

The Effects of Puerto Rican Dialect on Phonological Analysis in Typically Developing 3-5 year-olds Children

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May 2011

Introduction

The 2010 Census reported that the population in Puerto Rico decreased by nearly three hundred thousand people between 2000-2010. The effects of the Puerto Rican population in the U.S., as confirmed by the 2010 Census, states it is the the second largest Hispanic population in the U.S., consisting of 11.3% of all Hispanics in the US. The influx of Puerto Rican's can be found mainly in the East Coast (Massachusetts 8.8%, Connecticut 6.4%, New York 5.9%, New Jersey 5.1%, Rhode Island 4.0%, Florida & Illinois 3.5%, and Pennsylvania 3.3%). This growth of Puerto Rican population in the U.S. will likely affect speech-language pathologist caseload since this will increase the diversity of Spanish dialects in the U.S., augmenting demand for bilingual service and the need for research focused on obtain normative data of Spanish-English bilingual development and consideration of dialect-feature differences.

Few studies have focused on the impact of dialect features on phonological assessments. In the early 1990's three studies focused on African-American English dialect and its impact on standardized assessments (Washington & Craig, 1992; Cole & Taylor, 1990; and Fleming & Hartman, 1989). One study, by Goldstein & Iglesias (2001) focused on the Puerto Rican dialect of 3- & 4-year olds typical and phonological disorder children from Philadelphia, Pennsylvania and its impact on a phonological analysis. The conclusion of all four studies indicated that dialect features marked as errors result in mislabeling and/or affecting the severity level of a child's communication disorder. The author's urge SLPs to take this into consideration during assessment and intervention planning.

Purpose

Previous studies have focused on bilingual acquisition of children living in the U.S.; however, limited research has been conducted to determine speech acquisition of Puerto Rican children living in Puerto Rico. It is essential to investigate this group since Puerto Rican's are a fast growing population in the U. S. and practitioners need to understand how typically developing children of similar backgrounds develop sound systems.

The purpose of this study was to determine if dialect features affect the results of a phonological analysis on typically developing monolingual Puerto Rican children.

Questions:

1. Do dialect features impact the number of consonant errors and PCC produced?
2. Do dialect features increase the percentage of phonological processes?
3. Do dialect features influence severity and/or misdiagnosis of phonological disorders in typically developing Puerto Rican children?

Methods

Participants:

18 typically developing monolingual Puerto Rican children interviewed from a Pre-school in Santurce, Puerto Rico, eleven females and seven males.

- Participants divided into three age groups: 3.1-3.10 (6), 4.1-4.10 (7), and 5.1-5.9 (5)

- Participant Criteria: Puerto Rican Spanish primary language spoken at home; typically developing (no parent concern reported on the parent questionnaire); no evidence of organic anomalies related to speech or hearing mechanism; and no prior history of speech-language treatment.

Evaluation Instrument:

- PABA- Phonological and Articulation Bilingual Assessment, contains pictures to elicit monosyllabic and multisyllabic word structures (Gildersleeve-Neumann, 2011)
- Participants were individually assessed in their pre-school setting and were prompt to name the different pictures when asked “¿Qué es esto?, ¿Como se llama?”
- Administration time 10-20 minutes and all sessions were audio recorded
- The author of this study transcribed single word responses and transcriptions were analyzed by Logical International Phonetics Program software (LIPP, Oller & Delgado, 2000).

Data Scoring

In order to determine the effect of the PR dialect features both the phonetic and phonological process information was examined. (Goldstein & Iglesias, 2001; Shriberg & Kwiatkowski, 1980).

- Phonetic Analysis: determine the amount of consonant errors (total and mean), percentage of consonants correct (PCC), and consonant sound class errors.
- Phonological processes: 9 commonly occurring processes were chosen because they have been reported to frequently occur in typically developing children’s speech and they have shown to capture 85-95% of the errors in speech. These are: final consonant deletion, stopping, liquid simplification, cluster reduction, velar fronting, palatal fronting, assimilation, weak syllable deletion, and initial consonant deletion (Goldstein & Iglesias, 2001; Shriberg & Kwiatkowski, 1980).

Analysis of the Data

In order to demonstrate the impact of Puerto Rican dialect feature on phonological assessments the data was analyzed twice.

1. The single word transcriptions were analyzed under the General Spanish Referent (GSR). Data analyzed without taking into consideration the Puerto Rican dialect.
2. The single words were re-analyzed under the Puerto Rican Referent (PRR) taking Puerto Rican dialect into consideration.

Puerto Rican Dialect

A description of the Puerto Rican dialect as investigated by Poplack (1980) and Terrell (1981) can be distinguished from the General Spanish Referent by: two rules affecting nasals and liquids, one rule affecting glides, and five rules that either weaken or delete fricatives. Table below provides the rules in more details

| Manner | Rules Affecting |
|---------------------------------|---|
| Nasals | Word-final /n/ is deleted and the preceding vowel is nasalized; For example: /raton/ > [ratõ] |
| | Word-final /n/ becomes velarized; For example: /raton/ > [ratõŋ] |
| Glide | Glide /j/ becomes the voiced palato-alveolar affricate [dʒ]; For example: /kaβajo/ → [kaβaɟo] |
| Liquids: Trill & | Word-initial & intervocalic trill /r/ become uvular trill [R] or velar fricative [x]; For example: /roxo/ → [Roxo]; /pero/ → [pexo] |

| | |
|-------------------|--|
| Tap | Word-final & before alveolar tap /r/ is substituted by /l/; For example: /flor/→[fɫol]; /sortixa/→[soltija] |
| Fricatives | Syllable-initial /x/ becomes /h/; For example: /xamón/→ [hamón] |
| | Weak syllable with syllable-final /s/ is deleted; For example: /eskoβa/→[koβa] |
| | Word-final /s/ is deleted and the preceding vowel may or may not be lengthened; For example: /dos/→[do] or [do:] |
| | Syllable-final /s/ deleted and may or may not be aspirated [h]; For example: Deleted: /eskwela/→[ekwela] Aspirated: /eskwela/→[ehkwela] |
| | Intervocalic interdental fricative /ð/ is deleted; For example: /deðo/→[deo] |

Results

Out of 10 rules described as part of the Puerto Rican dialect by Poplack (1980) and Terrell (1981) only 5 rules were observed in these language samples and 3 new rules were included as part of the PRR.

Rules not observed and not included were:

- Two Nasal rules: word-final /n/ becoming velarized and/or deleted
- One Liquid rule: word-initial & intervocalic /r/ becoming the uvular [R] or velar fricative [x]
- Two Fricative rules: syllable-initial /x/ becomes /h/; and weak syllable with syllable-final /s/ deletion. (Small percentage of occurrence seen in 3yo: 2.5% of weak syllable deletion)

Rules included:

- One Glide rule: /j/ substitution with voiced palato-alveolar fricative [ʒ]. Produced >10% and was included as a PRR. For example: /sepijo/→[sepizɔ]
- Two Tap rules: tap /r/ before a bilabial and a velar was also substituted by /l/. Produced more than 30% across all age groups and included as part of PRR; For example:
 - Before bilabials /ermano/→[elmano]; /arβol/→[alβol]
 - Before velar /amburyesa/→[ambulyesa]; /arkoiris/→[alkoiris]

Phonetic Analysis:

Total of Consonant Errors: by comparing these two referents we can observe that GRS shows larger number of total consonant errors. The total amount of consonant errors decreased by 55% across all age groups when taking into consideration the Puerto Rican Referent.

| | 3-year olds | 4-year olds | 5-year olds |
|---------------------------------|-------------|-------------|-------------|
| General Spanish Referent | 376 | 310 | 211 |
| Puerto Rican Referent | 231 | 104 | 69 |

Percent of Consonant Correct: (mean) the data shows that age group's PCC slightly increased in comparison to PRR. Previous studies have relied on the use of GSR to calculate

Spanish-monolingual children’s PCC. The use of GRS to calculate PCC in monolingual Puerto Rican children increases the risk of mislabeling and misdiagnosing a speech-sound disorder.

| | 3-year olds | 4-year olds | 5-year olds |
|---------------------|-------------|-------------|-------------|
| GSR PCC Mean | 82 | 88 | 88 |
| PRR PCC Mean | 89 | 96 | 96 |

PCC t-test: a paired sample t-test was conducted to compare the PCC means of GSR and PRR. All age groups p-values were less than the Bonferroni correction of p.017, demonstrating a statistical significant difference between the two referents. The t-test demonstrates that not taking into consideration the PRR when calculating PCC participants run the risk

| AGE | GSR | PRS | T-test | S/N |
|------------|----------------|----------------|---------------------------------|-------------|
| 3yo | M=82.33 (5.50) | M=88.67 (4.50) | T(5)= -9.50, p=.000 | Significant |
| 4yo | M=87.71(3.40) | M=95.57(2.76) | T(6)= -4.84, p=.003 | Significant |
| 5yo | M=88.40(3.91) | M=96.20(1.79) | T(5)= -5.33, p=.006 | Significant |
| α:0.05 | | | Bonferroni Correction: p < .017 | |

Shriberg & Kwiatkowski (1982) assessing severity-ranking scale: uses the PCC scores to determine the severity level of a participant’s speech-sound development and/or severity. In this study it was observed that by not taking into consideration the PRR 14 out of 18 participants presented mild to mild-moderate speech-sound disorder because there PCC mean scores fell below 90%. However, by taking into consideration the PRR 4 out of the 18 participants PCC mean score fell below 90%, revealing the majority of the participants rank within the typically developing margins.

Ranking:

- 100%-90% Typically Developing
- 90%-85% Mild Disorder
- 85%-60% Mild-Moderate Disorder
- < 65% Severe Disorder

GSR PCC Assessing Severity Results:

| 3yo | 4yo | 5yo |
|--|---|--|
| 1= mild (90%) 5= mild-moderate disorder (75%-85%) | 2= typical developing (92%) 2= mild (88%-90%) 3= mild-moderate disorder (84%-85%) | 2= typically developing (94%-91%) 2= mild (86%) 1= mild-moderate (85%) |

PRR PCC Assessing Severity Results:

| 3yo | 4yo | 5yo |
|---|----------------------------|----------------------------|
| 2= typical (94%-91%) 2= mild (90%-89%) 2= mild-moderate (83%-84%) | All (7)= typical (91%-98%) | All (5)= typical (94%-98%) |

Percentage of Consonant Correct Sound Class Errors:

To examine the effects of dialect referent on specific sound classes, an analysis of PCC within each sound class was completed for both referent GSR and PRR. The results demonstrate a change in accuracy on three sound classes (fricative, glide, and tap). The magnitude of increase varied between sound classes, due to the participant's age and their age appropriate phonetic development. The sound class that demonstrated the largest percentage of increase in all three age groups was two fricatives, the [s] and the intervocalic interdental fricative [ð]. The intervocalic interdental fricative [ð] was deleted; for example /deðo/→[deo]. The syllable-final /s/ and word-final /s/ may be deleted and may or may not be aspirated preceding a vowel; for example /eskuela/→[ehkuela] or [ekuela]. The tap demonstrated different results among the three age groups. In word-final position and before bilabials, alveolar, and velars, the tap [ɾ] was substituted by /l/. In addition, it was observed that the 3 year-olds group substituted the tap [ɾ] for the glide /j/, for example: /arkoiris/→ /ajkoiris/. Finally the glide /j/ was substituted the voiced palate alveolar [ʒ] and the voiced alveopalatal affricate [dʒ]. In summary, not taking into consideration dialect features will result in participants demonstrating a higher percentage of consonant errors, lower PCC, and greater specific sound class errors.

Phonological Processes Analysis:

Three out of nine frequently occurring phonological processes were affected by the PRR by more than 10%, and exhibited percent changes of occurrence between GSR and PRR. These were: final consonant deletion, liquid simplification, and cluster reduction. The phonological processes dramatically decrease when PRR is taken into consideration, with the exception of cluster reduction in the 3-year olds group.

For all age groups final consonant deletion was the largest phonological processes observed and demonstrated the greatest decrease of occurrence when PRR is applied by 95%. The second largest phonological processes were liquid simplification, which decrease an average of 64%. Cluster reduction showed the smallest decrease between the two referents of 38%. The majority of the cluster reductions were /s/ clusters which were deleted or aspirated.

GSR vs. PRR

| AGE | Phonological Processes | GSR | PRR |
|------------|--------------------------|-----|-----|
| 3yo | Final Consonant Deletion | 30% | 2% |
| | Liquid Simplification | 20% | 8% |
| | Cluster Reduction | 17% | 15% |
| 4yo | Final Consonant Deletion | 42% | 1% |
| | Liquid Simplification | 21% | 3% |
| | Cluster Reduction | 8% | 4% |
| 5yo | Final Consonant Deletion | 36% | .8% |
| | Liquid Simplification | 17% | .6% |
| | Cluster Reduction | 8% | 3% |

Percent of Participants Exhibiting Phonological Processes

By not taking into consideration the PRR, the majority of the participants would have been unnecessarily treated for a phonological disorder that was influenced by dialect features. By taking into consideration the PRR there percent of phonological processes dramatically decreased and none of the participants would require intervention.

| | GSR | PRR |
|---------------------------------|-------------------------|-------------------------|
| Final Consonant Deletion | 3yo: 5 out of 6 (m=35%) | 3yo: 3 out of 6 (m=5%) |
| | 4yo: 6 out of 7 (m=48%) | 4yo: 2 out of 7 (m=.6%) |
| | 5yo: 5 out of 5 (m=37%) | 5yo: 1 out of 5 (m=7%) |
| Liquid Simplification | 3yo: 5 out of 6 (m=18%) | 3yo: 2 out of 6 (m=7%) |
| | 4yo: 5 out of 7 (m=21%) | 4yo: 5 out of 7 (m=5%) |
| | 5yo: 4 out of 5 (m=18%) | 5yo: 1 out of 5 (m=3%) |
| Cluster Reduction | 3yo: 5 out of 6 (m=17%) | 3yo: 4 out of 6 (m=16%) |

Conclusion

This study agrees with the previous studies, indicating that not taking dialect features into consideration does affect the phonetic and phonological analysis of typically developing children. Not taking into consideration dialect features increase the risk of over diagnosis and unnecessary treatment.

Questions:

1. Do dialect features impact the number of consonant errors and PCC produced?
 - a. Yes, taking into consideration PRR, consonant errors reduced dramatically while PCC increased when dialect features were taken into consideration.
2. Do dialect features increase the percentage of phonological processes?
 - a. Yes, final consonant deletion, liquid simplification, and cluster reduction were all affected by the Puerto Rican dialect features.
3. Do dialect features influence severity and/or misdiagnosis of phonological disorders in typically developing Puerto Rican children?
 - a. Yes, when dialect features are not taking into consideration, 9 participants ranked as having mild-moderate phonological disorder, 5 with mild disorders, and only 4 were labeled as typically developing. However, when dialect features were taken into consideration 14 were ranked as typically developing under the Shriberg & Kwiatkowski Assessing Severity scale.

Limitations

- Small number of participants
- Participants from one location in Puerto Rico: Capital Metropolitan Area
- Participant's parents bachelor and higher education
- Participants of middle-, upper- SES

Clinical Implication

This study does not suggest that all children from Puerto Rico will demonstrate all of these dialect features. The purpose is to make clinicians aware of possible impact Puerto Rican dialect has on phonetic and phonological analysis and to present the Puerto Rican dialect features into more details.

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