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Spontaneous and Imitated Productions in Spanish-Speaking Children With Phonological Disorders

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There is a general consensus among both researchers and speech-language pathologists that as much of a sample for phonological analysis as possible should be obtained from spontaneous productions (e.g., Schwartz, 1994). The extent to which, if any, imitated productions should be used as part of these analyses has been debated. Some researchers argue that including imitated productions may overestimate a child's phonological ability because imitated productions may be more adult-like than spontaneous ones (e.g., Shea & Blodgett, 1994). Others argue that including imitated productions assists the speech-language pathologist in diagnosing phonological disorders and providing subsequent intervention goals (e.g., Fokes, 1982).

The results of previous research studies exploring potential differences between phonological samples collected spontaneously and those collected imitatively have been equivocal. A number of studies have indicated that there is no significant difference in the results of articulation or phonological process assessments if spontaneous and imitated responses are compared (Andrews & Fey, 1986; Bankson & Bernthal, 1982; Bond & Korte, 1983; Dubois & Bernthal, 1978; Klein, 1984; Paden & Moss, 1985; Paynter & Bumpas, 1977). The results from these studies do not indicate that both methods always elicit the same response; however, the authors maintain that because there is no significant difference between sampling conditions, it is unnecessary to exclude imitated productions from phonological analyses. Other studies have shown that there is a significant difference between the two elicitation methods across a number of different dimensions (e.g., Carter & Buck, 1958). These researchers have found fewer overall phone errors on the imitation task (Johnson & Somers, 1978), higher test scores on a single-word test

ABSTRACT: **Purpose:** Research examining the relationship between spontaneous and imitated productions for phonological analysis has indicated that the inclusion of imitated productions may overestimate children's phonological abilities. Previous research in this area has included only English-speaking children. The purpose of this study was to determine what, if any, differences there were in the spontaneous and imitated productions of Spanish-speaking children with phonological disorders.
Method: Twelve Spanish-speaking children with phonological disorders (5 boys and 7 girls), ranging in age from 3;1 (years;months) to 4;9 (M = 3;11), participated in the study. Their spontaneous and imitated productions, based on a sample of single words, were analyzed to determine which elicitation task yielded the more adult-like production. Differences in consonant accuracy between the two tasks were analyzed, as was the shift in error type from spontaneous to imitated productions.
Results: The results indicated that spontaneous and imitated productions were identical in 62% of the cases, an imitated production was more adult-like than a spontaneous one in 25% of the cases, and a spontaneous form was more adult-like than an imitated one in approximately 13% of the cases. Consonant accuracy for some children also varied as a function of elicitation task.
Clinical Implications: For additional diagnostic and prognostic value, speech-language pathologists can incorporate imitated responses in their analyses.

KEY WORDS: Spanish, phonological disorders, spontaneous, imitation

when the items were elicited spontaneously (Kresheck & Socolofsky, 1972), higher percentage of consonants correct (PCC; Shriberg, Austin, Lewis, McSweeney, & Wilson, 1997) on an immediate imitation task than on either delayed imitation or spontaneous labeling tasks (Shea & Blodgett, 1994), and significantly more advanced forms in sentences that are delivered with a model than in sentences that are provided without a model (Weston, 1997). Based on the existing literature, one may conclude that if both types of elicitation tasks provide useful information, the important issues are determining the relationship between the two elicitation tasks, the possible reasons for differences between the two tasks, and the potential value of understanding discrepancies in the results of the two elicitation methods for assessment and intervention purposes.

The literature suggests that the two methods of elicitation do not consistently elicit the same level of response. For instance, Summers and Larson (1992) attempted to determine if there was a shift from (a) an error to a correct production, (b) a correct production to an error, or (c) one error to another error in spontaneous and then subsequent imitated productions. Results from 29 typically developing children between the ages of 5 and 7 revealed that there was a shift from an error in the spontaneous task (e.g., [pen] for /plen/ "plane") to a correct production in the imitation task (e.g., [plen]) 33% of the time. However, 19% of the time there was a shift from one error in the spontaneous task (e.g., [mu] for /mun/ "moon") to a different error in the imitation task (e.g., [mum] for /mun/). Surprisingly, there was a shift from a correct production in the spontaneous task (e.g., [pəlis] "police") to an error in the imitation task (e.g., [pis]) 48% of the time. This result may have occurred because the spontaneous form was elicited through a single-word production, but the imitated production was elicited through a sentence imitation task. Although the length and phonetic context of the sentences were held constant, the added length and complexity may have served to decrease articulatory accuracy between the spontaneous and imitated conditions.

Other studies have also demonstrated a number of similarities between the two conditions. In Kresheck and Socolofsky's (1972) study, 5 children achieved higher test scores on the spontaneous condition, and the two conditions yielded identical responses for 30 specific tokens. In addition, although many of the children's imitated productions were closer to the adult target, the productions still contained errors. Weston (1997) found that although significantly more advanced forms were seen in sentences that were delivered with a model than in sentences that were provided without a model, there was no significant difference in PCC between sampling conditions.

In part, children's phonological development may account for the discrepant results in the studies comparing spontaneous and imitated productions. Smith (1973) and Sutton (1980) found that when a new form was entering into the child's repertoire and was emerging, but had not yet been mastered, the child produced a target similarly, regardless of the elicitation method. As the target approached mastery, however, the child was more likely to produce a more adult-like production via imitation. If differences in spontaneous and imitated productions provide information on emerging and mastered forms, then one would expect discrepancies in the two sampling conditions across languages because of the inherent discontinuities in the phonological systems of the two languages and in their developmental trajectories.

Two languages with somewhat different phonotactic structures and developmental tracks are Spanish and English. The Spanish phonological system is different than that of English in terms of fewer consonant and vowel phonemes, relatively longer words, and less complex syllable structure (Cotton & Sharp, 1988; Vihman, 1996). Although Spanish and English "share" a number of phonemes (e.g., stops and the liquid /l/), there are also phonemes that exist in Spanish that do not occur in English (e.g., trill and flap), and vice versa (see Table 1; e.g., Goldstein, 1995; Hammond, 2002). Spanish and English also vary in terms of word length and syllable structure. Even though words in Spanish are longer (in terms of syllable number), on average, than those in English (Vihman, 1996), Spanish syllable structure is less complex than English syllable structure (Cotton & Sharp, 1988). In Spanish, for example, syllable onsets are limited to two members (e.g., *pl* in /plato/ "plate") as opposed to three members in English (e.g., *spl* in /splɪt/ "split").

In addition to the structural differences between the two languages, phonological development for Spanish-speaking children is different than that for English-speaking children. For example, in a group of monolingual English and monolingual Spanish 3-year-olds, Gildersleeve, Davis, and Stubbe (1996) found that the Spanish-speaking children exhibited a higher percentage of occurrence for cluster reduction than did the English-speaking children. Compared to the Spanish-speaking children, however, the English-speaking children exhibited a higher percentage of occurrence for final consonant deletion. It may be the case that because the phonotactic structure and developmental process are different for Spanish and English speakers, Spanish-speaking children respond differently than do English-speaking children in the two sampling conditions. On the basis of the findings of Smith (1973) and Sutton (1980), Spanish-speaking 3-year-olds may not produce clusters differentially across the two elicitation tasks because their accuracy is relatively low (i.e., they have not been mastered) in comparison to English-speaking children. On the other hand, the Spanish-speaking children may exhibit a difference in the two tasks for final consonants because use of word final sounds is relatively high at that age (i.e., they are emerging but not mastered).

One of the other reasons for obtaining imitated productions is to examine error patterns in children's productions. Examining errors is a useful analysis in helping to differentially diagnose children with phonological disorders (Smit, 1993), and they seem to be different depending on the ambient language being acquired. Goldstein, Belen, and Ballard (2002) showed that Spanish-speaking preschoolers exhibited different error patterns than did English-speaking children. For example, the most common error pattern for the Spanish-speaking children was the substitution of the alveolar flap for the voiced interdental fricative. For

Table 1. Shared and unshared phonemes in Spanish and English.

	Bilabial	*Labio-dental*	*Interdental*	*Alveolar*	*Palatal*	*Alveo-palatal*	*Velar*	*Glottal*
Shared phonemes								
Stops	/p/, /b/			/t/, /d/			/k/, /g/	
Nasals	/m/			/n/				
Fricatives		/f/		/s/				
Affricates						/tʃ/		
Liquids				/l/				
Glides	/w/				/j/			
Unshared phonemes: English								
Nasals							/ŋ/	
Fricatives		/v/	/θ/,/ð/	/z/	/ʃ/, /ʒ/			/h/
Affricates						/dʒ/		
Liquids				/ɹ/				
Unshared phonemes: Spanish								
Nasals					/ɲ/			
Fricatives							/x/	
Flap				/ɾ/				
Trill				/r/				

English-speaking children, however, the most common error pattern was the substitution of [d] for /ð/ (Bassi, 1983; Smit, 1993). In fact, the flap was never used as a substitute for the interdental fricative by any of the English-speaking children in either study. Despite methodological differences between the studies, these results indicate that, depending on the ambient language, differences in the structure of Spanish and English, the acquisition process for the two languages, and the use of error patterns may yield distinctions across elicitation procedures.

Obtaining imitated productions may also be of value in the clinical management process. The use of imitation as a diagnostic tool is employed routinely in the assessment of a child's stimulability (i.e., the ability to produce a sound following a model). Stimulability has been shown to correlate with phonological acquisition for typically developing children and for children with phonological disorders (Miccio, Elbert, & Forrest, 1999), to predict speech sound acquisition with and without intervention (e.g., Carter & Buck, 1958), to aid in planning intervention (e.g., Miccio & Elbert, 1996; Powell & Miccio, 1996), and to account for generalization patterns (e.g., Rvachew, Rafaat, & Martin, 1999) and phonological change during intervention (e.g., Glaspey & Stoel-Gammon, 2002).

The information from the studies presented above should be augmented for a number of reasons. First, the majority of prior studies examined typically developing children. Examining children with phonological disorders allows for exploring possible differences in acquisition and development between typically developing children and children with phonological disorders. Second, earlier studies did not always detail the differences between spontaneous and imitated productions by determining the ways in which consonant accuracy shifted between types of productions, especially for children with phonological disorders. This type of analysis may allow speech-language pathologists to use discrepancies in productions across elicitation tasks prognostically and may aid choice of treatment targets. Finally, differences in elicitation method may yield alternative results depending on the ambient language being acquired by the children. Previous studies, which have examined only English-speaking children, do not address the universality of this process. The purpose of this study was to explore the relationship between spontaneous and imitated productions in Spanish-speaking children with phonological disorders.

METHOD

Participants

A total of 25 Spanish-speaking children with phonological disorders were asked to identify a picture (spontaneous production), and, if the production was in error, the child was asked to imitate a model (imitated production). The number of participants was first reduced in order to control for the disparity in the number of words with both a spontaneous and an imitated production. In the original group of 25 children, there were seven words, on average, containing a production in both conditions. All children who had less than seven words with productions in both conditions were eliminated from the pool of children. Thus, controlling for number of words reduced the pool from 25 to 17. Second, to control for severity of disorder, the average PCC[1] for the remaining 17 children was computed and found to be 75.5%, a percentage that falls in the mild–moderate range (Shriberg & Kwiatkowski, 1982). Thus, any

[1]Although PCC was designed for and validated on productions from connected speech samples (Shriberg & Kwiatkowski, 1982), it has been applied to single words (e.g., Bernhardt & Stemberger, 2002) and is reported to correlate significantly with single-word productions (Garrett & Moran, 1992; Hodson, in press, as cited in Hodson, Scherz, & Strattman, 2002).

child whose PCC did not fall in the mild–moderate range (PCC 65%–85%) was eliminated from the sample. Controlling for severity in this way reduced the sample to the final 12 children (7 girls and 5 boys).

The 12 participating children ranged in age from 3;1 (years;months) to 4;9 (M = 3;11; see Table 2). Each child passed a pure tone audiometric and impedance screening bilaterally. No participant had received speech and/or language treatment before his or her participation in this study. The parents of all participants, all of whom resided in the same geographic area and linguistic community, reported that Puerto Rican Spanish was the children's first language and was the language and dialect that was spoken in the home until they went to school. Moreover, the children's teachers (who also spoke Puerto Rican Spanish) also confirmed that Spanish was the language that was spoken by the children. At school, the teachers used both Spanish and English with the children. Thus, in terms of age of acquisition, all of the children in this study would be considered at the beginning stages of sequential bilingualism (i.e., acquiring the second language [L2] after the first language), and in terms of functional ability, the children would be described as incipient bilinguals (i.e., "beginning to acquire L2") (Valdés & Figueroa, 1994, p. 11). In an attempt to minimize the effect of the children's emerging English language skills, all participants were assessed in Spanish within their first 4 months in school.

Following Goldstein and Iglesias (1996b), all of the children were identified as having a phonological disorder by either (a) teacher referral for and parent confirmation of a phonological disorder or (b) score on a phonological assessment tool (described below). It was necessary to use either one of the two methods of identification because teachers and/or parents may easily identify children with a phonological disorder who were highly unintelligible but may overlook and thus not refer children who were less severely unintelligible.

Children were defined as having phonological disorders if they (a) used any of the nine targeted phonological processes greater than 15% of the time or (b) produced more than nine consonant errors if they were 3 years old and five errors if they were 4 years old. These cutoff scores were derived from normative data collected from typically developing Spanish-speaking children (Goldstein, 1988; Goldstein & Iglesias, 1993). Although 75% of the children were initially identified by teacher and/or parent report, and 25% were identified by the examiner (the first author), all children were later confirmed to exhibit phonological disorders by the examiner and the child's teacher and parent.

Table 2. Age and gender of participants.

Participant	*Age (months)*	*Gender*
1	44	F
2	41	M
3	39	F
4	37	F
5	46	F
6	54	F
7	49	M
8	49	M
9	48	M
10	57	M
11	52	F
12	48	F
Average	47	

The children's phonological skills are represented in Tables 3 and 4 (these figures represent values for all of the items on the assessment). Table 3 lists PCC overall and by manner class. Across all children, PCC averaged 74.1%, with a range from 67.0% to 84.7%, indicating a mild–moderate phonological disorder for all participants (Shriberg & Kwiatkowski, 1982). The table also lists consonant accuracy by sound class. Not surprisingly, these children showed lower accuracy for sound classes attested to be later developing in Spanish-speaking children—trill, affricate, flap, /l/, and fricatives—and higher accuracy for sound classes found to be early developing in Spanish-speaking children—stops, nasals, and glides (Acevedo, 1993). Percentages of occurrence for phonological processes can be found in Table 4. These phonological processes are represented because they occur frequently in the speech of typically developing children and children with phonological disorders (e.g., Goldstein & Iglesias, 1996a, 1996b; Shriberg & Kwiatkowski, 1980). As might be expected for a group of Spanish-speaking children with phonological disorders, these children showed high percentages of cluster reduction, unstressed syllable deletion, stopping, final consonant deletion, and initial consonant deletion. These rates are much higher than those exhibited by a group of typically developing children of a similar age range from the same dialect community (Goldstein & Iglesias, 1996a). For example, the percentage of occurrence for cluster reduction was 50.0% for the children in this study as compared to 5.6% for typically developing 4-year-olds, and the percentage of occurrence for stopping was 14.09% for the children in this study as compared to 0.6% for typically developing 4-year-olds (Goldstein & Iglesias, 1996a).

Procedures

The Assessment of Phonological Disabilities–Spanish (APD; Iglesias & Goldstein, 1993; see Appendix), a single-word assessment designed to describe phonological patterns in Spanish-speaking children, was used to assess the participants. The APD is described in detail in Goldstein and Iglesias (1996a, 1996b). The APD was administered in one 20- to 30-min session. The children named each stimulus item spontaneously. The examiner prompted a response by asking, "Qué es esto?" (What is this?). If the children spontaneously produced a target with an error, the examiner then used delayed imitation to elicit from the child the name of the item (e.g., "Esto es un/a… [this is a …]; "Qué es esto?" [What is this?]. Only items for which there was a spontaneous and an imitated production were included for analysis.

Table 3. Percentage of consonants correct overall and percentage of consonants correct by manner of articulation.

Participant	*Overall*	*Stops*	*Nasals*	*Fricatives*	*Affricates*	*Glides*	*Liquid /l/*	*Flap*	*Trill*
1	77.32	84.38	93.33	81.82	66.67	100.00	54.55	40.00	25.00
2	78.79	90.32	86.67	64.00	33.33	100.00	80.00	83.33	50.00
3	68.89	87.50	100.00	65.00	0.00	75.00	44.44	42.86	0.00
4	70.21	87.10	85.71	52.38	66.67	100.00	60.00	50.00	0.00
5	84.69	96.88	93.33	75.00	66.67	100.00	66.67	57.14	100.00
6	72.34	71.88	92.86	75.00	33.33	100.00	60.00	83.33	0.00
7	79.57	83.87	93.33	75.00	100.00	100.00	50.00	50.00	100.00
8	69.39	96.77	73.33	62.50	0.00	100.00	50.00	0.00	25.00
9	70.83	80.65	92.86	58.33	100.00	100.00	40.00	33.33	66.67
10	75.79	93.55	93.33	80.95	0.00	60.00	55.56	28.57	50.00
11	73.40	77.42	86.67	90.00	33.33	100.00	40.00	50.00	0.00
12	67.02	93.55	92.86	42.86	33.33	100.00	33.33	42.86	0.00
Average	74.08	86.97	90.29	68.32	44.44	94.83	52.94	47.95	31.82

Table 4. Percentage of occurrence of phonological processes for all participants.

Participant	*USD*	*CR*	*ICD*	*FCD*	*FT*	*BK*	*ST*	*Assim*
1	31.82	54.55	10.00	12.50	1.04	6.25	8.00	6.38
2	9.09	20.00	0.00	0.00	5.21	4.17	28.57	7.84
3	18.18	18.18	27.59	33.33	2.20	2.20	17.39	2.33
4	34.78	60.00	6.67	16.67	3.26	5.43	29.17	4.55
5	25.00	50.00	0.00	0.00	2.11	0.00	3.70	0.00
6	31.82	54.55	6.67	20.00	4.35	4.35	8.70	8.88
7	27.27	60.00	6.67	0.00	2.20	1.10	4.35	2.33
8	43.48	80.00	3.33	10.00	2.08	3.13	14.81	6.12
9	27.27	50.00	6.67	12.50	2.13	6.38	11.11	8.51
10	34.78	60.00	0.00	14.29	6.25	0.00	8.33	8.51
11	26.09	55.56	36.67	16.67	2.15	1.08	0.00	2.27
12	27.27	40.00	10.00	33.33	6.45	5.38	33.33	4.44
Average	28.15	50.00	9.47	12.50	3.30	3.30	14.09	5.24

Note. USD = unstressed syllable deletion; CR = cluster reduction; ICD = initial consonant deletion; FCD = final consonant deletion; FT = fronting; BK = backing; ST = stopping; Assim = assimilation.

Of the possible 432 total words (36 words per child × 12 children) across all participants, 121 words (28%) contained both a spontaneous and a subsequent imitated production (see Table 5). Thus, 242 total words (121 words elicited spontaneously containing an error and those same 121 words elicited via delayed imitation) were available for analysis (M = 10.8; range = 7–15).

All productions were transcribed and analyzed using the Logical International Phonetic Programs (LIPP; Oller & Delgado, 2000). Three analyses were completed on the words containing both a spontaneous and an imitated production. The first analysis provided evidence for which elicitation task elicited the more adult-like form by determining when (a) both forms yielded the identical response, (b) the spontaneous form was more adult-like than the imitated form, or (c) the imitated form was more adult-like than the spontaneous form. After Sutton (1980), the following decisions were made to determine the more adult-like form:

- The form showing the fewest number of omissions was assumed to be the more advanced form. For example:

  (a) /plato/ (“plate”) → [pato]

  (b) /plato/ → [ato]

  Example (a) would be considered the more adult-like form.

- If a child’s errors resulted in different substitution errors, a feature analysis determining voicing, place of articulation, and manner of articulation was carried out to determine the more adult-like form. For example:

  (a) /kasa/ (“house”) → [kata]

  (b) /kasa/ → [kapa]

  Example (a) would be considered the more adult-like form because /s/ and /t/ differ across only one dimension (manner of articulation), whereas /s/ and /p/ differ across two dimensions (both place and manner of articulation).

- If a child’s errors resulted in both an omission and a substitution error, a phonotactic analysis was completed for the omission error and a feature analysis

Table 5. Number of words with both a spontaneous and an imitated production and number and percentage of words with more adult-like production.

		Identical response		*Spontaneous more adult-like*		*Imitated more adult-like*	
Participant	*# of words*	#	%	#	%	#	%
1	7	5	71.42	1	14.78	1	14.78
2	7	7	100.00	0	0.00	0	0.00
3	7	3	42.85	0	0.00	4	57.14
4	8	4	50.00	2	25.00	2	25.00
5	9	6	66.66	2	22.22	1	11.11
6	9	9	100.00	0	0.00	0	0.00
7	10	3	30.00	3	30.00	4	40.00
8	12	8	66.66	1	8.33	3	25.00
9	12	3	25.00	0	0.00	9	75.00
10	12	8	66.66	2	16.66	2	16.66
11	13	8	61.54	3	23.08	2	15.38
12	15	10	66.66	2	13.33	3	20.00
Average	10.08	6.16	62.28	1.33	12.78	2.58	25.00
SD			22.90		11.00		19.00

was carried out for the substitution error, determining changes in voicing, place of articulation, and/or manner of articulation. For example:

(a) /dos/ (“two”) → [ot]

(b) /dos/ → [doθ]

Example (b) would be considered the more adult-like form because consonant vowel consonant (CVC) syllable structure is maintained and initial consonant deletion is a rare process among typically developing children.

Second, for productions in the spontaneous task that contained an error, an analysis was completed to determine whether the error in the spontaneous task yielded the identical error, a different error, or a correct production in the imitation task. Finally, differences in consonant accuracy between the two elicitation tasks were calculated in order to determine if, as some researchers have suggested, imitated productions were more accurate than spontaneous ones. PCC was calculated for both spontaneous and imitated productions and by manner of articulation classes. Based on the structure of Spanish (Hammond, 2002), the following manner of articulation classes were examined: stops, nasals, fricatives, affricates, glides, liquids, flap, and trill (see Table 1 for the specific sounds in each class). Consonant accuracy was also computed for the three spirants [β], [ð], and [ɣ] separately from the other fricatives because they are allophones of the stop consonants /b/, /d/, and /g/, respectively.

It should be noted that all analyses were completed taking the children’s Puerto Rican Spanish dialect into account (after Goldstein & Iglesias, 1996a, 1996b). That is, sound changes that are recognized as being Puerto Rican dialect features were not counted as errors. For example, in this dialect of Spanish, /s/ is typically deleted in word-final position (i.e., /dos/ “two” is produced as [do]). Thus, when the children’s errors were analyzed, the elimination of /s/ was not scored as an error. In addition, the children’s productions were examined for possible influences of English on their Spanish phonology. There was one example in which the English prevocalic [ɹ] substituted for the Spanish trill in one word by 1 child (e.g., /karo/ “car” → [kaɹo]. That sound change was not scored as an error.

Reliability

In order to establish intra- and interjudge reliability for point-to-point transcription (after Shriberg & Lof, 1991), a bilingual (English–Spanish) research assistant used a broad transcription of the International Phonetic Alphabet to transcribe the tapes from the participants in order to compare the results with those of the examiner. Intrajudge reliability was determined by the examiner rescoring the productions of all children after a 4-week period. Interjudge reliability was found to be 90%; intrajudge reliability was found to be 91%.

Interjudge reliability was also completed between the first and second authors on determination of the more adult-like form. Of the 121 total words in the sample, there was agreement on 118 (97.5%) words as being the more adult-like production. Agreement on the other three words was reached by consensus and was included for analysis.

RESULTS

To determine which elicitation task yielded the more adult-like production, the percentage of words in which (a) both tasks yielded identical responses, (b) the spontaneous task elicited the more adult-like response, and (c) the imitated task resulted in the more adult-like response was calculated (see Table 5). The results indicated that both tasks resulted in identical responses for 62.2% of the words; for example, /dedo/ (“finger”) was produced as [devo] in both the spontaneous and the imitation conditions.

The spontaneous task elicited the more adult-like response in 12.8% of the words; for example, /elefante/ ("elephant") was produced as [efefante] spontaneously but as [fante] imitatively. The imitation task resulted in the more adult-like response in 25% of the words; for example, /tʃina/ ("orange") was produced as [ʃina] imitatively but as [ina] spontaneously.

Individual subject data (see Table 5) also presented a view of how the relationship between the productions from the two elicitation tasks varied across children. Eight of the 12 children exhibited a majority of words that were identical in both the spontaneous and the imitated tasks. Only two of the 12 children exhibited a majority of words that were more adult-like in the imitation task. No child exhibited a majority of words that were more adult-like in the spontaneous task. The difference in performance across children begins to suggest that the differences might be indicative of child-specific rather than task-specific factors influencing the relationship.

Although an imitated production was more adult-like than a spontaneous production for 25% of the words, this did not mean that the imitated production was necessarily an accurate one in comparison to the adult target. Thus, the next analysis focused on whether an error in the spontaneous task yielded the identical error, a different error, or a correct production in the imitation task. Overall, the results indicated that for 57.0% of the words, the same error was exhibited in the children's spontaneous and imitated productions. For example, /flor/ ("flower") was produced as [flo] in both the spontaneous task and the imitation task. An error in the spontaneous form resulted in a different error in the imitated form for 36.4% of the words. For example, /flor/ ("flower") was produced as [flo] in the spontaneous task and as [for] in the imitation task. Finally, an error in the spontaneous form resulted in a correct production in the imitated task for 6.6% of the words. For example, /flor/ ("flower") was produced as [flo] in the spontaneous task and as [flor] in the imitation task.

To determine possible differences in consonant accuracy between the spontaneous and imitated tasks on the words in which there was both a spontaneous and an imitated production, a paired *t* test with effect size for PCC for the productions in each elicitation task was calculated (see Table 6 for the raw data). Results indicated no significant difference, $t(11) = 1.58$, $p = .192$, $d = .75$, in PCC between the two elicitation tasks with a large effect size (Cohen, 1988). PCC for imitated productions was higher ($M = 56.89\%$) than that for spontaneous productions ($M = 51.83\%$). Six of 12 children exhibited a higher PCC on imitated forms than on spontaneous forms, 4 children demonstrated a higher PCC on spontaneous forms than on imitated ones, and 2 children showed equal PCC on both forms.

A Pearson correlation, using R^2 for effect size, was computed to determine the relationship between overall PCC, imitation PCC, and spontaneous PCC. There was no significant correlation between overall PCC and spontaneous PCC, $r = .47$, $p = .12$, and the effect size was small, $R^2 = .22$. In addition, there was no significant correlation between overall PCC and imitation PCC, $r = -.36$, $p = .25$, and the effect size was small, $R^2 = .13$. Thus, children with low (or high) overall PCC did not necessarily exhibit low (or high) PCC in the spontaneous and imitation tasks. For example, the child with the lowest overall PCC (67.0%), Participant 12, exhibited the fifth lowest PCC (52.3%) in the spontaneous condition and only the tenth lowest (i.e., third highest) PCC (59.1%) in the imitation condition. The child with the highest PCC overall (84.7%), Participant 5, exhibited the third highest PCC (56.3%) in the spontaneous condition and only the fifth highest PCC (56.3%) in the imitation condition.

Table 6. Percentage of consonants correct (PCC) in spontaneous and imitated productions.

Participant	*PCC overall*	*PCC spontaneous*	*PCC imitation*
1	77.32	58.33	54.17
2	78.79	59.09	50.00
3	68.89	47.83	54.17
4	70.21	52.63	73.68
5	84.69	56.25	56.25
6	72.34	53.13	48.48
7	79.57	54.17	45.83
8	69.39	52.78	52.78
9	70.83	42.86	62.16
10	75.79	44.44	58.33
11	73.40	48.28	67.74
12	67.02	52.27	59.09
Average	74.08	51.83	56.89
SD	5.19	5.10	8.01

Consonant accuracy was calculated for manner of articulation classes separately for both spontaneous and imitated productions and by manner class overall without regard to elicitation condition (see Table 7). The results indicated that segments in five sound classes—stops, nasals, fricatives, spirants, and the liquid /l/—were more accurate in the imitation task than in the spontaneous task. Segments in one sound class, affricates, were more accurate in the spontaneous task than in the imitation task. Finally, segments in three sound classes—glides, flap, and trill—were almost equal in both tasks.

In summary, these results indicated that (a) imitated and spontaneous productions were identical in more than half the cases, (b) an imitated production was more adult-like than a spontaneous one in 25% of the cases, and (c) a spontaneous form was more adult-like than an imitated one in approximately 13% of the cases. Although there was no significant difference in PCC between spontaneous and imitated productions, PCC did vary as a function of elicitation task for some children. For some children, PCC was higher for imitated productions, but for other children, PCC was either higher for spontaneous productions or the same, regardless of elicitation task. Consonant accuracy in individual sound classes was generally higher in the imitation task than in the spontaneous task. Finally, the results also showed that an error in the spontaneous task resulted in the same error in the imitation task in approximately 60% of the cases.

Table 7. Percentage correct and standard deviations by manner class for spontaneous and imitated productions.

Manner class	*Spontaneous*[a]	*Imitation*[a]	*Overall*[b]
Stops	67.59 (16.60)	77.36 (12.90)	86.97 (7.79)
Nasals	84.09 (15.00)	88.10 (17.80)	90.29 (6.65)
Fricatives	30.00 (18.50)	43.06 (20.80)	68.32 (13.52)
Spirants	0.00 (0.00)	11.55 (38.82)	16.67 (33.93)
Affricates	33.33 (32.10)	27.78 (38.50)	44.44 (35.77)
Liquid /l/	38.46 (28.00)	50.00 (32.20)	52.94 (12.93)
Glides	83.33 (49.24)	84.62 (45.90)	94.83 (12.93)
Flap	30.30 (29.60)	29.03 (31.30)	47.95 (22.54)
Trill	0.00 (0.00)	0.00 (0.00)	31.82 (38.41)

[a]Calculated only on words with both a spontaneous and an imitated production. [b]Calculated on all words on the assessment.

DISCUSSION

The purpose of this study was to determine how Spanish-speaking children with phonological disorders performed on spontaneous and imitative tasks. Specifically, the study examined whether an imitation task led to more adult-like production as compared to a spontaneous task, what percentage of the time an imitated production resulted in a more adult-like production, and how consonant accuracy differed in each condition. The initial analysis revealed that, for this group of children, the vast majority of words were produced identically in both tasks (62.2%). The percentage of words with a more adult-like production, however, was higher in the imitation task (25.0%) than in the spontaneous task (12.8%). These results differed somewhat from those found in Sutton's (1980) study of English speakers with phonological disorders. In Sutton's study, spontaneous and imitated productions were equal for 30.5% of responses; imitated productions were more advanced than spontaneous ones for 60.8% of responses; and finally, spontaneous productions were more adult-like than imitated productions for 8.7% of responses. One possible explanation for the discrepant results could be differences in the two languages. Given the relatively less complex phonotactic structure of Spanish as compared to English, as well as differences in phonological development for Spanish- and English-speaking children, it might be expected that Spanish-speaking children (even those with phonological disorders) would exhibit a higher accuracy on imitated forms than on spontaneous ones because mastery of the phonological system would be somewhat more advanced for Spanish-speaking children. The Spanish-speaking children in the current study, however, showed the opposite trend. The majority of responses were identical in both conditions, suggesting that many of the forms produced by this group of children were emerging, but were not mastered (Smith, 1973; Sutton, 1980). For 3 children, however, the majority of forms were more adult-like in the imitation task than in the spontaneous one.

In examining the accuracy for sound classes across the two elicitation conditions, stops, fricatives, spirants, and the liquid /l/ would seem to be approaching mastery (see Table 7) because they were produced more accurately imitatively than spontaneously (although nasals were more accurate in imitation, the difference is small, and those sounds were 90% accurate overall). Closer inspection of the data revealed that probably only stops were approaching mastery and fricatives were moving toward mastery. Accuracy for stops via imitation was 77.4%, and overall was 87%; accuracy for fricatives was 43.1% via imitation but almost 70% overall. The overall accuracy for the other sound classes with higher accuracy in the imitation condition—spirants and the liquid /l/—was quite low in the imitation condition, 11.6%, and 50%, respectively, and was also low overall, 16.7% and 52.9%, respectively. Thus, it is more likely that the liquid /l/ was emerging rather than becoming mastered. In addition, the children have yet to acquire the Spanish allophonic rule resulting in the spirants. It was not surprising that the children with phonological disorders in this study showed difficulty with the rule that generates spirants as they have shown to be later developing, even in the Spanish of typically developing bilingual (Spanish–English) children (Goldstein & Washington, 2001). It is unknown how these results compare to English-speaking children because previous researchers in this area did not complete a similar analysis.

Thus, the results from the current study on the accuracy of forms across the two tasks indicated that differences in production in the spontaneous and imitated conditions seemed to be determined more by phonological development and individual variation than by ambient language. This interpretation should be viewed with caution, however, because of the methodological differences in the current study and that of Sutton (1980). Sutton included only 6 individuals in her study, all of whom had been receiving an unspecified amount of intervention for their phonological disorder, and the responses of the individuals in her study were tracked longitudinally. These data indicated, however, that obtaining imitated productions may have prognostic value (Fokes, 1982), just as they do in measuring stimulability (e.g., Powell & Miccio, 1996; Stoel-Gammon & Stone, 1990). Imitated productions would seem to be useful in aiding speech-language pathologists in gauging ongoing acquisition and development by providing information about which specific segments are moving toward mastery or may soon become mastered. Longitudinal studies will be required to determine if those sound classes that show higher accuracy imitatively are, in fact, mastered soon thereafter.

The results from the current study also indicated that, although the imitation task did elicit the more adult-like production in 25% of the cases, the more adult-like production was not necessarily an accurate one (i.e., not identical to the adult target). An analysis of error patterns indicated that it was much more likely that there was a shift from an error in the spontaneous task to another error in the imitation task, as opposed to a shift from an error production in the spontaneous task to a correct production in the imitation task. In approximately 57.0% of the cases, an error in the spontaneous condition resulted in the same error in the imitation task; in 36.4% of the cases, an error in the spontaneous condition yielded a different error via

imitation; and in 6.6% of the cases, an error in the spontaneous task resulted in a correct production in the imitation task. These results differed markedly from those obtained by Summers and Larson (1992). In 16.2% of the cases in their study, an error in the spontaneous task yielded a different error in the imitation task, and in 41.7% of the cases, there was an error in the spontaneous task but a correct production in the imitation task. The difference in results between the two studies may have been the result of the phonological status of the children in both studies. The children in Summers and Larson's study were typically developing, whereas children with phonological disorders were included in the current study. It would be expected that typically developing children would show increased accuracy in their productions that were elicited through imitation. This result differed for children with phonological disorders, who still tended to exhibit errors in imitated productions, albeit different errors from the ones that were witnessed in their spontaneous productions. Children who exhibit phonological disorders are less likely than their typically developing peers to imitate new sounds or syllables due to a generalized phonological delay (Grunwell, 1991). This generalized phonological delay has been found for children with functional phonological disorders (Shriberg, Gruber, & Kwiatkowski, 1994; Shriberg & Kwiatkowski, 1994), late talkers (Mirak & Rescorla, 1998), and even young adults with long-standing phonological disorders (Johnson et al., 1999).

For the children in the current study, consonant accuracy was not significantly higher for imitated productions than for spontaneous productions, although the effect size was large (d = .75; Cohen, 1988), indicating a distinction in consonant accuracy between the two tasks. Weston (1997) also did not find significant differences in PCC between the two elicitation conditions, but Shea and Blodgett (1994) reported a significant difference in PCC between the spontaneous and imitation conditions, although neither study reported effect sizes. Recall, however, that for 6 of 12 children in the current study, PCC was either identical in both tasks or higher in the spontaneous task. There was also no significant correlation between overall PCC, spontaneous PCC, and imitation PCC. Thus, the results from this study indicated that the collection of imitated productions would not overestimate the phonological abilities for all children, as has been suggested (e.g., Johnson & Somers, 1978). Speech-language pathologists can incorporate imitated responses in their analyses without concern that their inclusion will artificially alter severity scores.

Overall, the data from this study seem to obviate the inclination by speech-language pathologists to exclude or separate productions elicited via imitation. In fact, speech-language pathologists should actively incorporate the elicitation of imitated productions in their phonological sampling, especially for productions containing errors. Recall that only 7% of words containing an error in the spontaneous task were produced accurately (i.e., in accordance with the adult target) in the subsequent imitation condition. In addition, charting the differences in production accuracy between spontaneous and imitated productions during the initial assessment and throughout the course of intervention may lead to a more accurate diagnosis of phonological disorder, aid in goal planning for intervention, and help determine which sounds are moving toward mastery.

FUTURE STUDY

These results suggest several areas for future investigation. The children in the current study all exhibited a mild–moderate phonological disorder. Future research should include children with more severe phonological disorders because it might be expected that as the severity of the disorder increases, the difference between elicitation methods would also increase. Moreover, these data were collected at one point in time. Longitudinal data should be collected to determine if specific segments that are produced accurately via imitation are then soon produced accurately in a spontaneous elicitation task. Finally, the effect of context on the results (e.g., syllable structure and word length) should also be examined to determine whether or not it is related to differences along those dimensions.

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APPENDIX. ASSESSMENT OF PHONOLOGICAL DISABILITIES–SPANISH

	Puerto Rican Spanish production[a]	English
Mono- & Bi-syllabic		
dos	[do:]	two
boca	[boka]	mouth
jabón	[haβoɪ]	soap
dedo	[deo]	finger
gato	[gato]	cat
jugo	[huɣo]	juice
café	[kafe]	coffee
silla	[sija]	chair
casa	[kasa]	house
huevo	[weβo]	egg
llave	[jaβe]	key
leche	[letʃe]	milk
china	[tʃina]	orange
rojo	[Roho]	red
carro	[kaRo]	car
mono	[mono]	monkey
naríz	[nari:]	nose
papa	[papa]	papa
ratón	[Ratõ]	mouse
relój	[Relo^{h}]	watch
lapiz	[lapi:]	pencil
baño	[baɲo]	bathroom
Clusters		
tren	[tɾeŋ]	train
flor	[flol]	flower
plato	[plato]	plate
bloque	[bloke]	block
cruz	[kru:]	cross
doctór	[doktol]	doctor
Multisyllabic		
caballo	[kaβajo]	horse
cuchara	[kutʃara]	spoon
sortija	[soltiha]	ring
martillo	[maltijo]	hammer
manzana	[mansana]	apple
muñeca	[muɲeka]	doll
bicicleta	[bisikleta]	bicycle
elefante	[elefante]	elephant

[a]It should be noted that these productions are the most common ones produced by Puerto Rican Spanish speakers. Delineating these examples does not mean that all children use all variants in all words. For example, the alveolar trill /r/ is often, but not always, produced as its uvular counterpart [R].