Effects of Length, Complexity, and Grammatical Correctness on Stuttering in Spanish-Speaking Preschool Children

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Purpose: To explore the effects of utterance length, syntactic complexity, and grammatical correctness on stuttering in the spontaneous speech of young, monolingual Spanish-speaking children.
Method: Spontaneous speech samples of 11 monolingual Spanish-speaking children who stuttered, ages 35 to 70 months, were examined. Mean number of syllables, total number of clauses, utterance complexity (i.e., containing no clauses, simple clauses, or subordinate and/or conjoined clauses), and grammatical correctness (i.e., the presence or absence of morphological and syntactical errors) in stuttered and fluent utterances were compared.
Results: Findings revealed that stuttered utterances in Spanish tended to be longer and more often grammatically incorrect, and contain more clauses, including more sub-ordinate and/or conjoined clauses. However, when controlling

for the interrelatedness of syllable number and clause num-ber and complexity, only utterance length and grammatical incorrectness were significant predictors of stuttering in the spontaneous speech of these Spanish-speaking children. Use of complex utterances did not appear to contribute to the prediction of stuttering when controlling for utterance length.
Conclusions: Results from the present study were consistent with many earlier reports of English-speaking children. Both length and grammatical factors appear to affect stuttering in Spanish-speaking children. Grammatical errors, however, served as the greatest predictor of stuttering.

Key Words: Spanish, stuttering, utterance length, syntactic complexity, grammatical correctness

M any empirical studies have examined the relationship between speech disfluencies, utterance length, and syntactic complexity in English-speaking children who stutter. Results of these investigations suggest that for young English speakers, increased syntactic complexity and, in some cases, utterance length are associated with increased stuttering (e.g., Bernstein Ratner & Sih, 1987; Brundage & Bernstein Ratner, 1989; Gaines, Runyan, & Meyers, 1991; Kadi-Hanifi & Howell, 1992; Logan, 2003; Logan & Conture, 1995; Sawyer, Chon, & Ambrose, 2008; Weiss & Zebrowski, 1992; Yaruss, 1999; Yaruss, Newman, & Flora, 1999). Further, there is evidence in English that a mismatch between a child's overall linguistic proficiency and increased linguistic complexity may compromise fluency in preschool children who stutter as well as those who do not

stutter (e.g., Bauerly & Gottwald, 2009; Zackheim & Conture, 2003). The impact of increased length and syntactic complexity on the fluency of young children lends support for psycholinguistic theories of stuttering, which suggest that syntactic, lexical, phonological, or suprasegmental aspects of speech production may play a role in the expression of stuttering (Bernstein Ratner, 1997). In addition, in studies of adults who stutter, it has been proposed that increased processing demands, such as those associated with increased length and/or linguistic complexity, may lead to fluency disruptions (Bosshardt, 2006). Others have explored the relationship between linguistic encoding difficulties and related motor instabilities, with outcomes suggesting that the motoric stability of persons who stutter may be uniquely vulnerable to increases in linguistic complexity (Kleinow & Smith, 2000). If these explanatory models of stuttering are to be confirmed, the relationships between stuttering, length, and linguistic complexity should be observed across languages. To date, however, there is a dearth of systematic study examining the potential connections among these variables in languages other than English, including Spanish.

Cross-Linguistic Investigations of Stuttering

The theoretical and clinical value of examining communication disorders, particularly stuttering, in other languages has been noted by many investigators (e.g., Anderson, 2007;

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Anderson & Centeno, 2007; Bernstein Ratner, 2004; Boey, Wuyts, Van de Heyning, De Bodt, & Heylen, 2007; Carias & Ingram, 2006; Centeno, Anderson, & Obler, 2007; Roberts & Shenker, 2007; Van Borsel, Maes, & Foulon, 2001). Cross-linguistic comparisons have the potential to reveal common characteristics and underlying attributes of stuttering, as well as to provide insights into the fundamental connections between stuttering and linguistic aspects of the languages. The convergence of study outcomes examining different languages may assist us in clarifying psycholinguistic and motoric stuttering models that have been developed predominantly through study of monolingual English speakers.

A number of studies have been completed examining disfluencies and stuttering in monolingual and/or bilingual speakers who speak languages other than English, including German (e.g., Dworzynski & Howell, 2004; Dworzynski, Howell, Au-Yeung, & Rommel, 2004; Dworzynski, Howell, & Natke, 2003; Natke, Sandrieser, Pietrowsky, & Kalveram, 2006), Dutch (e.g., Boey et al., 2007), Mandarin (e.g., Lim, Lincoln, Chan, & Onslow, 2008), Ga (Kirk, 1977), Igbo (Nwokah, 1988), Maltese (Agius, 1995), and Portuguese (e.g., Juste & de Andrade, 2006). Reports describing stuttering in Spanish speakers, on the other hand, remain relatively few—particularly in light of the growing number of Spanish speakers in the United States (U.S. Bureau of the Census, 2008). Available reports of investigations of stuttering in Spanish include descriptions of stuttering patterns in bilingual Spanish-English speaking children and adults (e.g., Bernstein Ratner & Benitez, 1985; Carias & Ingram, 2006; Dale, 1977; Howell et al., 2004; Weliky & Douglass, 1994). Cross-language comparisons within speakers provide important contributions to our understanding of stuttering. However, potential confounding issues associated with examining bilingual speakers (e.g., cross-linguistic influences, variability in language input/output, language proficiency and processing differences) present challenges in interpreting and generalizing findings to other individuals and groups who speak the same languages.

To control for the issues inherent in examining bilingual speakers and to provide a basis for future study of such speakers, investigations are needed examining monolingual speakers in different language groups, including Spanish speakers. Studies of monolingual Spanish-speaking children and adults that have been completed to date have focused on (a) describing the features of normal disfluencies and stuttering (e.g., Carlo & Watson, 2003, 2009; Watson & Anderson, 2001; Watson & Byrd, 2007; Watson, Byrd, & Carlo, 2011) and (b) examining the phonological nature and grammatical class (i.e., content vs. function words) of stuttering in the speech sequence (e.g., Au-Yeung, Gomez, & Howell, 2003; Howell, 2004; Howell & Au-Yeung, 2007; Howell et al., 2004; Watson, 2002; Watson, Byrd, & Carlo, 2007). However, to the authors' knowledge, no reported study has investigated the contribution of length and complexity on the speech fluency of monolingual Spanish-speaking children who stutter.

Linguistic Differences Between Spanish and English

If empirical outcomes examining the spontaneous speech of English-speaking children who stutter apply to Spanish-speaking children, young Spanish speakers' stuttered utterances should be longer and syntactically more complex when compared with their fluent utterances (e.g., Gaines et al., 1991; Logan & Conture, 1995; Logan & LaSalle, 1999; Yaruss, 1999; Zackheim & Conture, 2003). The possibility of similar stuttering patterns in Spanish- and English-speaking children has been supported. For example, in both English and Spanish, stuttering in young children has been observed to occur more frequently on or around function words (e.g., Au-Yeung, Howell, & Pilgrim, 1998; Bloodstein & Gantwerk, 1967; Bloodstein & Grossman, 1981; Howell, Au-Yeung, & Sackin, 1999; Howell et al., 2004; Watson, 2002; Watson et al., 2007).

On the other hand, linguistic differences between Spanish and English may lead to different effects of utterance length and complexity on stuttering in Spanish speakers. In two case studies examining the syntactic structures of stuttered speech of a bilingual Spanish-English adult (Bernstein Ratner & Benitez, 1985) and a bilingual Spanish-English child (Cabrera & Bernstein Ratner, 2000, as cited in Van Borsel et al., 2001), differences in Spanish and English sentence structure were purported to account for variations in the location of stuttered speech. For example, in the case of the bilingual adult, stuttering occurred more often at the beginning of Spanish utterances when compared with English utterances. The authors proposed that the pro-drop nature of Spanish (i.e., by which the sentential context and inflected verb form provide adequate information to identify the subject, and as a result, pronouns are omitted; Anderson & Centeno, 2007) leads to more verb initiated utterances and accounted for more stuttering at the beginning of the Spanish utterances.

In addition to sentence structure, other differences between Spanish and English may alter the role of length and grammatical complexity in disrupting fluency in Spanish. Some examples of Spanish-English differences include increased Spanish word length and highly inflected noun and verb systems in Spanish. Although Spanish words are phonemically less complex than English (Goldstein & Iglesias, 2006), they often are longer than English words. In Spanish, two- and three-syllable words account for 90% of Spanish tokens (Vitevitch & Rodríguez, 2004), in contrast to one- and two-syllable words representing about 80% of English tokens (Zipf, 1935). Many of the single-syllable function words in English are multisyllabic in Spanish, including conjunctions (e.g., *pero* [but], *sino* [but], and *como* [as]), articles (e.g., *una* [a] and *unos* [some]), and prepositions (e.g., *para* [for] and *desde* [from]). As a result, function words, which are often stuttered in Spanish- and English-speaking children, may be longer in Spanish when compared to English. In contrast, shorter utterances in Spanish may be grammatically complex due to the highly inflected nature of the language.

Spanish has multiple inflectional affixes to designate a wide range of syntactic and semantic functions. This inflectional complexity is in marked contrast to English, which has only eight inflectional affixes (e.g., plural, possessive, and past; see Anderson & Centeno, 2007, for a review of Spanish/English differences). For example, in Spanish, the definite female plural article *las* [the] requires agreement for

both gender and number. Thus, while it is comparable in length to the one-syllable article *the* in English, due to the inflections, it is linguistically more complex, may require more processing to encode, and thus may be more vulnerable to error. The relationship between grammatical errors and stuttering has been examined in English-speaking children by Yaruss (1999). Although no relationship was found between these two variables in this population, grammatical errors and stuttering require additional investigation in English-speaking children who stutter, due to limited data, and in Spanish-speaking children who stutter, where there are no data.

Measuring Length and Complexity in Spanish

Assessment of utterance length in Spanish-speaking children requires metrics that are sensitive to the linguistic characteristics of the language. Specifically, syllable counts are preferable to word counts because the latter may overlook significant speech production information found in polysyllabic words, which are more frequently observed in Spanish than in English (Vitevitch & Rodríguez, 2004).

Spanish syntactic complexity and proficiency in young children have been examined through a variety of measurements, including the assessment of clause number and clause complexity. Clause use, including subordination indices, has been utilized in assessing both monolingual Spanish- and bilingual Spanish-English-speaking children. These measurements have been reported to be sensitive to language growth in young Spanish-speaking children and a good measure of syntactic ability (e.g., Gutierrez-Clellen & Heinrichs-Ramos, 1993; Gutierrez-Clellen & Iglesias, 1992; Miller, Iglesias, & Rojas, 2006). Further, clause measurements, in combination with other measures, have been found to be a helpful measure when identifying language impairments in Spanish-speaking children, including monolingual Puerto Rican children (Gutierrez-Clellen & Hofstetter, 1994).

Clause use provides insights as to the complexity of Spanish-speaking children's output. However, the relationship between the number of clauses and the length of an utterance leads to difficulties in disambiguating these two constructs. Grammatical correctness, a measure also used to examine grammatical abilities in Spanish-speaking children, may be less influenced by utterance length and may provide additional information about utterance complexity independent of length. The measurement of grammatical accuracy has been used to describe the acquisition of grammatical structures in bilingual Spanish-dominant preschoolers who have no speech or language disorders (Anderson, 1996) and the grammatical morphology in a similar group of children with specific language impairments (Bedore & Leonard, 2001). Further, the frequency of grammatical errors in utterances has been found to have significant diagnostic potential in identifying disordered language in Spanish-speaking children (Restrepo, 1998) and has been used in morphosyntactic analysis of this population (Gutierrez-Clellen, Restrepo, Bedore, Peña, & Anderson, 2000).

In Spanish, clause count and clause complexity analyses, along with grammatical correctness, are language measures that are preferred to morphemes counts. Such counts have not been found to be developmentally sensitive markers in highly inflected languages and are fraught with difficulties when describing Spanish (Gutierrez-Clellen et al., 2000; Jackson-Maldonado & Conboy, 2007). Such problems include (a) a lack of consensus regarding procedural and morpheme count criteria, which leads to count inconsistencies (Anderson, 1995; Gutierrez-Clellen et al., 2000); (b) dialectal differences that affect morpheme counts (e.g., misidentification of the plural form due to postvocalic /s/ aspiration and/or deletion in Caribbean Spanish speakers, including Puerto Rican speakers; Bedore, 2004); and (c) frequent occurrence of ellipsis in Spanish reducing the accuracy of morpheme measures in sentence complexity assessment (Kayser & Restrepo, 1995).

Present Investigation

The previous discussion underscores the need to be cautious in assuming that the relationships between length, complexity, and stuttering observed in English will parallel those in Spanish. Further, we cannot reach conclusions about potential connections between these variables in monolingual Spanish speakers based on limited numbers of case studies examining bilingual Spanish-English speakers. Exploratory investigations are needed to determine whether longer and/or more syntactically complex utterances lead to fluency breakdown in young monolingual Spanish-speaking children. Further, these studies should include measurements of syntactic complexity that have been used with this population. Such exploration is the focus of the present investigation. If significant relationships are observed among length, complexity, and stuttering, follow-up study examining the specific structures, location, and error patterns will be warranted.

The purpose of the present study was to examine the length, clause number and complexity, and grammatical correctness of stuttered speech in monolingual Spanish-speaking children. Specifically, the following research questions were asked:

1. Do stuttered utterances tend to be longer than fluent utterances?

2. Are stuttered utterances more syntactically complex than fluent utterances as revealed by clause number and utterance complexity?

3. Are stuttered utterances more likely to be grammatically incorrect when compared with fluent utterances?

4. Do length, clause number and utterance complexity, and grammatical correctness predict stuttering in the spontaneous speech of Spanish-speaking children?

Method

Participants

Participants were 11 (seven male and four female) Spanish-speaking children who stuttered, ages 35 to 70 months ($M = 51.55$, $SD = 10.57$). All children were born and lived in Puerto Rico with Puerto Rican parents, and per parent and

teacher reports, all were monolingual Spanish-speaking. Participants were identified through area Head Start centers and private clinics. Each participant's speech sound production, voice, language, and hearing were screened by a bilingual Spanish-English-speaking researcher from Puerto Rico (the third author). Age-appropriate assessment tools were used to ensure normal speech (with the exception of stuttering) and language skills for Puerto Rican preschoolers. Following the accepted and preferred practice of licensed speech-language pathologists in Puerto Rico, the participants' speech sound production in a single-word picture-naming task and connected speech was screened using local norms for speech sound and phonological development (Anderson & Smith, 1987; Gonzalez, 1981; Navarro-Tomás, 1966; Stepanof, 1990; Vivaldi, 1990). Language skills were screened using the Spanish Editions of the Preschool Language Scale, Third Edition (Zimmerman, Steiner, & Pond, 1993) and Fourth Edition (Zimmerman, Steiner, & Pond, 2002), as well as the Screening Test of Spanish Grammar (Toronto, 1973). In addition to performing within normal limits on all screening tasks, no history or current concerns about speech (other than stuttering), language, and hearing were expressed by the children's parents or teachers. Further, no history of neurological, emotional, or intellectual problems was reported for any participant.

Stuttering was identified through parent report and confirmed by analyzing speech samples obtained the same day by the third author following the screening. At least one parent reported that the child's stuttering had been present for a minimum of 6 months, with a group reported average age of onset of 31.55 months (SD = 15.15) and time since onset average of 20.0 months (SD = 11.45). In addition, an independent Spanish-speaking, Puerto Rican speech-language pathologist who was certified by the American Speech-Language-Hearing Association (ASHA) confirmed the diagnosis of stuttering in each participant by examining the speech samples and completing the Stuttering Severity Instrument for Children and Adults, Third Edition (SSI–3; Riley, 1994). SSI–3 scores ranged from 10 (*mild*) to 37 (*very severe*) across participants. This assessment tool was used because there were no known standardized stuttering severity measures developed for Spanish speakers; reported scores should be interpreted with caution. Parents of four of the 11 children reported a family history of stuttering. Eight of the children had received no stuttering treatment, and three children had received treatment for 6 or fewer months.

Procedure

Data collection. Spontaneous speech samples were obtained the same day as the speech, language, and hearing screenings, following completion of the screenings, while interacting with the same Puerto Rican, bilingual researcher who conducted the screenings. The speech samples were collected in a quiet room either at the Head Start center or a private clinic. Throughout the interaction, the clinician and child were seated at a table and engaged in free-play activities with the age-appropriate materials (e.g., play food and cooking utensils, play phones, and Legos). In addition, a picture description task using stimuli from the SSI–3 (Riley, 1994) was included. The inclusion of these sampling tasks supported suggestions that at least two different elicitation techniques should be used in sampling language of Spanish-speaking children (Restrepo & Castilla, 2007). Interactions ranged from 10.37 to 20.67 min (M = 17.53, SD = 3.37) and were video-recorded, with the camera placed approximately 2 m in front of the child. Audio signals were enhanced through the use of an external microphone placed on the table in front of the participant.

Transcript preparation. Each speech sample, including both the clinician's and child's utterances, was orthographically transcribed verbatim by bilingual (Spanish-English) research assistants. Transcripts were reviewed and corrected by a Puerto Rican, Spanish-speaking researcher familiar with the dialectal variations of Spanish spoken in Puerto Rico. Once corrected, each transcript was transferred to the computerized language analysis system Systematic Analysis of Language Transcripts (Miller et al., 2006). Samples prior to utterance segmentation contained a total of 5,426 words, ranging from 300 to 651 words per child (M = 493.27, SD = 104.18).

Utterance segmentation was independently completed by two bilingual research assistants and compared to resolve any discrepancies. If after review and discussion a discrepancy remained, a third researcher's input was sought. This review system yielded a 100% agreement in utterance segmentation for all samples.

An utterance was defined as a series of words communicating one or more ideas, separated by a pause, and bound by a single intonational contour (Logan, 2003; Meyers & Freeman, 1985; Yaruss, 1999). To account for the highly inflected verb system in Spanish (Anderson & Centeno, 2007; Gutierrez-Clellen et al., 2000), a single word was considered an utterance if it was a verb plus bound morpheme indicating the subject (e.g., *Mira* [You look]) or subject plus object (e.g., *Caliéntalo* [You heat it up]), whether or not it was conjugated correctly. Multiclause productions were considered to be one utterance except when more than two independent clauses were joined by the conjunction *y* [and] (Lee, 1974; Miller et al., 2006).

When the clauses were independent, they were segmented after one *y* [and] (Miller et al., 2006). When a conjunction was part of a dependent clause, the utterance was not segmented (e.g., *Los Reyes me trajeron una pista que traía un carrito y un camión de bomberos* [The Three Kings brought me a racetrack that came with a little car and a fire truck]; Miller et al., 2006). When two (or more) independent clauses were joined without a grammatical link but were bound by a single intonational contour and no pause, it was considered one utterance (e.g., *Este es más grande yo creo* [This is bigger I think] or *Mira hay un barco* [Look there is a ship]; Lezama-Lima, Molinero, Lopez-de Tamargo, Vila Barnes, & Agullo, 2004). Titles, parentheticals, fragments, and elliptical responses were also coded as utterances and included in the analyses if they met the conditions described.

Any utterance containing the following was not considered an utterance and was excluded from the analyses: (a) unintelligible speech, (b) incomplete speech (e.g., when the child was interrupted or abandoned the utterance),

(c) speech that was not a spontaneous formulation (e.g., rhymes or imitated speech), (d) whispered speech, (e) singing, or (f) speech that involved assuming a character voice. A total of 1,044 utterances (49 to 124 utterances per child; $M = 94.9$, $SD = 21.0$) met these criteria and were included for further analyses. These utterances totaled 6,865 syllables (356 to 835 syllables per child; $M = 623.3$, $SD = 144.9$). Total word sample sizes and utterance numbers were comparable to and/or exceeded reported samples included in previous analyses examining English- and Spanish-speaking children (e.g., Au-Yeung et al., 2003; Yaruss, 1999).

Data Analysis

Utterance fluency. Each syllable in each utterance was examined to determine whether it was disfluent or fluent. If the syllable was disfluent, the nature of the disfluency was identified. Although limited information is available about disfluency types that characterize stuttering in Spanish-speaking children (e.g., Watson & Byrd, 2005; Watson et al., 2011), what has been reported corroborates reports of English-speaking children. For that reason, along with the opportunity for comparisons with earlier reports of English speakers, distinctions developed by Ambrose and Yairi (1999) describing stuttering in English-speaking children were used in this study.

Specifically, stuttered behaviors included sound, syllable, and/or monosyllabic word repetitions, prolongations, and/or blocks. In addition, disfluencies were identified that were not considered stuttering and included revisions, interjections, unfinished or broken words, and/or phrase or polysyllabic word repetitions (e.g., Ambrose & Yairi, 1999; Carlo & Watson, 2003; Watson & Anderson, 2001).

Utterances then were classified as (a) a stuttered utterance (containing one or more stuttered syllables), (b) an utterance with disfluencies other than stuttering, or (c) a fluent utterance (i.e., containing no disfluencies). If an utterance contained both stuttering as well as other types of disfluencies, it was categorized as a stuttered utterance. To control for the possible impact of normal nonfluency on utterance length and complexity, only utterances delineated as stuttered or fluent were included in further analysis. A total of 246 stuttered utterances ($M = 22.4$, $SD = 12.2$) and 717 fluent utterances ($M = 65.2$, $SD = 12.8$) were examined.

Utterance length. The length of stuttered and fluent utterances was determined by counting the number of syllables within each utterance. Spanish syllabification rules for combinations of strong (/α, ε, o/) and weak (/i, u/) vowels were used when identifying each syllable (Iguina & Dozier, 2008). One syllable was counted if the syllable contained (a) a strong vowel (e.g., *ho-la* [hello] = two syllables; *fe-o* [ugly] = two syllables), (b) a combination of two weak vowels (e.g., *fui* [I went] = one syllable; *cui-da-do* [careful] = three syllables), or (c) a strong and one or more weak vowels (e.g., *tie-rra* [dirt] = two syllables; *buey* [oxen] = one syllable; *puer-ta* [door] = two syllables). Two or more syllables were counted if there was (a) a combination of two or more strong vowels (e.g., *ma-es-tro* [teacher] = three syllables; *ca-no-a* [canoe] = three syllables), (b) a stressed weak vowel occurring before or after a strong

vowel (i.e., hiatus; e.g., *frí-o* [cold] = two syllables; *ba-úl* [trunk] = two syllables), or (c) a stressed weak vowel in combination with more than one strong vowel (e.g., *ve-í-a* [I used to see] = three syllables; *o-í-an* [they used to hear] = three syllables). Repetitions in sound, syllable, and/or monosyllabic word repetitions in stuttered utterances were not counted as syllables.

Clause number and utterance complexity. The total number of clauses (including independent and subordinate clauses) for each utterance was determined. In addition, each utterance was coded as (a) no independent or subordinate clauses (e.g., *Y un bebe chiquito* [And a little baby]), (b) simple (containing only one independent clause; e.g., *Esto es una camita* [This is a little bed]), or (c) complex (an independent clause with a subordinate clause and/or coordinated independent clause; e.g., *Estaba ahí donde la deje* [It was there where I left it]).

A clause was defined as a statement containing both a subject and a predicate (Miller et al., 2006). In addition, subjectless clauses with subject number and person marked in the verb were counted as clauses (e.g., *Ella tenía sueño, durmió todo el día* [She was sleepy, she slept all day]; Gutierrez-Clellen & Hofstetter, 1994). Commands where the subject *tú* [you] is implied were counted as clauses (e.g., *Mira* [You look]; *Come* [You eat]).

Subordinate clauses (i.e., clauses that modified, elaborated upon, and/or specified information from another clause within the same sentence) were identified based on their constituent structures. Subordinate clauses included (a) relative clauses that modified noun phrases (e.g., *La niña que me prestó el juguete está en mi escuela* [The girl who lent me her toy goes to my school]; *El fue quien se cayó* [He was the one who fell down]); (b) nominal clauses that functioned as a noun phrases in the main clause and can be in the subject or object position (e.g., *El que llegue tarde pierde* [The one that comes late loses]; *Nos preguntó si queremos comer más* [He asked us if we want to eat more]); and (c) adverbial clauses that provided information about time, purpose, reason, place, or manner (e.g., *No puedo terminar porque se cansó* [I can't finish because he got tired]; *Yo veo los muñequitos cuando llego a casa* [I watch cartoons when I get home]).

Clauses that contained grammatical errors (e.g., incorrect verb conjugations), omitted auxiliary verbs, or missing bound morphemes were included in the clause count (Miller et al., 2006). Semantics (i.e., the use of an incorrect content word) were not considered when counting clauses.

Grammatical correctness. In addition to clause measurements, the grammatical correctness of each utterance was examined. An utterance was coded as grammatically incorrect if it contained one or more morphological errors (e.g., a verb conjugation error such as *Y esta cosita vola* for *Y esta cosita vuela* [And this thing flies] or an article gender error such as *La agua estaba caliente* for *El agua estaba caliente* [The water was hot]) or syntactic errors (e.g., a word order error such as *Que la paloma después vino otra* for *Que después vino otra paloma* [And another dove came by afterwards]). An utterance was coded as correct if it contained no such errors.

To account for dialectal production patterns that might affect the judgments of morphosyntactic accuracy (e.g.,

omission of postvocalic /s/ and marking plurality only once in a noun phrase), assessment of grammatical correctness was completed by two Spanish-English-speaking speech-language pathologists from Puerto Rico (including one of the authors) who were knowledgeable about specific phonological variants of Puerto Rican Spanish speakers.

Measurement reliability. Inter- and intrarater reliability estimates were based on samples of two randomly selected participants, which yielded utterance numbers meeting or exceeding those included in reliability reports of comparable studies (e.g., Logan & LaSalle, 1999; Yaruss, 1999). Ratings of two bilingual research assistants and the third author yielded inter- and intrarater reliability Cohen's kappa coefficients of .965 and .982 for fluency categorization and Pearson correlation coefficients of .991 and .993 for syllable counts. Ratings of two ASHA-certified, bilingual Spanish-English speech-language pathology researchers from Puerto Rico (i.e., the third author and a professor whose research focuses on the syntactic development of Spanish-speaking children) yielded inter- and intrarater Cohen's kappa coefficients for clause counts of .949 and .920, respectively.

These same two Spanish-speaking researchers viewed all participant samples to confirm grammatical correctness and clause complexity decisions. Twenty utterances, or 1.9% of the total utterances, were excluded from further analysis of correctness and complexity due to lack of agreement between the two researchers. Thus, all utterances included in further study of clause complexity and grammatical correctness yielded 100% agreement for these variables.

Results

Logistic regression analysis was conducted on the utterances to determine whether utterance length, grammatical complexity (i.e., the inclusion of subordinate and or conjoined clauses), and grammatical accuracy predicted stuttering. Due to the clustered nature of the data (utterances nested within child), the analysis controlled for correlated data using the Proc Genmod procedure in SAS Version 9.0. The number of utterances included in the analysis ranged from 945 for grammatical accuracy to 957 for utterance length and grammatical complexity. The full model included 945 utterances. All of the models included data from the 11 children. To control for alpha inflation, the significance level was set at .01 (.05/5).

Utterance Length and Stuttering

The number of syllables in an utterance ranged from two to 34 across participants, with a mean of 9.31 (SD = 2.8) and 5.61 (SD = 0.97) for stuttered and fluent utterances, respectively. To determine whether stuttered utterances were longer than fluent utterances, a logistic regression model was completed using 957 utterances from the 11 children. To control for clustering of utterances at the participant level, the analysis was conducted using the Proc Genmod procedure in SAS Version 9.0. The results revealed that more syllables predicted greater odds of stuttering (odds ratio [OR] = 1.26, SE = 0.04, p < .001).

Clause Number and Utterance Complexity and Stuttering

To determine whether stuttering in the spontaneous speech of Spanish-speaking children tended to occur on syntactically complex utterances, total clause numbers and utterance complexity (i.e., containing no clauses, simple clauses, or subordinate and/or conjoined clauses) of stuttered and fluent utterances were examined. Total clause numbers (including independent and subordinate clauses) in each utterance ranged from zero to four across participants, with a mean of 1.05 (SD = 0.28) in stuttered utterances and 0.75 (SD = 0.09) in fluent utterances. The logistic regression results, controlling for clustering of utterances (N = 957) at the child level (N = 11) using Proc Genmod, revealed that more clauses predicted greater odds of stuttering (OR = 2.09, SE = 0.41, p < .001). As to utterance complexity, results revealed that across participants, stuttered utterances that featured subordinate and/or conjoined clauses ranged from 5.6% to 40% of all stuttered utterances. This was in contrast with the 1.5%–12.2% of fluent utterances featuring subordinate and/or conjoined clauses. Stuttered and fluent utterances with no clauses or only a simple clause ranged from 4.2% to 67.3% and 20.5% to 76.7%, respectively. The mean percentages of stuttered and fluent utterances that contained no clause, a single simple clause, and subordinate and/or conjoined clauses are presented in Table 1.

Two separate logistic regression models, controlling for clustering within child (N = 11), were conducted to examine the relationship between utterance complexity and stuttering for the 957 utterances. The results indicated that utterances containing a simple clause did not predict the odds of stuttering (OR = 0.71, SE = 0.17, p = .149), whereas utterances containing subordinate and/or conjoined clauses predicted greater odds of stuttering (OR = 4.62, SE = 1.30, p < .001).

Grammatical Correctness and Stuttering

Utterances containing grammatical errors ranged across participants from 4.5% to 31.8% of stuttered utterances and from 0% to 11.6% of fluent utterances. The average percentages of grammatically incorrect utterances was 18.3% (SD = 8.0%) when stuttered and 5.2% (SD = 3.5%) when fluent. To determine whether grammatically correct utterances were more likely to be fluent or stuttered, a logistic regression analysis was conducted using the Proc Genmod procedure to control for clustering at the child level. The

TABLE 1. Percentages (means and standard deviations) of stuttered and fluent utterances that contained no clause, a simple clause, or subordinate/conjoined clauses.

Utterance complexity	Stuttered utterances		Fluent utterances	
	M	SD	M	SD
No clause	22.7	15.8	30.3	8.1
Simple clause	53.7	13.1	64.2	9.4
Subordinate/conjoined clauses	23.7	12.5	5.4	3.3

analysis included 945 utterances from the 11 children. The results indicated that grammatically incorrect utterances predicted greater odds of stuttering ($OR = 3.64$, $SE = 0.81$, $p < .001$).

Stuttering, Utterance Length, Clause Number and Complexity, and Grammatical Correctness

To determine whether the utterance length, clause number and complexity, and grammatical accuracy provided unique information in the prediction of stuttered utterances, a multiple logistic regression was completed using 945 utterances from the 11 children. To control for clustering of utterances at the participant level, the analysis was conducted using the Proc Genmod procedure.

Prior to conducting the regression models, multicollinearity (i.e., the interrelatedness) among the predictor variables was examined. Tolerance and variance inflation factor tests indicated that the total number of clauses was highly correlated with the other predictors and therefore was not included in the final model. The predictor variables included in the analysis were (a) child age, (b) number of syllables, (c) grammatical incorrectness, (d) simple clauses, and (e) complex utterances (i.e., containing subordinate and/or conjoining clauses).[1]

While controlling for the effects of age, grammatical incorrectness, and clause complexity, the number of syllables predicted greater odds of stuttering ($OR = 1.218$, $p < .001$; see Table 2). In other words, more syllables predicted a greater likelihood of the utterance being stuttered. In addition, while controlling for age, syllable number, and clause complexity, grammatical incorrectness predicted greater odds of stuttering ($OR = 2.222$, $p = .027$). The odds ratios revealed that grammatical incorrectness was a stronger predictor of stuttering than utterance length (i.e., 2.22 times the odds of being a stuttered utterance vs. 1.218 times the odds). Based on the regression analysis, utterance complexity as indicated by the inclusion of subordinate and/or conjoined clauses did not predict odds of stuttering when controlling for the effects of age, length, and grammatical incorrectness.

Discussion

The purpose of the present study was to examine the influence of utterance length, syntactic complexity, and grammatical correctness on the stuttering of young, monolingual Spanish-speaking children. Given that this is the only published study, to the authors' knowledge, that has examined the influence of these specific linguistic variables on the speech fluency of monolingual Spanish-speaking children who stutter, comparisons were limited to studies that have been completed with monolingual English-speaking children who stuttered. Findings were consistent with many earlier reports of English-speaking children (e.g., Gaines et al., 1991; Logan & Conture, 1995, 1997; Bernstein Ratner

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[1]Following the recommended practice for categorical predictor variables, clause complexity was dummy coded for inclusion in the multiple regression model, such that the final model included single (single clause vs. other) and complex (complex clause vs. other).

TABLE 2. Summary of multiple logistic regression predicting stuttered utterances.

Predictor variables	Coeff.	SE	OR	p
Age	0.043	0.192	1.044	.823
Number of syllables	0.197	0.034	1.218	<.0001
Grammatical incorrectness	0.798	0.360	2.222	.027
Simple clause structure	0.037	0.332	1.037	.912
Complex utterances	0.428	0.306	1.534	.162

Note. Analysis controlled for clustering of utterances within participant. Coeff. = regression coefficient; *OR* = odds ratio.

& Sih, 1987; Weiss & Zebrowski, 1992; Yaruss, 1999; Zackheim & Conture, 2003) and revealed that stuttered utterances in Spanish contained more syllables and clauses per utterance than fluent utterances. In addition, the stuttered utterances were more likely to contain grammatical errors and to contain either a subordinate or a conjoined clause. However, when controlling for the interrelatedness of syllable number, clause number and clause complexity (i.e., the presence of a subordinate or conjoined clause), and grammatical correctness, only grammatical errors and utterance length were significant predictors of stuttering in the spontaneous speech of these Spanish-speaking children. Production of utterances that featured subordinate and/or conjoined clauses did not appear to contribute to the prediction of stuttering when controlling for utterance length.

Grammatical Correctness

The finding that grammatical incorrectness was the strongest predictor of stuttering in these Spanish speakers is consistent with reports which suggest that, in English-speaking children, morphology and syntactic complexity may be the more important contributor to stuttering when compared with utterance length (Bernstein Ratner & Sih, 1987; Brundage & Bernstein Ratner, 1989). In this study, grammatical correctness was used to determine whether those utterances that the children were not yet able to accurately produce provided insights as to the linguistic demands unique to a child. Grammatical errors may reflect the "leading edge" of a child's productions and contribute to fluency disruptions, a phenomena reported in English-speaking children who do not stutter (Rispoli & Hadley, 2001).

The increased likelihood for stuttering to occur during inaccurate productions supports the notion that, when attempting to produce a construction that seemingly exceeds a child's linguistic threshold, both grammatical inaccuracies and fluency breakdown may occur. The influence of grammatical correctness on stuttered speech needs further study to determine whether in fact the utterances that are grammatically incorrect are those utterances that are composed of morphological and syntactical structures that have not yet emerged in the child's linguistic repertoire. The use of an experimental exploration that controls for the developmental level of the productions required may allow further insight into whether the conceptual difficulty with that utterance is expected, emerging, or not expected given the child's age.

Yaruss (1999) explored the contribution of grammatical correctness to speech fluency in English speakers who stuttered and reported no significant relationship. Discrepancies between this earlier report and the outcomes of this current study may stem from differences between Spanish and English. The numerous inflections in Spanish may add to linguistic processing demands in these young children and affect fluency in a way that has not been observed in young English speakers. In any case, the limited sample sizes both in terms of the number of participants and the number of grammatically correct/incorrect utterances in both Yaruss's and this current investigation suggest the need for further study of the nature of grammatical accuracy in stuttering in English and Spanish.

In addition, how error patterns are related to normal language development expectations in stuttering and in normal disfluencies of both English-speaking and Spanish-speaking children needs to be examined. Moreover, since stuttering has been reported to be observed more often on or near function words in young English- and Spanish-speaking children (e.g., Au-Yeung et al., 2003; Howell, Au-Yeung, & Pilgrim, 1999; Howell, Au-Yeung, & Sackin, 1999; Howell et al., 2004), the relationship between grammatical correctness and grammatical class merits investigation. Although the findings of the present study did not yield a significant influence of age, our age range was limited to 35–70 months ($M = 51.55$, $SD = 10.57$). Future explorations of the role of age using a broader age range in larger samples are needed to consider possible change with time in Spanish-speaking children who stutter, as the influence of linguistic demands appears to shift with age in English-speaking children (e.g., Bauerly & Gottwald, 2009; Kadi-Hanifi & Howell, 1992; Wagovich, Hall, & Clifford, 2009).

Utterance Length

The relationship between stuttering and utterance length observed in this study is consistent with reports of English-speaking children who stutter (e.g., Logan & Conture, 1995; Yaruss, 1999; Zackheim & Conture, 2003). Utterances with increased numbers of syllables may lead to greater speech production difficulties, require increased motor planning, and possibly heighten processing demands. Thus, these preliminary data lend support to (at least) two key theories that have been developed to account for speech breakdowns in English speakers who stutter.

Internal/external imbalance. As has been theorized by Starkweather, Gottwald, and Halfond (1990) and demonstrated in English-speaking children who stuttered (e.g., Bauerly & Gottwald, 2009; Kleinow & Smith, 2000; Sawyer et al., 2008), an imbalance between linguistic and/or motor planning abilities and the related external or internal demands may significantly affect the fluency of the related output. Smith and colleagues (e.g., Kleinow & Smith, 2000; Smith & Kleinow, 2000; Smith, Sadagopan, Walsh, & Weber-Fox, 2010) have reported that persons who stutter demonstrate greater spatiotemporal variability in the motor movements they make during speech associated with long, linguistically complex utterances than they do when

producing short, relatively linguistically simple utterances, a finding that fits with the data from our present study and also the "demands versus capacity" frameworks that others have discussed.

The findings of the present study suggest that this theory may not be specific to English speakers. That is, the fluency of the Spanish-speaking children appeared to be significantly influenced by the grammatical complexity of the utterance produced. Although more data are needed to confirm these relationships, clinicians working with Spanish-speaking children who stutter should consider the possible connections between stuttering, length, and complexity as they facilitate speech production. Such therapies that systematically address increasing the length and complexity of children's utterances have been used in the treatment of stuttering in English-speaking children (e.g., Costello Ingham, 1999; Ryan, 1986).

Increased cognitive load. A second explanation for stuttering has been argued by Bosshardt (2006) and posits that persons who stutter are vulnerable to speech breakdowns in those speaking situations wherein there is an increased cognitive load. Data from the present study lend support for this theory, in that as the children attempted productions that required significantly higher levels of "conceptual work," their stuttering significantly increased. Given the number of grammatical decisions that a Spanish-speaking child must make to accurately and fluently produce his or her utterances, it is not surprising to see that typically developing monolingual Spanish-speaking children tend to produce more mazes, or what would be considered to be typical disfluencies, than English-speaking children (Bedore, Fiestas, Peña, & Nagy, 2006).

Applying that finding to children who stutter, one would expect that the number of grammatical units one needs to plan and/or the number of sequential motor movements one needs to execute would significantly affect the ability of the stuttering Spanish-speaking child to maintain fluent speech. That is not to say that monolingual Spanish-speaking children are at higher risk for developing stuttering or that, if they present with stuttering, they would more likely continue to stutter when compared with monolingual English-speaking children. Rather, if syntactic complexity plays a role in compromising speech fluency across all children who stutter, then the Spanish language provides fertile ground for future explorations of such potential connections.

Interaction Between Length and Complexity

To better understand the contribution of length to fluency breakdown in Spanish-speaking children, more study is needed examining the relationships between length and complexity. The present study supports the well-reported findings that both length and grammaticality affect fluency. However, the independence, or perhaps interdependence, of length and syntactic complexity and their relative or combined contribution to disfluent speech in Spanish-speaking children require additional exploration.

The interaction between length and complexity has challenged researchers in their study of stuttering in English-speaking children. Some reports note that, in English,

shorter utterances tend to be less complex than longer utterances (Zackheim & Conture, 2003). Others suggest that increased length is associated with certain syntactically more complex structures (e.g., inclusion of an embedded clause or noun phrase elaboration) but not with others (e.g., utterance function or presence of a negative marker; Yaruss, 1999).

Examination of length and complexity in Spanish-speaking children may provide an opportunity to further study the effects of these variables on fluency. For example, the increased number of inflectional features of pronoun case and noun and verb phrases coupled with the frequency of polysyllabic words may lead to utterances in Spanish that are equivalent in length but vary substantially in syntactic complexity (e.g., *Mira también se hace así y se levanta* [Look it is also done like this and it goes up]—14 syllables—vs. *Una de anaranjada y otra de verde* [An orange one and a green one], also 14 syllables). Both length and complexity appeared to have a role in disrupting fluency of these Spanish speakers. However, the number of syllables and number and types of clauses used could not be disambiguated in the same manner as grammatical errors and length. These findings suggest that clause use may not be the most sensitive metric when examining complexity in Spanish-speaking children in future studies.

Additional Considerations

Diversification of speech samples. Future studies of Spanish-speaking children should include methodologies leading to the systematic assessment of stuttering, length, and complexity in a variety of speech contexts. These investigations should include examining spontaneous speech as well as the use of more controlled experimental paradigms.

The impact of elicitation techniques on study outcomes, particularly when examining the stuttering–language connection in English, has been discussed by others (e.g., Bernstein Ratner, 1997; Logan & Conture, 1995). As noted in studies examining complexity in English, the spontaneous speech samples of the Spanish-speaking children in this study yielded "uneven opportunities" (Bernstein Ratner, 1997) to use various clause structures and possibly grammatically incorrect productions.

Further, just as study outcomes examining stuttering, utterance length, and syntactic complexity in English speakers seem to vary across elicitation tasks (e.g., sentence imitation vs. spontaneous speech), use of different sampling techniques with Spanish-speaking youngsters may yield disparate outcomes. For example, it has been reported that for Spanish-speaking, Mexican-American children, utterances are longer during picture description tasks when compared with interview or adult-led conversations (Restrepo & Castilla, 2007). Adult-led conversations, however, yield more utterances, and story-telling tasks result in the most grammatical errors in these children's samples. Researchers examining the relationship between stuttering and language are challenged to elicit adequate numbers of utterances (including utterances with different lengths), a full range of linguistic abilities (including opportunity for linguistic error), and representative stuttering behaviors.

Finally, studies such as the one completed by Kleinow and Smith (2000) wherein the relative impact of the motor planning can be explored while controlling for linguistic planning also would be extremely valuable with this population. Such explorations may assist in disambiguating the contribution (or lack thereof) of length and complexity to stuttered speech in Spanish-speaking children who stutter. All elicitation tasks, whether experimental or descriptive in nature, must reflect sensitivity for the cultural group being examined.

Monolingual versus bilingual exploration. As the number of children speaking more than one language continues to grow, the study of monolingual children within the United States is becoming increasingly more challenging. Recent Census data report an increased presence of Spanish-English bilingual children in the United States, with one in three U.S. residents projected to be Hispanic and nearly one in five projected to speak a language other than English at home by 2050 (U.S. Bureau of the Census, 2008). Given these trends, further research efforts should focus on the nature of stuttering in young bilingual children. In completing such work, we acknowledge that findings related to monolingual English and monolingual Spanish speakers who do and do not stutter cannot be presumed to be the same in bilingual Spanish-English-speaking children.

Clause type analyses. Additional study also is needed beneath the clause level, as specific types of clauses may enhance our understanding of syntactic factors that are more likely to compromise speech fluency. Such subfeature exploration could be completed employing similar analyses that have been used with Spanish-speaking children who present specific language impairment (Bedore & Leonard, 2001). Further, in light of reports of dialectal differences in syntactic complexity of young Spanish-speaking children (e.g., greater use of nominal clauses in narratives in Mexican-American children when compared with children from Puerto Rico, who use more adverbial clauses; Gutierrez-Clellen & Hofstetter, 1994), research should examine language-stuttering connections across Spanish dialects.

Linguistic judgment paradigms. Finally, it is critical that research be completed examining the potential contribution of linguistic complexity to stuttered utterances in a nonverbal manner. Such study would assist in determining if what is observed at the level of production is a reflection of presumed processing differences. Bajaj, Hodson, and Schommer-Aikins (2004) recently investigated the ability of English-speaking children who did and did not stutter to identify whether a sentence was grammatically incorrect or correct. Results indicated that the children who did not stutter were significantly better able to identify the syntactic accuracy of sentences than children who stuttered, suggesting that English-speaking children who stutter may present with reduced metalinguistic awareness skills. Such explorations of potential processing-based differences are warranted in monolingual Spanish-speaking children who do and do not stutter.

Conclusion

Taken together, results from the present study suggest that the underlying nature of stuttering across Spanish and

English may be similar. When Spanish-speaking children who stutter produce utterances that are long or not grammatically correct, there is a significant increase in disfluent speech production; a finding that has been demonstrated in English-speaking children who do and do not stutter. Although additional experimental and descriptive explorations are warranted, these cross-linguistic data lend support to the notion that there is not only universal existence of stuttering (Van Riper, 1982), but the factors that may contribute to stuttered speech also may be shared.

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