

# ***ECHO***

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**ECHO:** An international e-journal concerning communication and communication disorders within and among the social, cultural and linguistically diverse populations, with an emphasis on those populations who are underserved.

***ECHO is the Official Journal of the  
National Black Association for Speech-Language and Hearing***



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## *About the Editor*

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## *About the Journal*

ECHO is a refereed journal that welcomes submissions concerning communication and communication disorders from practitioners, researchers, or scholars that comprise diverse racial and ethnic backgrounds, as well as academic orientations.

ECHO welcomes submissions from professionals or scholars interested in communication breakdown and/or communication disorders in the context of the social, cultural, and linguistic diversity within and among countries around the world. ECHO is especially focused on those populations where diagnostic and intervention services are limited and/or are often provided services which are not culturally appropriate. It is expected that scholars in those areas could include, but not limited to, speech-language pathology, audiology, psychology, linguistics, and sociology.”

Articles can cover to any aspect of child or adult language communication and swallowing, including prevention, screening, assessment, intervention, and environmental modifications. Special issues of ECHO concerning a specific topic may also be suggested by an author or initiated by the editor.

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- Communication breakdowns among persons due to culture, age, race, background, education, or social status
- Use of the World Health Organization's International Classification of Functioning, Disability, and Health (ICF) framework to describe communication use and disorders among the world's populations.
- Communication disorders in underserved or marginalized populations around the world
- Service delivery frameworks for countries' minority populations, including those who are minorities for a variety of reasons including race, religion, or primary language spoken.
- Dialectical differences and their effects on communication among populations
- Evidence base practice research with culturally and linguistic diverse populations
- Provision of communication services in low income/resource countries
- Provision of communication services in middle income/resource countries
- Provision of communication services to immigrant and/or refuge populations
- Effects of poverty on communication development and the provision of services
- Education/training issues in serving diverse populations
- Ethical issues in serving diverse populations
- Role of religion in views of communication disability and its effect on service delivery

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- research papers using quantitative or qualitative methodology
- theoretical discussion papers
- works using disability frameworks or models
- critical clinical literature reviews
- tutorials
- clinical forums
- description of clinical programs
- scientifically conducted program evaluations demonstrating effectiveness of clinical protocols
- case studies
- letters to the editor.

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- Affirms that the manuscript has not been published previously, including in an electronic form;
- Affirms that the manuscript is not currently submitted elsewhere;
- Affirms that all applicable research adheres to the basic ethical considerations for the protection of human or animal participants in research;
- Notes the presence or absence of a dual commitment;
- Affirms that permission has been obtained to include any copyrighted material in the paper; and
- Supplies his or her business address, phone and fax numbers, and e-mail address.

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## *Current Issue*

*DIALECTAL VARIATIONS IN SPANISH PHONOLOGY: A LITERATURE REVIEW*, Silvia Martinez, EdD, CAS, CCC-SLP, *Howard University, Washington, DC*

*NARRATIVE ABILITIES OF SECOND GRADE AFRICAN AMERICAN CHILDREN*, Nancy L. Martino, PhD, CCC-SLP, *Xavier University of Louisiana, New Orleans, LA*

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# ***ECHO***

## ***DIALECTAL VARIATIONS IN SPANISH PHONOLOGY: A LITERATURE REVIEW***

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### **ABSTRACT**

The Spanish language comprises a number of dialects which are reflected in all linguistic parameters, including phonology. Differential diagnosis depends on descriptions of variations characterizing the diverse linguistic population in the United States. In order to address the limited information on dialectal variations of Spanish phonology available to clinicians, a literature review was conducted to address eight Spanish speaking countries. Theories on the origins of Spanish in the new world are summarized and a table of phonological variations is presented. The information also addresses the paucity of information with regard to Central American dialectal features.

**KEY WORDS:** Spanish, Phonology, Dialects, Central America Dialects, Language Diversity

## DIALECTAL VARIATIONS IN SPANISH PHONOLOGY: A LITERATURE REVIEW

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### INTRODUCTION

It is a well established ethical and procedural understanding that speech and language diversity may not be the basis for diagnosing communication problems in individuals. The American Speech-Language and Hearing Association (1993) states that “A speaker of any language or dialect may exhibit a language disorder unrelated to his or her use of the native dialect. An essential step toward making accurate assessments of communication disorders is to distinguish between those aspects of linguistic variation that represent regular patterns in the speaker's dialect and those that represent true disorders in speech and language (p. 2).” To effectively enforce this aim, dialectal differences must be studied, identified and presented in forums for clinicians to use. A prime example is the interest placed on African American English. A corpus of research relevant to African American English (Craig, Thompson, Washington, & Potter, 2003; Green, 2002; Seymour, Bland-Stewart, & Green, 1998; Washington & Craig, 1994, 2002) has shown finite dialectal differences through descriptive analysis of cultural, speech and language features. Studies have also enhanced our knowledge of developmental characteristics of AAE (Craig & Washington, 2004; Coles-White, 2004; Oeting & McDonald, 2001), as well contrastive analysis procedures (McGregor, Williams & Hearst, 1991) between standard and dialectal variations. All have been used to better serve clients during prevention, assessment, treatment, and other service delivery activities.

Validity in identifying persons with speech disorders is a challenge when dialectal variations are present. Speech-Language Pathologists and Audiologists with Spanish speaking clients face the similar challenges as those who address AAE and other English dialects. The challenge may be fairly harder in the face of the large diversity of dialectal features of Spanishes from Latin America present in the U. S. Demographically the largest groups of Hispanics comprise Mexicans (58.5%), followed by Puerto Ricans (9.6%), Cubans (3.5%), and Dominicans (2.2). Others include Central Americans (4.8%), South Americans (3.8%) and Others (17.8%). Nevertheless, in spite of the rich diversity of features of Spanish, there is a paucity of information in the field of communication sciences and disorders describing dialectal variations or clinical implications.

There are many linguistic differences between Spanish speaking groups. Differences appear in semantics, where the Mexican ‘papalote’ and Puerto Rican ‘chiringa’ stand for ‘kite’, or the more interesting case of using the verb ‘to bring’ by Salvadorans instead of the verb ‘to pick up’ such as in “Vine a traer la pizza.” (I came to bring the pizza.) for the expected “Vine a recoger la pizza.” (I came to pick up the pizza.) at a pizza take out. Similarly, an example of linguistic variety with regard to morphemes may be found in Guatemala. The verb form ‘to have’ appears as ‘tenés’ (accented on the final syllable) when accompanied by the second person singular informal pronoun ‘vos’ as in “¿Tenés vos (pronoun optional) mi libro?” (Do you have my book?). But, in Puerto Rico, the same sentence, when accompanied by the second person singular informal pronoun “tu”, would be “¿Tienes tu (pronoun optional) mi libro?”, or, when accompanied by the second singular formal pronoun “usted”, would be “¿Tiene usted (pronoun optional) mi libro?” Finally, in phonology the phoneme /s/ - depending on linguistic environmental constraints - may realize itself as [θ] in Honduras, as [ʃ] in Mexico, or as [h] in El Salvador. Unsurprisingly, such differences pose a challenge to clinicians serving clients from Spanish speaking countries.

In keeping with these challenges, this article expands on the information previously reported by Goldstein (1995, 2000), regarding Spanish phonological dialects. Goldstein, the source most used in our fields, has illustrated variations of Mexicans, Cubans, Dominicans and Puerto Ricans. To address the ever increasing variety of Spanishes being encountered by clinicians in the United States, information is being offered to include the following countries: Guatemala, Honduras, Nicaragua, and El Salvador.

### SPANISH DIALECTOLOGY

Origins. Lipski (1994) states that, in general, Spanish accents are identified by both “suprasegmental and segmental phonetic traits” (p.9). These originated from a variety of variables such as, political boundaries, distribution of indigenous populations, social and geographic European origins of settlers, lack of homogeneity of settlers, social/economic/political isolation and integration, and chronology of settlements. Therefore, Latin American Spanish dialects cannot so readily be defined as one would hope.

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Canfield (1981), Cotton and Sharp (1988), Hualde (2005), Lipski (1994), and Penny (2000), have described the origins of the American Spanish dialects. The starting point for many is to revisit the Spanish dialects in Spain spoken by the settlers at the time of colonization. There are two main dialects - in the broad sense - from Spain and an extension of one of these dialects in the Canary Islands. From the Northern-Central Peninsular Spanish, represented by the Castilian and more formal language (also known as the Madrid form), one can trace the deletion of final stop consonants (“verdad” (true) /bɛɫdad/ → [bɛɫda]), the deletion of /-d/ in participle -ado (“lavado” (washed) /labado/ → [labado]), and simplification of syllable-final consonant clusters (“próximo” (next) /prɔksimo/ → [prɔsimo]). The southern peninsular Spanish - which includes the Andalusian variety - tends to weaken or reduce some consonants. For example, the aspiration or loss of final /s/ in words, or before consonants (“casas” (houses) /kasas/ → [kasa]), velarization of final n /ŋ/ (“pan” (bread) /pan/ → [paŋ] and weakening of /tʃ/ (“escucha” (listen) /ɛskutʃa/ → [ɛskuʃa]). The variations from the Canary Islands are similar to those of the southern features, because the original Canary Island settlers were from the southern Spanish peninsula who maintained continued communication with the mainland.

The reflection of these dialects on specific geographical regions of Spanish America is not quite discreet. That is, while the variations from the Canary Islands appear more overt in the Caribbean, the influence of the Castilian and Andalusian variations cannot be identified by specific regions per se (Hualde, 2005). Different from the settling pattern of the English language in the United States which spanned starting from the East toward the West, and in relatively a short time with relatively homogenous individuals, Spanish colonization can best be described as spotted throughout the Latin American geography. That is, the upper class Castilians, were from the center of the Spanish government. They were responsible of the New World administration of governments, fiscal and religious affairs. These settlers carried out the commands of the crown from governing centers which were mostly found in high land regions, most importantly Mexico and Peru. On the other hand, Seville (in Andalusia) had been granted a monopoly of trade with the new world (Penny, 2000). As a result, the majority settling in the low land trading regions such as coasts, was either Andalusian, or from the Canary Islands (highly influenced by the Andalusians). Other settlers also included those linguistically influenced by the Andalusians either in Spain or in the long voyages to the new world. Therefore, the Castilians, being at the center of the new world government maintained communication with Spain, whereas many Andalusian communities (except those in the coasts) were isolated from the rest of the settlers and the new world. Beyond settlement explanations each country’s Spanish variety may be influenced by a diversity of indigenous languages, which include variations within themselves. For example, Boyd-Bowman (1960) states that Quechua lacks /f/ in Ecuador, Peru and Colombia.

Therefore, the tendency is to substitute this phoneme with [β], [x] and [h]. Hualde (2005) mentions the Mexican Spanish having the syllable onset consonant cluster /tl/ (as in the word chipotle) originating from the Nahuatl, and a glottal stop between vowels in word boundaries (“la anciana” (the old woman) /la ansiana/ → [laʔ ansiana]) in Paraguay influenced by the Guarani language. Lipski (2007) has identified African language influences in Spanish speaking countries, although the original influences have for the most part disappeared. For example, he notes the final /r/ and /s/ deletion in some parts of Bolivia, Paraguay, Cuba and the Dominican Republic. He also notes the neutralization of the /d/ → [r] in the Dominican Republic, Colombia, Ecuador, Peru, Venezuela and Panama. Unsurprisingly, some non-Spanish European languages have also impacted the phonological picture in the Americas. An example is Italian which has influenced the language in Buenos Aires, Argentina. This dialect, known as Rioplatense Spanish is characterized by a deletion or substitution with [h] of final /s/ except before consonant, deletion of final /r/ in verb infinitives (“querer” (to love) /kɛrɛr/ → [kɛrɛ]), and substitution of /j/ for /ʒ/ (“silla” (chair) /sija/ → [siʒa]).

## VARIATIONS

The Spanish language in the Americas consists of five vowels sounds /i/, /ɛ/, /u/, /o/, and /a/. Most linguists will identify 18 consonant sounds: /p/, /b/, /t/, /d/, /k/, /g/, /tʃ/, /f/, /s/, /x/, /j/, /m/, /n/, /ɲ/, /l/, /r/, and /r/. The /w/ may also be included (Nuñez-Cedeño & Morales-Front, 1999), although some construe it as an English adoption. Nevertheless, it is found in words such as “huevo” (egg) /wevo/. There is one other consonant sound which is open for debate. In orthography there is a distinction between the letters “b” and “v”, but the majority of Spanish speakers does not make a distinction and therefore produce /b/ for both representations. Nevertheless, Hualde (2005) explains that bilingual speakers may make the distinction if their other language does use it. He also explains and that there are countries where the phonological distinction is made as part of the “learning to read” process. For the intention of the work presented here, the total consonants described will be 19, including the /w/ and excluding /v/.

When addressing phonological variations of languages, linguists are faced with the challenge of identifying, for the sake of developing a model and describing phonological features, from which standard to depart. Frequently, the standard is identified by the empowered social strata and media formats, which in turn, are seen as more prestigious. For Spanish, the most prominent variation in the old world comes from Madrid and in the new world from Mexico City. Mexico City has a long-standing position in Latin American linguistics. First, for three hundred years it was the capital of New Spain, the Spanish colonial territory which included the now Mexico, Central America, parts of South America up to Costa Rica, and US states (California, Nevada, Utah, Colorado, Arizona, New Mexico and

Texas). Second, the Mexican media has become the Latin American media leader (television, news, soap operas, and movies).

For practical reasons dialectal variations are classified by political regions (i.e. Guatemala), geography (i.e. the Caribbean) or social/economic strata. These classifications, (particular country classifications), are the most useful when initially addressing client needs. The organization of sounds using these parameters also mirrors the sociolinguist literature. For example, Hualde (2005) has proposed a classification by region based on nine phonological traits. It distinguishes between seven regions (Mexico, Central America, the Andean region, Paraguay, Chile, and the River Plate region), while acknowledging that each region also comprise variations. Linguists have, as well, classified dialectal variations by indigenous influences, topographical regions (low versus high lands), and phonological traits. A discussion of each of the classification systems is beyond the scope of this paper but is worth noting since clinicians must be aware that within any classification system there are many variations stemming from the many influences at the core of diversity, including the fluidity of national borders, immigration patterns, etc.

Latin-American Spanish variations mainly occur in consonants. Hualde's (2005) regional classification previously alluded to, identified nine main phonological trait variations: aspiration of word and syllable final /s/, velarization of /n/, neutralization of final /l/ and /r/, deletion of intervocalic /-d-/, contrast between /k/ and /j/, pronunciation of /j/, pronunciation of /trill r/, pronunciation of /x/, pronunciation of /tʃ/. Canfield (1981) has described phonological variations in Central America. He states that Honduras, Guatemala, El Salvador and Nicaragua appear to form a "linguistic unit" with respect to phonology and syntax because they share many characteristics. In these three countries the substitution of /s/ → [θ] may appear, as would the substitution of /n/ → [ŋ] in final position. Still, there are differences. For example substitution of /s/ → [h] in final position only in Nicaragua. And finally, with respect to Guatemala, /s/ is always present in all positions. Goldstein (1995, 2000) summarized the literature on variations by manner of articulation (stops, nasals, fricatives, liquids, glides and affricates) of Mexicans, Cubans, Puerto Ricans and Dominicans. For example, he mentions the omission of /d/ in final word position by Cubans and Dominicans, the substitution of /b/ → [v] in initial word position by Mexicans, and the substitution of /n/ → [ŋ] in final word position by Cubans, Puerto Ricans and Dominicans. These allophonic realizations in Spanish speaking populations are as equally important to recognize and consider as the dialectal variations that occur in English. Just as with English dialects, Goldstein and Iglesias (2001) demonstrated that when dialectal variations in Puerto Rican children were accounted for "... the number of consonant errors, the number of errors within individual sound classes, and the percentage of occurrence for phonological processes all decreased (p. 403)." Furthermore, dialectal variations may influence the production

of English as a second language or the phonological awareness skills necessary for learning to read English text. For example, Cubans and Dominicans learning English may demonstrate interference problems when producing /d/ in final word positions of English words due to their dialectal constraints of final /d/ omission. For example, "sad" /sæd → [sæ]. It would not be a prediction for Mexicans to demonstrate interference problems when producing /d/ in final word positions of English words.

Research has mainly reported on the dialects of Mexicans and populations from the Caribbean (Puerto Rico, Santo Domingo), while Central Americans have been for the most part ignored. This represents a challenge to clinicians because the Hispanic population in the United States uses a wide spectrum of Spanish dialects. In fact, the speech and language differences of the more than 28.1 million (Census, 2003) Spanish speakers in the United States (data from Puerto Rico excluded) comprises a representation of Spanishes from Mexico (64%), Puerto Rico (9.0%), Cuba (3.4%), Dominican Republic (2.8%), Central America (7.6%), South America (5.5%), and others - such as from Spain - (7.7%) (U. S. Census Bureau, 2003). Developmental information, assessment tools and therapy materials presently available need to be supplemented with information about dialectal variations of the Central American and other communities.

Table 1 presents a list of dialectal variations by country. This table expands on the information presented by Goldstein (1995, 2000), the source most used in the field. Goldstein addressed Mexican, Cuban, Dominican and Puerto Rican dialects. Presently, with the ever increasing numbers of Spanishes in the United States, dialects from El Salvador, Guatemala, Honduras, Mexico, and Nicaragua have been included. Information for the elaboration of this table comes from the few well cited sources in the field of Spanish phonology (Bjarkman & Hammond, 1989; Canfield, 1981; Cotton & Sharp, 1988; Goldstein, 1995, 2000; Guitart, 1980; Hammond, 2001; Harris, 1980; Hualde, 2005; Jorge Morel, 1978; Lipski, 1994; Penny, 2000; Saciuk, 1980; Scavnick, 1980). The author has also contributed with own observations.

## PHONEMES AND ALLOPHONIC REALIZATIONS

Dialectal variations were described in 19 consonants. As can be seen in Table 1, the variations mainly occur as substitutions although omissions and additions do occur. Suprasegmental variations may also be present. For example, /r/ may manifest itself as [ø], [h] or [r]. Phonemes present a diversity of phonetic realizations intra and inter country, bound by phonetic context or word positions. Point in case is /d/ which is only omitted in intervocalic and word final positions in the Caribbean Islands of Cuba, Dominican Republic and Puerto Rico. Of all the phonemes /s/, /r/ and /r/ have the most reported variations. /s/ presented with 8, /r/ with 7, /r/ with 6 realizations.

The use of this table must take into account the following dialectal phenomena: a) not all speakers of the country will demonstrate the same dialectal variations, b) a speaker may not

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Table 1. Spanish Phonological Dialectal Variations

Phoneme	Allophonic realization	Cuba	Dominican Republic	El Salvador	Guatemala	Honduras	Mexico	Nicaragua	Puerto Rico
Plosives									
/p/	[b]								
	[k]								
/b/	[β]								
	[v]								
	[g]*								
/t/	[b]								
/d/	[ð]								
	[ø]								
	[r]								
/k/	[g]								
/g/	[ø]								
	[χ]								
	[ŋ]								
Fricatives									
/f/	[φ]								
/s/	[s]								
	[ʃ]								
	[z]								
	[k]								
	[θ]								
	[h]								
	[ø]								
	[ʔ]								
/f/	[φ]								
/x/	[ø]								
	[h]								
	[ħ]								
	[χ]								
	[y]								
/j/	[dʒ]								
	[ø]								
Affricates									
/tʃ/	[ʃ]								
	[tʃ]								
Nasals									
/m/	[ŋ]								
	[n]*								
/n/	[n]								
	[ŋ]								
	[ø]								
	[m]								
/ɲ/	[j]								
/m/	[ŋ]								

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Liquids									
/l/	[r]								
	[ʃ]								
	[ø]								
	[i]								
/r/	[ ]								
	[ø]								
	[l]								
	[ʃ]								
	[s]								
	[i]								
/r/	[χ]								
	[ɛ]								
	[r]								
	[r]								
	[ɰ]								
	[ɰ]								
	[s]								
	[l]								
	[h]								
	[ø]								
	[ŋ]								
Glides									
/w/	[gw]								

Sources: Blackman & Hammond, (1989); Canfield, (1981); Cotton & Sharp, (1988); Goldstein, (2000); Guitart (1980); Hammond, (2001); Harris, (1980); Hualde, (2005); Jorge Morel, (1978); Penny, (2000); Saciuk, (1980); Scavnick, (1980); \* Martinez observations

always exhibit all the dialectal characteristics, and c) speakers may be able to code switch between dialects. Furthermore, this table is not comprehensive because there may be more undocumented dialectal features and does not account for English influenced dialectal features in the United States. Equally important is that while some countries share allophonic variations, use may not be the same. For example, one country may have a rule of always omitting a phoneme while another country may only omit the phoneme based on specific phoneme boundaries (context) or word positions. Specifying rules by country is beyond this scope of this table.

**Plosives.** The following phonemes manifest variations: /p/, /b/, /t/, /d/, /k/, and /g/. /p/ may be voiced or may manifest itself as a [k]. Such is the case in the Dominican Republic where [k] appears before another plosive as in “septiembre” (September) /sɛptiɛmbɾɛ/ → [sɛktiɛmbɾɛ]. /b/ may be softened to [β] or [v] as in the Dominican Republic where “habla” (talks) /abla/ may appear as [aβla]. Another allophonic variation of the /b/ phoneme is found in Puerto Rico in the word “abuela” (grandmother) /abwɛla/ → [agwɛla] therefore becoming velar. /t/ and /k/ may assume a voiced nature when they borrow from the voicing of a vowel that may follow. With respect to the /d/ phoneme, three variations were documented. Most often than

not, /d/ appears as the interdental [ð] in the medial position in words. Exceptions are found in El Salvador, Honduras and Nicaragua where it may also appear in the initial position of words, such as in “dado” (dice) /dadɔ/ → [ðaðɔ]. It may also appear as [r] in rapid speech. In Puerto Rico and Mexico, /d/ may disappear as in the word “lado” (side) /ladɔ/ → [laɔ]. Regarding the /g/ phoneme, it may be omitted or may appear as the fricative [ɣ]. In El Salvador, it may adopt the characteristic of the nasal following it, so that the word “ignorante” (ignorant) /ignɔrante/ is produced as [iɲnɔrante].

The plosive variation shared by most countries was the /b/ → [β]. It was shared by the Dominican Republic, El Salvador, Guatemala Honduras and Nicaragua). Following was /g/ → [ɣ] which was shared by the Dominican Republic, El Salvador, Guatemala Honduras. The country with fewer plosive variations was Puerto Rico.

**Fricatives.** For the phonemes /s/, /f/, /x/, and /j/ there are variations reported. The realizations are all fricatives except for one realization that is a plosive and another that is an affricate. The /s/ becomes the velar dental [θ], similar to a lisp, in El Salvador, Honduras and Nicaragua. Therefore, the phrase “las manos” (the hands) /las manɔs/ is pronounced as [laθ manɔθ].

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It becomes and alveolar [z] in some parts of Mexico when producing “los dados” (the dice) /lɔs dadɔs/ → [lɔz dadɔz]. The literature also mentions it becoming the postalveolar [ʃ], the retroflex [ʂ] or the glottal plosive [ʔ]. When appearing before a plosive it may be changed into a velar such as [k]. This is the case in El Salvador where the word “estación” (station) /ɛstasiɔn/ may be produced as [ektasiɔŋ]. Finally, this phoneme may also be omitted or may present itself as an aspiration [h] in most countries. For example, in Honduras you may see “las semanas” (the weeks) /las sɛmanas/ → [lah sɛmanah] or “bolas” (balls) /bɔlas/ → [bɔla].

The velar /x/ presented with five realizations. It may lose its voice quality appearing as [χ], or it may be deleted. It may also take stronger characteristics such as the uvular [χ]. A pharyngeal [ħ] and a glottal [h] have been observed in the Dominican Republic in the word “jugo” (juice) /hugɔ/ → [hugɔ]; [hugɔ]. /j/ may be omitted, or may manifest itself as the palatal affricate [dʒ] as in the case of “calle” (street) /kajɛ/ which may become [kadʒɛ] in Cuba. In El Salvador an omission may be observed when producing the following word: “bella” /bɛja/ → [bɛa].

Finally, the fricative /f/ has one variation. /f/ may be realized as the voiced [ɸ]. Such is the case in most of Central America as demonstrated in the example “fueron” (went) /fwɛrɔŋ/ → [ɸwɛrɔŋ].

Fricative allophonic variations shared by all countries were /x/ → [h]. The following was shared by all countries but Guatemala: /s/ → [h]. Mexico exhibited significantly more variations than the rest of the countries.

**Affricates.** The affricate /tʃ/ presents with the substitutions [ʃ] and [tʃ]. In Cuba one may observe the realization of the fricative [ʃ] when producing a word such as “chorro” (jet of water) /tʃɔrɔ/ → [ʃɔrɔ]. In Puerto Rico the word “muchacho” (young man) /mutʃatʃɔ/ may become [mutjatʃɔ]. Guatemala, Honduras, Mexico, and Nicaragua have no documented variations of Affricates. The realization most shared was /tʃ/ → [ʃ] by all Caribbean countries.

**Nasals.** The nasals /n/, /ɲ/, and /m/ were reported with variations. /n/ is the only nasal that has multiple variations. It may be omitted or present itself as [ɲ], [ŋ], or [m]. The omission of /n/ will force the preceding vowel to take a nasal quality. Such is the case of “dicen” (they say) /disɛn/ → [disɛŋ] in Puerto Rico where the [ɛ] will carry the nasalization as in [disɛŋ]. The next three realizations happen in all countries. The realization of [ɲ] makes the word “mancha” /mantʃa/ in Puerto Rico become [maɲtʃa]. In Nicaragua, as in the other countries, it may become [ŋ], especially in final position in words: “pan” (bread) /pan/ → [paŋ]. Finally, and mostly in the Caribbean, the /n/ may appear as [m], such as in [um pɛsɔ] for “un peso” (one

peso) /un pɛsɔ/. The other two nasals, /ɲ/ and /m/ both have one substitution each. Instead of /ɲ/ in Mexico some populations may produce [ɲj] such as in “niño” (boy) /niɲɔ/ → [niɲjɔ]. /m/, on the other hand, will become [ŋ] in El Salvador. An example of this phenomena is the word “himno” (hymn) /imnɔ/ becoming [hiɲno].

Three variations were shared by all countries /n/ → [ɲ], [ŋ], [m]. Mexico only exhibited one nasal variation.

**Liquids.** These three liquids have multiple realizations: /l/, /r/, and, /r/. /l/ may be omitted in Cuba as in “volcán” (volcano) /bɔlkan/ → [bɔkan], or may be a [r] in the Caribbean as in “clavel” (carnation) /klabɛl/ → [klabɛr]. It may also be velarized [l̠] in the Caribbean. In the Dominican Republic one can see the substitution of this phoneme for the vowel [i] in the word “maldad” (evil) /maldad/ → [maidɑ].

The flap /r/ may appear as shortened, as [h], or omitted such as in “puerta” (door) /pwɛrta/ → [pwɛhta]; [pwɛta] in Cuba. Other realizations occur in Puerto Rico. “Mujer” (woman) /muɛr/ would appear as [muɛl] and “puerta” /pwɛrta/ as [puɛhta]. In Guatemala it may also be substituted for a [s]. Finally, in Santo Domingo the flap at times may become a vowel. For example, the word “parque” (park) /paɾkɛ/ → [paikɛ].

The third liquid receiving various realizations is /r/. It may be shortened, omitted or become aspirated [h]. It also loses its voiced quality in the Dominican Republic when producing a word such as “tierra” (dirt) [tiɛra]. In countries like Puerto Rico it may also appear as a [l] or [ɫ] as in “barco” (ship) /baɾkɔ/ → [balkɔ]; [baɫkɔ]. This phoneme is also substituted by fricatives. For example, in Guatemala, [paskɛ] may represent the word “parque” /paɾkɛ/, and in Puerto Rico, one prominent variation is the use of [χ] in words such as “carro” (car) /kaɾɔ/ → [kaχɔ]. Another fricative which may be carried in its place is [ʒ]. The nasal [ɲ] occurs in its place in the Dominican Republic when producing a word such as “virgen” (virgin) /birɛn/ → [biɲhɛɲ].

El Salvador and Nicaragua did not have any documented variations for liquids. There were significant more variations seen in the Caribbean countries as compared to Guatemala, Honduras and Mexico.

**Glides.** The /w/ phoneme has one reported substitution. It may be substituted by [gw] as in the proper name “Wanda” /wanda/ → [gwanɔda] in the Caribbean and in Mexico, but not in Central America. There are no documented allophonic variations in El Salvador, Guatemala, Honduras and Mexico.

## DISCUSSION

The dialectology of Spanish phonology is one that is very rich. As demonstrated in the table elaborated, there are documented variations in all 19 consonant sounds in the eight countries listed. The variations described are not comprehensive since there may be more that have not been documented in the literature. The variations appeared mostly as substitutions, but omissions and additions were also present. Furthermore, suprasegmental features such as voicing and length qualities have been documented. There were two phonemes sharing the same allophonic realizations between all countries. These were /x/→[h], and /n/→[ɲ], [ɲ], [m]. There were six phonemes that presented with only one variation. The phonemes with more variations were the fricative /s/ and the liquids /r/ and /r/. The latter presented with the most variations. Allophonic variations may be numerous for one single phoneme. The /s/ phoneme had eight variations. Six maintained their fricative manner of production and the other two changed into plosives. Meanwhile, the allophonic variations occurred as dental, alveolar, postalveolar, retroflex, velar and finally glottal. The phoneme /r/ had ten variations. Four maintained their liquid nature, four became fricatives and one became a nasal consonant (the tenth is an omission). Place of articulation of these realizations included velar, alveolar, postalveolar and glottal.

The scope of the present work was to elaborate a descriptive table of possible variations of phonemes. Nevertheless, it should be noted that the realizations are subject to rules governed by context or word position of phonemes. Just as with the many realizations of phonemes, rules governing these realizations may vary within and between countries. Interestingly, Guitart (2005) makes a distinction between radical and conservative dialects of Spanish. He states that the distinction between both is the tendency for conservative dialects to stay stable and close to the written forms, while the radical dialects (such as the Spanish Andalusian and Caribbean dialects) tend to weaken and delete phonemes, particularly in the coda position of syllables.

This elaborated profile of Spanish dialectal differences points to the need to become familiar with the linguistic variations spoken by clients. While the documented variations in the literature have served as guidelines to prevent discriminatory practices in assessment procedures, professionals should continue gathering data about the populations they serve. Especially, since just as in English dialects, Goldstein and Iglesias (2001) have demonstrated that to identify true errors one must account for the dialect. Therefore, beyond the information offered in scientific sources, the speech and language pathologist must depend on other sources in order to make sure that the information used is correct. For example, the issues previously alluded to regarding the phonemes /w/ and /v/ are yet to be clarified. Should we consider the /w/ when assessing and when offering treatment if it is not regarded a true Spanish phoneme?, or Why is it that some will use /b/ even when presented with a word that starts with the grapheme “v”, but when it appears between vowels will produce the bilabial fricative [β] or the

unvoiced labiodental fricative [f]? Are these allophonic variations of /b/ or /v/?

Centeno, et. al. (2007) explain how critical it is to apply ethnography and sociolinguistic approaches to speech and language pathology, and audiology practices by accounting for variability across sociocultural contexts, appropriate methods and diagnostic interpretations. Stone-Goldman, J. & Olswang, L. (2003) developed a method for using ethnographic methods for becoming more cultural sensitive and knowledgeable. Speech and language pathologists and audiologists can perform these steps to gather phonological data of their community. The clinician becomes a participant observer, who gathers thick notes of behaviors of interest, in this case speech, phonemes, allophones, and usage. Eventually, this raw data is interpreted looking for patterns and themes that would comprise phonological rules of usage, leading to final conclusions. It is, therefore, incumbent upon the clinician serving these linguistically diverse populations to get skilled in this process in order to enhance their service delivery.

ASHA (1985) has also offered alternatives because it is obvious that no speech language pathologist may possess all the knowledge and competencies related to servicing such culturally and linguistically diverse caseloads. They suggest establishing relationships with consultants and culture brokers who offer information regarding linguistic norms. Cooperatives may be established to hire experts to serve linguistic communities. Networks with university settings help to share resources being developed and to establish research programs to continue finding out about dialectal differences. They also suggest establishing practicum and CFY sites to attract students and recent graduates with diverse linguistic competences. A final suggestion is to establish interdisciplinary teams that include para-professionals and professionals with a different dialectal competence each.

In summary, with the rich diversity of Spanishes in the United States, there is a need to look at language diversity more intently. It is not appropriate to think of Spanish speakers as a homogenous group. Short lists pointing to broad Spanish allophonic variations serve as a starting point for determining if there are communication disorders and/or for determining therapeutic recommendations. Nevertheless, as has been shown, each dialectal variation of Spanish needs to be paid individual attention if one is to really understand the normal linguistic nature of one's clients. Nevertheless, even though phonological variations have been identified and explained, it is necessary to describe the contextual boundaries and word positions governing allophonic realizations. Therefore further studies should seek to elaborate and support the existing data, specifically how it relates to the job of the clinician. Similarly, other language parameters of Spanish should be addressed. Last, but not least, information about Spanish speakers in the US should continue to be disseminated related to dialectal differences, acquisition of dialectal features, English language interference in bilinguals, and how do these dialects affect the acquisition and use of English phonemes.

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# ***ECHO***

## *NARRATIVE ABILITIES OF SECOND GRADE AFRICAN AMERICAN CHILDREN*

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### **ABSTRACT**

The purpose of this study was to examine microstructure and macrostructure abilities of typically developing African American seven year-olds from low socioeconomic backgrounds in a story retelling task. Some of the results were compared with the seven year-old field test data from the Strong Narrative Assessment Procedure (SNAP; Strong, 1998). Findings indicated that most elements of microstructure and macrostructure did not differ significantly with the comparison group. However, African American children correctly answered more inferential questions about the story than children from the comparison group, suggesting an untapped strength. In addition to these findings, African American children's use of noun phrase elaboration was measured.

**KEY WORDS:** Narrative sampling, African American children, noun phrase elaboration, answering inferential questions, literate language

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### **INTRODUCTION**

In order to identify children with language impairments, it is recommended that part of the assessment process include narrative language assessment (Hughes, McGillivray, & Schmiddek, 1997; Johnson, 1995; McCabe & Peterson, 1991). One way of determining if children have language impairment is to compare their narrative language sample with a standard that has previously been obtained, usually from the mainstream population (Brown, 1973; Miller, 1981). Other researchers have focused their sampling on non-mainstream groups, such as African Americans and Hispanics (Craig & Washington, 2002; Craig, Washington & Thompson, 2005; Munoz, Gillam, Pena, & Gulley-Faehnle, 2003). The present study builds on these works by describing narrative microstructure and macrostructure elements of typically developing African American second graders from two public schools in New Orleans, Louisiana.

Relationship between narrative abilities and school

One of the reasons narrative ability is measured is because of its connection to other academic areas, such as reading and writing (Gregg, 1991; Hughes, McGillivray & Schmiddek, 1997). Children with poor narrative ability often are poor readers and have other oral language deficits that interfere with school (Botting, Faragher, Simkin, Knox, & Conti-Ramsden, 2001; Gillam & Carlisle, 1997). A large percentage of students in the New Orleans Recovery School District (67%) did not achieve the level of Basic (has the fundamental knowledge and skills needed for the next level of schooling) on the 2007 fourth grade state achievement test in English Language Arts (Louisiana Department of Education, 2009). In this test students must be able to write narrative and descriptive passages, read, comprehend, and respond to a range of materials using a variety of strategies.

While examining non-mainstream children's knowledge and exposure to the prerequisites for reading such as alphabet knowledge and phonological awareness is important, it is equally important to examine oral language abilities of this population. Narratives have a structure that requires correct use of vocabulary, grammar and organization. Westby (1991) described literate language style as the ability to use language to think abstractly and decontextually. This is the language that is needed to succeed in school.

There are many ways in which narratives can be measured. Macrostructure elements consist of examining the overall organization of a story, such as identifying story grammar components (Liles, Duffy, Merritt, & Purcell, 1995; Stein & Glenn, 1979). The organizational structure of a story based on Stein and Glenn (1979) consists of setting, initiating event, internal response, plan, attempt, consequence and resolution. These elements make an episode. Stories generally have more than one episode (Peterson & McCabe, 1983). Microstructure elements consist mostly of examining the grammatical structure of the discourse, such as, identifying communication units or C-units (an independent clause and any modifiers or dependent clauses), clauses per C-unit, and number of total words (Loban, 1976). These microstructure elements help to determine syntactic complexity of language (Brown, 1973).

One of the microstructure elements that identifies literate language is the elaborated noun phrase (Pellegrini, 1985). Elaborated noun phrases describe or add information to the noun through modifiers (e.g., *the little boy*) and relative clauses (e.g., *the man who used a cane*), among others (Scott, 1988). Greenhalgh and Strong (2001) found that children ages seven to ten years with language impairment used fewer elaborated noun phrases in their narratives than non-language impaired children of the same age. Eisenberg and her colleagues (2008) found that children's use of noun phrases become more complex as they develop.

### **Studies Involving Mainstream Populations**

Researchers have measured narrative language performance of predominately white children by determining various syntactic, semantic and story grammar calculations. For example, Strong (1998) calculated number of C-Units, number of different words, and subordination index, among others, for typically developing children and children with language impairments residing in Utah.

Newer narrative assessments like the Test of Narrative Language (Gillam & Pearson, 2004), have been normed on a percentage of African American children. Gillam and Pearson reported that 30% of the children in the sample were African American, yet do not report their specific geographical areas.

Also, the African American children's standard scores were lower than the European American children's standard scores, although not significantly so.

## **Studies Examining Nonmainstream English Populations**

Narrative abilities of individuals from non-mainstream groups have been the focus of several investigations. Recently, To and her colleagues (2010) performed a study on Cantonese speaking children in China. Their findings demonstrated developmental maturity in children between the ages of four and twelve years. A large database has been compiled by Miller and Iglesias (2008) on bilingual (Spanish/English) children's ability to retell stories. Others have explored Spanish speaking children's narrative abilities (Munoz, Gillam, Pena, & Gulley-Faehnle, 2003).

Craig and Washington (2002) gathered information from 100 typically developing African American preschool and kindergarten students during free play. The researchers established means and standard deviations for mean length of C-unit, amount of complex syntax and number of different words. They also reported findings from a study of 295 typically developing African American children from first to fifth grades in a picture description task (Craig, Washing, & Thompson, 2005). They found gender differences for mean length of C-unit and amount of complex syntax with girls producing more than boys and gradual increases by grade for mean length of C-unit, amount of complex syntax, number of different words, and responding to requests for information.

It has been documented that some African American children come to school with different narrative styles. Michaels (1981) described African American children's storytelling as being topic associative, where a series of anecdotes are related in a non-linear fashion. Gee (1989) suggests that this style hinders children from succeeding in literate-based activities, especially if their teacher is not from their same cultural background. A teacher who is not aware of this type of narrative may think the child's story is rambling and unorganized.

While it is important to take into consideration narrative styles of non-mainstream populations, one must also keep in mind that schools in the United States typically use a mainstream story format (Paul, 2007). It is this format in which most children must be able to comprehend in order to pass State tests and move on to their next grade level. For example, one of the standards of the Louisiana Education Assessment Program's (LEAP) English Language Arts test is for students to be able to read, comprehend and respond to fiction, nonfiction and poetry (Louisiana Department of Education, 2009).

## **Elicitation Methods**

Various ways to elicit fictional narratives have been documented (Hughes, McGillivray & Schmidek, 1997). Strong (1998) used a wordless picture book narrated by a prerecorded speaker. After the child listens to the story, the book is removed and the child tells the story to a naïve listener. Miller and Iglesias

(2008) use the same wordless picture books and script; however, they allow the child to look at the book while retelling the story.

Another way to elicit narratives is by having the child explain a single picture, usually one that denotes a problem. Children are instructed to make up a story that goes with this picture. Some investigators give an example first by showing a different picture and telling a story. They then present a new picture and say, "Now it's your turn to make up a story." For a more complete discussion of procedures to elicit fictional narratives, see Hughes, McGillivray and Schmidek (1997).

In order to obtain more information on the narrative abilities of African American children, the author felt that a comparison of African American and Caucasian children's narrative abilities would be justified. The Strong Narrative Assessment Procedure (SNAP; Strong, 1998) was chosen as a comparison instrument for several reasons. The field test data consisted of Caucasian children only. This allows for the examination of groups with differing narrative styles. The elicitation and scoring directions are clear cut and easy to follow. This would be beneficial if, in the future, all speech-language pathologists in the district could use this instrument in their narrative assessments. The stories are tape recorded so that the children all hear the same words and intonation of the speaker. The four stories that are used, known as the Frog Stories (Mayer, 1967, 1969, 1974; Mayer and Mayer, 1975), consist of similar length, and syntactic and story grammar complexity, thus allowing for test-retest purposes. The SNAP's format is that of a retell; after the child hears a story and views a wordless picture book, he is asked to tell the story back as accurately as possible. Each story contains five episodes, 44-46 C-units, and 397-403 words. The instrument was field tested on 104 children, ages seven through ten, both typically developing and language disordered.

The current study was designed to investigate whether differences would be found in microstructure and macrostructure elements of seven-year-old, African American, low income, urban children and the seven-year-old, Caucasian children that were used to obtain field data from the SNAP. It was predicted that microstructure elements would not be significantly different based on previous research that suggests syntactic elements are not influenced by culture (Craig & Washington, 1994; Whitehurst, 1997). An additional microstructural element, the elaborated noun phrase, was not included in the SNAP field study data. This information was calculated for this study in order to begin to analyze the emergence of this characteristic in African American children. Significant differences were predicted between the two groups of children for macrostructure elements and answers to inferential questions. It was predicted that the African American children in this study would not recall as many complete episodes nor would they correctly answer as many inferential questions due to the stylistic differences between African American and mainstream story telling styles.

## METHOD

### Participants

Seventeen seven-year-olds from two New Orleans public schools participated in the study (6 girls and 11 boys). They ranged in age from 7.4 years to 7.11 years of age. All were in second grade, African American, and qualified for reduced or free lunch, indicating that they were from low socioeconomic background.

### Procedure

Second grade teachers were asked to identify three to five typically developing students from their classrooms to participate in the study. Since the study was conducted in the spring, it was assumed that teachers knew which of their students were developing normally. No students were enrolled in special education or were receiving speech or language therapy or had repeated a grade. After parental consent was obtained, each child was individually tested in a separate room in the child's school. The child was first administered the Expressive Vocabulary Test (EVT, Williams, 1997) to determine expressive vocabulary knowledge. This test was chosen for two reasons: it has been deemed to be culturally fair by the developer and several responses for each item may be counted as correct, allowing for linguistic and dialectal variations. All children scored within normal (average) range according to the test manual. Standard scores from this test ranged from 87 to 105 ( $M = 98.9$ ;  $SD = 4.42$ ).

After the EVT was administered, two stories from the Strong Narrative Assessment Procedure (SNAP, Strong, 1998), *Frog Goes to Dinner* (Mayer, 1974) and *One Frog Too Many* (Mayer & Mayer, 1975), were administered. These stories were chosen because the examiner felt that the settings (eating at a restaurant and receiving a present) and emotions (getting into trouble and being jealous) of the story were ones in which children might be familiar. Testing procedures followed the guidelines from the SNAP protocol. The child looked at a wordless picture book while listening to a tape recorded story. The child listened to the story with earphones to rule out any distraction. After hearing the story, the child told it to a naïve listener without picture prompts who recorded it using a digital tape recorder and lavalier microphone. The naïve listener told the student that she didn't get to hear the story and wanted the student to retell it to her. She gave the student as much time as needed, using eye contact and head nodding, to keep the student engaged. If the student stopped before the story was completed, she waited a few seconds and made a comment about the story, (e.g., "Well, that was interesting.") The student then answered ten comprehension questions (five literal and five inferential). The first story, *Frog Goes to Dinner*, was used to familiarize the student with the task. Only the second story, *One Frog Too Many*, was used in the analysis.

### Transcription and Segmentation

All stories were transcribed directly from the recordings into text documents by the author. Then all stories were placed into the Systematic Analysis of Language Transcripts (SALT, Miller & Iglesias, 2008) software. Stories were divided into communication units (C-Units; Loban, 1976) following SNAP instructions. Each child's C-Unit was coded for number of clauses, and type of elaborated noun phrase. African American dialectal features were coded according to Oetting's list of 36 nonstandard patterns (Oetting & McDonald, 2001; Oetting & Pruitt, 2005) and were not counted as errors. Each C-unit was coded for story grammar elements by a trained undergraduate student. The SALT program then calculated number of C-Units, number of total words, words per C-Unit, and clauses per C-Unit. Descriptive statistics were computed for the following: number of C-units, number of total words, clauses per C-Unit, presence of elaborated noun phrases, number of episodes, number of correct literal questions, and number of correct inferential questions.

### Reliability

All of the retells were rated by a second rater. An undergraduate speech pathology major, who was trained in the transcription and coding process, (as was the naïve listener). First the rater listened to the retells and followed along on the transcriptions for transcription errors. Agreement was 96% for transcription. Then the rater identified all codes and compared them to the first rater's codes. Agreement was 90%. For each code that was inconsistent, the raters discussed and agreed upon the correct code.

## RESULTS

Results of the findings for the African American seven-year-olds from low income, urban homes were compared with the SNAP norms and standard deviations for typically developing seven-year-olds who were residing in Utah. In order to obtain normative results of the SNAP for seven-year-olds, thirteen normally developing children were tested (Strong, 1998). In the present study seventeen children were tested. In the SNAP study, children ranged in age from 85 to 95 months ( $M = 88.5$ ;  $S.D. = 3.6$ ) while in this study children ranged in age from 88 to 95 months ( $M = 92.3$ ;  $S. D. = 2.7$ ). In this sample the number of C-units ranged from 9 to 37 ( $M = 21.4$ ;  $SD = 7.0$ ). The number of words ranged from 91 to 323 ( $M = 175.7$ ;  $SD = 57.2$ ). Words per C-unit ranged from 6.59 to 10.82 ( $M = 8.3$ ;  $SD = 1.22$ ). Clauses per C-unit ranged from .95 to 1.71 ( $M = 1.2$ ;  $SD = .19$ ).

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**Table 1.** Means, standard deviations and p values for the seven variables comparing African American seven year olds with seven year olds from Utah.

	Caucasian N = 13 (from SNAP data)	African American N = 17	
<b>Categories</b>			P value
Number of C-Units	20.8 (6.8)	21.4 (7.0)	.723
Number of Words	160.4 (57.8)	175.7 (57.2)	.286
Words/ C-Unit	7.7 (.9)	8.3 (1.2)	.067
Clauses/ C-Unit	1.11 (.08)	1.2 (.19)	.04*
Complete Episodes	2.3 (1.2)	2.0 (1.4)	.409
Correct Factual Questions	4.5 (.9)	4.3 (.7)	.400
Correct Inferential Questions	1.4 (1.3)	2.6 (.93)	.000**

\*p < .05, \*\*p < .001

Table 1 compares measures from this study with those from the SNAP. One sample t-tests revealed that no significant differences exist between the African American children in this study with the Utah children in the SNAP norms for number of C-Units, number of words, words per C-unit, complete episodes and correct factual questions. However, clauses per C-unit and correct inferential questions revealed significant differences.

An episode, according to the SNAP, consists of a problem or motivation (initiating event or internal response), event (plan or attempt), and outcome (consequence). For each episode all three of these story grammar components must be included in the child's retelling in order to be counted as recalled. Each story was coded for these elements. According to the SNAP, the first episode begins with the event of the boy acquiring a second frog (setting). The problem is that the big frog is jealous of the new frog (internal response). When the boy puts the two frogs together (initiating event), the big frog tries to bite the new frog (attempt). The big frog then gets punished (consequence).

The number of complete episodes children recalled ranged from 0 to 5, with 5 being the number of episodes in the story. One of the children recalled all five episodes (6%); one recalled four (6%); five children recalled three (29%); three recalled two (18%); four recalled one (6%); and three recalled none (18%). This number was not statistically significant from the mean number of episodes recalled from the typically developing seven years from Utah.

The number of factual questions children answered correctly ranged from 3 to 5, with 5 being the most one could obtain. Over half of the children (8) answered all five questions correctly (47%); seven answered four correctly (41%) and two answered 3 correctly (12%). The mean number of factual questions answered correctly was 4.5. This number was not statistically significant from the mean number of factual questions answered correctly from the typically developing seven years from Utah. The number of inferential questions children answered correctly

ranged from 1 to 5, with 5 being the most one could obtain. One of the children answered all five questions correctly (6%); one answered four correctly (6%); seven children answered three questions correctly (41%); seven answered two correctly (41%); and one answered one correctly (6%). This number was statistically significant from the mean number of inferential questions answered correctly from the typically developing seven years from Utah.

All of the children in the sample used noun phrases that contained one or two modifiers (the boy, the big frog). Eight out of the seventeen children (47%) used noun phrases that contained three modifiers (the little baby frog). Thirteen of the seventeen children (76%) used noun phrases with postmodification (It was about a boy who had a frog; They heard a noise of the little bitty frog.)

## DISCUSSION

The aim of the present study was to identify microstructure and macrostructure elements within oral narratives produced by typically developing, low income, seven-year-old African-American children. The investigation included comparison of linguistic features of this population with typically developing seven year old white children from Utah (Strong, 1998). Of the four microstructure elements that were compared with this data, no differences were found comparing number of C-units, number of words, or words per C-unit. These findings agree with other studies that suggest syntactic elements are less likely to be influenced by culture (Craig & Washington, 1994; Whitehurst, 1997). The finding that the group means differed significantly for clauses per C-unit was surprising. Upon closer inspection, however, one child in the African American sample produced a large number of C-units with two or more clauses. One of her C-units contained three clauses (And that's when he kicked him off the thing that they was floating on) and another contained four (I think the big frog was jealous of the little frog because

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he think that the little frog is special to Mike.) Since the sample was small, this one child's data may have skewed the number of clauses per C-unit for the group.

The African American children in this study answered inferential questions correctly significantly more often than did the comparison group. Out of the five inferential questions, African Americans answered an average of 2.6, whereas the SNAP group answered an average of 1.4 correctly. A contributing factor may be related to the African American culture's oral tradition. In the oral narrative, inferences must be made more often about relationships within the story because segments in the story may jump in an associated way and themes or points are not explicit (Gee, 1989; Michaels, 1981). If the children have heard these topic associated stories or anecdotes from family members and even teachers, they would have the background knowledge of this type of narrative. Perhaps the children are tapping into an ability heretofore not examined. It is possible that this may be a strength of African American children who come from a topic associative tradition.

Noun phrase elaboration has been demonstrated to be present in children's narratives. Although in their study narratives were elicited in a different manner, Eisenberg, et al. (2008), suggests the usage of complex premodification (noun phrase consisting of two or more descriptive elements before the noun) should not be expected until after 8 years of age. However, almost half of the children in the present study used it. One explanation is due to the characters of the story: a big frog and a little frog. The use of two modifiers was demonstrated by all children (the big frog). If a child wanted to add a modifier, he would have had to distinguish between the two frogs. Some examples of complex premodification were: the little baby frog, the big frog's head.

The use of postmodification by the children in the present study was found to be slightly higher than in other studies. Eisenberg, et al. (2008) found that 53% of the five-year-olds and 60% percent of the eight-year-olds in their study demonstrated postmodification in a story generation task. In the present study, 76% of the African American children used postmodification in their retells. Story generation may have been a more challenging task than the story retell used in this study due to the level of support that the story retell provides. Another explanation of the higher use in this study is that African American children may be using more dramatic and evocative language (Smitherman, 1993). Hicks (1991) found that first grade African American children used more descriptive words than European North American children when recalling videos. Further examination of African American children's use of postmodification in narratives is warranted.

## LIMITATIONS

This study provides a preliminary investigation of African American children's ability to retell stories. Part of the investigation utilized a comparison of two distinct groups: low income, African American children from New Orleans,

Louisiana and white children from Utah. The SNAP data is not considered to be normative, nor is the sample size large enough to make definite claims; however, the results add to the corpus of data on African American children's narrative abilities.

The children in this study were from two schools in New Orleans and are typical of school children from this geographical area. More children from different area schools should be included in future studies. Comparisons of similar groups from other parts of the country may give additional insight into narrative abilities of this population.

The author chose not to include an analysis of African American English (AAE) usage in this study. Since all children exhibited some form of AAE, it was thought that the results would not be affected. However, researchers have identified individuals who use varying amounts of AAE Oetting & McDonald, 2001; Terrell, 1975; Washington & Craig, 1998). This may warrant investigation in the future.

## CONCLUSION

The results of this study indicate that some of the field test data of the Strong Narrative Assessment Procedure for typically developing seven year olds can be used with African American seven year olds. The number of C-units, number of total words, words per C-unit, correct number of factual questions and number of episodes may be compared. However, clauses per c-unit and correct inferential questions may not be compared. The SNAP is an easy tool to use to determine narrative abilities of children. The Frog Stories are engaging to the children and have themes that children can relate to (e.g., jealousy, loss). Each of the stories in the SNAP contain the same number of episodes, so that the test can be given more than once for comparison purposes. Future studies will examine the use of this instrument with both younger and language impaired African American children's narrative abilities. African American seven year olds' use of elaborated noun phrases appears to be comparable to other children's. However, more investigation is needed, especially with postmodification.

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# ***ECHO***

## ***NORMATIVE NASALANCE VALUES ACROSS LANGUAGES***

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### **ABSTRACT**

The Nasometer is an objective computer-based instrument designed to measure the acoustic correlates of resonance and velopharyngeal function. The device has proven to be useful for early identification of persons at risk for velopharyngeal dysfunction. Since its introduction, the Nasometer has been used in craniofacial centers and other clinical settings both in the United States and around the world. The purpose of this paper is to describe the Nasometer and its clinical uses, discuss speaker characteristics that might influence nasalance values, and provide a compilation of published normative nasalance data across English, Spanish, Asian, and European languages. Additionally, languages in need of normative nasalance data are discussed.

**KEY WORDS:** Nasometer, Nasalance, Normative data, Objective acoustic analysis

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## NORMATIVE NASALANCE VALUES ACROSS LANGUAGES

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### INTRODUCTION

Paired with perceptual speech assessment, objective instrumental devices have enabled clinicians to reliably identify persons at risk for velopharyngeal (VP) dysfunction and related resonance disorders (e.g., hypernasality). Over the last thirty years, instrumental systems have increased our understanding of the structure and workings of the velopharyngeal mechanism, allowed professionals to acquire quantifiable reproducible data, and render informed treatment recommendations to persons presenting with or at risk for velopharyngeal dysfunction (Dalston and Warren, 1985; Kummer, 2008; Moon, 1992). In a study of the importance of instrumental assessment of velopharyngeal function reported by 63 craniofacial centers in the United States, 88 percent of these centers rated such devices as very important or important to the evaluation process (Pannbacker et al. 1992). These devices can either allow clinicians to directly visualize and assess the structure and function of the velopharyngeal mechanism (e.g., nasoendoscopy) or indirectly make inferences about velopharyngeal adequacy during speech (e.g., acoustic measures). Indirect objective measures of velopharyngeal function have the advantage of being comparatively non-invasive or non-obtrusive to subjects--limiting exposure to radiation or discomfort associated with insertion of scopes into the confines of the nasopharynx and can be used with young children.

Within the category of indirect objective assessment procedures, nasometry is a method of measuring the acoustic correlates of resonance and velopharyngeal function and can be compared to standardized norms for interpretation (Kummer, 2008). Acoustic events associated with velopharyngeal function during speech involve the movement of sound pressure/vibrational energy through the vocal tract and the proper transmission of that energy through the oral and/or nasal cavities as required by the particular speech activity. Nasometric measures have been shown to be strongly correlated with aerodynamic and perceptual measures of velopharyngeal function and have proven to be useful for early identification of patients at risk for velopharyngeal dysfunction (Dalston, Warren, & Dalston, 1991).

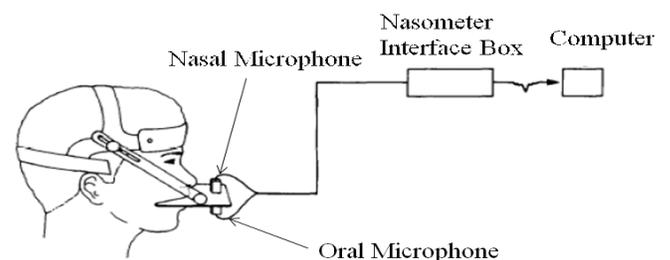
The Nasometer has gained widespread clinical and research usage within the United States and internationally. Consequently, normative nasometric data have been obtained from children and

adults in numerous separate studies in North America, Europe, Asia, Australia, and the Caribbean. However, to our knowledge, these data have not been presented in a single report. Thus, the purpose of this paper is to describe the Nasometer and its clinical uses, discuss speaker characteristics that might influence nasalance values, and provide a compilation of normative nasalance data across English, Spanish, Asian, and European languages. Additionally, languages in need of normative nasalance data are discussed.

### THE NASOMETER

A computer based system, the Nasometer allows clinicians to determine the relative amount of oral and nasal energy in an individual's speech (Dalston & Seaver, 1992; Kummer, 2008). With the device, nasal (N) and oral (O) acoustic components of a subject's speech are sensed by microphones separated by a horizontal head set-mounted sound separator that rests on the upper lip (see Figure 1). The signal from each of the microphones is filtered and digitized by custom electronic modules. The data can then be processed by a personal computer and displayed in real-time on a computer screen. The resultant signal is a ratio of nasal-plus-oral acoustic energy. The ratio is multiplied by 100 and expressed as a percentage "nasalance" score. Specifically, the nasalance score can be described thusly:

$$\text{Nasalance} = N \div (N + O) \times 100.$$



**Figure 1.** Headset, microphones, and computer interface for the Nasometer.

Nasalance is, perhaps, the most widely used objective, non-invasive measure that relates to perceived nasality (Awan & Virani, 2010). Presently, there are two Nasometer models. The Nasometer 6200 (Kay Elemetrics Corporation, Lincoln Park, NJ) first introduced in 1987, represents the original model of the device and is the source of much of the normal and disordered nasalance data that has been used to describe speech resonance in normal and clinical populations. Subsequently, in 2003 the Nasometer 6200 was replaced with the Nasometer II 6400 (Kay Elemetrics/PENTAX, Lincoln Park, NJ).

There are some differences in the hardware and software characteristics between the two systems. Awan and Virani (2010) reported that in the Nasometer 6200-1, the nasal and oral microphone signals are separately preamplified and then fed to bandpass filters (center frequency = 500 Hz; -3 dB bandwidth of 300 Hz) to capture the lower frequency region of the speech spectrum. The data acquisition routines in the Nasometer 6200-1 software sample the root mean square (RMS) level of the nasal and oral microphone signals at a rate of 120Hz at 8 bits of resolution (Fletcher, Adams, & McCutcheon, 1989).

The Nasometer II Model 6400 v. 2.70 incorporated several changes to the original Nasometer. While the headgear (separator plate and microphones) and the bandpass filtering procedure were maintained, the oral and nasal microphone signals are now digitally sampled at 11,025 Hz per channel at 16 bits of resolution. Nasalance is then calculated using the digitized data by means of an 8 ms averaging frame to approximate the procedure used in the Nasometer 6200 (Awan & Virani, 2010). In addition, changes in the microphone calibration procedures, and the capability for signal playback were also incorporated into the Nasometer II 6400.

The hardware and software changes rendered by the manufacturer appear significant enough to warrant caution when interpreting nasalance data derived from the Nasometer 6200 and Nasometer II 6400. Specifically, in a study comparing measures of nasalance obtained from a group of normal adult males and females using the Nasometer 6200 versus the Nasometer II 6400, Awan and Virani (2010) reported that the two units differed significantly on mean nasalance for the Zoo and Rainbow

Passages but not for the Nasal Sentences. The authors stated that mean nasalance scores obtained from the Nasometer II 6400 were statistically lower than those derived from the Nasometer 6200. Based on this finding, Awan and Virani (2010) cautioned clinicians and researchers against interpreting nasalance data obtained from each unit as equivalent and recommended that professionals “consult norms that have been developed for the specific system that is being used (Nasometer 6200 or Nasometer II 6400).”

## CLINICAL USES OF THE NASOMETER

The Nasometer has proven to be a useful, non-invasive method of assessing persons at risk for velopharyngeal impairment (e.g., those with cleft palate and other oral-facial disorders, motor speech disorders, etc.) and upper airway impairment (e.g., those with nasal or nasopharyngeal obstruction). The nasometer is an effective adjunct to perceptual and aerodynamic findings as well as endoscopy and/or videofluoroscopy assessments. Moreover, the data obtained from the Nasometer are easily interpretable and can be understood by a lay person with no more than a brief explanation (Dalston & Warren, 1985). Table 1 provides a listing of the many clinical uses of the Nasometer,

As noted by Kummer (2008), when an individual’s nasalance score is compared to normative data, a judgment can be made regarding the normalcy of resonance. High scores, in comparison to normative data, suggest hypernasality; low scores, in comparison, suggest hyponasality. Nasalance scores are typically obtained by having the client read or repeat a standardized passage, sentences, or syllables. The level of nasalance varies depending on the type of vowel produced (Lewis & Watterson, 2003). There are greater levels of nasalance on high vowels than on low vowels. For example, nasalance for /i/ is usually 10 percentage points higher than that for the low vowel /a/ (Kummer, 2005; 2008). Most English language nasalance norms have been established using three standardized passages---the Zoo Passage (Fletcher, 1972), the Rainbow Passage (Fairbanks, 1960), and Nasal Sentences (Fletcher, 1978).

**Table 1. Clinical Uses of the Nasometer.**

Clinical Uses	Representative Studies
Assessment of resonance in children with hearing impairment.	Tatchell et al.(1991)
Assessment of upper airway obstruction and hyponasality.	Dalston et al. (1991); Nieminen et al. (2000); Williams et al. (1990)
Selection of at-risk individuals for adenoidectomy.	Gonzalez-Landa et al. (1990); Kummer et al. (1993); Williams et al. (1992)
Measure changes in resonance following surgical procedures such as pharyngoplasty, uvulopalatopharyngoplasty, maxillectomy, and functional endoscopic sinus surgery.	David et al. (1999); Dejonckere & van Wijngaarden (2001); Nellis et al. (1992); Prunkngarmpun et al. (2008); Soneghet et al. (2002); Van Lierde et al (2002)
Measure effects of various forms of therapy such as CPAP and prosthetic management.	Sweeney et al. (2004); Reiger et al. (2002)
Assessment of nasality in children with apraxia of speech.	Skinder-Meredith et al. (2004)
Assessment of post-speech treatment intelligibility in persons with dysarthria.	Cahill et al. (2003); McHenry (1999); Roy et al. (2001); Wenke et al. (2010)
As a biofeedback instrument in speech therapy.	Van Lierde et al. (2011); Zajac et al. (1996)

The Zoo Passage contains no nasal phonemes and is useful in determining if velopharyngeal closure can be obtained and maintained throughout connected speech (Kummer, 2008). Listeners generally perceive inadequate velopharyngeal closure during speech as hypernasality (Watterson et al. 1993). The Rainbow Passage contains both oral and nasal phonemes (11.5% of the phonemes in this passage are nasal consonants) and it is useful for examining the timing of velopharyngeal closure. Problems with the timing of velopharyngeal closure during speech can be perceived by listeners as hypernasality, assimilative nasality, or mixed hypernasality-hyponasality. The Nasal Sentences contain a preponderance of nasal consonants (i.e., 35% of its sounds are nasal phonemes) and they have proven useful in identifying obstruction at the level of the nasopharynx and nasal cavity which would reduce the transmission of acoustic energy through the nasal airway. The perceptual consequence of such obstruction during speech is typically identified by listeners as hyponasality.

Thus, in interpreting nasalance scores for the Zoo Passage or a similar passage devoid of nasal phonemes, a nasalance score of 28 percent obtained from a speaker of American English via the Nasometer 6200 would be the threshold for differentiating speakers with borderline velopharyngeal function from those who are normal speakers (Kummer, 2008). Likewise, norms derived from the Nasometer II Model 6400 suggest that for a passage devoid of nasal phonemes, a speaker with a score less than 20 percent does not have hypernasality; scores between 20 to 30 percent are in the borderline range; and scores over 30 percent are considered abnormal (Kummer, 2008).

Finally, it is important to understand that nasalance values can be affected by articulation errors (e.g., glottal stop substitutions, sound deletions, sound-specific nasal air emission). Thus, interpretation of nasalance scores should also be based on an accompanying perceptual assessment by a qualified speech-language pathologist (Kummer, 2008).

## **EFFECTS OF SPEAKER CHARACTERISTICS ON NASALANCE VALUES**

Researchers have examined the effects of speaker characteristics on nasalance scores in normal persons. These speaker characteristics have included age, gender, regional dialect, and native language. For example, normal nasalance values have been shown to be statistically lower in school age children (9 – 19 years) compared to adults (20 – 85 years) (Hutchinson et al. 1978; Seaver et al. 1991; Rochet et al., 1998). Explanations for this trend include (a) age-related lengthening of the vocal tract from childhood to adulthood that may influence the acoustic resonance characteristics of the oral and nasopharyngeal cavities; (b) physiological changes with age that may influence the maintenance of neuromuscular control of the velopharyngeal port across the ongoing demands for VP closure during non-nasal connected utterances, and the rapid adjustments in the VP port required for production of nasal phonemes; and

(c) soft tissue, bony tissue, and muscle changes associated with the advanced aging of the vocal tract (Rochet et al. 1998). It is important to note that while differences in nasalance values between young children and adults have been reported to be statistically significant, these scores differ on average by a mere three percentage points. Thus, the differences would not be viewed as clinically significant (Mayo et al. 1996; Rochet et al. 1998).

Gender differences typically are not seen in nasalance scores (Litzaw & Dalston, 1992) or, if evident, are not considered clinically significant (Seaver et al. 1991). In those instances in which gender differences in nasalance values have been reported, women have been found to exhibit higher scores than men on oral passages, mixed oral-nasal passages, and nasal sentences. The small but persistent gender differences in nasalance values reported by some studies might be related to (a) sensitivity variations in the frequency response of the two Nasometer microphones (oral and nasal) that could interact differently with the female vocal tract (Zajac et al. 1996); (b) females possibly requiring more time to achieve velopharyngeal closure during speech (Zajac & Mayo, 1996); or gender differences in ‘transpalatal nasalance’, i.e., vibration of palatal structures during production of vowels and other voiced phonemes that transfers acoustic energy to the nasal cavity (Bundy & Zajac, 2006). However, at this point, the aforementioned explanations for gender differences in nasalance values remain unconfirmed. Nasalance scores have been reported to vary with speaker regional dialect when the same reading passage is used. For example, Seaver, Dalston, Leeper, and Adams (1991) found significantly higher Zoo Passage and Rainbow Passage nasalance scores among normal speakers from the Mid-Atlantic dialectal region compared to speakers from the Southern and Mid-western dialectal regions of the United States and Ontario, Canada. However, similar patterns were not seen during readings of the Nasal Sentences. Additionally, Leeper, Rochet, and MacKay (1992) reported the presence of regional dialectal variations for nasalance among speakers of Canadian English.

In her explanation of why nasalance scores might differ across regional dialects, Kummer (2008) noted that since consonants are produced essentially the same, regardless of dialect, these dialect-related differences in nasalance must be in the production of the vowels. Kummer (2008) further observed that “it might be presumed that dialects, accents, or even languages that use more high vowels or a higher tongue position might be expected to have higher nasalance scores as compared to those with greater incidence of low vowels or a lower tongue position.” (p. 391). Elsewhere, Mayo, Floyd, Warren, Dalston, and Mayo (1996) hypothesized that across dialects, there may be differences in the timing of VP closure when transitions are made between nasal consonants and vowels. Thus, it is possible that these linguistically-related VP timing differences during speech might influence nasalance characteristics. However, similar to reported gender-related differences in nasalance values, dialect-associated

variations in such scores have been described as not large enough to be clinically significant (Mayo et al. 1996; Rochet et al. 1998; Seaver et al. 1991).

Since its introduction in 1987 by Kay Elemetrics Corporation in the United States, use of the Nasometer has spread internationally across English and non-English-speaking countries. Several studies have indicated that nasalance values can vary with language. In North America, Leeper, Rochet, and MacKay (1992) reported significantly higher nasalance values for speakers of Canadian English than of Canadian French. However, in a later study, Rochet, Rochet, Sovis and Mielke (1998) observed that the nasalance scores of speakers of Canadian English and French were similar during readings of non-nasal passages but differed for mixed oral-nasal and nasally loaded passages. In a European investigation, Santos-Terron, Gonzalez-Landa, and Sanchez-Luis (1991) found higher nasalance scores among native speakers of Castilian Spanish than among speakers of American English during reading of a passage devoid of nasal consonants.

Based on the findings of the studies discussed in this section, the following statements can be made. First, normal nasalance values appear to differ based on the age of a speaker. Thus, nasalance scores of children, on average, tend to be slightly lower than those of young or older adults. While, these age differences in nasalance are not clinically significant, they may provide clinicians with useful information about the development of the vocal tract within a speaker (e.g., lengthening of the vocal tract, involution of the adenoids and tonsils in children, and the aging of the vocal tract structures). Second, gender and regional speaker dialects appear to influence nasalance values but not to the extent of requiring separate nasalance norms for either speaker characteristic. Third, in those published studies where nasalance values have been directly compared across languages (e.g., Canadian English vs. Canadian French, Castilian Spanish vs. American English), the findings suggest that the native language of a speaker should be considered by clinicians when using the Nasometer.

With respect to the latter statement, as the Nasometer technology spread outside of the United States, clinicians and researchers began to establish nasalance norms for sounds, words, and sentences in many other languages to accurately reflect the linguistic and nasalance characteristics of those languages. As Whitehill (2001) observed, “the primary purpose in providing normative data for a given language is clinical; such information is necessary to assist in the evaluation and management of speakers with resonance disorders. However, investigations and comparisons of nasalance data from different languages are also of theoretical benefit because they facilitate our understanding of the influence of linguistic and sociocultural factors on resonance judgment measurement.” (p. 120).

In the next section of this paper, the authors have compiled normative nasalance data from 18 published studies around the world (including two from the United States). The compilation

was derived from studies published in English for ease of clinician/researcher accessibility and interpretation. The authors acknowledge that there are a small number of published normative nasalance studies written in languages other than English as well as theses or dissertations that offer such data.

These nasalance data provide useful reference information for clinicians who evaluate resonance disorders at cleft palate-craniofacial centers in other countries. Additionally, as the treatment-seeking population of the United States continues to diversify culturally and linguistically, these nasalance data and those obtained in the future might be used with children and adults whose primary languages are not American English. Unless otherwise indicated, the reading passages or sentences used by these studies to obtain nasalance values were translated into the language of the speakers and represent speech stimuli either devoid of nasal phonemes, having a mix of oral and nasal phonemes, or heavily loaded with nasal phonemes.

Mean nasalance scores and standard deviations were available for most of these normative nasalance studies and are reported in this compilation. The majority of the nasalance values (72%) were obtained from the Nasometer 6200 system. The reader is reminded that nasalance scores obtained from the Nasometer 6200 tend to be higher than those derived from the Nasometer II 6400 and therefore, he/she should interpret the nasalance values reported in this compilation based on norms that have been developed for the specific Nasometer system. Finally, the reader should note that the normative nasalance data made available in this compilation were obtained from 2,100 speakers worldwide with as few as nine and as many as 315 persons represented in the studies.

## **NORMATIVE NASALANCE VALUES ACROSS LANGUAGES**

### **English Language Nasalance Norms**

Normative nasalance data for four varieties of English---American, Canadian, Irish, and Australian, are shown in Tables 2 and 3. Major points from the American English speaker data include (a) nasalance values of white adult speakers of the Mid-Atlantic dialect are slightly higher than those of speakers of Mid-Western or Southern regional dialects (Seaver et al. 1991) and (b) African American speakers generally exhibit lower scores for the Nasal Sentences than white speakers (Mayo et al. 1996). In general, oral passage nasalance scores of the Canadian speakers are somewhat lower than those of American English speakers. The Irish English (Sweeney et al. 2004) and Australian English (Van Doorn & Purcell, 2004) nasalance data for like-age children are similar. No published nasalance data are available for either Irish or Australian adults. However, one unpublished study (Lee & Browne, 2008) indicated that adult speakers from Southern Ireland exhibit lower nasalance values than English speakers from North America. Missing from the normative database are values for speakers of British English.

## Canadian French Nasalance Norms

Canadian French nasalance values are shown in Table 4. Noteworthy is the fact that mixed oral-nasal passage and nasal sentences scores for these speakers are quite lower than those of English talkers when compared directly (Rochet et al. 1998). An explanation for this finding may lie in the fact that phonemic nasal vowels exist in the French spoken language and these phonemes were contained in the reading passages used to obtain Canadian French nasalance norms. These nasal vowels produce both oral and nasal energy because the mouth and velopharyngeal port are open during their production. That is, languages such as French use the velopharyngeal port to achieve a phonemic contrast between oral and nasal vowels. For example, in French, *pain* /pɛ̃n/ ('bread') and *paix* /pɛ̃/ ('peace') are distinguished by the presence or absence of nasalization. Therefore, nasal vowels in French will generate less nasalized acoustic energy to be detected by the nasal microphone of the Nasometer resulting in lower mixed oral-nasal or nasal sentences values. Presently, there are no published nasalance data for European French or the many varieties of the language spoken globally.

**Table 2.** Mean Normative Nasalance Scores (in %) from Studies of English Speakers in the United States and Canada. Standard Deviations are in Parentheses. 'M' Indicates Male. 'F' Indicates Female. 'NA' Indicates Data Not Available for a Reading Passage or Sentences.

Speakers	Nasometer Model	Mean Nasalance Score (%)			Authors	
		Oral Passage	Oral-Nasal Passage	Nasal Sentences		
<u>United States</u>						
White Adult men & women (16-63 yrs) from three geographic/ dialectal regions in the United States N = 148	Nasometer 6200	Mid-Western <sup>1</sup> :			Seaver et al. (1991)	
			15.0	35.0		62.0
			(6.0)	(5.0)		(6.0)
		Mid-Atlantic <sup>2</sup> :				
			21.0	39.0		65.0
			(5.0)	(6.0)		(5.0)
African American Adult men & women (23.2 yrs) from the Mid-Atlantic region of the United States N = 40	Nasometer 6200	Southern <sup>3</sup> :			Mayo et al. (1996)	
			13.0	34.0		61.0
			(7.0)	(6.0)		(6.0)
		M = 15.3	NA	56.5		
			(4.4)			(8.2)
		F = 18.6	NA	58.9		
	(6.0)		(2.4)			
<u>Canada</u>						
Adult men, women & children (9-85 yrs) from Western Canada N = 315	Nasometer 6200	M = 11.3	32.9	61.6	Rochet et al. (1998)	
			(5.0)	(5.3)		(6.7)
		F = 11.5	34.5	62.7		
			(4.4)	(4.6)		(6.2)

<sup>1</sup>Illinois, <sup>2</sup>North Carolina, <sup>3</sup>Alabama

**Table 3.** Mean Normative Nasalance Scores (in %) from Studies of English Speakers in Ireland, and Australia. Standard Deviations are in Parentheses. ‘NA’ Indicates Data Not Available for a Reading Passage or Sentences.

Speakers	Nasometer Model	Mean Nasalance Score (%)			Authors
		Oral Passage	Oral-Nasal Passage	Nasal Sentences	
<u>Ireland</u>					
Children (4-13 yrs) from Dublin, Ireland N = 70	Nasometer 6200	14.0 (5.0)	26.0 (5.0)	51.0 (7.0)	Sweeney et al. (2004)
<u>Australia</u>					
Children (4-9 yrs) from Sydney, Australia N = 245	Nasometer 6200	13.1 (5.9)	NA	59.6 (8.1)	Van Doorn & Purcell (2004)

**Table 4.** Mean Normative Nasalance Scores from a Study of Speakers of Canadian French<sup>1</sup>. Standard Deviations are in Parentheses. ‘M’ Indicates Male. ‘F’ Indicates Female. All Reading Passages and Sentences Were Translated into French and Read in that Language.

Speakers <sup>1</sup>	Nasometer Model	Mean Nasalance Score (%)			Authors
		Oral Passage	Oral-Nasal Passage	Nasal Sentences	
Children & Adolescents (9-19 yrs) N = 59	Nasometer 6200	M = 9.2 (4.1)	24.0 (4.4)	33.4 (6.1)	Rochet et al. (1998)
		F = 8.8 (2.3)	25.3 (3.5)	35.6 (5.1)	
		M = 13.9 (5.3)	28.3 (5.5)	38.6 (7.0)	
Young & Early Middle-Age Adults (20-44 yrs) N = 56		F = 14.5 (5.8)	30.1 (6.0)	40.3 (6.8)	
		M = 12.4 (4.8)	26.0 (5.1)	35.0 (6.0)	
Middle-Age & Older Adults (45-85 yrs) N = 38		F = 14.1 (4.6)	29.7 (5.2)	39.5 (6.6)	

<sup>1</sup>Speakers were from the Canadian provinces of Alberta, Manitoba, and Saskatchewan.

### Spanish Language Nasalance Norms

Normal nasalance values for speakers of Spanish are presented in Table 5. These data were obtained from adult men and women from two dialectal regions in Mexico (Nichols, 1999) and adult women in Puerto Rico (Anderson, 1996). The differences in nasalance scores between the Mexican and Puerto Rico groups might be accounted for by the fact that the latter group consisted

of female speakers who, as previously noted, typically exhibit slightly higher values. Given the vast dispersion of the Spanish language in the United States and around the world, more studies are called for to account for possible geo-linguistic variations in normal nasalance among speakers of this language.

**Table 5.** Mean Normative Nasalance Scores from Studies of Spanish Speakers in Mexico and Puerto Rico. Standard Deviations are in Parentheses. 'NA' Indicates Data Not Available for a Reading Passage or Sentences.

Speakers	Nasometer Model	Mean Nasalance Score (%)			Authors
		Oral Passage	Oral-Nasal Passage	Nasal Sentences	
Adult men & women (20-40 yrs) & children (6-13 yrs) from Mexico City and Cuernavaca N = 152	Nasometer 6200	17.0 (6.7)	NA	55.62 (6.0)	Nichols (1999)
Adult women (21-43 yrs) from Puerto Rico N = 40	Nasometer 6200	21.9 (8.6)	36.0 (7.0)	63.0 (7.7)	Anderson (1996)

## European Languages

Published normative nasalance data, displayed in Table 6, are available for five European languages---Portuguese, Flemish, Finnish, Hungarian, and Swedish. Most of these data were collected using the newer Nasometer II 6400 system. The reader should note that the lower average nasal sentences values for Portuguese (a language spoken in Europe, Africa, South America, North American, and Asia) are most likely a function of its use of phonemic nasal vowels (similar to French) resulting in less nasalized acoustic energy to be detected by the nasal microphone of the Nasometer. Notable in the their absence from the normative database are nasalance values for European French, German, Italian, Greek and Slavic languages (e.g., Russian).

## Asian Languages

Normative nasalance data for Japanese, Thai, and Cantonese are shown in Table 7. All three are considered tonal languages though Japanese is said to have a simpler tone system (Bao, 1999). The Japanese data, collected from five regions in Japan, revealed no

significance differences in nasalance values due to dialect (Mishima et al. 2008; Tachimura et al. 2000). Currently, there are no published normative nasalance data for children in Japan. Nasalance values of speakers of Thai and Cantonese (the latter the official language of Hong Kong and Macau and spoken by about 70 million persons worldwide) are reported to be similar to those of English speakers (Prathanee et al. 2003; Whitehill 2001). Nasalance data for children who speak Marathi (Nandurkar, 2002) are presented in Table 8. Marathi is one of the languages of India and is spoken by approximately 90 million persons globally. While the number of speakers that comprised the Marathi normative nasalance database are small (N = 9), it should be noted that the values are very similar to those reported by Kummer (2005) for consonant-vowel-consonant syllables of the same phonetic categories (i.e., plosive, fricative, and affricates) produced by American English-speaking children ranging in age from three years to nine years (N = 272). There are currently no published nasalance data for Mandarin, Filipino/Tagalog, Korean, Vietnamese, the other languages of India or Pacific Island languages.

**Table 6.** Mean Normative Nasalance Scores from Studies of European Language Speakers (Portuguese, Flemish, Finnish, Hungarian, Swedish). Standard Deviations are in Parentheses. 'NA' Indicates Data Not Available for a Reading Passage or Sentences.

Speakers	Nasometer Model	Mean Nasalance Score (%)			Authors
		Oral Passage	Oral-Nasal Passage	Nasal Sentences	
<u>European Portuguese</u> Adult men & women (19-27 yrs) N = 25	Nasometer 6200	10.0	NA	44.0	Falé & Faria (2008)
<u>Flemish (Belgium)</u> Children (7-13 yrs) N = 33	Nasometer II 6400	11.3	31.9	51.6	Van Lierde et al. (2003)
Adult men & women (19-27 yrs) N = 58		(4.7)	(4.8)		
		10.9	33.8	55.8	Van Lierde et al. (2001)
<u>Finnish</u> Adults & preschool/school age children (3-54 yrs) N = 42	Nasometer 6200	13.6 (5.6)	NA	69.4 (8.2)	Haapanen (1991)
<u>Hungarian</u> Adults (20-25 yrs) Children (5-7 yrs) N = 75	Nasometer II 6400	13.4 11.0	39.5 31.7	56.0 50.6	Hirschberg et al. (2006)
<u>Swedish</u> Children (6-11 yrs) N = 245	Nasometer II 6400	12.7 (5.6)	29.5 (6.1)	56.5 (6.0)	Brunnegard & Van Dorn (2009)

**Table 7.** Mean Normative Nasalance Scores from Studies of Asian Language Speakers (Japanese, Thai, and Cantonese). Standard Deviations are in Parentheses. ‘NA’ Indicates Data Not Available for a Reading Passage or Sentences.

Speakers	Nasometer Model	Mean Nasalance Score (%)			Authors
		Oral Passage	Oral-Nasal Passage	Nasal Sentences	
<u>Japanese</u>					
Adult men & women speakers from four geographic regions in Japan (men: 23.8 yrs; Women: 23.2 yrs) N = 68	Nasometer II 6400	M = 10.3 (5.8)	NA	NA	Mishima et al. (2008)
		F = 15.6 (8.4)	NA	NA	
		Total = 9.1 (3.9)	NA	NA	
Adult men & women speakers of Osaka dialect of Mid-West Japan (19-35 yrs) N = 100	Nasometer 6200	M = 8.3 (4.0)	NA	NA	Tachimura et al. (2000)
		F = 9.8 (3.5)	NA	NA	
		Total = 9.1 (3.9)	NA	NA	
<u>Thai</u>					
Children from Khon Kaen municipality, Thailand (7-12 yrs) N = 141	Nasometer 6200	14.3 (5.8)	35.6 (5.9)	51.1 (6.4)	Prathanee et al. (2003)
<u>Cantonese</u>					
Adult women from Hong Kong, China (18-33 yrs) N = 141	Nasometer 6200	13.6 (7.1)	35.4 (6.2)	55.6 (7.3)	Whitehill (2001)

**Table 8.** Mean Normative Nasalance Scores from Studies of Asian Language Speakers (Marathi). Standard Deviations are in Parentheses.

Speakers	Nasometer Model	Mean Nasalance Score (%)		Authors
		Consonant-Vowel-Consonant Syllables		
<u>Marathi</u>				
Children from Mumbai, India (5-11 yrs) N = 9	Nasometer 6200	Plosives	8.6 (1.5)	Nandurkar (2002)
		Fricatives	7.9 (1.5)	
		Affricates	11.4 (3.0)	

## CLINICAL AND RESEARCH CONCLUSIONS AND RECOMMENDATIONS

Velopharyngeal dysfunction can have a profound effect on resonance, articulation, and overall speech intelligibility. The Nasometer has proven to be useful in evaluating persons suspected of having velopharyngeal dysfunction. Likewise, the safety, noninvasiveness, and ease of use of the Nasometer system are significant factors in its increasing application in clinical settings throughout the world (Krakow & Huffman, 1993). Normative nasalance values are available for languages spoken by millions of persons internationally. This article has provided a compilation of nasalance data for several of these languages. With a few exceptions (i.e., Canadian French and European Portuguese), normative nasalance values appear remarkably similar across the languages discussed and adhere to previously reported trends in gender and age variations. One explanation for the latter observation is that regardless of how time-varying patterns of nasalization are specified

phonologically or phonetically within a language, the Nasometer appears to effectively capture these phenomena and represent them as nasalance values.

As discussed in this paper, there are languages in need of normative nasalance data and clinicians and researchers are encouraged to acquire and share these data. Among these tongues are the varieties of African and Middle Eastern languages, other varieties of English (e.g., Caribbean, British, New Zealand), European languages (e.g., French, Italian, Slavic), and Asian languages (e.g., Korean, Vietnamese, Mandarin, language varieties of India and Pakistan). We must also remember that a number of these languages have been ‘exported’ to other countries in the world. For example, English, French, Spanish, Portuguese, and Dutch are spoken as primary or secondary languages in countries in Africa, the Caribbean, etc. Likewise, in the United States, 20 percent of the population speaks a language other than English in the home (Shin & Kominski, 2010). Thus, research is needed that compares nasalance values in

a primary versus secondary language (e.g., Spanish vs. English). Additionally, more effort should be directed toward culturally and linguistically relevant translation of speech materials to facilitate ease of production by native speakers during nasometric assessment.

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