The Effect of Dialect on Phonological Analysis: Evidence From Spanish-Speaking Children

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This study examines the effect of dialect on phonological analyses in Spanish-speaking children. Phonological analyses were completed for fifty-four 3- and 4-year-old typically developing Spanish speakers and fifty-four 3- and 4-year-old Spanish speakers with phonological disorders. Analyses were made in reference to both the General Spanish dialect and the Puerto Rican dialect of Spanish to demonstrate the effect of dialect on the results. The results indicated that the number of consonant errors, percentage of consonants correct, number of errors within individual sound classes, and percentage of occurrence for phonological processes all differed based on the accounting of dialect features.

Key Words: children, Puerto Rican Spanish, dialect, phonological patterns

All dialects of a particular language are rule-governed and mutually intelligible. Thus, any dialect could be considered a standard from which we could measure variations. However, common practice is to establish the dominant (i.e., most prestigious) dialect as the gold standard against which the linguistic varieties of all speakers of that language are judged. Speakers who do not use a version of the so-called "standard" or "general" dialect are at risk for being negatively perceived by individuals outside of their speech community (Wolfram & Schilling-Estes, 1998). For example, Crowl and MacGinitie (1974) noted that the speech of African American children was judged by Caucasian teachers to be inferior to that of Caucasian children. Ramirez and Milk (1986) found that bilingual teachers rated the local Mexican dialect of Spanish as less appropriate than the General dialect of Spanish. Children's productions that conform to the dialect of the community may also be misidentified by speech-language pathologists who are not familiar with the dialect of the children they serve. This comparison becomes more difficult when individuals being assessed use dialect features that affect an entire sound class or the majority of members of a sound class.

For some time now, researchers have indicated that dialect plays a role in the description of children's phonology,[1] and they have urged speech-language pathologists to take dialect features into account when scoring phonological assessments (e.g., Haynes & Moran, 1989; Seymour & Ralabate, 1985; Wolfram, 1994). Thus, dialect features should not be scored as errors on phonological assessments. If the dialect features affect a considerable number of segments (e.g., all or most members of a sound class), then failure to account for these dialect features on phonological assessments may either shift the diagnosis from one of "typically developing" to one of "phonological disorder" or alter the severity category (e.g., from mild to severe phonological disorder) of children's phonological disorders. Another consequence of scoring dialect features as error patterns is causing specific phonological patterns to be targeted unnecessarily in treatment. For example, if a phonological process approach is used in intervention, the speech-language pathologist must decide which phonological process to target based on percentage of occurrence. In choosing specific phonological processes for intervention targets, Hodson and Paden (1991) suggested a percentage of occurrence of at least 40%. McReynolds and Elbert (1981) suggested 20% as one criterion to indicate the suppression of phonological processes. Scoring dialect features as errors may increase the percentage of occurrence for some phonological processes past these criteria, resulting in their being targeted mistakenly during intervention.

The extent to which dialect features affect the results on assessments of phonology has been examined in three different studies, all using children speaking African American English (AAE) as subjects. These studies were completed in an attempt to determine whether or not

[1]The terms "phonology" and "phonological" are used throughout this article to encompass both segment- and pattern-based aspects of speech sound production.

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scoring dialect features as "errors" artificially inflated children's severity ratings to the point where some children were misidentified as exhibiting phonological disorders. The studies indicated that severity scores of individual children rose if dialect features of AAE were not taken into account. The extent to which this rise may cause a child to be labeled with a phonological disorder, however, was equivocal.

In their examination of 10 children aged 5;11–6;11 (years;months), Cole and Taylor (1990) found that not taking dialect into account resulted in the misdiagnosis of half of the children, on average, across three segment-based tests. Two other studies, while advocating that dialect should be accounted for in phonological assessment, did not find the same significant results as Cole and Taylor. Fleming and Hartman (1989) examined seventy-two 4-year-olds using the Computer Assessment of Phonological Processes (Hodson, 1985). They determined that although some test items are influenced by "Black English phonological rules," the assessment as a whole is not invalid (p. 28). Moreover, they indicated that re-scoring results taking dialect into account did not change the diagnostic category for children with phonological disorders. Washington and Craig (1992) administered the Arizona Articulation Proficiency Scale: Revised (AAPS-R; Fudala, 1974) and the Arizona Articulation Proficiency Scale: Second Edition (AAPS-SE; Fudala & Reynolds, 1986) to 28 preschool children aged 4;6–5;3. Twenty children did not exhibit a phonological disorder ("non-impaired speech"), and 8 children were diagnosed with a phonological disorder ("impaired speech"). All of the children in the "non-impaired speech" group were classified as typically developing both before and after a re-scoring of the test items.

A re-scoring of test items on the AAPS-R in the impaired speech group resulted in a change in severity classification for three children. These three children, who were originally classified with a *severe* phonological disorder, were subsequently labeled with a *moderate* phonological disorder after AAE features were taken into account. On the AAPS-SE, 2 children in the impaired speech group who were originally classified with a *mild* phonological disorder were subsequently labeled as typically developing after AAE features were taken into account. In comparing their results with Cole and Taylor (1990), Washington and Craig (1992) indicated that their dialect scoring changes did "not seem to penalize the BE [Black English]-speaking preschoolers to a degree that is clinically significant" (p. 206) and attributed the dissimilarity of the results to differences in geographic location. The children in Cole and Taylor's study lived in Mississippi; the children in Washington and Craig's study lived in Detroit.

Despite differences in the results of these studies, it can be concluded that scoring dialect features as errors may result either in some children being mislabeled as phonologically disordered when, in fact, they are developing typically, or in a change in severity classification for children who exhibit phonological disorders. Subsequently, these children might receive intervention for a dialect difference rather than a phonological disorder or receive inappropriate intervention based on an inaccurate severity classification. It is the position of the American Speech-Language-Hearing Association (ASHA) that, except for elective services, children should not receive intervention for dialect differences (1983). That is, intervention must focus on true errors and not patterns that can be attested as dialect features.

Although the studies described above examined the effects of dialect on the assessment of phonology in children, the information obtained from them should be augmented for several reasons. First, clear agreement as to the nature of the interaction between dialect and diagnosis of impairment does not exist. Moreover, previous studies have not focused on whether specific dialect features are more or less likely to affect the results. Second, these studies examined either phonetic or phonological process data only. There is a need to explore the effect of dialect on the use of both aspects of phonology, because speech-language pathologists typically use segment- and pattern-based information to determine phonological disorder. Third, these studies did not explore possible age effects. Present findings on the effect of dialect on the diagnosis of impairment may be, in part, age-related. For example, younger children may show an overall greater number of dialect features relative to older children. Thus, younger children may exhibit a greater discrepancy than older children between the original score (i.e., before dialect features are taken into account) and the recalculated score (i.e., after dialect features are taken into account). Finally, all three studies examined children speaking only one language, English, and one dialect of English, AAE.

Cross-linguistic studies are needed to determine the relationship between dialect and diagnosis of disorder and the variability of this phenomenon depending on the language in question. A language such as Spanish may be a relevant language for inquiry for a number of reasons. First, Spanish is a language in which there are a number of dialects that vary from each other and from General Spanish (i.e., that dialect of Spanish that is spoken in some regions of Spain and is taught in the U.S. educational system). Because Spanish dialects differ greatly from each other, and these differences are characterized by consonant distinctions (the basis for typically diagnosing a phonological disorder), the consequences of not taking dialect into account may be more serious for Spanish-speaking children. Although Spanish dialects show differences on vowels, dialects in Spanish are characterized mainly by consonant differences and affect large consonant sound classes—particularly fricatives, liquids, glides, and nasals (Cotton & Sharp, 1988).

In determining the connection between dialect and diagnosis of impairment, it is necessary to examine each of the three main Spanish dialects spoken in the United States (Cuban, Mexican, and Puerto Rican Spanish) independently. The Puerto Rican dialect, however, will be the subject of inquiry here because it exhibits many features that differentiate it from General Spanish in general and the other Spanish dialects in particular (e.g., Goldstein, 1995; Goldstein & Iglesias, 1996a). Although a number of studies have examined phonological development in

Spanish-speaking children using a variety of dialects (e.g., Cuban: Terrell, 1981; Mexican: Eblen, 1982; Puerto Rican: Anderson & Smith, 1987), none has examined specifically the effect of dialect on phonological analysis.

The purpose of the present study was to determine if taking or not taking into account Puerto Rican Spanish dialect features alters the results of phonological analyses. To that end, the following questions were asked:

- Does accounting for dialect features of Puerto Rican Spanish affect the number of consonant errors and the percentage of consonants that are produced correctly for 3- and 4-year-old typically developing children and children with phonological disorders?
- Does accounting for dialect features of Puerto Rican Spanish affect the percentage of occurrence of phonological processes for 3- and 4-year-old typically developing children and children with phonological disorders?
- How do the diagnosis of phonological disorder and the determination of severity vary as a function of taking into account the dialect features of Puerto Rican Spanish?
- Does the choice of potential intervention targets differ as a function of taking into account the dialect features of Puerto Rican Spanish?

Method

Participants

The participants in this study consisted of one-hundred-eight 3- and 4-year-old Spanish-speaking children of Puerto Rican descent. All 108 children were enrolled in a bilingual (Spanish-English) Head Start program in Philadelphia, Pennsylvania; were of Puerto Rican descent (determined by Head Start records); and spoke the Puerto Rican dialect of Spanish as their primary language at home (characteristics of Puerto Rican Spanish are described in the Appendix). Each child passed a pure-tone hearing screening bilaterally at 500, 1000, 2000, and 4000 Hz at 25dB HL and an impedance screening. None of the children had been diagnosed with a communication disorder or had received speech and/or language intervention.

Fifty-four children were typically developing Spanish speakers: twenty-four 3-year-olds (17 girls and 7 boys) and thirty 4-year-olds (18 girls and 12 boys). These children ranged in age from 3;2 to 3;11 in the younger age group (M = 3;7) and from 4;3 to 4;11 (M = 4;4) in the older age group. For the typically developing children, no child was included in the study whose parents or teachers expressed concern about speech and/or language development. In fact, the child's teacher and parent and the investigators all concurred that these children exhibited typical speech and language development. According to teacher reports, these children also exhibited normal functioning in the classroom (i.e., the ability to follow classroom routines and participate in classroom activities).

Originally, 65 children with suspected phonological disorders were referred by either their teacher or their parent to the first author for having a "speech sound problem." Eleven children were excluded because they did not meet Goldstein and Iglesias' (1996b) criterion for being labeled with a phonological disorder, a percentage of occurrence greater than 15% on any of the targeted phonological processes. Thus, 54 Spanish-speaking children were diagnosed with phonological disorders: twenty 3-year-olds (10 males and 10 females) and thirty-four 4-year-olds (24 males and 10 females). The ages of these children ranged from 3;1 to 3;11 in the younger age group (M = 3;7) and from 4;0 to 4;9 (M = 4;4) in the older age group. All children with phonological disorders were referred and assessed within 6 weeks of their enrollment in school. In addition, this was the first school experience for all of the children.

Evaluation Instrument

The Assessment of Phonological Disabilities (APD; Iglesias & Goldstein, 1993), a phonological assessment designed specifically for Spanish-speaking children, was used to assess the children (the APD is described in detail in Goldstein & Iglesias, 1996a). This assessment has been used previously to describe phonological patterns in both typically developing Spanish-speaking children (Goldstein & Iglesias, 1996a) and those with phonological disorders (Goldstein & Iglesias, 1996b). The APD is a single-word assessment containing simple mono- and disyllabic words, clusters, and multisyllabic words (see Goldstein and Iglesias [1996b] for a complete listing of test items). All the words depict objects and attributes that are familiar to preschoolers; 95% are nouns and 5% are adjectives. Also, the percentage of phones represented on the assessment corresponds approximately with their percentage in spoken Spanish, as determined by Wilson (1984).

Data Collection

Each child was assessed individually in Spanish by the first author. The examiner had interacted with and observed these children in their classrooms prior to testing. All children entered the testing area (a quiet space within the Head Start Center) without prompting and complied with the testing procedure. Each data collection session lasted approximately 30 minutes.

Children were asked to name each stimulus item separately. The examiner prompted a response by asking, "Qué es esto?" (What is this?). If this prompt did not elicit the name of the item, the examiner described the object ("it is used for...") and then asked the child to label the item. If the child did not name the item, the examiner used imitation, naming the item and then asking the child to name it. Imitated responses were accepted because a number of studies have shown that there is no significant difference in the results of articulation or phonological process analyses when spontaneous and imitated responses were compared (e.g., Bankson & Bernthal, 1982; Bond & Korte, 1983; Paynter & Bumpas, 1977). Results from these studies did not indicate that both methods always elicited the same response; however, they showed that the differences between the methods were negligible. Responses were

audiotaped on a Superscope Model C-202LP tape recorder and transcribed by the first author at the time of administration using the International Phonetic Alphabet (IPA). The diacritic markings that were transcribed included nasalization, vowel length, and aspiration.

Scoring of the Data

The data were scored in three ways in order to examine both phonetic and phonological process information. First, consonant errors were scored in the following ways: (a) the total number, mean, and range of consonant errors were computed for each age group; (b) a percentage of consonants correct score (PCC; Shriberg & Kwiatkowski, 1982) was also calculated for each child[2]; and (c) the total number, mean, and range of consonant errors by sound class were determined for each age group.

Second, the nine phonological processes targeted by the APD that were evident in the speech of each child were identified. The targeted processes included final consonant deletion (12 possible occurrences), velar fronting (33), stopping (64), palatal fronting (15), liquid simplification (39), assimilation, weak syllable deletion (74), cluster reduction (29), and initial consonant deletion (34). With the exception of initial consonant deletion, these processes were targeted because they occur frequently in the speech of typically developing children across a variety of language groups (Shriberg & Kwiatkowski, 1980) and they have been shown to capture 85–95% of the errors in the speech of typically developing Spanish-speaking children (Goldstein & Iglesias, 1996a). Initial consonant deletion was included because children with phonological disorders from the targeted population exhibited this process (Goldstein & Iglesias, 1996b). All processes were defined by the criteria outlined on the Natural Process Analysis (Shriberg & Kwiatkowski, 1980).

For each error, the examiner determined under which of the nine targeted phonological processes the error could be categorized. For example, if the word /boka/ *(mouth)* was produced as [bota], the clinician would score that substitution as an error under the category of velar fronting. This process continued until all of the errors that could be categorized under one of the target processes were scored. The total number of errors was then added for each process and then divided by the number of total possible occurrences for each process; thus, a percentage of occurrence was derived.

Finally, after the phonological process errors were scored, other sound changes that could not be categorized by one of the nine phonological processes (e.g., denasalization, metathesis) were counted. These non-process errors were taken from lists of sound changes that are normally exhibited in typically developing children (e.g., Hodson & Paden, 1991; Shriberg & Kwiatkowski, 1980). These errors were also examined for possible influences of dialect.

[2]Although PCC was developed to examine the production of segments in connected speech, it was felt that this measure was an appropriate one to compare the children's severity levels across the two analysis procedures that are described later.

Analysis of the Data

To show the effect of dialect on the identification of phonological patterns in these children, the data were analyzed twice. In the first analysis, the data were analyzed *without* taking into account the dialect features of Puerto Rican Spanish (i.e., comparison against the "General Spanish referent" [GSR]). In the second analysis, the data were reanalyzed taking into account the Puerto Rican dialect features (i.e., comparison against the "Puerto Rican Referent" [PRR]). For example, in the Puerto Rican dialect of Spanish, unstressed syllables with /s/ in coda position are deleted: /eskoba/ → [koßa] *(broom)*. If a child produced [koßa] for /eskoba/, the production was scored as an "error" of weak syllable deletion in comparison to the GSR, but not as an error of weak syllable deletion in comparison to the PRR. It should be noted that errors compared against the GSR are not truly "errors" but are, in actuality, dialect features. This comparison is being made to demonstrate the difference in the results when dialect features are scored as actual errors. This type of scoring system has been used previously for African American children to demonstrate the role of dialect in characterizing phonological patterns (Cole & Taylor, 1990; Taylor & Payne, 1983).

A three-factor (dialect x age x phonological status) analysis of variance (ANOVA) with repeated measures with an alpha level of .05 was computed. Age (3- vs. 4-year-olds), phonological status (typically developing vs. phonological disorder), and dialect (GSR vs. PRR) served as the independent variables, with number of errors and PCC as the dependent variables. All statistical analyses were performed using the Statistical Package for the Social Sciences 10.0 for Windows (SPSS, 1999).

Reliability

Each administration of the APD was audiotaped and the child's responses were transcribed by the examiner using the IPA. Transcription agreement was calculated separately for typically developing children and for children with phonological disorders. Inter-judge reliability for number of consonant errors and categorization of phonological process errors was also completed. Each will be described in turn.

For typically developing children, the second author used a broad transcription of the IPA (with the diacritic markings mentioned previously—nasalization, vowel length, and aspiration) to transcribe the tapes from 10 children and to compare the transcription results with those of the examiner and determine inter-judge agreement. A percentage of agreement was then calculated using a 90% agreement level as the criterion. If this criterion was not achieved, then the first author and the second author re-listened to and came to a consensus on the item(s) in question. Prior to reaching a consensus, the percentage of agreement between the two transcribers for the data collected from the typically developing children was 88%. After reaching a consensus on disputed items, the two were in 98% agreement. Most discrepancies were related to differences in narrow phonetic transcription. Intra-judge reliability, determined by re-scoring all the productions

from 10 children after a 4-week period, was 99%.

For the children with phonological disorders, a bilingual (English-Spanish) speech-language pathologist used a broad transcription of the IPA to transcribe the tapes from 10 children and compared results with those of the examiner. A percentage of agreement was then calculated. Intra-judge reliability was determined by the examiner's re-scoring of the productions of 10 children after a 4-week period. Inter-judge reliability was found to be 90%; intra-judge reliability was 91%.

Inter-judge reliability was calculated between the two authors for number of consonant errors and categorization of phonological process errors. Both measures were completed separately for 10 typically developing children (five 3-year-olds and five 4-year-olds) and 10 children with phonological disorders (five 3-year-olds and five 4-year-olds). For typically developing children, inter-judge reliability was 98.2% for number of consonant errors and 94.7% for categorization of phonological process errors. For children with phonological disorders, inter-judge reliability was 97.1% for number of consonant errors and 91.0% for categorization of phonological process errors.

Results

This study examined the effect of dialect on phonological patterns in 3-year-old and 4-year-old Spanish-speaking children of Puerto Rican descent. Analyses were made with respect to the GSR (i.e., without taking dialect features into account) and the PRR (i.e., taking dialect features into account). The results are presented below for both typically developing children and those with phonological disorders in the following three sections: (a) consonant errors, (b) phonological processes, and (c) phonological patterns not affected by referent.

Consonant Errors

The first analysis calculated the total number, mean number, and range of consonant errors (see Table 1).

The results indicated that for typically developing children and children with phonological disorders, the total number, mean number, and range of consonant errors differed when compared across the GSR and PRR. For typically developing 3-year-olds, the mean number of errors was 30.6 in comparison to the GSR and 7.3 in comparison to the PRR. The same trend was seen in 4-year-olds; the mean number of errors was 24.9 in comparison to the GSR and 7.5 in comparison to the PRR. For 3-year-old children with phonological disorders, the mean number of errors was 46.3 in comparison to the GSR and 22.7 in comparison to the PRR. For 4-year-olds, the mean number of errors was 44.4 in comparison to the GSR and 21.4 in comparison to the PRR. An ANOVA was performed to determine whether referent, phonological status, and age affected the mean number of errors. The results of the ANOVA indicated that there was a significant main effect of referent, [$F(1, 103) = 3012.47$, $p = .000$]; phonological status, [$F(1, 103) = 110.67$, $p = .000$]; and age, [$F(1, 103) = 134.88$, $p = .000$]. There was no significant interaction of phonological status and age [$F(1, 103) = .20$, n.s.].

For the second analysis, the PCC and the range of PCC scores were computed in comparison to the GSR and PRR (see Table 2).

The results indicated that for both typically developing children and those with phonological disorders, PCC increased in comparison to the PRR. For typically developing 3-year-olds, PCC was 80.5 in comparison to the GSR and 95.2 in comparison to the PRR. For 4-year-olds, PCC was 89.4 in comparison to the GSR and 96.6 in comparison to the PRR. For 3-year-olds with phonological disorders, PCC was 67.6 in comparison to the GSR and 76.5 in comparison to the PRR. For 4-year-olds with phonological disorders, PCC was 70.2 in comparison to the GSR and 80.3 in comparison to the PRR. The results of the ANOVA indicated that there was a significant main effect of referent, [$F(1, 103) = 2030.65$, $p = .000$]; phonological status, [$F(1, 103) = 113.57$, $p = .000$]; and age [$F(1, 103) = 51.39$, $p = .000$]. There was also a significant interaction of phonological status and age, [$F(1, 103) = 4.21$, $p = .04$],

TABLE 1. Consonant errors in typically developing children and children with phonological disorders compared against the General Spanish referent and the Puerto Rican referent.

	Typically Developing Children		Children With Phonological Disorders	
	General Spanish Referent	Puerto Rican Referent	General Spanish Referent	Puerto Rican Referent
3-Year-Olds				
Total	736	176	925	454
Mean *(SD)*	30.6 (10.9)	7.3 (4.9)	46.3 (8.9)	22.7 (8.4)
Range	17–54	1–21	31–68	4–40
4-Year-Olds				
Total	746	224	1511	728
Mean *(SD)*	24.9 (8.7)	7.5 (5.4)	44.4 (7.2)	21.4 (8.9)
Range	13–42	1–20	33–64	8–45

TABLE 2. Percentage of consonants correct in typically developing children and children with phonological disorders compared against the General Spanish referent and the Puerto Rican referent.

	Typically Developing Children		Children With Phonological Disorders	
	General Spanish Referent	Puerto Rican Referent	General Spanish Referent	Puerto Rican Referent
3-Year-Olds				
Mean *(SD)*	80.5 (7.2)	95.2 (3.4)	67.6 (8.9)	76.5 (9.4)
Range	74.0–89.4	86.7–98.9	21.8–64.4	54.0–95.4
4-Year-Olds				
Mean *(SD)*	89.4 (3.5)	96.6 (2.6)	70.2 (7.6)	80.3 (9.7)
Range	80.7–93.1	90.3–99.5	26.4–62.1	48.3–90.1

indicating that the shift in PCC as a function of age is greater for typically developing children than for children with phonological disorders.

Use of the GSR when calculating PCC might contribute to the mischaracterization of the severity level of phonological skills in many children. The results of this study indicated that 40 out of 54 (74%) typically developing children would have been characterized with at least a mild-moderate phonological disorder (PCC scores ranging from 65 to 85; Shriberg & Kwiatkowski, 1982) in comparison to the GSR. All 3-year-olds would have been characterized with a mild-moderate disorder, and of the thirty 4-year-olds, 10 children would have been characterized with a mild disorder and 6 with a mild-moderate disorder. In comparison to the PRR, however, no typically developing child in either age group would have been characterized with a phonological disorder. In fact, twenty-two of the twenty-four 3-year-olds and all thirty 4-year-olds showed PCC scores greater than 90%, and twenty-four of the thirty 4-year-olds exhibited scores greater than 95%.

Based on PCC scores, the results indicated shifts in severity in comparison to the PRR for children with phonological disorders. In comparison to either referent, all 54 children would have been characterized with at least a mild-moderate phonological disorder. There was a shift in severity category, however, for many children when each referent was applied. In comparison to the GSR, five 3-year-olds would have been characterized with a severe disorder and 15 with a moderate-severe disorder. In comparison to the PRR, none was characterized with a severe disorder, 3 were characterized with a moderate-severe disorder, and 17 with a mild-moderate disorder. A pattern of severity shift was witnessed in the 4-year-old children as well. In comparison to the GSR, 6 children would have been characterized with a severe disorder, 23 with a moderate-severe disorder, and 5 with a mild-moderate disorder. In comparison to the PRR, 3 were characterized with a severe disorder, 3 with a moderate-severe disorder, and 28 with a mild-moderate disorder.

In order to examine the effect that dialect referent would have on specific sound classes, an analysis of PCC within each sound class for the GSR and the PRR was completed (Table 3). The results are presented by age group across typically developing children and those with phonological disorders.

The results indicated that consonants from four sound classes (fricatives, glides, liquids, and nasals) showed a change in accuracy between the GSR and the PRR (only those sound classes affected by Puerto Rican dialect features are represented). In both typically developing children and those with phonological disorders, the PCC by sound class increased approximately 12% when compared with the PRR. The magnitude of the increase varied somewhat by sound class. For both typically developing children and those with phonological disorders, fricatives tended to show the largest percentage of increase from the GSR to the PRR. Three segments, [ð], /s/, and /x/, were responsible for the difference in results for both age groups. The intervocalic interdental fricative, [ð], is deleted; for example: /deðo/ *(finger)* → [deo]. Syllable-final /s/ may be deleted (and may or may not aspirate the preceding vowel); for example, /esto/ *(this)* → [e^{h}to] or /esta/ [eta]. Unstressed syllables with syllable-final /s/ are also deleted; for example: /eskoba/ *(broom)* → [koßa]. Syllable-initial /x/ is substituted by [h]; for example, /xuɣo/ *(juice)* → [huɣo]. Liquids showed a large discrepancy between the GSR and PRR. Two segments, /r/, and /ɾ/, were responsible for the difference in results for both age groups. The trill /r/, in either word-initial or intervocalic position, becomes the uvular trill [R] or the velar fricative [x]; for example, /roxo/ *(red)* → [Roho]/[xoho] or /pero/ (*dog*) → [peʁo]/[pexo]. In word-final position and before alveolars, the flap /ɾ/ is substituted by [l]; for example: /floɾ/ *(flower)* → [flol] or /sortixa/ *(ring)* → [soltiha]. Nasals showed a slight difference between the two referents. One segment, /n/, was responsible for the difference in results for both age groups. That phoneme is often deleted in syllable-final position (the preceding vowel may also be nasalized). For example, /raton/ *(mouse)* is produced as [rato] or [ratõ]. Finally, there was a slight difference between the referents for glides. One segment, /j/, was responsible for the difference in results for both age groups. The glide /j/ is produced as the voiced alveopalatal affricate [dʒ]; for example, /kaßajo/ *(horse)* → [kaßadʒo].

In summary, the results of these analyses suggest that the number of consonant errors, the PCC, and the number

Table 3. Percentage of consonants correct by sound class* compared against the General Spanish referent and the Puerto Rican referent for typically developing children and children with phonological disorders.

	Typically Developing Children		Children With Phonological Disorders	
	General Spanish Referent	Puerto Rican Referent	General Spanish Referent	Puerto Rican Referent
3-Year-Olds				
Fricatives	57.8	94.6	54.1	72.4
Glides	96.2	99.2	93.0	94.0
Liquids	81.7	93.4	49.7	63.3
Nasals	82.1	98.8	77.1	86.8
4-Year-Olds				
Fricatives	80.8	94.9	54.1	74.9
Glides	90.0	99.6	84.7	87.1
Liquids	79.7	95.9	57.3	69.8
Nasals	97.7	99.0	75.0	88.9

*Only sound classes affected by dialect features are represented here.

of errors within certain sound classes vary depending on referent. Not taking referent into account will result in both typically developing children and ones with phonological disorders, on average, exhibiting more consonant errors, a lower PCC, and more errors on consonants in specific sound classes.

Phonological Processes

Table 4 depicts the percentage of occurrence of phonological processes in comparison to the GSR and PRR. Only those processes influenced by Puerto Rican dialect features are examined in detail. Phonological processes not affected by dialect are examined in a later section.

Three processes—final consonant deletion, liquid simplification, and weak syllable deletion—showed a change in percentage of occurrence between the GSR and the PRR. The results indicated that in both typically developing children and those with phonological disorders, the percentage of occurrence decreased approximately 25% when compared with the PRR. The magnitude of the decrease varied somewhat by specific phonological process and age of the children. For both typically developing children and those with phonological disorders, final consonant deletion showed the largest decrease (an average of 48%) from the GSR to the PRR. The difference in the results between the GSR and the PRR was accounted for by the deletion of the phonemes /s/ and /n/. In the Puerto

TABLE 4. Percentage of occurrence for phonological processes* compared against the General Spanish referent and the Puerto Rican referent for typically developing children and children with phonological disorders.

	Typically Developing Children		Children With Phonological Disorders	
	General Spanish Referent	Puerto Rican Referent	General Spanish Referent	Puerto Rican Referent
3-Year-Olds				
Final consonant deletion	70.7	0.4	51.3	3.2
Liquid simplification	44.3	6.1	50.3	14.7
Weak syllable deletion	4.1	2.0	9.2	9.2
4-Year-Olds				
Final consonant deletion	32.9	0.3	51.2	6.1
Liquid simplification	12.8	2.2	42.7	19.0
Weak syllable deletion	4.5	2.4	7.1	7.1

*Only phonological processes affected by dialect features are represented here.

Rican dialect, but not in the General Spanish dialect, these phonemes were readily eliminated in word-final position. If the final consonant was /n/, that phoneme was eliminated and the preceding vowel was lengthened and nasalized; for example, /raton/ *(mouse)* → [Ratõ:]. If the final consonant was /s/, that phoneme was deleted, the vowel may or may not lengthen, and the preceding vowel may or may not be aspirated; for example, /dos/ *(two)* → [do:] or [do^{h}].

The second greatest discrepancy between the two referents was in liquid simplification (average decrease of 27% in comparison to the PRR). The discrepancy in results between the GSR and the PRR can be accounted for by the phonemes /ɾ/ (flap) and /r/ (trill). Specifically, the flap /ɾ/ was substituted by [l] before alveolars; for example, /sortixa/ *(ring)* → [soltiha]. In addition, the trill /r/ was substituted by its uvular counterpart [ʀ] or alveolar fricative [x], for example, /pero/ *(dog)* → [peʀo]/[pexo].

Weak syllable deletion showed the smallest decrease between the two referents (average decrease of 1%). The slight difference in the mean percentage of occurrence for weak syllable deletion between the GSR and the PRR can be accounted for by the deletion of unstressed word-initial syllables with /s/ in syllable-final position; for example, /eskaleɾa/ *(stairs)* → [kaleɾa].

Number and percentage of children exhibiting processes affected by referent. The number and percentage of typically developing children and those with phonological disorders who exhibited the three processes affected by Puerto Rican dialect features (i.e., final consonant deletion, liquid simplification, and weak syllable deletion) are provided in Table 5.

The results demonstrated that, when referent was accounted for, the number of typically developing children and those with phonological disorders who exhibited the three phonological processes decreased (with the exception of weak syllable deletion in 4-year-old children with phonological disorders). The decrease was more dramatic for typically developing children than for those who exhibited phonological disorders. In both groups, final consonant deletion was most affected by referent. In typically developing children, the number of children exhibiting final consonant deletion decreased from 54 to 27; and from 54 to 18 in children with phonological disorders. The number of children exhibiting liquid simplification also dropped, from 54 to 29 in typically developing children and from 54 to 51 in children with phonological disorders. Finally, there was a decrease in the number of children exhibiting weak syllable deletion—from 41 to 32 in typically developing children and from 28 to 25 in children with phonological disorders.

Percentage of occurrence for phonological processes. A consensus does not yet exist to determine when either a phonological process is suppressed (i.e., ready to be eliminated from children's speech) or a particular phonological process should be targeted for intervention. McReynolds and Elbert (1981) advocated a 20% criterion as one indicator that a phonological process had been suppressed. Hodson and Paden (1991) noted that a phonological process should be considered as a potential intervention target if its percentage of occurrence is 40% or greater. Results from the current study were thus compared to those two criteria (Table 6).

Using McReynolds and Elbert's criterion, taking dialect features into account reduced the number of children for whom particular phonological processes might have been potential intervention targets. Final consonant deletion, liquid simplification, and weak syllable deletion might have been targeted erroneously for a number of typically developing children and those with phonological disorders if the features of the Puerto Rican dialect of Spanish were not taken into account. In the group of typically developing children, the percentage of occurrence for final consonant deletion was greater than 20% for 53 of 54 children (98%) in comparison to the GSR, but for only 9 of 54 (17%) children in comparison to the PRR. The percentage of occurrence for liquid simplification was greater than 20% for 23 of 54 children (43%) in comparison to the GSR, but for only 3 of 54 children (6%) in comparison to the PRR. The percentage of occurrence for weak syllable deletion was greater than 20% for 4 of 54 children (7%) in comparison to the

TABLE 5. Number and percentage of children exhibiting phonological processes affected by dialect features.

	Typically Developing Children		Children With Phonological Disorders	
	General Spanish Referent	Puerto Rican Referent	General Spanish Referent	Puerto Rican Referent
3-Year-Olds				
Final consonant deletion	24 (100.0%)	1 (4.2%)	20 (100.0%)	5 (25%)
Liquid simplification	24 (100.0%)	16 (66.7%)	20 (100.0%)	19 (95%)
Weak syllable deletion	14 (58.3%)	13 (54.2%)	20 (100.0%)	17 (85%)
4-Year-Olds				
Final consonant deletion	30 (100.0%)	26 (86.7%)	34 (100.0%)	13 (38%)
Liquid simplification	30 (100.0%)	13 (43.3%)	34 (100.0%)	32 (94%)
Weak syllable deletion	27 (90.0%)	19 (63.3%)	8 (24.0%)	8 (24%)

TABLE 6. Number and percentage of children exhibiting phonological processes greater than 20% (McReynolds & Elbert, 1981) and 40% (Hodson & Paden, 1991).

	Greater Than 20%		Greater Than 40%	
	General Spanish Referent	Puerto Rican Referent	General Spanish Referent	Puerto Rican Referent
Typically Developing *(N* = 54)				
Final consonant deletion	53 (98%)	9 (17%)	35 (65%)	0 (0%)
Liquid simplification	23 (43%)	3 (6%)	N/A	N/A
Weak syllable deletion	4 (7%)	0 (0%)	N/A	N/A
Phonological Disorders *(N* = 54)				
Final consonant deletion	54 (100%)	5 (9%)	54 (100%)	5 (9%)
Liquid simplification	53 (98%)	33 (61%)	39 (72%)	3 (6%)
Weak syllable deletion	12 (22%)	10 (19%)	1 (2%)	0 (0%)

Note. N/A = not applicable (did not reach the 40% criterion)

GSR, but for 0 of 54 children in comparison to the PRR. In the group of children with phonological disorders, the percentage of occurrence for final consonant deletion was greater than 20% for all 54 children (100%) in comparison to the GSR, but for only 5 of 54 (9%) children in comparison to the PRR. The percentage of occurrence for liquid simplification was greater than 20% for 53 of 54 children (98%) in comparison to the GSR, but for only 33 of 54 children (61%) in comparison to the PRR. The percentage of occurrence for weak syllable deletion was greater than 20% for 12 of 54 children (22%) in comparison to the GSR, but for only 10 of 54 children (19%) in comparison to the PRR.

Using the 40% criterion proposed by Hodson and Paden (1991), the number of children for whom a particular phonological process might have been considered as an intervention target also decreased in comparison to the PRR. In the group of typically developing children, only final consonant deletion reached the 40% criterion. Final consonant deletion might have been considered as an intervention target in 35 of 54 typically developing children (65%) if the GSR was used, but in none of these children if the PRR was used. In the group of children with phonological disorders, final consonant deletion might have been considered as an intervention target in all 54 children (100%) in comparison to the GSR, but for only 5 of 54 children (9%) in comparison to the PRR. Liquid simplification would have reached the criterion in 39 of 54 children (72%) in comparison to the GSR, but for only 3 of 54 (6%) children in comparison to the PRR. Weak syllable deletion might have been considered as an intervention target for 1 of 54 (2%) children in comparison to the GSR, but for none of the 54 children in comparison to the PRR.

Phonological Patterns not Affected by Referent

Both typically developing children and those with phonological disorders exhibited error patterns that were not affected by referent. That is, the percentage of occurrence of these phonological patterns was the same regardless of the comparison referent. Thus, the re-scoring of responses for any one of these patterns would not be necessary. There were six targeted phonological processes that were not affected by referent: cluster reduction, assimilation, velar fronting, stopping, palatal fronting, and initial consonant deletion. Other error patterns exhibited by the children not affected by referent and thus not requiring a re-scoring of the responses included:

- backing (e.g., /teʧo/ *roof* → [keʧo]),
- deaffrication (e.g., /ʧina/ *orange* → [ʃina]),
- palatalization (e.g., /kasa/ *house* → [kaʃa]),
- /t/ → [p] (e.g., /teʧo/ *roof* → [peʧo]),
- /ð/ → [l] (e.g., /deðo/ *finger* → [delo]),
- addition (e.g., /gora/ *cap* → [gloha]),
- metathesis (e.g., /boka/ *mouth* → [koba]),
- lisping (e.g., /kasa/ *house* → [kaθa]), and
- denasalization (e.g., /mano/ *hand* → [bano]).

Discussion

The purpose of this study was to examine possible differences on phonological analyses in Spanish-speaking children when the features of the Puerto Rican dialect of Spanish were and were not taken into account. The results from this study indicated that the number of consonant errors, the number of errors within individual sound classes, and the percentage of occurrence for phonological processes all decreased based on the accounting of Puerto Rican dialect features. In addition, the PCC increased after accounting for dialect features. These results are consistent with all three studies examining the role of dialect in AAE speakers—Cole and Taylor (1990), Fleming and Hartman (1989), and Washington and Craig (1992)—in showing that not accounting for dialect features will decrease the overall scores of children on phonological analyses.

As was the case in Cole and Taylor (1990) and Washington and Craig (1992), a number of the children in the

current study might have been characterized as having a phonological disorder when, in fact, they did not, if dialect features had not been taken into account. (Fleming and Hartman [1989] did not perform this type of analysis.) In Cole and Taylor's (1990) study, the number of children exhibiting a phonological disorder after dialect features were taken into account decreased dramatically for each of the three assessments used in the study: from 7 (initial analysis) to 0 (reanalysis) children on the AAPS-R (Fudala, 1974); from 6 to 2 children on the Templin-Darley Tests of Articulation (Templin & Darley, 1969); and from 3 children to 1 child on the Photo Articulation Test (Pendergast, Dickey, Stalley, Selman, & Sorder, 1969).

Results from using PCC as a metric to determine severity level of the children in the current study indicated that 40 of 54 (74%) typically developing children would have been characterized with at least a mild-moderate phonological disorder in comparison to the GSR. In comparison to the PRR, however, no typically developing child in either age group would have been characterized as having a phonological disorder. Based on PCC scores, the severity category changed for a number of children, most typically from moderate-severe to mild-moderate. This shift in diagnostic category was also evidenced by the children in Washington and Craig's (1992) study. In their study, the diagnostic category changed for children with "impaired speech." The diagnostic category changed for 5 of 16 children; 3 from severe to moderate and 2 from mild to normal. There was no effect for the children in the "non-impaired speech" group in their study.

The results from the current study revealed that in addition to some typically developing children being misidentified as having a phonological disorder if dialect features were not taken into account, certain phonological processes evident in both typically developing children and those children with phonological disorders might have been unnecessarily targeted for intervention based on their high percentage of occurrence in relation to the GSR. For the children diagnosed with phonological disorders, a decision must be made by the speech-language pathologist as to which specific phonological targets should be chosen for intervention. Using McReynolds and Elbert's (1981) suppression criterion of 20% and Hodson and Paden's (1991) 40% criterion for targeting a particular phonological process during intervention, the number of children with phonological disorders for whom specific processes (final consonant deletion, liquid simplification, and weak syllable deletion) would have been intervention targets decreased dramatically in comparison to the PRR. In addition, if speech-language pathologists applied the more stringent 40% criterion suggested by Hodson and Paden, inappropriate intervention goals are even less likely to be prescribed. Thus, accounting for dialect features has an impact not only on the number of children being identified with a phonological disorder, but also on possible intervention targets. Speech-language pathologists, then, need to be concerned about the identification of children with phonological disorders and their intervention goals.

There was one factor, age, that affected both the PCC scores and the percentage of occurrence for phonological processes. Recall that the results from the ANOVA indicated, for PCC, an interaction of phonological status and age. This result is not surprising, because one would expect the rate of change in PCC to be greater for typically developing children than for children with phonological disorders. In general, younger children (i.e., 3-year-olds) showed a larger discrepancy between the GSR and PRR than did older children (i.e., 4-year-olds). For example, of the 25 children who would have been characterized with at least a mild phonological disorder based on the results of the PCC scores if dialect features had not been considered, 19 were 3-year-olds and only 6 were 4-year-olds. The age of the children also affected the magnitude of the percentage of occurrence decrease across the three phonological processes that showed variances between the GSR and PRR. In general, younger children exhibited a larger change between the two referents than did older children. In typically developing children, 3-year-olds showed a larger decrease than 4-year-olds (an average decrease of 36% compared to 12% in 4-year-olds). In children with phonological disorders, 3-year-olds also showed a slightly larger decrease than 4-year-olds (an average decrease of 28% compared to 23% in 4-year-olds).

Differences across age groups might be due to younger children consistently using more dialect features than older children. That is, the younger children exhibited greater dialect density. McGregor and Reilly (1998) found higher dialect density for morphosyntactic dialect features in younger AAE speakers than in older AAE speakers. This general tendency might also be evident with phonological features and is reflected in the observed higher discrepancy between the GSR and the PRR for the younger children as compared to the discrepancy scores for older children. The question still remains, though, as to why younger children exhibit higher dialect densities. One alternative, as suggested by Washington and Craig (1992) in their explanation of differences across studies on phonological errors in AAE speakers, is that the differences could be accounted for by geography. This would mean that younger children used a sub-dialect of Puerto Rican Spanish that had a higher dialect density than the one used by the older children. This explanation is possible and is consistent with Terrell's (1981) findings that dialect differences exist between urban/rural and coastal/inland Puerto Rican Spanish. It should be noted, however, that all of the speakers in the present study were randomly selected from one speech community. An alternative explanation might be that the nature of the data collection task influenced the results. Poplack (1980) noted that the use of dialect features varied based on speaking situation. In more informal speaking situations, segments tended to weaken (e.g., deletion of syllable-final /s/), whereas in formal situations, segments tended to be preserved. It may be that the older children in this study interpreted the picture naming task as a more formal speaking situation and thus preserved more segments than did the younger children.

In summary, taking Puerto Rican dialect features into account would have decreased the number of typically developing children who were labeled as having a phonological disorder. Although the accounting of Puerto Rican

dialect features would not have changed the classification of any child in the phonologically disordered group to typically developing, it would have decreased the severity rating for a number of children. This change in severity rating could affect intervention, for example, in terms of prognosis, number of goals, and types of goals.

Clinical Implications

The data from this study support the view that a Spanish-speaking child's dialect must be considered in any phonological analysis. By taking the features of Puerto Rican Spanish into account, there was a decrease in the number of consonant errors, number of errors within individual sound classes, and percentage of occurrence for phonological processes, and an increase in PCC. Although the differences in the group data on number of errors and PCC were not statistically significant, the differences do seem to be clinically significant in terms of overall characterization of children with phonological disorders and the choice of potential phonological targets for intervention. Recall that almost half of the typically developing children would have been characterized with at least a mild phonological disorder based on their PCC score. In addition, final consonant deletion, liquid simplification, and weak syllable deletion might have been considered incorrectly as intervention targets for a number of children with phonological disorders if the features of the Puerto Rican dialect of Spanish were not taken into account. Using the more stringent 40% criterion would have further refined speech-language pathologists' abilities to choose more appropriate "intervention target pattern priorities" (Hodson, 1986, p. 35). Employing the 40% criterion, however, ameliorates, but does not eliminate, the problem that is encountered when Spanish dialect features are not taken into account.

Because it is impractical for phonological assessments to be developed for specific Spanish dialect groups, speech-language pathologists must be vigilant in their analyses and take into account all features of a child's dialect, whether using formal (i.e., standardized assessments of phonology) or informal measures (e.g., connected speech samples). Speech-language pathologists interested in analyzing errors of dialects other than Puerto Rican Spanish might want to consult other sources describing those features (e.g., Goldstein, 2000; Vaquero, 1996). Taking dialect into account still leaves sufficient "potential errors" that would differentiate typically developing children from ones with phonological disorders. The failure of speech-language pathologists to account for dialect features in the speech of Spanish-speaking children of Puerto Rican descent may result in the increase of false positives (i.e., labeling typically developing children as having a phonological disorder).

Speech-language pathologists may have to consider other factors in the phonological assessment of Spanish-speaking children as well. First, all of the children in the current study lived in the same speech community. Studies of African American children have shown a regional influence in the exhibition of dialect features (Washington & Craig, 1992). Thus, it may be necessary to collect speech samples from the child's peers, older children, and adults in the community in which the child resides. Second, because Spanish dialects differ markedly from one another, it is imperative to examine dialects other than Puerto Rican Spanish to determine the extent to which this phenomenon is as prevalent for other dialects of Spanish.

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Appendix

Characteristics of Puerto Rican Spanish

Spanish Phonology

There are 18 consonant phonemes in General Spanish (i.e., that version of Spanish that is spoken in some regions of Spain and taught in the American educational system): the voiceless unaspirated stops, /p/, /t/, and /k/; the voiced stops, /b/, /d/, and /g/; the voiceless fricatives, /f/, /x/, and /s/; the affricate, /tʃ/; the glides, /w/, and /j/; the lateral, /l/; the tap /ɾ/ and trill /r/; and the nasals, /m/, /n/, and /ɲ/. The three voiced stops /b, d, g/ are in complementary distribution with the fricatives [ß, ð, ɣ], respectively. The fricative allophones most generally occur intervocalically both within and across word boundaries (e.g., /xabón/ [xaßón] *soap* and /la gata/ [laɣata] *the cat-female*).

Puerto Rican Spanish

The Puerto Rican dialect (Cotton & Sharp, 1988; Poplack, 1980; Terrell, 1981) can be distinguished from General Spanish along a number of parameters that are listed below. By delineating these features, we are not suggesting that all Puerto Rican Spanish speakers make use of every dialect feature.

***Fricatives*:** There are five rules that either weaken or delete fricatives in the Puerto Rican dialect of Spanish. First, syllable-initial /x/ is substituted by [h]; for example, /xamón/ *(ham)* → [hamo]. Second, word-final /s/ may be deleted, and the preceding vowel may or may not lengthen; for example, /dos/ *(two)* → [do:] or /dos/ → [do]. Third, syllable-final /s/ may be deleted and may or may not aspirate the preceding vowel; for example, /esto/ *(this)* → [eʰto] or /esta/ → [eta]. Depending on socioeconomic status and educational level, syllable-final /s/ may be maintained in many speakers of this dialect (Poplack, 1980). However, in the community of Puerto Rican Spanish speakers used in this study, syllable-final /s/ tended to be deleted with aspiration on the preceding vowel. Fourth, unstressed syllables with syllable-final /s/ are deleted; for example: /eskoba/ *(broom)* → [koßa]. Fifth, the intervocalic interdental fricative is deleted; for example: /deðo/ *(finger)* → [deo]. Finally, the labiodental fricative becomes a bilabial fricative in initial and medial positions and following /n/; for example, /kafe/ *(coffee)* → [kaɸe] and /enfermo/ *(sick)* → [emɸermo]. In the latter example, bilabial assimilation also occurs.

***Liquids*:** There are two rules that affect liquids. First, the trill /r/, in either word-initial or intervocalic position, becomes the uvular trill [ʁ] or the velar fricative [x]; for example, /roxo/ *(red)* → [ʁoho]/[xoho] or /pero/ *(dog)* → [peʁo]/[pexo]. Second, in word-final position and before alveolars, the flap /R/ is substituted by /l/; for example: /floɾ/ *(flower)* → [flol] or /soɾtixa/ *(ring)* → [soltiha].

Glide: There is one rule that affects glides. The glide /j/ becomes the voiced alveopalatal affricate [dʒ]; for example, /kaßajo/ *(horse)* → [kaßadʒo].

***Nasals*:** The two rules affecting nasals are in free variation. First, word-final /n/ is deleted and the preceding vowel is nasalized; for example: /raton/ *(mouse)* → [Ratõ]. Second, the word-final alveolar nasal becomes velarized in word-final position (usually before a following vowel or a long pause); for example, /raton/ → [Ratoŋ].

Erratum

In the August 2001 issue of *AJSLP* (Vol. 10, No. 3, pp. 246–247), the authors listed for the computer program "Following Directions: One- and Two-Level Commands" are Wilson and Fox. In fact, the author is Eleanor Semel.