A Noncontrastive Model for Assessment of Phonology

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ABSTRACT

The contrastive/noncontrastive model developed by Seymour and Seymour (1977) can be applied to the development of a dialect-sensitive phonological assessment that uses a single scoring and test format, regardless of a child's dialect. Through extensive field research, stimulus items were found that respect the phonotactics of African American English (AAE) (i.e., no targets are final consonants or final consonant clusters), yet are sufficiently demanding to show development in the age range from 4 to 9 years. Consonant clusters of varying levels of phonological difficulty are shown to discriminate between typically developing and phonologically impaired children of different dialect groups, Mainstream American English (MAE) and non-MAE. Implications for further diagnosis and remediation are presented.

KEYWORDS: Contrastive and noncontrastive substitution patterns, type I, II, and III errors, consonant clusters

Learning Outcomes: As a result of this activity, the participant will be able to identify (1) how the contrastive-noncontrastive model of assessment was applied in the development of the proposed dialect-sensitive phonology assessment, and (2) several key features of the proposed phonology assessment items.

PHONOLOGY DOMAIN

The contrastive/noncontrastive model¹ described in Seymour² was applied in the development of a dialect-sensitive phonology assessment. As with other domains of language, *contrastive* refers to phonological features that

differ (contrast) between African American English (AAE) and Mainstream American English (MAE). The most common of these features in AAE are absent elements of consonant clusters and the absence of a word final consonant.^{3,4} These contrastive features have

Evaluating Language Variation: Distinguishing Dialect and Development from Disorder; Editors in Chief, Nancy Helm-Estabrooks, Sc.D., and Nan Bernstein Ratner, Ed.D.; Guest Editors, Harry N. Seymour, Ph.D., and Barbara Zurer Pearson, Ph.D. *Seminars in Speech and Language*, volume 25, number 1, 2004. Address for correspondence and reprint requests: Harry N. Seymour, Ph.D., Department of Communication Disorders, University of Massachusetts Amherst, Amherst, MA 01003. E-mail: hseymour@comdis.umass.edu. ¹Professor Emeritus, Department of Communication Disorders, University of Massachusetts Amherst, Amherst, Massachusetts. Copyright © 2004 by Thieme Medical Publishers, Inc., 333 Seventh Avenue, New York, NY 10001, USA. Tel: +1(212) 584-4662. 0734-0478,p;2004,25,01, 091,100,ftx,en;ssl00184x.

particular diagnostic implications. Consider the cluster "st" as an example. In AAE phonology, the reduction of /st/ → [s] is commonly observed. Although the cluster is similarly absent in the speech of very young MAE-speaking children, it is no longer absent by 4 years of age in the initial word position, and in the final word position, "st" is typically mastered by 7 years of age.⁵ These age-appropriate expectations can indicate a possible phonological/articulation disorder if a child fails to meet them.

However, in the case of an AAE-speaking child who may produce either "fast" or "fas," that child should not necessarily be viewed in the same way. When spoken by children of AAE backgrounds, this type of consonant reduction should not be considered a potential clinical problem, but should be viewed as a contrastive feature of AAE. Hence, such AAE features have at best limited diagnostic value as indicators of a phonological disorder when they are absent either as single consonants in final word positions or elements of a cluster. Because of the ambiguity of their status, it would not be clear whether the absent forms are due to the AAE dialect or to a phonological problem.

Although most contrastive features produce ambiguous interpretations in the diagnostic process, this is not true of all contrastive features. Clearly, a consonant cluster reduction such as /st/ → [t] (as in "ret" for "rest") could not be explained by AAE phonological rules, and thus, would be considered either an error of development or of disorder. In addition, the ambiguity associated with absent forms does not exist for all substitution patterns. Phonological substitution patterns that do not follow the AAE characteristic profile would be patterns of either development or disorder. For example, an /f/ → [th] substitution would yield a "mouth" → [mouf] substitution in AAE, but a /th/ → [s] substitution as in "mouth" → [mous] would be inconsistent with AAE and could only be explained as a developmental or a disordered error.

As for most substitution patterns, there is no ambiguity with noncontrastive patterns. The "st" in the initial position (*steam*) is noncontrastive and is expected to be mastered by 4 years of age. Failure to achieve this mastery would

arouse concern. Although this concern would most probably apply for AAE speakers as well, there remains some question about whether AAE and MAE follow the same acquisition schedule. As stated above, age 4 is the expected MAE mastery milestone for the initial "st." Is it the same for AAE? The answer is probably "yes" based on most studies comparing MAE and AAE among children,^{6,7} but these studies are limited⁸; in the absence of extensive longitudinal studies on AAE comparable to those on MAE, this question cannot be answered with absolute certainty. For this reason, we chose stimulus items based on extensive field-testing and piloting to ensure that items were in fact noncontrastive and that they would not differ between AAE and MAE in terms of age appropriateness.

RESEARCH BACKGROUND

The phonology stimulus items on which we have concentrated derived from several years of research on AAE phonology. As a result of a National Institutes of Health (NIH) grant to Seymour and Roeper in 1994 (See Acknowledgments), an extensive database on AAE phonology was developed. This database made possible an in-depth analysis of phonological constraints governing features of AAE. The phonological contexts under which AAE patterns were favored confirmed important similarities between child AAE and the adult AAE phonology described in the literature.^{6,8-11} This led to the selection of more than 200 consonant and cluster combinations about which predictions were made as to which best discriminated AAE and MAE by age, which were produced in identical ways by MAE and AAE speakers across ages, and which best discriminated typically developing children from phonologically impaired children.

These predictions about potential stimulus items for phonology assessment were tested in a 1998 NIH contract awarded for 6 years to Seymour, Roeper, and de Villiers. (See Acknowledgments). The NIH contract addressed several aspects of language and involved piloting of test items in schools and preschools in Hartford, Connecticut, and Springfield, Massachusetts. Overall, several hundred

African American and non-Hispanic white children who were determined either to be AAE speakers or MAE speakers, and who were matched for socioeconomic status and educational background, participated in pilot studies. See Pearson¹² for details regarding field testing and developmental milestone research, and Ciolli and Seymour¹³ for uses of the contrastive features that we piloted for screening items.

THE ASSESSMENT FORMAT

The assessment format of the Phonology domain that was finally constructed allowed two important challenges to be met. First, to ensure a developmental demarcation across ages, consonant clusters of varying levels of phonological difficulty were used as targets in the stimulus words. Second, using clusters only in the initial and medial word positions avoided AAE patterns and thus eliminated difficult clinical decisions about what is disordered and what is not among speakers of AAE. By restricting target stimuli in this way, the testing format allowed for the most difficult phoneme combinations and contained no AAE patterns. It also created a natural developmental growth curve.

Twenty-five word targets containing 25 clusters represented the target stimuli. These particular targets were selected following extensive field testing of numerous target words and clusters. They were among the best at discriminating between typically developing and phonologically impaired children. Their effectiveness stems from the following several unique phonotactic and context conditions:

1. Clusters were assessed within continuous sentence context as opposed to in isolated words;
2. Clusters were assessed in either a monosyllabic or multisyllabic context;
3. Clusters comprised both two and three consonants;
4. Clusters were either intra- or intersyllabic;
5. Some clusters were assessed within iambic words; and
6. Some clusters comprised liquids (/r/ and /l/).

The administration of the Phonology items involved the presentation of a picture depicting a cartoon image about which the child was asked to repeat a sentence produced by the examiner. Each sentence began with the carrier phrase "I see a . . ." introducing a small clause or noun phrase. For example, the examiner would show a picture of a truck and say, "I see a truck pull a boat," or a picture of a leaf and say, "I see a leaf." The child was to repeat the entire sentence exactly as presented. This procedure was an attempt to control the memory load across stimulus sentences, whose length could vary greatly. In addition, in an effort to avoid dialect interference among AAE speakers, this first-person present tense construction ("I see. . .") restricted the use of certain morphosyntactic markers. To illustrate a context in which a dialect interference is possible, consider the target sentence "The boy *c*loses the door" containing the target cluster /kl/. The third-person singular form ("closes") could interfere with an AAE speaker's production of /kl/ because of the natural inclination to reduce "closes" to "close" in this third-person context. By using the small clause construction this potential interference is avoided, as in the sentence "I see the boy close the door." See Figure 1 for examples of target stimuli.

ASSESSMENT FORMAT RATIONALE

Background research for the selection of targets and the stimulus format is discussed below.

Age Difference and Diagnostic Relevance

Considerable research supports the use of consonant clusters to test phonology in this age range of 4 to 9 years. In general, children do not fully master the production of all of the consonants of English until around 8 years of age.¹⁴⁻¹⁶ Even though children have acquired their phonemic system of contrasts much earlier, during this period of acquisition, there is a gradual but progressive mastery of phonetic constraints.¹⁷ The error patterns produced by children during the acquisition period are in fact systematic and predictable.^{18,19} It is when children no longer produce these developmental

Figure 1 Phonology stimuli.

error patterns that they have achieved mastery of their phonemic system. This acquisitional mastery occurs over several years and its order is also systematic and predictable.⁵ It is this predictable order that determines the age-appropriate milestone targets characteristic of most tests of phonology. Our proposed test also draws upon the predictable and systematic nature of phoneme acquisition, but is unique in that stimulus items were designed to be difficult to sharpen distinctions across ages and enhance the differences observable between typically developing and phonologically impaired children.

There is supporting evidence for each facet of the testing format: that generally clusters are more difficult to master than singleton phonological structures²⁰; that three member clusters are more difficult to master than two member clusters (e.g., “*stream*” versus “*stick*”¹⁷; that intrasyllabic clusters [re – (str)ain] are more difficult to produce than inter-syllabic clusters [ce(n–tr)al]²¹; that multisyllabic words are more difficult to produce than monosyllabic words²²; that children with disordered or delayed phonology may have difficulty producing the first syllable in iambic words [(a)sleep with initial unstressed syllable],^{23–25} that consonant clusters containing liquids can often result in consonant cluster simplification among speakers with immature and disordered phonological systems¹⁷; and that productions of words targeted for articulation are more authentic in continuous speech than in isolated words.^{26–30} All of these characteristics converge in creating a relatively difficult production task that challenges less mature and impaired phonologies

while maintaining strong milestone distinctions across ages.

English Variation Status

We sought a phonological assessment method for the proposed test that would work as well for AAE- as it does for MAE-speaking children. Our final design included dialect-neutral stimulus items that emphasize the identification of phonological impairment without penalizing a child for phonological patterns typical of variations in English such as AAE. Indeed, AAE phonological features were quite prevalent among most of the African American children examined in the various pilot studies and standardization sampling that we have conducted, in keeping with the extant literature. These included the most often observed patterns (i.e., absent final consonants and absent consonants of word final clusters).^{3,4,6,8,21} Because no stimulus items involving consonants, final consonants, or final consonant clusters as targets were included in the final phonology probes, AAE features were inconsequential because there is no requirement for a child to produce them under test conditions. Thus, the diagnostic dilemma faced by most phonology tests is avoided (i.e., having to adjust and manipulate scores for AAE speakers compared to MAE speakers). This kind of manipulation attempts to accommodate different response patterns for AAE and MAE, creating the complication of a possible different scoring format and/or scale for each of those variations of English.

Figure 2 Phonology scores by Dialect (typically developing only. AAE, African American English; MAE, Mainstream American English.)

THE PHONOLOGY DOMAIN RESULTS

Developmental milestone testing of the Phonology probe showed its effectiveness in meeting the assessment objective; that is, the assessment of phonological disorders in a linguistically and culturally fair manner. With respect to dialect differences, there was no significant difference between AAE and MAE typically developing children across ages 4 to 9 (Fig. 2). As expected, young children made far more errors than older children. However, because of the nature of the task, differences among ages were not as great as those observed for the other language domains discussed in this issue, but the age differences were still statistically significant [Age, $F(5, 736) = 16.691$, $p < .0001$; Dialect, $F(1, 736) = .060$, $p = .806$; Age by Dialect, $F(5, 736) = .818$, $p = .537$].

An inspection of the distribution of mean scores across ages for impaired versus typically developing children shows an obvious separation across all ages except age 9 years (Fig. 3). This pattern is borne out in the statistics, which show strong effects of age and clinical status, and also an interaction between them: Age, $F(5, 1079) = 19.267$, $p < .0001$; Clinical Status, $F(1, 1079) = 180.40$, $p < .0001$; Age by Clinical Status, $F(5, 1079) = 3.807$, $p = .002$. This strong separation is also consistent within each dialect; that is, AAE-impaired children differ from AAE typically developing children (Fig. 4) (Age, $F(5, 670) = 8.088$, $p < .0001$; Clinical Status, $F(1, 670) = 117.08$, $p < .0001$; Age by Clinical Status, $F(5, 670) = 1.63$, $p = .146$], and the same results hold for MAE [Fig. 5, Age, $F(5, 380) = 7.655$, $p < .0001$; Clinical Status, $F(1, 380) = 46.231$, $p < .0001$].

Figure 3 Phonology scores by Clinical Status (phonologically impaired versus not impaired).

Figure 4 Phonology scores by Clinical Status (phonologically impaired versus not impaired), African American English (AAE) background only.

Age by Clinical Status, $F(5, 380) = 1.192$, $p = .313$).

IMPLICATIONS FOR FURTHER DIAGNOSIS

If a child’s performance on the Phonology probe were to suggest a phonological problem, we believe that the child should be given an in-depth phonological evaluation. Because the phonology domain assesses clusters only, an examination of the full array of both singleton and cluster phonemes is recommended. This diagnosis along with error patterns on a Phonology probe such as the one we developed would form the basis for intervention strategies.

There are several traditional formats that are used to assess phonology and articulation in children.³² These commonly include standardized tests that assess the full range of English consonants, connected speech samples, single-word corpus analysis, and stimulability testing, among others. The analysis applied to the child’s phonological productions can be of several kinds, including segmental, natural process, and distinctive features. Design features reflected in the phonotactic and context characteristics of the Phonology domain can suggest a child’s area(s) of weakness and motivate a particular format for testing and focus of analysis.

It is recommended that the clinician choose diagnostic procedures she or he prefers,

Figure 5 Phonology scores by Clinical Status (phonologically impaired versus not impaired), Mainstream American English (MAE) background only.

but that a battery employing several measures may be necessary to describe fully the nature and extent of a child's departure from age-appropriate phonological targets.

In addition, the planning, implementation, and interpretation of the diagnosis should be influenced by the child's dialect background. If the child is an MAE speaker one can employ traditional and "best practice" methods, which are familiar to speech-language pathologists (SLPs) and should represent the most current and common practices.^{21,32-34}

Alternatively, if the child is not an MAE speaker, the examining clinician *must* be familiar with the phonological characteristics of the particular dialect spoken by the child. For example, if a child speaks AAE, there are certain predictable contexts in which consonants may be absent, such as in final positions of words and within certain consonant clusters. Specific to AAE, there are three types of phonological errors that must be taken into consideration.³⁵

1. Type I refers to violations on consonants that are common or noncontrastive between AAE and MAE such as ([tat] for "cat").
2. Type II errors involve typical contrastive AAE patterns where an AAE speaker would produce [f] for a /θ/ in word final position [mouf], but an impaired child might produce [mous] (the [s] for /θ/ is a pattern of neither AAE nor MAE).
3. Type III errors involve impairment features that are qualitatively shared between the AAE and MAE but are quantitatively different. There is a higher probability in both dialects that in certain contexts a consonant cluster may be reduced, as when the cluster is followed by a consonant ("fast ball" → "fas ball") than when followed by vowel ("fast end" → "fast end"). A type III error would involve a child producing a higher proportion of the cluster followed by the vowel than is expected for even an AAE speaker.

It is important to conduct an in-depth analysis to determine the extent to which the three types described above characterize the child's impairment. In characterizing the child's error types, as with the MAE child, one

should employ traditional and "best practice" methods.

IMPLICATIONS FOR INTERVENTION STRATEGIES

Clinicians should employ best practice methods in devising and implementing phonology intervention strategies, which may include motoric approaches in treating phonemic segments and/or cognitive/linguistic approaches involving phonological processes or distinctive features.^{21,32-34} Intervention strategies apply to both the selection of intervention target behaviors and the remediation procedures to address those target behaviors. Target behaviors should result from the in-depth diagnosis described above. Remediation methods typically involve both perception and production tasks.

The planning and implementation of intervention strategies should be influenced by the child's dialect background. If the child is not an MAE speaker, selection of target behaviors should first focus on Type I errors (those that do not contrast between AAE and MAE (such as [tat] for "cat"). Traditional remediation practices should prevail in addressing this kind of target behavior.

The next behaviors that should be targeted are Type III errors (those that generalize from a typical English cluster reduction ("fas ball") to an atypical one ("fast end"). Again, traditional remediation practices should prevail. The last target behaviors to be addressed would be Type II errors (those that violate the AAE rule, such as when a child fails to produce either the MAE ([θ]) or AAE pattern (/θ/ → [f] ("mouf"). This error pattern is more difficult to treat because a decision must be made as to whether the target should be the AAE pattern or the MAE pattern. It is possible that effective intervention for Type I and Type III could resolve Type II problems without direct remediation. However, the result is likely to be the preservation of the AAE pattern, in which case the clinician must be willing to accept the child's dialect pattern.

In the event that Type II errors are unaffected by intervention for Type I and III errors, it is recommended that a code-switching

model be implemented by stimulating the child to perceive and produce both the MAE and AAE patterns. It is possible that the child will continue to code switch, or choose to use the pattern most consistent with his or her community dialect, and either would be acceptable. Undoubtedly, this recommendation is controversial and SLPs may find it difficult to accept response patterns other than MAE. Nevertheless, code switching is a common and natural mode among AAE speakers and can be among the most realistic of clinical goals given the child's community dialect.

CONCLUSION

We believe that a dialect-sensitive phonological assessment should have the following characteristics:

1. It has a single scoring and test format regardless of a child's variety of English.
2. Both typically developing MAE and non-MAE speaking children perform equally well across ages.
3. AAE speakers are in no way penalized for speaking AAE.
4. A developmental age differential is evident among typically developing children of both MAE and non-MAE language backgrounds.
5. It is equally effective in differentiating phonologically impaired children from typically developing children of both MAE and non-MAE backgrounds.

ACKNOWLEDGMENTS

This work was funded in part by National Institutes of Health (NIDCD) under Contract # N01 DC8-2104 and Grant # R01 DC 02172-04 to Harry Seymour, Principal Investigator, at the University of Massachusetts Amherst, with Thomas Roeper and Jill de Villiers at the University of Massachusetts and Smith College, as co-investigators. It was accomplished in conjunction with The Psychological Corporation of Harcourt Assessment, Inc., San Antonio, TX.

The tests that are the products of this research collaboration are the *Diagnostic Eva-*

luation of Language Variation (DELV) assessments, the *DELV Screening Test*, *DELV Criterion-Referenced* edition, and the *DELV Norm-Referenced* edition. The phrase "evaluating language variation" refers generally to the assessment processes discussed in this issue. The term *DELV* is the name trademarked by The Psychological Corporation of Harcourt Assessments, Inc., and refers to the specific tests that are the outcome of the extensive research described in this article. The specific tests are referred to as the *DELV-ST*, or "screener," or the *DELV-CR*, *DELV-NR*, or the "full diagnostic test," as appropriate. Questions about the principles underlying the tests can be referred to the authors of this issue (Seymour, Roeper, de Villiers, de Villiers, Pearson, and Ciolli). Questions about the tests themselves should be addressed to the Project Leader at The Psychological Corporation of Harcourt Assessment, Inc.; Lois Ciolli, Senior Research Director.

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