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Speech Rate and Perceived Language Ability in Bilingual School-Age Children

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Speech Rate and Perceived Language Ability in Bilingual School-Age Children

by

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Abstract

Speech Rate and Perceived Language Ability in Bilingual School-Age Children

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Clinicians and teachers may associate slow speech rate with low language ability during assessment in bilingual children. The goals of this thesis are a) to understand the relationship between speech rate and perceived language ability, and b) to understand the causes of within-utterance pauses and between-utterance pauses. English narratives for 116 Spanish–English bilingual 4–6-year-olds were analyzed for speech rate and pause time. Modifiability scores for each child were obtained. There was a low but significant correlation between speech rate and child responsivity. The distribution of between-utterance pauses was significantly different for children with high speech rates and children with low speech rates. An average of 56.5 wpm was found, confirming speech rates averages found in similar studies. These findings suggest that speech rate is one feature that SLPs attend to when considering the responsiveness of a child. Also, long between-utterance pauses can be used as an indicator of low speech rate.

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INTRODUCTION

As listeners, we often make judgments about the qualities of a speaker based on the fluency of their speech. As speech language pathologists (SLPs), our job is to make decisions about children's language abilities, and speech rate is one feature of children's speech that we are trained to attend to. For example, the Systematic Analysis of Language Transcripts (SALT) manual suggests using measures of speech rate to identify children who are 'hypoverbal', or exhibit a slow rate of speech. These children may be viewed as non-responsive or uncooperative by school personnel (Miller & Iglesias, 2010, p. 44). This may be particularly problematic for children acquiring English as a second language because they have a lower average rate of speech than their monolingual English-speaking peers (Garcia, 1991; Derwing & Munro, 1997; Prezas, 2008). Thus, SLPs may show unconscious biases against bilingual children who are 'hypoverbal' during assessment.

While there are a number of studies documenting cross-language differences in speech or diadochokinetic rates in children with speech disorders, there is little work examining the relationship between speech rate, language development, and language impairment. The goal of the current study is to understand the relationship between speech rate and perceived language ability, as well as to understand the causes of within-utterance pauses and between-utterance pauses in children's narratives.

CHAPTER 1: BACKGROUND

Despite the fact that the term "fluency" is regularly used in language pedagogy and language testing, there seems to be no consensus concerning what is understood by this concept (Kormos & Dénes, 2004). For the population of bilingual children, the definition of fluency used by Speech-Language Pathologists and ESL professionals is relevant. This definition of fluency refers to fluidity, or motoric coordination, of speech. It has nothing to do with grammar, vocabulary, or ability to reason, nor is it an overall measure of language ability.

This work focuses on fluency of speech. Variables that influence the perceived speech fluency of a speaker include accuracy, vocabulary, speech rate, mean length of utterance, phonation time ratio, stressed words per minute, and the mean length of pauses (Kormos & Dénes, 2004). Speech rate has been defined both by the rate at which sounds are articulated and the number of pauses made within and between utterances (Cucchiarini, Strik, & Boves, 2002). This is the working definition of speech rate for this research.

Though fluency is not an overall measure of language ability, many listeners and examiners equate fluency with language competence. Research investigating the variables which underlie listeners' perception of fluency has been very scarce. The aim of this research is to investigate how speech rate affects the listeners' perception of responsiveness and language ability.

RATE ASSESSMENT

The most common approach to speech rate assessment is to determine the number of syllables or words that a speaker expresses per unit of time (Logan, Byrd, Mazzocchi, & Gillam, 2011). Rate of speech varies as a function of an individual's situation. It has been shown that people speak at different rates when engaged in spontaneous conversation, telling stories, rehearsed addresses, rote material, persuasive speeches, or while reading aloud (Pindzola, Jenkins, & Lokken, 1989). Data on rate, then, are comparable only when collected under similar circumstances.

Rate of speech is measured in a variety of ways. Phonemes per second, syllables per second, and words per minute have all been used to measure speech rate. The methods of collecting these data also vary: stopwatches, spectrographic analysis, and a variety of computer programs have been used. Thus, in addition to the nature of the sample, data on rate are also only comparable when measured in the same way.

The analyses of these measurements can be further complicated by whether or not one takes other variables, such as pauses, into account. Whether or not to include pauses, both within and between utterances, in the calculation of speech rate can dramatically affect the results (Conture & Curlee, 2007). Therefore, the inclusion or exclusion of pauses is critical to speech rate measurement. Furthermore, pause frequency and distribution is important to this study in that it has been linked to perception of proficiency. Cucchiarini et al. (2002) found that, in addition to rate of speech, the number and duration of both filled and silent pauses strongly correlated with expert's ratings of perceived fluency of language during spontaneous speech.

The Systematic Analysis of Language Transcripts (SALT) program allows multiple types of data on rate to be accessed from language samples. Mean length of utterance (MLU), number of different root words, words per minute (wpm), and number and duration of pauses (both between and within utterances) can be assessed once the sample is transcribed and the file has been time stamped and the pause times entered.

SPEECH RATE IN TYPICALLY-DEVELOPING CHILDREN

Estimates of expected speech rates have been addressed in published literature for the target age range (kindergarten children, ages 5-7). Research reveals speech rate differences across ages and tasks. The rate of speech gradually increases as children progress from the preschool years through the upper elementary-school years (Logan et al. 2011).

Shipley and McAfee (2008) stipulate that the conversational speech rate for kindergarteners is around 125 wpm. In a 2007 study by Sturm and Seery, the average conversational speech rate for 7-year olds was 117.7 wpm (range of 91.1-152.3) and the average speech rate for narratives was 124.6 wpm (range of 86.7-153.5). Tilstra and McMaster (2007) elicited narratives from kindergarten children using a single picture prompt and found that their average rate of speech was 58.6 wpm. Oral reading tasks are not typically used with five to six year old children, as reading is not an expected skill in kindergarten.

Diadochokinetic speech rate, which is used to assess speech motor skills and articulation abilities, also increases as a child's motor system matures. When children in kindergarten are asked to repeat the phrase "pətəkə" for one minute, the normal

diadochokinetic rate is 1.14 to 1.45 repetitions per second (St. Louis & Ruscello, 2000). Rates continue to increase until about age 11, when they plateau.

SPEECH RATE ACROSS LANGUAGES

There are several studies of rate of speech in different languages. Speech rate is perceived to differ by language. However, results of cross-linguistic studies of rate often cannot be compared because there is no consistent methodology to elicit samples of speech rate. Limited research has been done on the topic of speech rate among Spanish-dominant English Language Learning (ELL) children.

As previously stated, typical, monolingual five- to six-year-old children speak at an average of 125 words per minute in English (Shipley & McAfee, 2008). However, for Spanish-dominant ELLs, the average rate of speech is between 58 and 70 words per minute in both languages (Miller, Heilmann, Nockerts, Iglesias, Fabiano, & Francis, 2006). In fact, one of the differences between native speech (L1) and speech in a person's second language (L2) may simply be speaking rate. Previous studies reported that the overall speech rate in L2 is slower than in native speech (Garcia, 1991; Derwing & Munro, 1997; Prezas, 2008). Prezas (2008) found that, in bilingual children, the average rate of speech in Spanish (L1) was 76 syllables per second, while the average rate in English (L2) was significantly lower, at 61 syllables per second. Garcia (1991) proposed that bilingual speakers take longer to process both of their languages, and that slower speech rate is the natural result.

In the productive narratives of ELLs, increased speaking rate has been found to correlate strongly with increasing age and proficiency in children's second language

(Miller et al., 2006; Prezas, 2008). This means that as children get older or have more experience speaking their L2, their speech rate increases. Prezas (2008) found that speech rate for bilingual Spanish-English children slightly increased from 60-70 to 60-80 syllables per second between the ages of 4 and 5 in both English and Spanish. This correlation of age and speech rate converges with observations of monolingual English-speaking children (Logan et al., 2011).

Furthermore, speaking rate is positively correlated to factors that demonstrate second language learners' proficiency in their second language, including perceptual judgments from native listeners (Miller et al., 2006). In other words, as speech rate increases and nears the rate of native speakers, the native speakers' perceptions of their language ability improve. Furthermore, Derwing, Rossiter, Munro, and Thomson (2004) found that comprehensibility of L2 increased with increased speech rate across picture, monologue, and conversation tasks.

SPEECH RATE IN COMMUNICATION IMPAIRED POPULATIONS

Atypically fast or slow speaking rates tend to reduce the intelligibility of children with speech and language disorders (Sturm & Seery, 2007). Speech rate has been most widely researched in the area of fluency disorders, such as stuttering and cluttering. Current research suggests that, when the instances of disfluent speech are removed, most children who stutter have a mean rate of speech that is appreciably faster than that of normally fluent children (Wolk, Edwards, & Conture, 1993). Based on this conclusion, a markedly high speech rate may be an indicator of stuttering. Furthermore, as reductions

in speech rate can lead to reductions in stuttering frequency (Craig & Cleary, 1982), reducing rate of speech is commonly used in the treatment of stuttering.

Speech rate has also been studied using diadochokinetic scores as a measure of speech intelligibility of children with motor speech disorders, such as dysarthria and childhood apraxia of speech (Lewis, Freebairn, Hansen, Iyengar, & Taylor, 2004). Both of these disorders result in a general slowed rate of speech.

With school-age children who have language learning disabilities, rate of speech is significantly lower for conversational and narrative tasks than typically developing children of the same age (Scott & Windsor, 2000). In addition, Flipsen (2002) found that children with speech delays of unknown origin may have slower than normal speech rates at preschool age, but that they catch up to their typically developing peers by at least 12 years of age.

A large variety of disorders are characterized by unintelligible speech as a result of either high or low speech rate. As these inappropriate speaking rates tend to reduce the intelligibility of children, speech rate data can be used in the assessment of people with communication disorders. In addition to intelligibility, there are data to suggest that speech rate differs between dialects and in turn impacts the general perception toward persons who speak those dialects.

PERCEPTION OF SPEECH RATE – DIALECTICAL DIFFERENCES

An inherent difference in the Northern and Southern dialects of American English is speech rate. O'Neill (2008) examined the difference between Northern and Southern dialects in speaking rates in read sentences and spontaneous speech, controlling for age

and gender. Results showed a significant difference in both rates of spontaneous speech and read sentences for the two dialects, with the Southern dialect being slower and the Northern dialect being faster for both.

These differences in rate affect perception of these populations. Preston (1998) writes that the common descriptions of Southern speech by Northerners include 'drawl', 'twang', and many references to slow rate of speech. This affects their perceptions of Southerners, who have the baseless stereotypes of being "rural, backward and uneducated" (Preston, 1998, p. 148). Though unsubstantiated and offensive, Southern dialect, with its slow rate of speech, has come to be associated with lower intelligence and language ability. This faulty assumption by the layperson may also be found in the SLP who is analyzing the language skills of a bilingual child.

DYNAMIC ASSESSMENT

Dynamic Assessment (DA) is the combination of assessment and teaching processes within a single assessment procedure (Peña et al., 2006). A test-teach-retest method is used to reveal a child's latent capacity for change. Dynamic assessment has been advocated as an alternative and/or supplemental approach to traditional standardized testing of children who are culturally and linguistically diverse, as DA has been shown to be more accurate in the assessment of these populations (Peña et al., 2006).

One aspect of the DA scoring procedure is the examiner's rating of the teaching effort and student responsiveness, also called a modifiability score. Decisions regarding what to target during the DA sessions are partially based on determinations regarding student modifiability (Miller, Gillam, & Peña, 2001). In Peña et al. (2006), modifiability

scores were shown to be the single most accurate indicator of language impairment (93% sensitivity and 82% specificity). Therefore, the modifiability score is a highly reliable measure of an examiner's judgment regarding a child's responsiveness.

Though the reliability of this examiner rating has shown to be high, it is unclear precisely what examiners focus on when rating student responsiveness. One possibility is that they attend to rate. Miller and Iglesias (2010) suggest that children who exhibit a slow rate of speech may be viewed as non-responsive by examiners and school personnel. This study seeks to clarify if rate of speech is a factor that SLPs consider when considering the responsiveness of a child.

It is possible that clinicians and teachers may be biased during assessment by decreased speech rate in children. Ensuring an unbiased initial assessment is crucial to accurate diagnosis. Furthermore, speech rate is a possible index of language productivity, and a better understanding of the role it plays in children's language development is needed. One aspect of speech rate that is neglected in childhood development research is the difference between within-utterance pauses and between-utterance pauses in speech samples. With these concerns in mind, the following questions were addressed. For bilingual school-age children, during narration tasks,

- Is there a relationship between speech rate and modifiability scores?
- Does the modifiability rating differ between children with high speech rates and low speech rates?
- Is the distribution/duration of within-utterance and between-utterance pauses the same for high and low rate children?

CHAPTER 2: PROCEDURES

PARTICIPANTS

Participants were part of a larger on-going study of risk for language impairment in children acquiring language in bilingual environments. Participants were drawn from two small school districts in central Texas that enroll large numbers of bilingual students. Children were invited to participate in the study if they scored in the at-risk range on the Bilingual Oral Language Screener (BESOS; Peña, Bedore et al., in preparation). To participate in the study children also had to use Spanish and English each at least 20% of the time. Amount of use of both languages was determined by a parent questionnaire and interview. In addition, all children had to be from Latino-American backgrounds as indicated by the parents.

Based on these criteria, 136 children were initially selected as participants for this study. At the time of testing, the ages of the participants ranged from 5;0 to 6;10 (mean = 5.68) years. 129 of the 136 children who were selected for this study were reported to be typically developing with respect to their language ability, and 8 were identified as having language impairment based on expert judgment.

Children's data were excluded from this analysis if there were missing audio files or if the combined narrative samples had fewer than 10 utterances. 14 children were eliminated from this study due to missing data, and 6 children with less than 10 utterances in their cumulative sample were removed, resulting in a final sample size of

116 participants. 110 of the 116 children were reported to have typically developing language abilities, and 6 were identified as having language impairment.

DATA COLLECTION

Trained bilingual graduate and doctoral students in the field of speech-language pathology tested children individually. Two wordless picture books were utilized to elicit two narratives in English from each participant. The stories were collected 4 to 6 weeks apart, according to procedures published in Dynamic Assessment and Intervention (Miller, Gillam, & Peña, 2001). The story *Two Friends* (Miller, 2000b) was administered as a pretest. Immediately following the pre-test narrative, a dynamic assessment MLE lesson about story elements and how to tell good stories was taught. The second narrative, *Bird and His Ring* (Miller, 2000a) was given as the post-test.

In keeping with Berman and Slobin (1994), participants were presented with a wordless picture book and were instructed to think of a story to go with the pictures. Children could look at the pictures as long as they wished. When children indicated that they were ready, they told their story while looking at the pictures. Prompts were used if the child paused or failed to respond (i.e., "And…?" "And what else?" "Is there more?"). In addition, general back-channeling cues (e.g., "yes," "uh-huh," "mm-hmm") were also used throughout the procedure. The examiner recorded the child's responses using an audio recorder.

TRANSCRIPTION OF SAMPLES AND CALCULATION OF RATE AND PAUSES

Audio samples of the two narratives were transcribed and analyzed using the SALT software (Miller & Chapman, 2002). Only the English pre-tests and post-tests for the dynamic assessment narratives (DAN) were utilized for this study.

Beginning and ending time stamps for the audio samples of these subjects were verified. "Time stamping" was accomplished by one clinician listening to each sample and entering into SALT the precise time that the child started their story on the audio sample, as well as the time that they finished their story. These time stamps were used to calculate the duration of the sample, which was then used in the calculations for rate of speech.

Pauses within and between utterances, both silent and filled, were measured in seconds for the 10 subjects with the highest rates of speech and the 10 subjects with the lowest rates of speech. Pauses between utterances of less than two seconds were deemed to be normal for a narrative task (Wood, 2004), so only pauses of 3 seconds or more were coded and analyzed. Statistics for number of pauses, total pause time, and average pause time were gathered for both within- and between-utterances pauses. By subtracting the total pause time from the duration of the sample and recalculating rate of speech, a Detailed Rate of Speech was obtained.

SCORING MODIFIABILITY

Modifiability involves the amount of teaching effort required by the instructor and the amount of change made by the learner in response to the interventions provided (Peña et al., 2006). Modifiability scales (adapted from Peña & Villarreal, 2000) were used to assess the child's overall responsiveness to mediation and the intensity of effort

required by the mediator to induce change. The modifiability scale was completed by trained bilingual doctoral students and research associates in the field of speech-language pathology. Twelve areas were scored using a 5-point Likert scale (see Appendix A). These 12 areas fell into four categories: cognitive arousal, cognitive elaboration, internal social-emotional state, and external social-emotional state. High child responsivity was scored as a 1, while low child responsivity was scored as a 5. Scores across the 12 areas were added together to yield a total modifiability score. The lowest possible score was 12 points indicating low teaching effort and high student responsiveness. The highest possible score was 60 points indicating high teaching effort and low student responsiveness.

ANALYSIS AND RELIABILITY

The SALT software database function of a Standard Measures analysis was utilized (Miller & Chapman, 2002). Statistics for total number of utterances, number of analysis set utterances, mean length of utterance (MLU) in words, number of different words (NDW), and rate of speech in words per minute (wpm) were calculated and tabulated.

SPSS Statistics software, a comprehensive set of data and predictive analytics tools, was used to analyze the data. Consulting with statistics support specialist ensured correct use of SPSS and interpretation of the results of the analysis.

Inter-rater reliability for the coding was evaluated for the measures derived from the two procedures. The time stamping (beginning and ending) was assessed for 10% of

the large sample (n = 12) and pause times were evaluated for 10% of the small sample (n = 2). To choose subjects, the examiner randomly selected samples with varying (high, medium, low) speech rates. A bilingual graduate student evaluated the samples as a second rater. Reliability was calculated using a single measure intraclass correlation. The inter-rater reliability of time stamping for the large sample was 0.972. The inter-rater reliability of the pause times for the small sample was 0.948.

CHAPTER 3: RESULTS

To review, the purpose of the present study was threefold: 1) to determine if a relationship exists between speech rate and modifiability scores, 2) to determine if total pause time affects this relationship, and 3) to determine if differences exist for the distribution and duration of within-utterance and between-utterance pauses for the different rate groups.

To address the first question, a Pearson Product Moment correlation coefficient was used to determine if a relationship existed between speech rate and modifiability. Results revealed a negative correlation between these two variables, $r = -.295$, which is small in absolute size, though highly significant, $p < .001$. This supports the hypothesis that low child responsivity (indicated by a high modifiability scores) is significantly associated with low rates of speech. Table 1 contains a summary of the mean, median, and range of speech rate scores.

Table 1

Mean, Median, and Range of Speech Rate (in wpm)

Measure	**Score**
Mean Speech Rate	56.49
Median Speech Rate	55.15
Range of Speech Rates	10.80 - 101.88

Note. $N = 116$.

To address the second research question and to further explore this relationship between speech rate and judged language ability, a detailed rate of speech was obtained from 20 children from the larger sample. These 20 children were classified into a high speech rate group (10 children) and low speech rate group (10 children). The results are presented in Table 2, which contains a summary of the average speech rates and modifiability ratings for the high speech rate and low speech rate groups.

Table 2

Mean Detailed Speech Rate for High Rate and Low Rate Groups

Group	***N***	**Mean Detailed Speech Rate**
High Speech Rate group	10	28.50 (6.8)
Low Speech Rate group	10	18.40 (8.1)

Note. Standard deviations in parentheses.

To determine if differences existed in the continuous modifiability rating between the high and low groups for speech rate, an ANOVA was used. An ANOVA is used to look at differences between scores on a continuous dependent variable between two or more categories or groups. In this ANOVA, the grouping variable was detailed speech rate and the dependent variable of interest was modifiability rating.

The Levene statistic was utilized to determine if the data met the assumption of homogeneity of variance of scores for the dependent measure between the two groups. The Levene statistic was .079, which was not significant, $p = 0.782$. Therefore, no correction for a violation of this assumption was needed.

Results of the one-way ANOVA showed that there was a significant relationship between detailed speech rate and modifiability score, $F(1,18) = 8.993$, $p = .008$. This result confirmed the hypothesis and replicated the result of the analysis for research question one, even after the between- and within-utterance pauses had been removed from speech rate calculations. Examining the mean modifiability scores for the low and high speech rate groups showed that the low speech rate group had higher modifiability scores. The mean modifiability for the low speech rate group was 28.50 ($SD = 6.80$), while the mean modifiability for the high speech rate group was 18.40 ($SD = 8.20$).

The final research question addressed the distribution and duration of within-utterance and between-utterance pauses for the high and low speech rate groups. Data from the same 20 high and low speech rate children were used to analyze within-utterance and between-utterance pauses. The distribution, particularly the variance of scores, and the duration of the between- and within-utterance pauses were analyzed by again using an ANOVA. Again, the homogeneity of variance test was utilized to determine if the data met the assumption of homogeneity of variance for the two outcomes of interest, between-utterance and within-utterance for the two speech rate groups. The Levene statistic for the between-utterance pauses was 10.293, which was significant, $p = 0.005$. This signifies that the variance for between-utterances pauses between low and high speech rate groups was statistically significant. The Levene

statistic for the within-utterance pauses was 6.376, which was significant, $p = 0.021$. This indicates that the variance for within-utterances pauses between low and high speech rate groups was statistically significant. Therefore, different variances were found for both within- and between-utterance pauses. Even though the Levene statistics were significant, ANOVA is robust to violations of this assumption. Table 3 presents a summary of the mean pause times for the high rate and low rate groups.

Table 3

Mean Pause Times for High Rate and Low Rate Groups

	Group	***N***	**Mean Pause Time**
Average Between-Utterance Pause Time	High Speech Rate group	10	0.00 (0.0)
	Low Speech Rate group	10	12.35 (4.1)
Average Within-Utterance Pause Time	High Speech Rate group	10	1.05 (1.2)
	Low Speech Rate group	10	2.25 (2.8)

Note. Standard deviations in parentheses.

Turning to the results of the ANOVA, it was found that durations also differed for between-utterance pauses ($F(1,18) = 89.99$, $p < .05$), but not for within-utterance pauses ($F(1,18) = 1.58$, $p = .22$). Welch's tests, which are robust to violations of the assumption of homogeneity of variance, produced the same results.

CHAPTER 4: DISCUSSION

The purpose of this study was to understand the relationship between speech rate and perceived language ability, as well as to understand the causes of within-utterance pauses and between-utterance pauses in children's narratives. The results of this study reveal some notable findings.

The results of the first analysis indicate that low child responsivity (indicated by a high modifiability score) is significantly correlated with low rates of speech, which indicates that speech rate is one feature of children's speech that SLPs may attend to when considering the responsiveness of a child. Because many speech and language disorders produce unintelligible speech due to either high or low speech rate, it is a factor that clinicians should attend to. However, a weak correlation was found, suggesting that clinicians attend to additional information when rating ability (beyond speech rate). The results of the second analysis indicate that when pauses are excluded from children's sample times, there exists a significant relationship between speech rate and modifiability score This signifies that pauses are not the sole cause for decreased speech rate and that speech rate, even when calculated a different way, is consistently correlated with modifiability score.

Given that the children with low rates of speech had lower modifiability ratings, and because we know that bilingual children have lower speech rates, it can be deduced that bilingual children may be placed at higher risk for language impairment due to rate alone.

Different variances were found for both within- and between-utterance pauses. Different durations existed for between-utterance pauses for the high and low rate children, but not within-utterance pauses. Additionally, between-utterance pauses were significantly longer than within-utterance pauses for children with low rates of speech. For children in the high speech rate group, no between-utterance pauses of greater than 2 seconds were observed, and though within-utterance pauses existed, they were shorter than those of the children in the low speech rate group. This suggests that within-utterance pauses do not significantly contribute to variations in speech rate in this population. On the other hand, the duration of pauses were significantly different between utterances, which suggests that between-utterance pauses are an important variable of rate of speech. Furthermore, high numbers and durations of between-utterance pauses can be used by professionals to correlate to low speech rate.

The length between-utterance pauses in these low-rate children may be caused by a variety of factors. The child may be having linguistic uncertainty due to a conflict between L1 and L2, and the extra time needed to resolve this conflict is observed as a pause. It is also possible that vocabulary and grammar rules are less automatic in English as in their L1, and a lack of familiarity is causing increased processing time, which is exhibited as pauses. Finally, it is possible that, due to lack of experience, that the child is unfamiliar with the narrative form and does not know what is expected in this story-telling task. Any or a combination of these causes may contribute to pausing.

The children with language impairment were compared to the typically-developing children in regards to speech rate. An analysis revealed that they did not

consistently fall in either the high rate or low rate group. Their rates of speech were not significantly different from those of the typically-developing children.

In this study, the average speech rate for typically-developing, bilingual kindergarteners during narrative tasks was 56.49 wpm (range from 10.8 - 101.88 wpm). As this relates to other literature, these results are consistent with the norms for rates of speech as published by Miller et al. (2006) and Tilstra and McMaster (2007). However, the mean score for this study fell slightly below the normal range of 58-70 wpm. This small discrepancy may be due to differences in task or rate analysis. This average score increased to 58 wpm when the detailed rate analysis was used instead of the basic analysis of rate.

There are several limitations of this study. SALT was not an ideal tool to use when examining speech rate or pauses, because all times had to be entered by hand. This required a high expenditure of time and allowed for more error. A spectrographic analysis may have yielded different results when calculating speech rate. Also, the use of audio samples did not allow the researcher to determine if pauses were intentional or simply due to distraction. Video footage could be used to increase accuracy of this measure. Finally, the level of bilingualism may result in discrepancies of rate of speech and pause times.

CHAPTER 5: CONCLUSIONS

As professionals who make decisions about children's language abilities, it is important for speech language pathologists to know which features of children's speech require attention. Equally, it is important to be aware of features of children's speech that may bias an SLP during assessment. On the basis of the present study, it is possible to conclude that rate of speech may fall into both of these categories. Consequently, it is important for clinicians to be aware of their potential perceptions of low responsivity or uncooperativeness in children with low rates of speech, and not allow these perceptions to unduly influence their decisions during assessment. This is especially important when assessing populations which lower speech rates than their peers, such as bilingual children.

One of the goals of this study was to understand the causes of within-utterance pauses and between-utterance pauses in children's narratives. The results of the current study reveal that the distribution of between-utterance pauses was significantly different for children with high speech rates and children with low speech rates. This indicates that long between-utterance pauses can be used as an indicator of low speech rate. Additionally, within-utterance pauses were not significantly different between low rate and high rate groups. Therefore, for the purpose of understanding language fluency, it may not be necessary to measure this time-consuming variable when considering the speech rate of an individual.

After comparing the rates of speech found in this study to the published body of literature, these children's speech rates are similar to those studied in the past. The

average rate of 57 wpm compared well with the average of 58 wpm from previous research (Miller, et al., 2006; Tilstra & McMaster, 2007). Therefore, this study validates the previous studies that English-Spanish bilingual kindergarteners have slower rates of speech than monolingual English-speaking children of the same age.

The conclusions of this study further our understanding of rate of speech in bilingual school-age children during narration tasks. Also, they affect the current clinical practice of SLPs in the diagnosis of this population. Future research could examine the differences in speech rate between English and Spanish narratives for bilingual children. Other rate assessment tools, such as spectrographic analysis, could be utilized to compare results on rate of speech to that of the current study. Other evaluation tools should be utilized to confirm whether the DA results were accurate or significantly compromised by the SLP being swayed by the speech rate. Finally, future research should extend the current study by asking SLPs to specify the factors that influence their decisions about modifiability.

APPENDIX

APPENDIX A. MODIFIABILITY SCALE

	1	*2*	*3*	*4*	*5*
Internal Social-Emotional (Affect)					
Anxiety	Calm, little to no soothing required	Fidgety but can be soothed	Uncomfortable, breaks needed to sooth	Distressed, much soothing required	Distraught, crying, cannot be soothed
Motivation	Enthusiastic, readily engages in tasks	Curious, shows interest	Ambivalent, unsure about tasks	Guarded, seems fearful of tasks	Avoidant, does not want to engage
Non-verbal persistence	Persistent, wants to continue despite difficulty	Indicates difficulty non-verbally, but continues	Tentative, appears unsure about continuing	Demonstrates non-verbal frustration, continues under protest	Non-verbal rejecting, cannot continue
Cognitive Arousal					
Task orientation	Completely understands tasks	Mostly understands tasks (75%)	Understands tasks some of the time (50%)	Often doesn't understand tasks (25%)	Doesn't understand tasks
Meta-cognition	Aware of all errors	Aware of most errors (75%)	Aware of some errors (50%)	Unaware of most errors (25%)	Unaware of any errors
Non-verbal self reward	Positive response to task regardless of difficulty	Positive response related to task difficulty	Demonstrates insecurity, positive and negative responses related to difficulty	Negative response related to task difficulty	Negative response regardless of task difficulty
Cognitive Elaboration					
Problem-solving	Systematic and efficient, used forethought, reflection	Organized, but somewhat inefficient (<25% off task)	Sketchy plan, trial and error	Disorganized, haphazard plan	No plan, unsystematic guessing
Verbal mediation	Elaborates plan clearly	Talks through problem	Talks occasionally	1-2 utterances only	No verbal mediation
Flexibility	Uses multiple strategies readily	Has preferred strategies but can change when necessary	Some evidence of more than one strategy and occasionally utilizes them	Recognizes limitations of strategy, but cannot see alternatives	Persists with one strategy, regardless of outcome
External Social-Emotional (Behavior)					
Responsiveness to feedback	Very positive, maintains enthusiasm	Positive but hesitant, requires some feedback	No response to feedback	Negative, disheartened, requires much feedback	Very negative, rejects feedback
Attention	Attentive and focused	Focused, but distractible at times	Distractible, but can be refocused, needs prompting	Distracted and difficult to refocus	Distracted and off task
Compliance	Cooperative	Insecure	Hesitant	Uncooperative	Refusing

REFERENCES

Berman, R. A., & Slobin, D. I. (1994). *Relating events in narrative: A crosslinguistic developmental study*. Hillsdale, NJ: Erlbaum.

Conture, E. G. & Curlee, R. F. (2007). *Stuttering and Related Disorders of Fluency (3rd ed.)*, New York, NY: Thieme Medical Publishers, Inc., p. 193.

Craig, A.R. & Cleary, P.J. (1982). Reduction of stuttering by young male stutterers using EMG feedback. *Applied Psychophysiology and Biofeedback*. 7(3): 241-255.

Cucchiarini, C., Strik, H., & Boves, L. (2002). Quantitative assessment of second language learners' fluency: Comparisons between read and spontaneous speech. *Journal of the Acoustical Society of America*, 111(6): 2862-2873.

Derwing, T. M. & Munro, M. J. (1997). Accent, Intelligibility, and Comprehensibility: Evidence from Four LI's. *Studies in Second Language Acquisition*, 19:1-16.

Derwing, T. M. Rossiter, M. J., Munro, M. J., Thomson, R. I. (2004). Second Language Fluency: Judgments on Different Tasks. *Language Learning*, 54(4): 655-679.

Flipsen, P. Jr. (2002). Longitudinal changes in articulation rate and phonetic phrase length in children with speech delay. *Journal of Speech, Language, and Hearing Research*, 45(1): 100-10.

Folha, G.A. & Felício, C. M. (2009). Relationship between age, percentage of consonants correct and speech rate. *Pro Fono*, 21(1): 39-45.

García, G. E. (1991). Factors Influencing the English Reading Test Performance of Spanish-Speaking Hispanic Children. *Reading Research Quarterly,* 26.4, 371-392.

Hasbrouck, J. E. & Tindal, G. (1992). Curriculum-based oral reading fluency norms for students in grades 2 through 5. *Teaching Exceptional Children*, 24(3), 41-44.

Jones, D. L. & Folkins, J. W. (1985). Effect of speaking rate on judgements of disordered speech in children with cleft palate. Cleft Palate Journal. 22, 246–252.

Koopmans-van Benium, F. J. & Van Donzel, M. E. (1996). Relationship between discourse structure and dynamic speech rate. In Bunnell, H. T. & Idsardi, W. (Eds.), *Proceedings of the International Conference on Spoken Language Processing* (p. 1724-1727). Institute of Phonetic Sciences, University of Amsterdam, the Netherlands.

Kormos, J. & Dénes, M. (2004). Exploring measures and perceptions of fluency in the speech of second language learners. *System*. 32(2): 145-164.

Levelt, W. (1989). *Speaking: From intention to articulation*. Cambridge, MA: MIT Press.

Lewis, B.A., Freebairn, L.A., Hansen, A.J., Iyengar, S.K., & Taylor, H.G. (2004). School-age follow-up of children with childhood apraxia of speech. *Language, Speech, and Hearing Services in Schools*. 35(2), 122-40.

Logan, K. J., Byrd, C. T., Mazzocchi, E. M., & Gillam, R. B. (2010). Speaking rate characteristics of elementary-school-aged children who do and do not stutter. *Journal of Communication Disorders*, 44(1):130-47.

Meyers, S. C. & Freeman, F. J. (1985). Mother and child speech rates as a variable in stuttering and disfluency. *Journal of Speech and Hearing Research*. 28(3), 436-444.

Miller, J. & Iglesias, A. (2010). Systematic Analysis of Language Transcripts (SALT), Research Version 2010 [Computer Software], SALT Software, LLC., 44-45.

Miller, J. F., Heilmann, J., Nockerts, A., Iglesias, A., Fabiano, L., & Francis, D. J. (2006). Oral Language and Reading in Bilingual Children. *Learning Disabilities Research & Practice*. 21(1): 30–43.

Miller, L. (2000a). *Bird and his ring*. Austin, TX: Neon Rose Productions.

Miller, L. (2000b). *Two friends*. Austin, TX: Neon Rose Productions.

Miller, L., Gillam, R. B., & Peña, E. D. (2001). *Dynamic assessment and intervention: Improving children's narrative skills*. Austin, TX: PRO-ED.

O'Neill, C. G. (2008). *Dialect Variation in Speaking Rate. (Senior Honors Thesis)*. Ohio State University, Ohio.

Peña, E. D., Gillam, R. B., Malek, M., Ruiz-Felter, R., Resendiz, M., Fiestas, C., & Sabel, T. (2006). Dynamic Assessment of School-Age Children's Narrative

Ability: An Experimental Investigation of Classification Accuracy. *Journal of Speech, Language, and Hearing Research*. 49(5): 1037–1057.

Peña, E., & Villarreal, B. (2000). *Modifiability observation form*. [Unpublished instrument].

Peña, E.D., Bedore, L.M., Gutie´rrez-Clellen, V.F., Iglesias, A., and Goldstein, B.A. In preparation. Bilingual English Spanish oral screener (BESOS).

Preston, D. R. (1998). They speak really bad English down south and in New York City. In Bauer, L., & Trudgill, P. (Ed.), *Language myths* (pp. 139-149). London: Penguin Books.

Prezas, R. F. (2008). *An investigation of bilingual preschool children's intelligibility in Spanish and English: comparing measures of performance with listener ratings in both languages (doctoral dissertation),* Wichita State University, Kansas.

Sawyer, J., Chon, H., & Ambrose, N. G. (2008). Influences of Rate, Length, and Complexity on Speech Disfluency in a Single Speech Sample in Preschool Children Who Stutter. *Journal of Fluency Disorders*. 33(3): 220–240.

Scott, C. M. & Windsor, J. (2000). General language performance measures in spoken and written narrative and expository discourse of school-age children with language learning disabilities. *Journal of Speech, Language, and Hearing Research*. 43: 324-339.

Shipley, K. G. & McAfee, J. G. (2008). *Assessment in Speech-Language Pathology: A Resource Manual*. Canada: Delmar Cengage Learning.

St. Louis, K.O. & Ruscello, D.M. (2000). *Oral Speech Mechanism Screening Examination – Third Edition*. Austin, TX: PRO-ED.

Sturm, J. A. & Seery, C. H. (2007). Speech and Articulatory Rates of School-Age Children in Conversation and Narrative Contexts. *Language, Speech, and Hearing Services in Schools*. 38. 47-59.

Tilstra, J. & McMaster, K. (2007). Productivity, fluency, and grammaticality measures from narratives: Potential indicators of language proficiency? *Communication Disorders Quarterly*, 29: 43-53.

Wolk, L., Edwards, M.L., & Conture, E.G. (1993). Coexistence of stuttering and disordered phonology in young children. *Journal of Speech and Hearing Research.* 36(5): 906-917.

Wood, D. (2004). An Empirical Investigation into the Facilitating Role of Automatized Lexical Phrases in Second Language Fluency Development. *Journal of Language and Learning*. 2(1). 1-24.

Vita

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This thesis was typed by Sarah Webb.