	Tamil	12	4–5 years	Word	3.87	8.33	2.4 ^d	1.0	NR	—

Note. Em dashes indicate stutter-like disfluencies and typical disfluencies combined when reporting total disfluency. NR = not reported.

^aSome studies (Carlo & Watson, 2003; Rathika et al., 2012) had larger *N*s, but the numbers reported in the table are for the preschool-aged children only. ^bTotal disfluency count includes “interrupted utterances.” ^cThis percentage is the sum of “ungrammatical” and “grammatical” pauses. ^dPhrase revisions were included in the “false starts” category, which also included pronunciation changes and word level changes.

Table 2. Frequency (standard deviation) of typical disfluencies reported in selected studies of monolingual English-speaking children who do not stutter.

Citation	N	Age ^a	Word or syllable	% Filled pauses/ interjections	% Silent pause/ hesitation	% Phrase revision	% Phrase repetition	% Multisyllable word repetition	Total % typical disfluencies
Wexler (1982)	12	2;6	Word	3.03 (2.0)	NR	3.48 (2.29)	2.18 (1.43)	2.11 (0.85) ^b	—
Yairi (1981)	33	24–33 months	Word	1.38 (1.70)	NR	1.07 (1.18)	0.57 (0.44)	0.07 (0.16)	—
Yairi & Lewis (1984)	10	2–3 years	Word	1.42 (1.43)	NR	1.16 (0.61)	0.57 (0.24)	0.01 (0.04)	—
Ambrose & Yairi (1999)	54	24–60 months	Syllable	0.37	NR	0.32	0.08 ^d	—	0.76
DeJoy & Gregory (1985)	30	3;6	Word	1.78 (1.45)	2.15 ^c	2.73 (1.26)	1.16 (0.62)	1.37 (0.73) ^b	—
Pellowski & Conture (2002)	36	3–4 years	Word	NR	NR	NR	NR	NR	1.5 (1.6)
Martin et al. (1972)	10	3.5–4.5 years	Word	NR	NR	NR	NR	NR	3–4
Tumanova et al. (2014)	244	50 months	Word	NR	NR	NR	NR	NR	3.05 (2.0)

Note. Em dashes indicate stutter-like disfluencies and typical disfluencies combined when reporting total disfluency. NR = not reported.

^aSome studies (DeJoy & Gregory, 1985) had larger *N*s, but the numbers reported in the table are for the preschool-aged children only. ^bStudy did not distinguish between multisyllabic and monosyllabic word repetitions. ^cSum of “ungrammatical” and “grammatical” pauses. ^dSum of multisyllable word repetitions and phrase repetitions.

exist (e.g., DeHouwer, 1990), there are no group studies focused solely on participants younger than school age, which is problematic because the preschool years are when we would expect to see increased disfluencies as children learn a language (Pindzola & White, 1986). There are a few group studies (described below) that included at least some children who were younger than 5 years of age, but these children were reported as part of groups with older children.

Typical Disfluencies in Spanish–English Bilingual Children

Carias and Ingram (2006) studied language and disfluency relationships in four bilingual children between the ages of 4 and 10 years. Three of the children had been referred for speech-language evaluation because of fluency concerns, and the fourth had a documented language impairment. The average proportion of disfluencies in the English samples was 0.53 and ranged from 0.17 to 0.79. The average proportion of disfluencies in Spanish was 0.71 and ranged from 0.32 to 0.83. Perhaps, the most salient finding of this case study was that MLU was significantly correlated with disfluency rate. However, the small sample size, the large age range, and the presence of fluency concerns and language impairments in the children studied make it difficult to generalize these findings to typically developing bilingual children.

Rom and Alpern (1994) conducted a study with adolescent children, comparing the disfluency rates of eight monolingual children with language learning disability (LLD), eight monolingual children with no NLD (NLLD), seven bilingual children with LLD, and seven bilingual children with NLLD. Similar to findings of monolingual children with language disability (Boscolo et al., 2002; Hall et al., 1993), they found that children with LLD were more disfluent than children with NLLD. In addition, the English samples of the bilingual children were more disfluent than the monolingual English samples. As with the findings of Carias and Ingram (2006), these findings cannot be generalized to typically developing bilingual children given the small sample size and large variation in linguistic skills present in each group.

There have been two well-controlled group studies of Spanish–English bilingual children that address aspects of typical disfluencies within this population. In a study of the underlying causes of maze use in the speech of bilingual children, Bedore, Fiestas, Peña, and Nagy (2006) analyzed the speech of 22 Spanish-dominant bilingual children ($M_{\text{age}} = 5;9$) and their Spanish and English monolingual age-matched peers. They elicited narrative retellings from the children and calculated the frequency of mazes in the children's narratives. Mazes included filled pauses, "repetitions" (including part-word, sound, whole-word, and phrase repetitions), and various types of revisions (lexical, phonological, and grammatical) and "connector" words (conjunctions used at beginnings of sentences); some of these behaviors would be considered typical disfluencies, whereas others would not. Results indicated that bilingual and monolingual

children exhibited similar percentages of mazes and that the frequency of mazes increased as MLU increased. Both Spanish monolingual and Spanish bilingual children produced higher frequencies of grammatical revisions when speaking Spanish, compared with English—a finding that Bedore and colleagues suggest might be due to structural differences in English and Spanish. All other maze behaviors noted above occurred at similar rates in Spanish and English.

A similar-sized investigation of Spanish–English bilingual children was performed by Byrd, Bedore, and Ramos (2015) using a sample of 18 Mexican-American kindergarteners (nine boys and nine girls; age = 5;6–6;7); six were balanced bilinguals, six were Spanish dominant, and six were English dominant. As in Bedore et al.'s (2006) study, the participants were prompted to retell a narrative they were given. Revisions, unfinished words, interjections, phrase repetitions, and polysyllabic word repetitions were considered nonstuttering disfluencies. Across all 18 children, the average rate of non-SLDs was 5.23% in English and 8.50% in Spanish; these rates were not significantly different across the two languages. These authors also noted much individual variation in disfluency rates, with some children exhibiting higher rates in English, others exhibiting higher rates in Spanish, and still others exhibiting relatively equivalent rates across languages.

Purpose of the Current Study

The above two studies have furthered our understanding of typical disfluencies in bilingual children at or near school age. This study aims to extend our understanding to younger Spanish–English bilingual children. We present data from a large group of bilingual children at 30 months of age—a time of rapid language development. Our aim was to investigate the typical disfluency rates in bilingual children and the possible relationships between these disfluency rates and linguistic complexity, vocabulary diversity (VocD), and speaking rate in each language.

Method

Participants

Fifty-three simultaneous bilingual children (Spanish–English) participated in this study (26 boys and 27 girls). All participants were part of a larger longitudinal study addressing language development in English–Spanish bilingual children from 30 to 60 months of age. All children were 30 months of age at the time of the current study and lived in southern Florida. They were typically developing at 30 months of age, and their developmental status was verified using the Ages and Stages Questionnaire (Squires, Bricker, & Mounts, 2009). Per parent report, all of the children were born in the United States at full term and had passed newborn hearing screening at birth. Table 3 contains information about the children's language exposure within and outside the home, obtained via parent report.

Table 3. Means, standard deviations, and ranges of linguistic input characteristics.

Characteristic	<i>n</i>	<i>M</i>	<i>SD</i>	Range
% English input at home	53	45.73	22.75	10%–90%
% Spanish input at home	53	54.22	22.71	10%–90%
Number of hours of English exposure out of the house per week	43	9.06	13.34	0–50 hr
Number of hours of Spanish exposure out of the house per week	43	8.58	14.71	0–74 hr

Parent reports are valid measures of language exposure in bilingual families (Hoff & Rumiche, 2012).

The mean age of arrival in the United States for the mothers was 19.6 years ($SD = 11.18$ years). Colombia was the country of origin for 20 of the mothers. Seven mothers were born in Peru; and another seven, in the United States. Three mothers were from Cuba, and three were from Puerto Rico. Six mothers came from Argentina, Dominican Republic, and Uruguay (two from each). The remaining mothers were from El Salvador, Australia, Guatemala, Mexico, Spain, and Venezuela. Eight (15.1%) of the mothers held an advanced degree. Nineteen (35.8%) of the mothers held 4-year college degrees, and 15 (28.3%) held 2-year associate of arts degrees. Ten (18.9%) had high school diplomas, and one (1.9%) did not.

The mean age of arrival for the fathers was 14.91 years ($SD = 12.83$ years). Nine of the fathers were from Colombia, five were from Argentina, and five were from Cuba. Four fathers were born in Peru; and three, in the Dominican Republic. Sixteen of the fathers were born in the United States. The remaining 10 fathers were born in El Salvador, Guatemala, India, Italy, Lebanon, Mexico, Puerto Rico, United Kingdom, and Venezuela, and one father did not report his country of origin.

Of the 53 children in this study, 45 (85%) had mothers who were native speakers of Spanish and eight (15%) had mothers who were native speakers of English. Thirty-three (62%) of the children had fathers who were native speakers of Spanish, 16 (30%) had fathers who were native speakers of English, and the remaining four children had fathers who were bilingual speakers of other languages ($n = 3$) or a parent who did not provide the information ($n = 1$).

At the time of the study, 44 (83%) of the mothers identified themselves as bilingual speakers, seven (13.2%) identified themselves as English speakers, and one (1.9%) identified herself as a Spanish speaker. Thirty-two (60.4%) of the fathers identified themselves as bilingual speakers, 12 (22.6%) identified themselves as English speakers, and one (1.9%) identified himself as a Spanish speaker. One mother (1.9%) and five fathers (9.4%) identified themselves as multilingual. Parents were asked to self-rate their own proficiency in English and Spanish using a 3-point scale, where 1 = *understand only a few words*, 2 = *limited proficiency*, and 3 = *good proficiency*. This information is presented in Table 4.

Participants were recruited via flyers, word of mouth, and local advertisements in English- and Spanish-language magazines catered toward parents of young children. Children were eligible for the study if either one or both of their

parents were from a Spanish-speaking country, and their parents reported that their children were producing sentences of at least two words in both languages by 2 years of age. Data collection occurred in South Florida. Investigators from Florida Atlantic University scored standardized tests, obtained videotaped language samples, and sent videotaped interactions to George Washington University for a fluency analysis.

Materials and Procedure

Standardized Tests

Trained bilingual examiners visited the homes of the participants every 6 months beginning when the children were 30 months old and ending when they were 60 months old. Data for the current study were taken from the 30-month visits. The children were visited twice at 30 months. During one visit, the parents were asked to interact in English with their child, and during the other visit, they were asked to interact in Spanish. The order of languages was counter-balanced. The children were free to respond in either language.

Children and parents completed a series of standardized tests and videotaped interactions during each visit. Parents completed extensive language histories at each visit and reported on their child's vocabulary in both languages as well as completed the MacArthur Communicative Development Inventories (Fenson et al., 2007) for English and its Spanish equivalent, the *Inventario del Desarrollo de Habilidades Comunicativas* (Jackson-Maldonado et al., 2003). The children were administered the auditory comprehension subtest of the *Preschool Language Scale–Fourth Edition* (Zimmerman, Steiner, & Pond, 2005) in English as well as the *Preschool Language Scale–Fourth Edition: Spanish Edition* (Zimmerman, Steiner, & Pond, 2002). This subtest assesses receptive language abilities. Percentile scores for each of these tests in each language are presented in Table 5.

Table 4. Number (%) of parents reporting each level of proficiency in English and Spanish.

Proficiency level	Mothers		Fathers	
	Spanish	English	Spanish	English
Good proficiency	44 (83)	45 (85)	29 (55)	40 (76)
Limited proficiency	5 (9)	6 (11)	5 (9)	7 (13)
Understand only a few words	1 (2)	0	13 (25)	0
Did not respond	3 (6)	2 (4)	6 (11)	6 (11)

Table 5. Mean (standard deviation) percentile scores for standardized test scores.

Test	Language	
	Spanish	English
MCDI-English or IDHC-Spanish Percentile	16.65 (18.20)	18.39 (25.15)
PLS4-Auditory Comprehension Percentile	64.18 (31.43)	37.26 (31.89)
Standard score	106.31 (20.62)	90.81 (18.97)

Note. MCDI = MacArthur Communicative Development Inventories; IDHC = MacArthur Inventarios del Desarrollo de Habilidades Comunicativas; PLS4-Auditory Comprehension = Preschool Language Scale—Fourth Edition, auditory comprehension subtests.

Videotaped Interactions

Children were videotaped in their homes interacting with their parents. Parent–child play interactions occurred with standardized sets of toys provided by the examiners. The parents were asked to play for 10–15 min with picnic toys and then for 10–15 min with toy animals. These videotaped interactions occurred in both English and Spanish.

Data Coding

Disfluency Rates

The parent–child conversations were transcribed by trained transcribers at Florida Atlantic University using CHAT, a transcription program that is part of the TALK-BANK initiative (MacWhinney, 2000). The conversations were coded at the George Washington University laboratory for typical disfluencies in CHAT, using a standard set of disfluency codes (Bernstein Ratner, Brundage, & Fromm, 2018). Native Spanish-speaking research assistants coded the Spanish transcripts, and native English-speaking research assistants coded the English transcripts. Reliability of disfluency coding was achieved through consensus reliability. This process consisted of each coder being trained to a criterion of 80% reliability. Once trained, one coder coded the entire transcript of a participant. A second coder then reviewed the transcript and verified the codes. If there were any disagreements, the two coders came to a consensus. Any remaining disagreements were resolved by a certified fluency specialist. The following typical disfluencies were coded: phrase revisions, word revision, phrase repetitions, filled pauses, and unfilled pauses (see Table 6 for definitions and examples). CLAN is an analysis program within TALK-BANK; we used the CLAN utility MOR to identify the parts of speech for each word produced in the transcript. The FLUCALC utility was used to count the number of occurrences of each code present in each transcript. The FLUCALC utility also calculated the total disfluency rate; *total disfluency rate* was the sum of all phrase revisions, word revisions, phrase repetitions, filled pauses, and unfilled pauses divided by the number of words spoken and then multiplied by 100.

Linguistic Complexity, VocD, and Speaking Rate

The CLAN utility KIDEVAL was used to calculate linguistic aspects of the children’s speech. Three calculations were extracted from the KIDEVAL spreadsheet and added to our data set for analysis: MLU in words (MLU-W), VocD, and utterances per second (Utts/Time). *MLU-W* is the average number of words in an utterance. We chose MLU-W because of research suggesting that, compared with MLU in morphemes, MLU-W “may be the more satisfactory measure for cross-linguistic comparisons” because MLU-W is less prone to systematic errors due to the inflected nature of Spanish and the presence of code-switching in bilingual speech samples (Gutiérrez-Clellan, Restrepo, Bedore, Peña, & Anderson, 2000, p. 95). *Utterances* were defined as “a string of words that contains at least two of the following: (1) is followed by a pause of one second or more; (2) ends with a terminal contour; and (3) has a complete grammatical structure” (Bernstein Ratner et al., 2018, p. 13). *VocD* is the total number of different words produced by each participant. *Utts/Time* is a speaking rate measure and is the number of utterances spoken per second.

Code-Switching

Code-switching is common in conversations involving bilingual speakers (Genesee & Nicoladis, 2007). Both the parents and the children in our study code-switched during the Spanish interactions and during the English interactions. Words in the code-switch (i.e., English words that were spoken during the Spanish interaction and Spanish words spoken during the English interaction) were omitted from the MLU-W, VocD, and Utts/Time analyses. Words in code-switches were not omitted from disfluency analyses because they were part of the child’s intended message, regardless of the language used.

Results

Types and Rates of Typical Disfluency

The distributions for disfluency rates in English and Spanish were graphed using SPSS Version 25 (International Business Machines, 2018) and visually inspected. Kolmogorov–Smirnov tests revealed significant findings for Spanish disfluency rate ($p = .001$) and English disfluency rate ($p = .001$). Therefore, nonparametric statistics were used for comparisons of disfluency rates.

Medians for each type of typical disfluency and for total disfluency are presented in Table 7. Filled pauses were the most frequent type of typical disfluency in both languages. Phrase revisions and word revisions did not occur in either language in our sample.

Wilcoxon matched-pair signed-rank tests were used to compare the overall disfluency rates in English and Spanish. Interestingly, although the median disfluency rate was the same in both languages, the Wilcoxon test revealed a significant difference in disfluency rate across languages ($z = -2.46, p = .013$). This significant finding is due to the

Table 6. Typical disfluency definitions and examples.

Disfluency type	Description	Example
Phrase repetition	Repetitions of more than one word	<that is a> [/] that is a cat
Phrase revision	A revision of a phrase	<what did you> [/] how did you do that?
Word revision	Revision of a single word	that clown is funny [/] scary.
Unfilled pause	Break of more than 1 s in the middle of an utterance	put it (.) over there.
Filled pause	Production of nonlinguistic sound that fills silence	it is &-um an elephant.

larger range of disfluency rates in English (see Figure 1), coupled with the greater number of participants who have higher rates of disfluency in English ($n = 31$) versus those who have higher disfluency rates in Spanish ($n = 15$) and those whose disfluency rates did not change across languages ($n = 7$). As can be seen in Table 7 and Figure 1, the interquartile range for English is much larger than that for Spanish. We calculated an effect size (r) using the procedure outlined in Pallant (2016). These calculations yielded an $r = .24$, indicating a small effect size between English and Spanish disfluency rates.

Linguistic Variables and Typical Disfluencies

In order to address our interest in exploring the effects of linguistic variables on disfluency rates in both languages, we compared MLU-W, VocD, and Utts/Time and typical disfluency rates. The distributions for the three linguistic variables were graphed using SPSS Version 25 (International Business Machines, 2018) and visually inspected. Kolmogorov-Smirnov tests revealed significant results for MLU-W in English ($p = .014$) and Spanish ($p = .025$). Results were nonsignificant for Utts/Time in English ($p = .07$) but were significant for Spanish ($p = .001$). Normality testing was nonsignificant for VocD in English and Spanish ($ps = .200$ for both). Because of the significant values for MLU-W and Utts/Time in Spanish, we used nonparametric statistics for our linguistic comparisons.

Table 8 contains medians for the three linguistic variables in both languages. Comparisons between the English and Spanish samples using related-samples Wilcoxon signed-rank tests revealed significantly greater MLU-W ($z = -2.69$, $p = .007$) in English. There were no differences in VocD ($z = -0.55$, $p = .58$) or Utts/Time ($z = -0.19$, $p = .84$) between

the English and Spanish samples. These results suggest that the bilingual group exhibited greater linguistic length and complexity in English than they did in Spanish, but they exhibited similar levels of VocD and speaking rate in English and Spanish.

Correlational Analyses

In the following set of analyses, we explored possible relationships between typical disfluency rates and performance on linguistic variables. We adjusted our alpha level using the Bonferroni correction in order to guard against the bias of repeated testing effects. Because we were measuring three linguistic variables (i.e., MLU-W, VocD, and Utts/Time), we divided .05 by 3, which gave us an adjusted α level of .017. Spearman's rank-order correlations were used for all correlational analyses.

In Spanish, typical disfluency rate was not significantly correlated with MLU-W ($\rho = .29$, $p = .03$), VocD ($\rho = -.10$, $p = .94$), or Utts/Time ($\rho = -.13$, $p = .35$). In English, typical disfluency rate was significantly correlated with MLU-W ($\rho = .43$, $p = .001$) and VocD ($\rho = .37$, $p = .009$), but not with Utts/Time ($\rho = -.05$, $p = .71$). These results suggest that, in English, linguistic complexity and VocD exert stronger influences on typical disfluency rate than speaking rate does. No such relationships were observed in Spanish.

Figure 1. Typical disfluency rate in Spanish and English. **Table 7.** Median (interquartile range [IQR]) for typical disfluency rates in each language.

Disfluency type	Spanish	English
	Mdn (IQR)	Mdn (IQR)
Phrase repetition	0.00 (0.00)	0.10 (0.60)
Phrase revision	0.00 (0.00)	0.00 (0.00)
Word revision	0.00 (0.00)	0.00 (0.20)
Unfilled pause	0.00 (0.40)	0.00 (0.40)
Filled pause	0.50 (1.75)	0.70 (2.0)
Total typical disfluency rate	1.30 (1.95)	1.30 (2.95)

Table 8. Median (interquartile range) performance on linguistic variables.

Linguistic variables	Language	
	Spanish	English
MLU-W	1.34 (0.35)	1.47 (0.44)
VocD	31.89 (24.56)	34.34 (18.00)
Utts/Time	0.92 (0.31)	0.96 (0.30)

Note. MLU-W = mean length of utterance in words; VocD = vocabulary diversity; Utts/Time = number of utterances per second.

Discussion

This study aimed to characterize the typical disfluencies in the speech of a large group of simultaneous Spanish–English bilingual children at the age of 30 months, a time of rapid language development. In addition, we investigated possible relationships between the children’s typical disfluency rates and MLU, VocD, and speaking rate, because the disfluency rates of monolingual English speakers are influenced by these variables. Relationships between these linguistic variables and disfluency are less clear for bilingual speakers. Prior studies of older Spanish–English (school-age) children suggest higher disfluency rates in these bilingual children when compared with either monolingual speakers or monolingual disfluency norms (Bedore et al., 2006; Byrd et al., 2015). Our study aimed to extend typical disfluency information to a group of younger simultaneous bilingual children. The bilingual population in the United States is growing. Speech-language pathologists will need to understand the effects of learning two languages on disfluency rates in young bilingual children.

Disfluency Rates

Three previous studies have reported disfluency rates in monolingual English-speaking children at ages similar to the children in our study (Wexler, 1982; Yairi, 1981; Yairi & Lewis, 1984). When compared with the 24- to 36-month-olds in these studies, the 30-month-olds in our study exhibited lower rates of filled pauses, phrase repetitions, and revisions when speaking English. Although it is not possible to compare overall typical disfluency rates across these studies because SLDs were included in the overall disfluency rate calculations in the three prior studies, it appears that bilingual children have lower English typical disfluency rates than monolinguals at this age.

When comparing the 30-month-olds in the current study with older preschool-aged monolingual English-speaking children, our participants again had lower rates across all typical disfluencies compared with the 42-month-old children studied by DeJoy and Gregory (1985). However, our participants had higher filled pause rates and higher total disfluency rates than the 24- to 60-month-old children in Ambrose and Yairi’s (1999) study. The overall typical disfluency rate in our study was similar to the rate reported

for 3- to 4-year-old English monolinguals (Pellowski & Conture, 2002) and lower than the typical disfluency rates reported for 50-month-olds (Tumanova et al., 2014). To us, these results add support to the conclusion that monolingual disfluency norms are not appropriate for characterizing the disfluencies of bilingual children (Byrd et al., 2015).

The Spanish and English typical disfluency rates in our study are also lower than those reported for monolingual children speaking languages other than English (Carlo & Watson, 2003; Leclercq et al., 2018; Natke et al., 2006; Rathika, Kanaka, Sunila, & Rajashekhar, 2012). In fact, the rates for each type of typical disfluency are lower in our study than for any of these studies. These comparisons also suggest that monolingual norms are not adequate for bilingual speakers.

The typical disfluency rates of the children in our study are also lower than those reported for older bilingual children (Bedore et al., 2006; Byrd et al., 2015). The most obvious reason for these differences in typical disfluency rates is that our children were younger than the children in the other studies. However, the children in our study were at an age of rapid linguistic development, a time where one might reasonably expect an increase in disfluency rate (Colburn & Mysak, 1982a; Wexler, 1982; Yairi, 1981). Another explanation may be the nature of the task used. We calculated our data from spontaneous speech samples, whereas Byrd et al. (2015) and Bedore et al. (2006) used narrative sampling. There is an indication that the frequency of disfluencies is typically greater in narration than in conversation due to the cognitive demands of storytelling (Leadholm & Miller, 1992). Thus, one explanation for our difference in results may be the method by which we collected data.

A third possible explanation for the lower disfluency rates in our bilingual children is more speculative: Perhaps being bilingual is somehow protective of early fluency development. Bilingual children have documented advantages in executive control, including better inhibitory control and metalinguistic awareness when compared with monolingual peers (Bialystok & Viswanathan, 2009; Galambos & Goldin-Meadow, 1990; Quinteros Baumgart & Bates Billick, 2018). Interestingly, children who stutter have deficiencies in inhibitory control (Eggers, De Nil, & Van den Bergh, 2013) and metalinguistic awareness (Bajaj, Hodson, & Schommer-Aikins, 2004). Lower levels of executive control are associated with a higher frequency of stuttering (Jones et al., 2017), a finding that led Jones and colleagues to suggest that, for children with “relatively well-developed executive functions...cognitive regulation/executive functions may serve as a ‘buffer,’ insulating or protecting their speech-language planning and production system” (Jones et al., 2017, p. 2145). It could be that being bilingual is another such “buffer” against increased disfluency.

Disfluency Rates and Linguistic Variables

Our bilingual children had significantly higher MLU-W in English than they did in Spanish. This is likely the result of unique differences between the Spanish and English

languages. Given the morphological structure of Spanish, one Spanish word can contain multiple morphemes to indicate subject gender, subject number, and verb tense (Gutiérrez-Clellan et al., 2000). Bilingual speakers are therefore able to communicate more meaning with fewer words in Spanish as compared with English. VocD and speaking rate did not differ across languages.

Typical disfluency rates in English were significantly correlated with MLU-W for the 30-month-olds in our study. This finding is similar to those for monolingual English speakers reported in the literature (Bernstein Ratner & Sih, 1987; Colburn & Mysak, 1982b; DeJoy & Gregory, 1985; Gordon & Luper, 1989). Our finding that the overall typical disfluency rate was significantly and positively correlated with VocD is similar to other investigations where increases in lexical diversity led to increases in revisions (Rispoli, 2018). These relationships between MLU-W, VocD, and typical disfluency rate did not occur in Spanish, suggesting the possibility that these are English-specific effects.

Our nonsignificant findings for speaking rate across languages disagree with the findings of Logan et al. (2011). This could be due to a number of reasons, the most obvious of which is the differences in ages in the two studies. It could also be due to the relatively imprecise nature of the variable we used to quantify rate effects in our study.

Clinical Implications

The “typical bilingual” child does not exist (Hoff & Core, 2015). Many variables influence language development and production, and therefore typical disfluency rates, in bilingual children. In addition to the differences in language structures, bilingual children differ in terms of the amount of input received in each language, the nature of the input received, the length of time that they have spoken each language, and the relative strengths they exhibit in each language. The influences and interactions between these variables mean that bilingual children “pose unique challenges for clinicians” (Hoff & Core, 2015, p. 90). Byrd et al. (2015) concluded that monolingual disfluency norms should not be used for bilinguals, and our findings support this conclusion. Results from the current study and prior studies emphasize the importance of taking measurements during bilingual fluency assessment and treatment in both languages. This is consistent with the recommended practice of assessing bilingual children (Goldstein, 2006). It may be most meaningful to describe the child’s relative strengths and weaknesses in each language spoken and how these variables do or do not impact fluency.

Limitations and Future Directions

Spontaneous conversation, such as in our study, may not have been as challenging to fluency and language performance as other tasks are known to be, such as narrative recall (Byrd et al., 2015). However, our children were too young to perform narrative recall tasks, and parent–child interaction is commonly used to gather speech samples

with children this age (Carlo & Watson, 2003; Leclercq et al., 2018; Natke et al., 2006; and all citations in Table 2, all of which used spontaneous speech samples to collect disfluency data). The parents in our study were asked to attempt to speak with their children in Spanish during the Spanish recording visits and in English during the English recording visits. This likely felt unnatural to the parents. The children were not given any instructions on which language(s) to use.

There is an urgent need to study the fluency development of bilingual speaking children over time, as they become more proficient with their language(s) and speak in more linguistically complex sentences and with a greater range of vocabulary (Housen & Kuiken, 2009; Malvern, Richards, Chipere, & Durán, 2004; Nation & Chung, 2009; Ravid, 2005). Other potential future directions include investigating the location of typical disfluencies in syntactically complex utterances. The participants in this study did not speak in long enough utterances to justify such an analysis. However, in longer and more complex sentences, one may find that the structural and functional differences between the Spanish and English languages (Anderson, 1995; Merino, 1992; Ordóñez & Treviño, 1999; Roach, 1982) could result in differences in disfluency location as well. Such findings regarding both rates and locations of disfluencies at later ages would further inform our assessment of fluency development in bilingual children.

Acknowledgments

We thank Nan Bernstein Ratner and Cynthia Core for comments on an earlier version of this article. Portions of this article were presented at the 2016 ASHA Convention and the 2017 Oxford Dysfluency Conference.

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