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ABSTRACT

A study of the pronunciation problems of language-minority children had as subjects 578 first, third, and fifth-graders from seven ethnolinguistic groups (urban and rural Mexican-Americans, Puerto Ricans, Cuban-Americans, Franco-Americans, Native Americans, and Chinese-Americans) from low to low-middle income communities in California, Texas, Florida, New York, Louisiana, and New Mexico and 128 Anglo children from similar income groups. Results showed a significant positive relationship between phoneme production and reading achievement for some groups of third and fifth-graders, as well as for Anglo first-graders. The difficulty pattern varied across the ethnolinguistic groups, but the greatest pronunciation difficulty for the language-minority children was with the phonemes acquired last by first-language English speakers. While some phonological difficulties seem to disappear with increasing age for some groups, for others the difficulties are greater in the higher grades. (Author/MSE)

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CHEAP SHIP TRIPS: A PRELIMINARY STUDY OF SOME ENGLISH PHONOLOGICAL DIFFICULTIES OF LANGUAGE-MINORITY CHILDREN AND THEIR RELATIONSHIP TO READING ACHIEVEMENT

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CHEMP SHIP TRIPS: A PRELIMINARY STUDY OF SOME ENGLISH PHONOLOGICAL DIFFICULTIES OF LANGUAGE-MINORITY CHILDREN AND THEIR RELATIONSHIP TO READING ACHIEVEMENT*

Sharon E. Duncan

ARSTRACT

The purpose of this preliminary study was to (1) examine the degree of association between the performance of eight groups on the Phoneme subscale of the Language Assessment Scales (LAS) (De Avila and Duncan, 1977) and their performance on standardized reading achievement measures, (2) describe the nature of the phonological difficulties for different language groups, and (3) describe the developmental aspects of these difficulties.

The sample included first-, third-, and fifth-grade children (N = 578) from seven ethnolinguistic groups (urban and rural Mexican-American, Puerto Rican, Cuban-American, Franco-American, Native American, and Chinese-American) drawn from the low to low-middle income communities in California, Texas, Florida, New York, Louisiana, and New Mexico. An Anglo group (N = 152) of first-, third-, and fifth-grade children from low to low-middle income groups served as a criterion group.

Results showed a significant positive correlation between phoneme production and reading achievement for ten groups of third and fifth graders, as well as for Anglo first graders. The pattern of difficulty varied across the ethnolinguistic groups; however, the greatest pronunciation difficulty for the language-minority children was with the phonemes acquired last by first-language English speakers. While some phonological difficulties seem to disappear with increasing age for some groups, for others the difficulties are greater in the higher grades.

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*This study was conducted as part of a three-year cross-cultural investigation of cognitive styles of eight ethnolinguistic groups, supported by Contract #400-65-0051 between the National Institute of Education and the Southwest Educational Development Laboratory, Austin, Texas, May 1982.

INTRODUCTION

Speech, the process of encoding information into human vocal sounds, is one of the most complex skills humans acquire. Speech requires phonemes, a special set of sounds produced in the lower respiratory tract as kinetic energy or moving air and distributed through the speaker's oral and nasal cavities. When these phonemes are appropriately strung together to form a meaningful sentence, language is produced--what Miller (1973) called "the most subtle and powerful technique we have for controlling other people" (p. 5). However, it is necessary that both the sender of the spoken sounds (the "encoder") and the receiver (the "decoder") understand the code that dictates how these sounds are strung together, in order for communication to occur. When, for whatever reason, the encoded speech is nonstandard or different from what the decoder is expecting or accustomed to, communication can be limited, confused, or lost completely. A communication situation that demands of the listener a great deal of phonetic guesswork--as in the case of decoding the heavily accented speech of a "foreigner"--will detract a proportionate amount of interest from the message itself.

Ability to speak and to understand speech is universal among humans, and it is commonly taken for granted that all children who are not deaf, brain impaired, or otherwise sensorially deprived will acquire it in more or less the same sequence and time frame. In fact, between the child's first prebabbling sounds, many of which are discarded or forgotten and later relearned, and the ages of five to seven, the phonemic repertory of a child's native language (somewhere between 15 and 85 sounds) is completed (Fry, 1966; Menyuk, 1971).

While a number of empirical studies exist on the emergence of English phonemes in the monolingual child (Gleason, 1961; Irwin, 1947; Velten, 1943;

Weir, 1962), Hakuta (1980) has pointed out that very litt' systematic research has been done on the acquisition of English phonemes in language-minority children who acquire English as a second language in the United States. Yet there are a significant number of questions to be answered in this area. For example, in children who begin to acquire English when they start school, at a time when their native phonological system is nearing completion, what is the order of acquisition of the English phonemes? After age six or seven, are all new phonemes acquired simultaneously or does the order of acquisition parallel that of first-language speakers? Is the challenge faced by children learning a second-language phonological system primarily physiological (motoric) or cognitive? Finally, is there a significant association between the phonological difficulties of language-minority children and their level of school performance?

The preliminary study to be described is concerned with three issues. First, the extent of phonological difficulty across seven groups of language-minority children was examined. These groups included urban and rural Mexican-American, Cuban-American, Puerto Rican, Chinese-American, Franco-American, and Native American (Navajo). Second, an examination was conducted of the developmental (across grades) aspects of these difficulties. Third, the relationship between the difficulties, or lack thereof, and performance on standardized tests of reading achievement was explored. To clarify the results of the study and its implications for programmatic treatment, I will first briefly review some commonly held notions about the acquisition of a first-language phonological system, the phonological problems faced by children acquiring English as a second language, and the relation of phonology to reading.

THE SOUNDS OF ENGLISH

This paper will not provide a complete discussion of the English phonological system and its contrasts with other languages. Such treatments exist elsewhere (see Brown, 1965; Chomsky and Halle, 1968; Miller, 1951; Stockwell and Bowen, 1965). Nor will it attempt to deal with phonological aspects of nonstandard English dialects, such as Hawaiian Creole, Black English, etc., which have been studied and discussed elsewhere (see Andersen, 1979a and 1979b; Day, 1975; Smith, 1978; Speidel, 1979a). Rather, I will provide a brief overview of some of the developmental aspects of acquiring the sounds of English as a first language and relate these to the acquisition of English as a second language.

A First Language

Speech is behavior and, as such, limited by the cognitive and physiological machinery that must do the work (Miller, 1951).. Perception or decoding of speech requires that we take in as many as 25 or even 30 phonetic elements per second. Since the ear cannot separate individual acoustic events at such a rate, it merges them to form a unitary sensation, which is then perceived as a word or words, then syllables, and if necessary, as phonemes (Menyuk, 1971). In the encoding of speech, we are limited by the rate at which we move our muscles; thus, muscles for several successive phonetic segments are moved all at once (Lieberman, 1973). Cognitively, this limitation, which has been described as the "information bottleneck," is overcome through the process of "chunking," i.e., 1 + 1 = 1, a + t = at, etc. (Miller, 1951).

In isolation, a phoneme--the smallest unit of speech in a language or dialect that distinguishes one utterance from another--is semantically empty. "P" uttered in isolation, at least in English, has no meaning. When two or

more phonemes are arranged sequentially in accordance with the rules of a particular language, they form larger units called morphemes. Thus, when "p" is combined with other phonemic units, the morpheme **please**, written phonemically as /pliz/, emerges. A somewhat different arrangement of phonemes would produce **plan** /plæn/, and so on. When morphemes are arranged sequentially, again according to the syntactical, semantic, and even social rules of a language, they form units called phrases and sentences, and /pliz/ becomes **please go**, or **please don't do that**, or **yes, please**, ad infinitum. Thus, from a relatively small number of phonemes (English has about 50) and the naturally acquired notions of phonetic correspondence, it is not difficult for a native speaker to construct the 10,000 or so morphemes that comprise an average spoken vocabulary, and from these morphemes to construct an infinite set of sentences.

The English alphabet has 26 letters, but more than 50 distinct sounds. These sounds that comprise the language are formed by adjusting the shape of the "speech path" from the larynx out through the mouth. This process of adjustment is called "articulation," and involves four articulators: the lips, tongue, teeth, and palate. The sounds or phonemes of English are usually divided into two groups: consonants and vowels.

English consonants are classified according to manner of articulation: as **stops** or **plosives** (where the breath is checked in its outward movement, then suddenly released in a slight explosion, as in the production of /p/, /b/, /t/, etc.) or **continuants** (a sound that may be continued or prolonged). Continuants may be subdivided into fricatives /f/, /v/, /h/, /θ/, etc., nasals /m/, /n/, /ŋ/, or laterals /l/. Consonants may be further subclassified according to their production with or without **voicing** and point of articulation (labial, labio-dental, alveolar, etc.). Vowels are usually

classified according to the position of the tongue in the mouth during production and the part of the tongue that acts as articulator. While there are 42 acoustically possible classes of vowels in English, there are not more than 14 or 15 that must be differentiated (Clarey and Dixson, 1963). In addition, there are about six combinations of vowels, sometimes described as "vowel plus glide," which are used as diphthongs, e.g., /ey/ as in late, etc.

As we stated above, phonemes in isolation are meaningless. Thus, it is not surprising that young children do not acquire phonemes in isolation but as a convergence of the babbling development with perceptive development in which phonemes are learned as parts of words. Fry (1966) describes six steps in this acquisition process:

> It is agreed by all observers of infant speech that recognition of words, that is to say, the associating of a word with a situation, precedes any deliberate attempt on the part of the child to say the word with reference to that situation....Let us look more closely at what is involved in acquiring a particular word. First, the baby hears a group of sounds associated with a given situation; second, he learns to recognize the sounds; third, he makes his own attempt at reproducing the word, at first without associating it with the situation; fourth, he says the word in the situation in order to call forth a response; fifth, he changes his own utterance to make it match the pattern he has heard in order to obtain more certain and more satisfactory responses; sixth, he continues the modification process until the word gains the desired response from all listeners in all appropriate situations. (p. 192)

As can be seen the speech-learning process involves successive stages of finer and finer cognitive/acoustic discriminations. At the very beginning of the infant's life other human sounds are, for the most part, undifferentiated (Gibson, 1969). Very soon (within the first month), these sounds come to be associated with pleasant situations, such as feeding. However, at this stage, the infant does not differentiate the voice from other simultaneous sounds (Fry, 1966). While there are individual differences in the manner and speed

with which young children acquire a phonological system, there seems to be evidence (Lenneberg, 1973; Fry, 1966) that most children pass through more or less similar developmental stages, which include pre-babbling, babbling, development of articulation with the establishment of auditory feedback, and the development of a phonological system. In the babbling stage, the young child produces many sounds, some that will be useful later on, some that may never be needed in the native language, and some that will be discarded and relearned later.

The order in which phonemic units are added to the child's speech seems to be determined by two factors: the relative difficulty of pronouncing the sound and the informational load carried by a certain phoneme. For example, certain sounds such as the consonants /s/, /r/, and /θ/ require more muscles and finer acoustic coordination that "simpler" sounds like /p/, /t/, or /m/ (Fry, 1966). Informational loading refers to the frequency with which the distinction between a given pair of phonemes is employed to distinguish one word from another. That is, if the difference between two phonemes is critical for the words the child is hearing and using all the time, e.g., /k/ and /g/, as in bag versus back, learning to discriminate and use each of the two will occur more rapidly. In the absence of such minimal pairs, it may take longer to get the phonemes right (Fry, 1966). In addition, certain phonemes may appear later than others, not because they present developmental articulation or discrimination difficulties, but because of their relatively low frequency in spoken English. Thus, the /t/, which has a relatively high frequency in English (Miller, 1951; Mines et al., 1978) may be acquired earlier than the "j" /dz/ sound or the unvoiced "th" /θ/ sound.

As shown in Table 1, sequence of phoneme acquisition is not necessarily dependent on those sounds that a baby babbles earliest or most often.

Table 1

SEQUENCE AND AGE OF MASTERY OF ENGLISH PHONEMES BY NATIVE SPEAKERS*

Age	Phonemes
Year 3	all vowels; /b/, /m/, /n/, /f/, /w/, /h/
Year 4	/p/, /d/, /g/, /k/, /y/, /l/
Year 5	/ɪ/, /v/, /ɛ/, /z/, /š/, /ž/
5½	/č/, /r/
Year 6	/j/
6+	/θ/, /ð/, /ŋ/

*Adapted from data presented by Menyuk (1971) and Fry (1966).

For the most part, this data supports the sound acquisition framework proposed by Jakobson (1941, 1968) in which vowel-consonant contrast and stop-continuants are among the earliest acquired; stops and nasals precede affricates and liquids, the /l/ precedes the /s/, and so on. As the speech system of a language is acquired, the child acquires insights into different sequences of sounds and into which sounds are important. Thus, the phonemic forms of a language a child acquires are those that have function. Those without function are ignored and discarded. In this way, Smith (1977) reminds us, "they grow up speaking language and not imitating the noise of the air conditioner" (p. 387).

Hunt et al. (1976) have found differences in cognitive development, which necessarily includes language, to be more attributable to differences in child-rearing practices than to different levels of economic and educational status.

> The maturation of mechanism and sensorimotor systems is augmented with use and retarded by lack of use. The development of sensorimotor organizations comes about

> through modifications made in the course of adaptive efforts to cope with the demands of situations encountered....because central processes can run off faster than events, the knowledge gleaned from past encounters with the environment yields expectations which get confirmed or denied in new encounters with environmental circumstances. (Hunt et al., 1976, p. 222)

Thus, one would expect that the extent of verbal stimuli and reinforcement provided by the young child's environment would significantly affect the rate, if not sequence, of phoneme acquisition.

It should also be noted that there is not always complete consensus among linguistic researchers as to what constitutes mastery of a phoneme. For example, Fry (1966) includes /h/ and /f/ among the sounds last acquired, along with /r/ and /θ/. Menyuk (1971), however, includes /h/ and /f/ among the earliest acquired sounds. Some of the confusion, as Menyuk notes, is that complete mastery of a sound is often delayed because it is not mastered in all three positions (initial, medial, and final) at the same age. For example, the final /r/ may be mastered by four years, but in initial and medial position not until five-and-one-half years.

A Second Language

By approximately six years, all non-English-speaking children who have not suffered verbal deprivation may be assumed to have acquired the phonological (as well as the syntactical) system of their native language. Thus, they bring to English a whole set of operative verbal skills and linguistic expectations, many distinct from those required in English. While there is some disagreement among researchers (Jakobovits, 1970; Oyama, 1976), it is a commonly accepted notion that children who acquire a second or foreign language before puberty can do so without retaining an "accent" as adults. Such a notion carries with it the assumption that as the child acquires increasing

communicative competence in English, a number of relatively complex aspects of English pronunciation are mastered and internalized. These aspects involve such features as stress, rhythm, assimilation, contraction, intonation, and voicing (Clarey and Dixson, 1963). For example, there is a principle in English that may be stated as follows: **Most vowels, when occurring in unstressed syllables, are reduced from their normal values to the level of the neutral vowel /ə/, commonly pronounced "uh," as in** a**long,** a**bout, d**o**mestic, liber**a**l, etc.** In many other languages, including Spanish, the child's speech development has included a respect for the quality of all vowels. As this verbal habit carries over to English, the more clearly the child pronounces the English syllables, the heavier the "accent."

Another speech rule in English is that **all voiced consonants occurring at the end of a word are generally held and voiced.** Yet, in German, Slavic, and the Romance languages, the opposite situation prevails: All voiced consonants occurring in final position are unvoiced (Clarey and Dixson, 1963). In English, many minimal phonemic pairs are distinguished only by voicing or unvoicing the final consonant; thus, without proper voicing, we have such communication confusions as buzz versus bus, seed versus seat, bid versus bit, etc. Therefore, it is necessary to master the phonemic distinctions between one morpheme and another (Langacker, 1973).

Another challenge facing ESL learners is phonemic distribution: the positions where a specific phoneme is "permitted" to occur in relation to other phonemes. Even where a similar phoneme exists in both languages, the distribution may be strikingly different. For instance, in English /s/ is permitted to occur before another consonant in the same syllable, as in s**t**ain, s**p**ider, s**k**unk, etc.; in Spanish it is preceded by a vowel. Thus, a Spanish speaker of English tends to add a vowel in front of the /s/, pronouncing stop as

estop, **snail** as **esnail**, **stainless** as **estainless**, etc. (This process of adding a sound is called **epenthesis**.)

While considerations of phonology in language may be thought to be merely studies of "form" and social grace by some, and contrastive analysis (CA) is avoided by others because of dialectical differences in standard American English[1], Hakuta (1980) reports a consensus among second-language teachers "...that phonology is the level at which CA enjoys the best predictive success..." (p. 5). Hakuta also finds such studies beneficial for the information obtained about individual differences in second-language acquisition.

> There is, I think, an additional benefit to be derived from such phonological studies in the way of constructing reliable measures of individual differences in second language development. The correlations between such a measure and other measures of individual differences would be revealing. (p. 6)

This study is concerned with deviations from standard American English pronunciation when and if these deviations interfere with cooperative linguistic behavior, i.e., with language functions, which include inter-individual communication and the encoding and decoding of written messages. Thus, while there may be variability in the pronunciation of such words as **route** (both [rut] and [rowt] are acceptable) or **what** ([hwat] or [wat]) and **now** may be heard as [no w] or [naw] (Dickerson, 1975), speakers of one variant have no trouble understanding speakers of another. However, when a speaker cannot discriminate orally or aurally between **boys** and **voice**, between **yellow** and **jello**, or between **fifteen** and **fifty**, then we have a sit-

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[1]Stockwell and Bowen (1965) have listed "conspicuous" dialectical variations in standard American English primarily involving differences in vowels and diphthongs, as used in various regions of Canada and the United States.

uation that may involve ridicule and humiliation as well as serious miscommunication.

Spoken language has been found to strongly influence a listener's perception of a speaker's personality (Brown, 1969; Labov, 1966; Tucker and Lambert, 1969), and teachers' perceptions of student performance are often confounded by attitudes toward their speech style. Cohen (1973) has noted that both teachers and mainstream students who hold preconceived attitudes about language-minority children tend to equate reading ability (or reading achievement) with intelligence. These attitudes become part of a self-fulfilling prophecy that includes language-minority students as co-conspirators.

Frender et al. (1970) have suggested that the speech style of lower-class children may hinder their advancement in school. Williams (1970) has shown that teachers' status ratings of children are influenced by such linguistic cues as pronunciation of sounds like th. Seligman et al. (1972), in an exploration of the influence of speech style in relation to other personal stimulus cues on teacher expectation of pupil behavior, report that "the boys with good voices were always evaluated significantly more favorably than those with poor voices."[2]

A number of other studies of both children and adults have reported that individuals with heavily accented English are often thought of as "lower class"; that what they say is discounted by others (Giles, 1970; Wenner, 1967); and that, despite professional competence acquired in another country, their work activities in the United States may be hindered for the rest of their lives (Coates and Regdon, 1974). Brown, 1969; Labov, 1966; Tucker and

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[2]Voices were evaluated on pronunciation, speed of speech, pitch, quality, and individual characteristics (Seligman et al., 1972).

Lambert, 1969; and Ryan et al., 1977, have found that spoken language exerts a major influence on a listener's perception of the speaker's personality.

The Reading of English as a Second Language

It is no longer commonly assumed that the sounds of speech are "like" the letters of the alphabet or that all children who have learned to talk will automatically learn to read. However, a number of reading theories have postulated that reading and learning to read is, for minority children, largely dependent upon speech (Conrad, 1972; Sanders, 1977). An individual does not passively decode written language; prior experiences and knowledge, particularly knowledge of language, are brought to bear upon the reading process. Learning to read is a far easier task for young native speakers than for children who must learn to read a second language to which they have only been exposed perhaps a year and with which there are still phonemic and other difficulties. For language-minority children, low reading achievement has been well established in numerous reports over the last two decades (Cervantes, 1976; United States Commission on Civil Rights, 1971a, 1971b, 1972, 1973, 1974). The low academic achievement of language-minority children, particularly Spanish-speaking children, is most frequently blamed on the "language problem."

The essential skill required in reading is to get meaning from a printed or written message (Gibson, 1955). To get meaning in spoken language, the listener must decode a barrage of uttered acoustic symbols. In reading, the superficial task of the "receiver" is to decode the graphic symbols. With beginning readers, this may involve letter identification or low-level

phonemic analysis, only later followed by syllable and word identification.

> ...since the beginner's grasp of language is, for the first few years of learning to read, significantly above his ability to recognize this same language in print, the decoding skills are essentially the key to comprehension, the ultimate accepted mature skill. (Chall, 1973, p. 122)

Menyuk (1971) has also noted that the phonological component of language is presumed to be the initial reference in learning to read (Reyes-Kramer, 1978). After extensive analysis of past research, Chall (1967) finds that word and sound recognition are the necessary lower-order skills in the learning-to-read hierarchy that ultimately encompasses the higher-order skills of comprehension. There also seems to be evidence that a "phonics" or "code" approach tends to produce fewer serious reading problems.

> These trends were also supported by the laboratory experiments as well as by correlational studies. Indeed, knowing the names (and sounds) of the letters in kindergarten or early grade 1 came out as one of the strongest predictors of success at the end of grade 1 in different studies, up through 1965, and also in the more recent large-scale methods studies sponsored by the U. S. Office of Education from 1966 to 1968. (Chall, 1973, p. 123)

Chall (1973) reports evidence that the results of code emphasis are even more beneficial for children of low socio-economic status.

Saville (1970) includes perception and production of speech sounds among necessary reading-readiness skills. In order to read, children must bring some knowledge of English phonology to their first encounter with reading and writing (Read, 1971). A number of educators have concluded that some of the problems faced by language-minority children in learning to read are caused by phonological differences between English and the home language (Matluck and Mace, 1973; Modiano, 1973; Saville, 1970). Thus, all of these researchers

have reported a relationship between phonological skills and reading-acquisition skills.

DESIGN OF THE STUDY

The principal intent of this study was threefold. First, I examined the degree of association between phonological difficulties of language-minority children and their performance on standardized reading achievement measures. Second, the extent to which different language-minority groups have difficulty with specific English phonemes was examined. Third, I investigated the differences in children's phonological difficulties at three grade levels.

This study was cross-sectional; data were collected in four Hispanic communities in California, Texas, Florida, and New York, as well as in a Chinese-American (in the San Francisco Bay area), Franco-American (in the New Orleans area), Native American (near Albuquerque), and Anglo (California) community.

Subjects

A total of 726 children attending public and private (Franco-American site only) schools at eight sites in grades one, three, and five comprised the sample, making a total of 24 groups on which data were available. The subject breakdown by ethnolinguistic group and grade is shown in Table 2. Children were selected for participation in the study according to school personnel's knowledge of their ethnolinguistic background. All children were from lower to lower-middle class.

Procedure

Data were collected as part of a larger three-year study of cognitive styles (De Avila and Duncan, 1980) during a 10- to 14-week period at each site.

Table 2

SUBJECT BREAKDOWN BY GRADE AND MEAN AGE[a] (IN MONTHS) FOR ETHNOLINGUISTIC GROUP

	1			2			3			4			5			6			7			8					
Grade	Urban Mexican-American			Rural Mexican-American			Puerto Rican			Cuban-American			Franco-American (Cajun)			Chinese-American			Native American (Navajo)			Anglo			Totals		
	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD
1	25	84.28	5.85	40	85.45	7.63	28	74.04	3.17	33	73.67	2.76	25	75.92	6.49	34	82.82	3.87	11	76.36	5.54	48	79.26	4.19	242	79.46	5.15
3	20	110.70	7.03	37	110.35	6.12	26	104.72	8.11	30	97.70	3.27	40	101.22	6.37	30	108.90	6.19	18	102.28	9.40	52	104.69	11.47	252	104.95	7.94
5	18	133.50	16.23	40	140.35[b]	7.48	26	128.69	7.69	24	122.17	2.58	26	125.81	10.59	31	132.42	5.65	16	120.87	3.44	52	127.25	5.79	232	129.72	7.90
Total	63	106.73	21.34	117	113.12	22.76	80	101.57	23.58	87	95.33	19.78	91	101.30	20.31	95	107.24	21.28	45	102.56	.41	152	104.56	20.99	726	104.51	19.44

[a]Differences in mean age across sites are due to differences in time tests were administered.

[b]High age due to four or so outliers.

The English language proficiency test, upon which the findings of this study are based, was administered individually by local English-fluent bilingual examiners. Each of the 10 to 12 examiners at each site received intensive training in the administration and scoring of the tests.

The standardized test of reading achievement was administered at each site as part of the school districts' regularly scheduled fall or spring assessment program.

Instrumentation

Reading achievement was measured by the reading subscale of a number of standardized achievement tests. These are shown in Table 3 by site and grade. Each of these tests was administered by local school personnel and scored by the school districts according to publishers' instructions.

Phonological proficiency was measured by the Phoneme subscale of the **Language Assessment Scales (LAS)** (De Avila and Duncan, 1977), English version, Level I. The **LAS** is a convergent assessment measure consisting of five subscales: phoneme discrimination, phoneme production, lexical, oral comprehension, and oral production (storytelling).

In the Phoneme subscale, the child is asked to repeat a word in which a specific phoneme is embedded and then asked to repeat a sentence in which the same phoneme is embedded twice. All stimuli for this subscale are produced by an audio cassette to standardize input. Each response of the Phoneme subscale is scored dichotomously by the examiner.

Interrater reliability on the Phoneme subscale of .987 has been reported by De Avila and Duncan (1977). (For a more complete description of the inter-judge, internal, and test-retest reliability of the general procedure and

Table 3

LIST OF ACHIEVEMENT TESTS USED TO OBTAIN ACHIEVEMENT DATA FOR EACH ETHNOLINGUISTIC GROUP

Ethnolinguistic Group	Test		
	Grade 1	Grade 3	Grade 5
Urban Mexican-American	California Test of Basic Skills (1974)	California Test of Basic Skills	California Test of Basic Skills
Rural Mexican-American	(none)	California Achievement Test (Tiegs and Clark, 1970)	California Achievement Test
Puerto Rican	Stanford Achievement Test (1973)	Stanford Achievement Test	Stanford Achievement Test
Cuban-American	(none)	Stanford Achievement Test	Stanford Achievement Test
Chinese-American	Cooperative Primary (1965-1967)	Cooperative Primary	California Test of Basic Skills
Franco-American (Cajun)	(none)	Metropolitan Achievement Test (Durost et al., 1971)	Metropolitan Achievement Test
Native American (Navajo)	(none)	California Test of Basic Skills	California Test of Basic Skills
Anglo	California Test of Basic Skills	California Test of Basic Skills	California Test of Basic Skills

specific phonemes, see Ulibarri and Costa, 1979, and De Avila and Duncan, 1981.)

Analyses

Raw scores on the various achievement tests were converted to standard deviation units, and Pearson product-moment correlations with the Phoneme subscale (De Avila and Duncan, 1977) were calculated. Means and standard deviations were calculated on each item of the Phoneme subscale. Using the Anglo children as the criterion group, one-half a standard deviation below the Anglo score was calculated and served as criterion for pass/fail. (See Table 4 for Anglo group means.)

RESULTS AND DISCUSSION

Reading Achievement

The Pearson product-moment correlations between English phonemes and reading achievement are shown in Table 5. First-grade reading achievement scores were available for only three groups: Chinese-American, urban Mexican-American, and Anglo. The correlations for these groups are significant at the first grade only for the Anglo children. At the third grade, correlations were significant (at the .01 level or above) for Chinese-American, rural Mexican-American, Puerto Rican, Cuban-American, Native American, and Anglo groups, ranging from .24 to .71. There were significant correlations for four fifth-grade groups, including Chinese-American, rural Mexican-American, Puerto Rican, and Native American, ranging from .43 to .76. Thus, for 9 of the 16 third- and fifth-grade language-minority groups for which achievement data was available, there was a significant relation between phonemic proficiency and reading level. It seems noteworthy that there were modest (.24 to .30) and

Table 4

ITEM ANALYSIS OF MEAN SCORES FOR ANGLOS ON PHONEMES SUBSCALE
OF THE (ENGLISH) LANGUAGE ASSESSMENT SCALES (LAS)

Item	Subscale:	Grade 1			Grade 3			Grade 5			Total		
No.	Phonemes	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD
51.	this	48	.896	.309	52	.981	.139	52	.981	.139	152	.948	.223
52.	My father is further.	48	.875	.334	52	.962	.194	52	.981	.139	152	.935	.248
53.	very	48	.833	.377	52	.923	.269	52	.962	.194	152	.902	.298
54.	The rivers are moving.	48	.979	.144	52	.981	.139	52	.981	.139	152	.974	.160
55.	Yes.	48	.917	.279	52	.981	.139	52	.962	.194	152	.948	.223
56.	The yard is yellow.	48	.979	.144	52	.981	.139	52	.962	.194	152	.967	.178
57.	ham	48	.958	.202	52	.923	.269	52	.923	.269	152	.928	.259
58.	The hat is hot.	48	.979	.144	52	.962	.194	52	.962	.194	152	.961	.195
59.	luck	48	.958	.202	52	.981	.139	52	.962	.194	152	.961	.195
60.	He hugged the bug.	48	.896	.309	52	.808	.398	52	.788	.412	152	.824	.382
61.	bad	48	.958	.202	52	.962	.194	52	.962	.194	152	.954	.210
62.	He sat on a mat.	48	.979	.144	52	.981	.139	52	.962	.194	152	.967	.178
63.	stop	48	.979	.144	52	.923	.269	52	.923	.269	152	.935	.248
64.	The snail can spin.	48	.875	.334	52	.885	.323	52	.962	.194	152	.902	.298
65.	thing	48	.896	.309	52	.923	.269	52	.962	.194	152	.922	.270
66.	Old Kathy is thin.	48	.833	.377	52	.846	.364	52	.923	.269	152	.863	.345
67.	cheap	48	.792	.410	52	.827	.382	52	.923	.269	152	.843	.365
68.	He chewed his chocolate.	48	.917	.279	52	.942	.235	52	.962	.194	152	.935	.248
69.	peas	48	.938	.245	52	.846	.364	52	.923	.269	152	.895	.307
70.	The boys were busy.	48	.979	.144	52	.904	.298	52	.962	.194	152	.941	.236
71.	bed	48	.979	.144	52	.923	.269	52	.962	.194	152	.948	.223
72.	Let the pet in.	48	.896	.309	52	.923	.269	52	.923	.269	152	.908	.289
73.	toad	48	.958	.202	52	.885	.323	52	.904	.298	152	.908	.289
74.	The food was good.	48	.979	.144	52	.981	.139	52	1.000	0	152	.980	.139
75.	hill	40	.925	.267	38	.947	.226	42	.952	.216	120	.934	.250
76.	He bit the chip.	40	.950	.221	38	.947	.226	42	.952	.216	120	.942	.234
77.	rib	40	.925	.267	38	.921	.273	42	.952	.216	120	.926	.263
78.	The crab was in the tub.	41	.976	.156	38	.921	.273	42	.952	.216	121	.943	.234
79.	beet	41	.976	.156	38	.947	.226	42	.952	.216	121	.951	.217
80.	They need the feed.	41	.902	.300	38	.921	.273	42	.952	.216	121	.918	.275
81.	bag	41	.927	.264	38	.947	.226	42	.952	.216	121	.934	.249
82.	My gum is good.	42	.976	.154	38	.947	.226	42	.976	.154	122	.959	.198
83.	white	43	.884	.324	38	.816	.393	42	.905	.297	123	.863	.345
84.	There's white and wheat.	43	.907	.294	38	.895	.311	42	.976	.154	123	.919	.273
85.	paint	44	.909	.291	39	.923	.270	42	.952	.216	125	.921	.271
86.	The pig was in the park.	48	1.000	0	52	1.000	0	52	.981	.139	152	.987	.114

Table 5

PEARSON CORRELATIONS OF ENGLISH PHONEMES WITH READING ACHIEVEMENT FOR EIGHT ETHNOLINGUISTIC GROUPS IN THREE GRADE LEVELS

	Ethnolinguistic Group							
	Urban Mexican-American	Rural Mexican-American	Puerto Rican	Cuban-American	Franco-American (Cajun)	Chinese-American	Native American (Navajo)	Anglo
Grade 1								
r	.11	NA*	NA	NA	NA	.21	NA	.30
N	19					35		.48
Sig.	NS**					NS		.02
Grade 3								
r	.29	.52	.44	.46	-.01	.58	.71	.24
N	15	33	24	25	35	32	16	50
Sig.	NS	.001	.02	.01	NS	.001	.001	.05
Grade 5								
r	-.13	.48	.43	-.04	.05	.47	.76	.17
N	18	36	24	19	19	31	15	46
Sig.	NS	.001	.02	NS	NS	.004	.001	NS

* NA = no achievement data available.

**NS = correlation coefficient is not statistically significant.

significant correlations for both first and third graders of the Anglo criterion group, thus indicating that even for native speakers there is a relationship between a child's pronunciation and reading achievement skills.

Phoneme Production

Ten consonants (/p/, /b/, /d/, /g/, /č/, /v/, /θ/, /ð/, /z/, and /h/) and four consonant clusters (/sp/, /st/, /sn/, and /hw/) were tested. The results of the analyses by grade and ethnolinguistic group are shown in Table 6.

Voiceless bilabial stop /p/. This phoneme is commonly acquired by native speakers of English by age four (Menyuk, 1971). Of the four language-minority groups tested, only the Puerto Rican first graders had difficulty with the first item, "paint." However, on the second item, "The pig is in the park," the Cajun (Franco-American) children had slight difficulty at grade one and both Puerto Rican and Navajo (Native American) children had difficulty at all grade levels, although both groups approach criterion at grade five.

Voiced bilabial stop /b/. This phoneme is one of the first acquired by English-speaking children and nearly always mastered by age three (Irwin, 1947; Menyuk, 1971). Navajo, rural Mexican-Americans, and Chinese-American first graders, as well as Cajun fifth graders, had difficulty with the item "rib"; "The crab was in the tub" presented difficulty for five first-grade groups (Puerto Rican, urban and rural Mexican-American, Chinese-American, and Navajo), three third-grade groups (Puerto Rican, Navajo, and Chinese-American), and three groups at grade five (Franco-American, Chinese-American, and Navajo).

Voiced alveolar stop /d/. The consonant /d/ is acquired relatively early, usually no later than age four (Irwin, 1947; Powers, 1957). In this

Table 6

SUMMARY OF PHONOLOGICAL DIFFICULTY FOR SEVEN ETHNOLINGUISTIC GROUPS AT THREE GRADE LEVELS

		Consonants										Vowels/Semi-Vowels						Consonant Clusters		
		Stops				Affricates/Fricatives														
	Gr.	/p/ w s	/b/ w s	/d/ w s	/g/ w s	/č/ w s	/v/ w s	/θ/ w s	/ð/ w s	/z/ w s	/h/ w s	/æ/ w s	/ə/ w s	/ɛ/ w s	/ɪ/ w s	/i/ w s	/y/ w s	/hw/ w s	/st/ w	/sn/,/sp/[a] s
Urban Mexican-American	1		x	x		x	x	x x	x		x	x	x	x	x		x	x x		
	3						x x		x						x		x	x		
	5			x	x	x x	x	x x		x			x			x				
Rural Mexican-American	1		x x		x	x x	x	x x	x	x	x	x	x		x	x	x			
	3								x						x		x			
	5			x	x	x x	x x	x x	x x			x					x			
Puerto Rican	1	x x	x	x x	x	x	x x	x x	x	x x	x	x x	x	x x	x	x x		x x	x	x
	3	x	x	x	x	x	x	x x	x	x		x x		x	x	x	x	x		x
	5	x		x			x	x	x	x		x x		x x	x		x	x		x
Cuban-American	1			x		x	x	x	x x						x					
	3					x	x		x x											
	5							x	x x											
Franco-American (Cajun)	1	x		x x	x		x	x x	x x	x x	x		x					x x	x	
	3					x		x x	x x						x			x x	x	x
	5		x x	x				x x	x x									x x		
Chinese-American	1		x x	x x			x	x	x x	x x	x	x	x				x	x x		
	3		x	x			x		x x								x	x x		
	5		x			x	x		x x	x x								x x		
Native American (Navajo)	1	x	x x	x x		x	x x		x x	x		x			x	x x		x x	x	x
	3	x	x			x	x	x x	x x	x	x	x x			x x			x		x
	5	x	x	x	x	x	x	x x	x x	x	x	x			x	x	x	x	x	x

x = group did not reach criterion

w = word-embedded item

s = sentence-embedded item

[a]Administered only to Cuban-American, Franco-American, Native American, and Puerto Rican groups

investigation, the single word item "toad" presented difficulties only for four groups of first graders: Chinese-American, Franco-American, Navajo, and Puerto Rican. However, on the second item, "The food was good," five groups of first graders (Franco-American, Chinese-American, Puerto Rican, Native American, and urban Mexican-American) and at least one grade level of all ethnolinguistic groups except the Cuban-Americans fell below criterion.

Voiced velar stop /g/. A number of studies report that the phoneme is usually acquired by age four (Irwin, 1947; Menyuk, 1971). The single word item "bag" was difficult for only two groups: Puerto Rican third graders and rural Mexican-American fifth graders. On the sentence, "My gum is good," five groups failed to reach criterion: Franco-American, rural Mexican-American, and Puerto Rican first graders, and Navajo and urban Mexican-American fifth graders.

Voiceless alveo-palatal affricate /c/. The phoneme /c/ is acquired somewhat later than the above phonemes, around the age of five-and-a-half (Menyuk, 1971). In this study, in relation to the criterion group, the item "cheap" was difficult for both Mexican-American groups at the first-grade level and the Navajo and both urban and rural Mexican-American fifth graders. The item, "He chewed his chocolate," was somewhat more difficult. The following groups failed to reach criterion: Puerto Rican, Cuban-American, rural Mexican-American, and Navajo first graders; Puerto Rican, Cuban-American, and Navajo third graders; and Chinese-American, urban Mexican-American, and rural Mexican-American fifth graders.

Voiced labio-dental fricative /v/. This phoneme is commonly acquired by age five. The single item "very" presented difficulty for five groups: Navajo and Puerto Rican first graders, urban Mexican-American third graders, and rural Mexican-American and Chinese-American fifth graders. When this

phoneme was embedded in the sentence, "The rivers are moving," 16 groups failed to reach criterion. Or, more simply, only Franco-American and rural Mexican-American third graders; and Franco-American, Cuban-American, and Chinese-American fifth graders passed it.

Voiceless dental fricative /θ/. The voiceless "th" is one of the latest acquired sounds, at approximately six-plus years (Menyuk, 1971). The single item "thing" was difficult for all first-grade ethnolinguistic groups except the Navajos; it was difficult for Navajo, Franco-American, and Puerto Rican third graders; and it was also difficult for all fifth-grade ethnolinguistic groups except for Puerto Rican and Chinese-American. The item, "Old Kathy is thin," presented difficulty for 12 of the 21 ethnolinguistic groups: urban and rural Mexican-Americans, Puerto Rican, and Franco-American first graders; Navajo, Puerto Rican, and Franco-American third graders; and for urban and rural Mexican-American, Navajo, Puerto Rican, and Franco-American fifth graders.

Voiced dental fricative /ð/. The voiced "th" is acquired by approximately the same age as the unvoiced "th," i.e., six-plus years. Four of the first-grade ethnolinguistic groups failed to reach criterion (Cuban-American, Chinese-American, Franco-American, and Navajo) as did all third-grade groups except Puerto Rican and all fifth-grade groups except Puerto Rican and urban Mexican-American. On the item, "My father is further," no first-grade ethnolinguistic group reached criterion and only urban and rural Mexican-American third graders and urban Mexican-American fifth graders did so.

Voiced alveolar fricative /z/. This phoneme is commonly acquired by native speakers around age five (Menyuk, 1971). The single word item "peas" was difficult for four ethnolinguistic groups: Puerto Rican, Franco-American, and Chinese-American first graders; and Chinese-American fifth graders. The

sentence, "The boys were busy," was somewhat more difficult: only urban and rural Mexican-American third graders and urban Mexican-American fifth graders reached criterion.

Voiceless glottal fricative /h/. The "h" sound is acquired early, around age three (Irwin, 1947; Menyuk, 1971). On the item "ham," all ethnolinguistic groups fell within one-half standard deviation of the Anglo criterion group. The sentence, "The hat is hot," was difficult for all first-grade groups except Cuban-American and Navajo. At the higher grades, only Navajo third and fifth graders failed to reach criterion.

Consonant cluster /st/. The single word item "stop" was difficult for Franco-American, Puerto Rican, and Navajo first graders; Franco-American third graders, and Navajo fifth graders.

Consonant clusters /sn/ and /sp/.[3] These clusters were tested by the sentence item, "The snail can spin." This item was difficult at all three grade levels for two ethnolinguistic groups (Puerto Rican and Navajo) and was somewhat difficult for Franco-American third graders.

Consonant cluster /hw/. On the single word item "white," nine groups failed to reach criterion. These included Navajo, Puerto Rican, urban Mexican-American, Chinese-American, and Franco-American first graders; Chinese-American and Franco-American third and fifth graders. The sentence item, "There's white and wheat," was difficult for Chinese-Americans, Puerto Ricans, Franco-Americans, and Navajos at all three grades; and first- and third-grade urban Mexican-Americans.

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[3]Subjects had to correctly produce both clusters in order to pass this item.

Vowels. Five vowels /æ/, /ə/, /ɛ/, /ɪ/, /i/, and one semi-vowel /y/ were tested. Among native standard-English speakers, the vowels are commonly acquired by age three and the semi-vowel, by age four.

Low-front vowel /æ/. On the item "bad," six ethnolinguistic groups failed to reach criterion. These included Chinese-American and Puerto Rican first graders, Puerto Rican and Navajo third graders, and Puerto Rican and rural Mexican-American fifth graders. The item, "He sat on a mat," was difficult for four first-grade ethnolinguistic groups: urban and rural Mexican-Americans, Navajos, and Puerto Rican. The third- and fifth-grade Navajo and Puerto Rican students also failed to reach criterion on the item.

Mid-central vowel /ə/. The item "luck" was difficult for three first-grade ethnolinguistic groups (Chinese-American, and urban and rural Mexican-American) and for urban Mexican-American fifth graders. The sentence item, "He hugged the bug," proved difficult for two groups: Franco-American and Puerto Rican first graders.

Mid-front vowel /ɛ/. Three groups failed to reach criterion on the item "bed": urban Mexican-American and Puerto Rican first graders, and Puerto Rican fifth graders. The item, "Let the pet in," was consistently difficult for the Puerto Rican children at all grade levels.

High-front vowel /ɪ/. The single word item "hill" was somewhat difficult only for Navajo third graders. On the sentence item, "He bit the chip," 12 groups failed to reach criterion: all Hispanic and Navajo first graders; third-grade Puerto Ricans, urban and rural Mexican-Americans, and Navajos; and Puerto Rican and Navajo fifth graders.

High-front vowel /i/. The single word item "beet" was difficult for Puerto Rican and Navajo first grader, and Navajo fifth graders. On the sentence item, "They need the feed," five groups failed to reach criterion, in-

cluding Puerto Rican, rural Mexican-American, and Navajo first graders; Puerto Rican third graders; and urban Mexican-American fifth graders.

Voiced alveo-palatal semi-vowel /y/. The single item "yes" was slightly difficult only for Puerto Rican fifth graders. On the item, "The yard is yellow," nine groups failed to reach criterion, including urban and rural Mexican-American and Chinese-American first graders; Puerto Rican, urban and rural Mexican-American, and Chinese-American third graders; and rural Mexican-American and Navajo fifth graders.

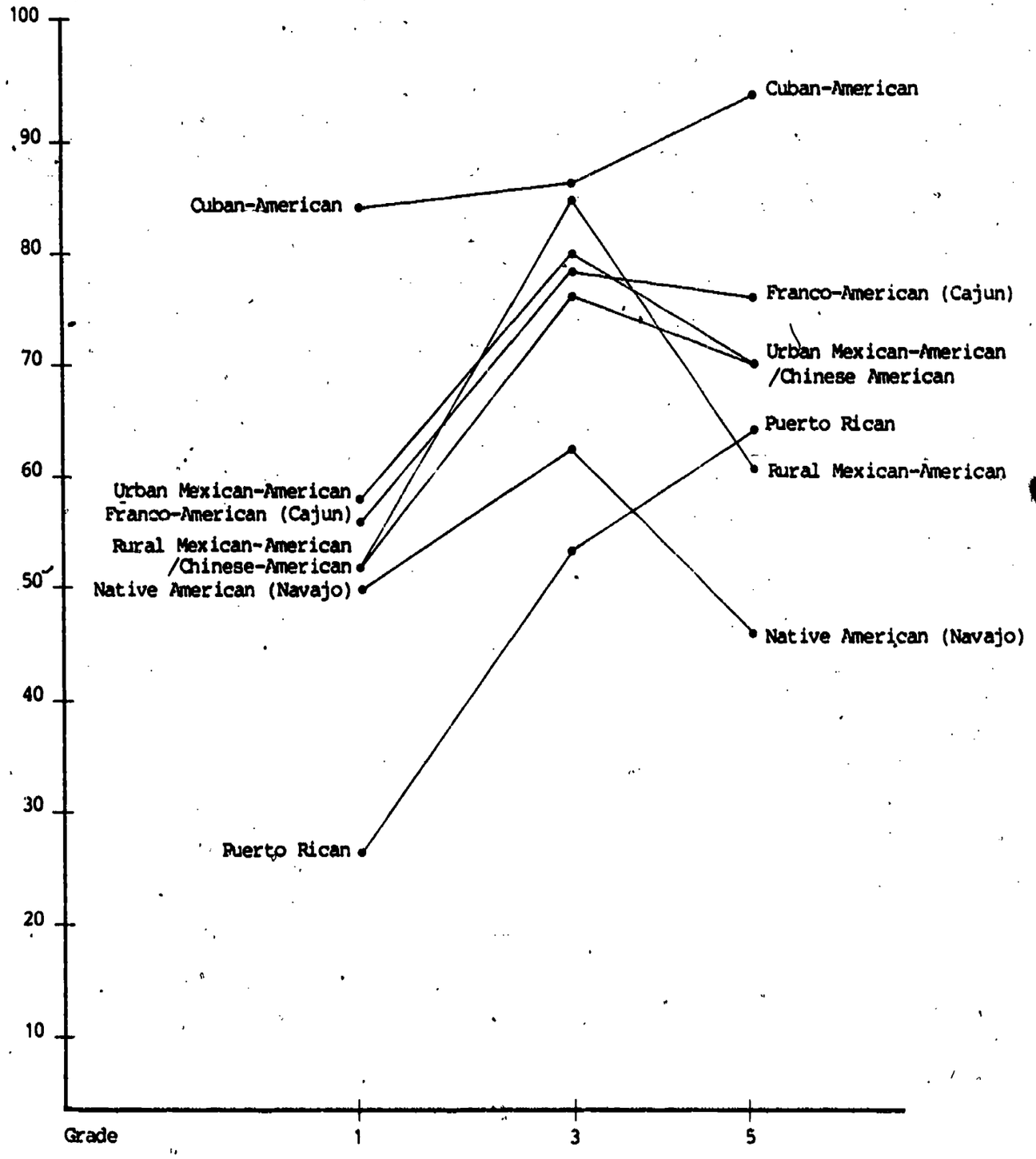
There seemed to be much variation both within and across groups as to which English sounds constitute difficulties. For example, as shown in Figure 1, at the first-grade level the Puerto Rican children had the greatest difficulty with the phonemes tested and reached criterion on only 25 percent of the items. All other first-grade groups reached criterion on at least 50 percent of the phonemes tested. The Cuban-American first graders reached criterion of 83 percent of the items.

At the third grade, the greatest difficulty overall was encountered by the Puerto Rican and Navajo children and the least difficulty by the rural Mexican-Americans and Cuban-Americans.

At the fifth-grade level, five of the seven groups had more difficulty with the items than their third-grade counterparts. In fact, the Navajo fifth graders reached criterion on only 47 percent of the items, a smaller percentage than either their first- or third-grade counterparts. The Cuban-American fifth graders had the least difficulty; they reached criterion on 92 percent of the items. The drop in performance at the fifth-grade level for several groups, or the failure to even approach criterion by this age, is in line with a number of studies (Speidel, 1979b; United States Commission on Civil Rights,

Figure 1

PERCENTAGE OF ITEMS ON WHICH CRITERION WAS REACHED FOR SEVEN ETHNOLINGUISTIC GROUPS AT THREE GRADE LEVELS



1971b), which have reported that language skills of minority children do not necessarily improve as they progress through the grades.

Two recent studies may shed further light on these results. First, De Avila and Duncan (1980) reviewed the level of oral-language proficiency for these seven groups. They report a mean score of 72.49 for Puerto Rican children (interpreted as being limited-English-proficient), while the Cuban-American children at all ages fell within the proficient English-speaking level. Duncan (1979), in a study of English/Spanish relative linguistic proficiency and cognitive style, found that 15 percent of the Puerto Rican first-grade children were identified as late language learners, i.e., lacking even limited competence in either Spanish or English. Such findings might suggest difficulties other than linguistic. It also may be that the testing procedures, because of extralinguistic or possibly cultural factors, were inappropriate.

Hierarchy of Difficulty

In order to obtain a clearer picture of the phonemes that cause problems for particular children, we have compared the relative difficulty of the items for the Anglo criterion group with the seven ethnolinguistic groups in Table 7. Table 8 provides a breakdown by grade for the Anglo group and Table 9 for the Spanish-speaking groups.

The greatest pronunciation difficulty for the language-minority children was with the phonemes acquired last by native English speakers, i.e., /č/, /θ/, and /ð/. Such findings have also been reported by other researchers. The most difficult word-embedded items for the Anglo criterion group were the initial /č/ and the initial /hw/. The /č/ was most difficult for both first ($\bar{X}$ = .75 to .79) and third ($\bar{X}$ = .80 to .84) graders (see Table 8). One hun-

Table 7

RELATIVE DIFFICULTY OF ITEMS BETWEEN ANGLO GROUP AND SEVEN ETHNOLINGUISTIC GROUPS

Anglo			Across Seven Ethnolinguistic Groups		
Rank	Item	$\bar{X}$	Rank	Item	%[a]
		Word-Embedded Phonemes			
1[b]	initial /č/	.80 - .84	1	initial /θ/, /ð/	71
2	initial /hw/ final /z/	.85 - .89	2 3	initial /h/, initial /hw/ medial /æ/	50 29
3	initial /v/, final /d/, initial /p/, initial /θ/ final /b/, initial /h/, final /g/, medial /ɪ/, initial [C+C]	.90 - .94	4 5 6	initial /v/ final /b/, final /d/, initial /č/, final /z/, medial /ə/ medial /ɛ/, medial /i/	24 19 14
4	initial /ð/, initial /y/, medial /ɛ/, medial /i/, medial /æ/, medial /ə/	.95 - .99	7 8 9	final /g/ initial /p/, initial [C+C] initial /y/, medial /ɪ/	 8 5
		Sentence-Embedded Phonemes			
1	medial /ə/	.80 - .84	1	initial /ð/	86
2	medial and initial /θ/ medial /ɛ/	.85 - .89	2 3	medial /v/ initial /hw/	76 71
3	initial [C+C], medial /i/, initial /hw/, initial /č/, medial /ð/, final /z/, final /b/, medial /ɪ/	.90 - .94	4 5 6 7	final /d/, initial /č/ initial /p/ medial and initial /θ/ final /z/, final /b/, medial /ɪ/	62 58 57 52
4	initial /h/, final /g/, medial /æ/, initial /y/, medial /v/, final /d/, initial /p/	.95 - .99	8 9 10 11 12 13	initial /y/ medial /æ/, initial /h/ initial [C+C] medial /i/, initial /g/ medial / / medial /ə/	43 33 29 24 14 10

[a] % refers to percentage of groups that failed to reach criterion on this item.

[b] 1 = most difficult

Table 8

RELATIVE DIFFICULTY OF PHONEMES FOR ANGLO CRITERION GROUP

Grade 1			Grade 3			Grade 5		
Rank	Item	$\bar{X}$	Rank	Item	$\bar{X}$	Rank	Item	$\bar{X}$
				Word-Embedded Phonemes				
1[a]	init. /č/	.75 - .79	1	init. /č/, init. /hw/	.80 - .84	1	init. /h/, init. [C+C]	.90 - .94
2	init. /v/	.80 - .84	2	fin. /z/, fin. /d/	.85 - .89		init. /č/, fin. /z/,	
3	init. /hw/	.85 - .89	3	init. /v/, init. /h/,	.90 - .94		fin. /d/, init. /hw/	
4	init. /ð/, init. /y/,	.90 - .94		init. [C+C], init. /θ/,		2	init. /ð/, init. /v/,	.95 - .99
	init. /θ/, fin. /z/,			med. /ɛ/, fin. /b/,			init. /y/, med. /ə/,	
	med. /ɪ/, fin. /b/,			init. /p/			med. /æ/, init. /θ/,	
	fin. /g/, init. /p/		4	init. /ð/, init. /y/,	.95 - .99		med. /ɛ/, med. /ɪ/,	
5	init. /h/, med. /ə/,	.95 - .99		med. /æ/, med. /ə/,			fin. /b/, med. /i/,	
	med. /æ/, init. [C+C],			med. /ɪ/, med. /i/,			fin. /g/, init. /p/	
	med. /ɛ/, fin. /d/,			fin. /g/				1.000
	med. /i/							
				Sentence-Embedded Phonemes				
1	init. & med. /θ/	.80 - .84	1	med. /ə/	.80 - .84	1	med. /ə/	.75 - .79
2	med. /ð/, init. [C+C]	.85 - .89	2	init. [C+C], init. &	.85 - .89		—	.80 - .84
3	med. /ə/, init. /č/,	.90 - .94		med. /θ/, init. /hw/			—	.85 - .89
	med. /ɛ/, med. /i/		3	init. /č/, med. & fin.	.90 - .94	2	init. & med. /θ/	.90 - .94
	init. /hw/			/z/, med. /ɛ/, fin. /b/,			med. /ɛ/	
4	med. /v/, init. /y/,	.95 - .99		med. /i/		3	med. /ð/, med. /v/,	.95 - .99
	init. /h/, med. /æ/,		4	med. /ð/, med. /v/,	.95 - .99		init. /y/, init. /h/,	
	fin. & med. /z/,			init. /y/, init. /h/			med. /æ/, init. [C+C],	
	fin. /d/, med. /ɪ/,			med. /æ/, fin. /d/			init. /č/, fin. /z/,	
	fin. /b/, fin. /g/			med. /ɪ/, init. /g/			med. /ɪ/, fin. /b/,	
5	init. /p/	1.000	5	init. /p/	1.000		med. /i/, init. /g/,	
							init. /hw/, init. /p/	
						4	fin. /d/	1.000

[a]1 = most difficult

Table 9

RELATIVE DIFFICULTY OF PHONEMES FOR SPANISH-SPEAKING GROUPS

Grade 1			Grade 3			Grade 5		
Rank	Item	%[a]	Rank	Item	%	Rank	Item	%[a]
				Word-Embedded Phonemes				
1[b]	init. /θ/	100	1	init. /ð/	75	1	init. /θ/	100
2	init. /p/, med. /ə/, med. /ɛ/, init. [C+C] init. /hw/	50	2	init. /θ/, fin. /g/, init. /v/, med. /æ/	25	2	init. /ð/, med. /æ/	50
3	fin. /b/, fin. /d/, init. /č/, init. /v/, init. /ð/, fin. /z/ med. /æ/, med. /i/	25	3	init. /p/, fin. /b/, fin. /d/, init, /č/, fin. /z/, init. /h/, init. /y/, med. /ə/ med. /ɛ/, med. /ɪ/,	0	3	fin. /g/, init. /v/, fin. /x/, med. /ə/ med. /ɛ/	25
4	fin. /g/, init. /h/ init. /y/, med. /ɪ/	0		med. /i/, init. [C+C], init. /hw/		4	init. /p/, fin. /b/ fin. /d/, fin. /z/ init. /h/, med. /ɪ/, med. /i/, med. [C+C], init. /hw/	0
				Sentence-Embedded Phonemes				
1	med. /v/, med. /ð/, med. /ɪ/	100	1	init. /c/	100	1	fin. /d/, med. /v/, med. & init. /θ/, med. /ð/	75
2	fin. /b/, init. /č/, init. & med. /θ/, init. /h/, med. /æ/	75	2	med. /v/, med. /ɪ/, init. /y/	75	2	init. /p/, init. /č/, fin. /z/, init. /hw/	50
3	init. /p/, fin. /d/, init. /g/, fin. /z/, init. /y/, med. /i/	50	3	init. /p/, med. /ə/, init. /hw/	50	3	init. /g/, init. /y/ med. /æ/, med. /ɛ/, med. /ɪ/, med. /i/, init. [C+C]	25
4	med. /ə/, med. /ɛ/ init. [C+C]	25	4	fin. /b/, fin. /d/, med. & init. /θ/, fin. /z/, med. /æ/, med. /ɛ/, med. /i/, init. [C+C]	25	4	fin. /b/, init. /hw/, med. /ə/	0
			5	init. /g/, med. /ə/, init. /h/	0			

[a] % refers to proportion of groups that failed to reach criterion on this item.

[b] 1 = most difficult

dred percent of the Spanish-speaking first graders and 75 percent of the third and fifth graders failed to reach criterion on the medial /v/ when it was embedded in a four-word sentence. This finding is not surprising, given that the Spanish medial "v" is an allophone of /b/ and produced as a bilabial [β].

The most difficult sentence-embedded phonemes for the Anglo criterion group, as shown in Table 8, were initial and medial /θ/ for the first graders ($\bar{X}$ = .80 to .84); medial /ə/ for the third graders ($\bar{X}$ = .80 to .84); and medial /ə/ for fifth graders ($\bar{X}$ = .75 to .79).

Sentence-embedded items were somewhat easier than word-embedded items for the Anglo criterion group. The reverse is true for most other language groups. Thus, one might assume that the Anglo children were able to pick up more contextual acoustical cues from the longer items. However, for the language-minority children the longer items may have carried a larger memory demand.

The majority of the pronunciation difficulties of the seven ethnolinguistic groups were with consonants and, seemingly, not dialectical in nature. However, there were three phonemes included that may be dialectical. The first is the initial /hw/, which in some English dialects is pronounced as /w/ (Dickerson, 1975). The others are the low front vowel /æ/ and the mid-central vowel /ɪ/, both sectors of the vowel chart that a number of linguists have found to be replete with dialectical differences (see Dickerson, 1975, and Stockwell and Bowen, 1965, for a complete discussion of the variable and non-variable vowels and consonants). In terms of teaching English as a second language, one would have to agree with Dickerson (1975) that contrast units not used by all standard English speakers are variable and therefore need not be taught.

IMPLICATIONS FOR THE CLASSROOM

In interpreting the above preliminary findings into practical classroom activities, it should be remembered that phoneme acquisition seems to follow a developmental sequence. Thus, for example, probably little would be gained in attempting to improve pronunciation of the voiced and unvoiced "th" before at least six-and-a-half years. It also seems important to remember that language sounds are not learned in isolation. Just as babies acquire phonemes as a convergence of babbling with perceptive development, older children learning English as a second language may well acquire requisite phonological skills simultaneously with lexical and syntactic/semantic skills in an environment that encourages generalization of language learning.

Many papers, studies, and findings, both empirical and anecdotal, seem to support such a generalized approach. Cazden (1972) has examined the effectiveness of teaching specific grammatical structures (i.e., the use of the negative in English). She suggests that too specific training may result in too specific learning. Speidel (1979a) has compared the effectiveness of two instructional approaches to language development with Hawaiian Creole-speaking children and found the language in natural context approach to be more effective than a teacher-structured pattern repetition approach. Martlew et al. (1978) report that role playing has an important function in development of effective communication and in modification of language use. Leontev (1975), following Vygotsky (1962), discusses the necessity of including cognitive, intellectual activity as a component of foreign-language teaching. Ratner and Bruner (1977) report that games assist language-acquiring children by allowing development of reversible role relationships between speaker and hearer.

More specifically, Hollingsworth (1977) has found poetry beneficial in language arts because "[it] abounds in basic vocabulary [and combines] high frequency words with rhythm and rhyme...[allowing repetition]" (p. 180). With respect to reading, "poems break...long line[s] of print into small... [manageable] chunks" (p. 181). D'Angelo (1977) reports that proverbs are a source and means of presenting and preserving both ethical and ethnic values--and at the same time provide useful material for either oral or written language arts. Trachtenberg (1979) reports on the effectiveness of jokes in the enrichment of communicative competence: Jokes and riddles involve formulae that vary from language to language; they offer a mini-lesson in vocabulary, grammar, and speech patterns; jokes and riddles promote not only receptive and productive fluency, but an acquisition of the target language's sociolinguistic values.

Other educators recommend language-arts programs that embody a holistic curricular integration. Fortson (1977) reminds us that science experiments not only reinforce science concepts but encourage children to read. Art can promote spoken thought and encourage reflective thinking, problem-solving, and social awareness. Mathematics and language arts reinforce each other, developing mathematical problem solving and language composition skills as well as abilities to produce, organize, and express original ideas. [See De Avila et al. (1981) for results of an experiment in which children were exposed to a wide variety of science/math experiments and activities designed to improve linguistic as well as cognitive and academic skills.] Finally, following the above findings and recommendations, there is a recent series of language arts materials (Duncan et al., 1980) that embodies a language-enrichment approach and includes a wide range of oral and written language games and activities, including rhymes, riddles, jokes, tongue twisters, puz-

zles, proverbs, syllogisms, etc. Ideally, the appropriate use of such linguistic vehicles provides not only pronunciation practice or vocabulary building, but a total environment in which natural language is both the medium and the message.

QUESTIONS FOR FURTHER RESEARCH

This study has raised a number of questions essential to a clear picture of the implications of phonological difficulties of bilingual children. These include:

1. To what extent is low reading achievement of language-minority children with phonological difficulties confined to English?
2. What is the pattern and hierarchy of phonological difficulty of Spanish-speaking children across all English phonemes in all possible positions?
3. Is there a significant correlation between phonemic production proficiency and auditory discrimination? Between phonemic proficiency and overall oral fluency?
4. What is the acquisition pattern of English phonemes when examined longitudinally? Do some groups, indeed, become less proficient with age?
5. Is there an ordinal sequence in the acquisition of certain phonemes by speakers of specific other languages, such that when an individual is at one "phonemic step" it may be assumed that the earlier "step" has already been acquired?

The answers to these and other questions would go a long way toward facilitating integrated programmatic treatment for language-minority children.

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