Perception of African American English Word-Final Stop Consonants by Mainstream American English and African American English Listeners

by

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Abstract

PERCEPTION OF AFRICAN AMERICAN ENGLISH WORD FINAL STOP CONSONANTS BY MAINSTREAM AMERICAN ENGLISH AND AFRICAN AMERICAN ENGLISH LISTENERS

by

Lynda J. Felder

Advisor: Professor Winifred Strange

The purpose of this study was to determine whether listeners experienced in processing African American English (AAE) use different cues than Mainstream American English (MAE) listeners to perceive final voiced and voiceless stop consonants produced by speakers of AAE. In this study, 12 experienced AAE listeners and 12 listeners with limited AAE experience were presented with words containing open syllables (CV) and closed syllables (CVC+) where C+ = /b, d, g, p, t, k/. The words were presented in two medial sentence contexts; target word followed by a vowel in "Say__ again" or target word followed by the voiceless fricative consonant /f/ in "Say__ for me". Two moderate-to-heavy AAE speakers produced the corpus of 60 words. Participants selected one of seven response alternatives (b, d, g, p, t, k, v). The v represents an open syllable (i.e., no final consonant). The listeners' responses were scored as correct if the intended consonants (underlying forms) were selected. The voicing and place distinctions perceived by AAE users to distinguish final stop consonants were established by comparing productions identified correctly by AAE listeners but incorrectly by MAE listeners, incorrectly by both sets of listeners, and correctly by both sets of listeners.

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Introduction

Over the past four decades research on African American English (AAE) has resulted in a vast body of knowledge about the dialect, however, significant gaps exist. Early studies in AAE (Ambrose, 1978; Baran and Seymour, 1976; Baratz, 1969, Clark and Richards, 1966; Cole and Taylor, 1990; Copple and Suci, 1974; Dillard, 1972; Eisenberg, Berlin and Dill, and Frank, 1968; Fasold and Wolfram, 1987; Gottesman, 1972; Labov, 1970, 1972; Ratnusnik and Koenigsknecht, 1975; Seymour and Seymour, 1981; Smitherman, 1977) were primarily contrastive-analysis studies that compared morphosyntactic, grammatical, morphophonemic, and phonological similarities and differences between AAE and the mainstream preferred dialect, standard American English (SAE), herein referred to as Mainstream American English (MAE). The contrastive analyses of the past examined selected features of AAE, using a narrow range of participant variables (e.g., age, geography, education, and socioeconomic status). In more recent studies, the focus has shifted from the adult model of AAE feature production to acquisition and production of the dialect features by AAE speaking children (Craig, Thompson, Washington, and Potter, 2003; Craig & Washington, 2000, 2004; Haynes and Moran, 1989; Hester, 1996; Isaacs, 1996; Moran, 1993; Seymour and Ralabate, 1985; Stockman, 1996; Terrell, 1975; Washington and Craig, 1992, 1998; Williams and Wolfram, 1997).

The terms SAE and MAE are often used synonymously. In this paper, the term MAE is preferred over the term SAE. SAE implies that there is one acceptable, though idealized, American English (AE) dialect. Even though SAE varies by region, it can be confusing and cumbersome to differentiate standard from nonstandard variations, e.g.,

Southern Standard English, New England Standard English, Southern White nonstandard etc. (Wolfram, 1977). The terms Nonmainsteam English (NMAE) and Nonstandard English (NSAE) are synonymous and refer to any regional and social dialect that varies from the acceptable dialect of a particular area. Regional AE dialects generally differ by vowel inventories and production (Lowe, 1996; Williams and Wolfram, 1977; Wolfram, 1987, 1997). MAE seems to be a more inclusive term because it includes all acceptable regional dialectal variations of AE. Social dialects are associated with the speaker's race, ethnicity, or SES. AAE is a social, regional, and nonmainstream AE dialect that varies from MAE in all linguistic areas, e.g. grammar, phonology, semantics, syntax, and pragmatics. However, it contains enough similarities to MAE to be considered a dialect rather than a separate language. The term accent is often used to describe phonological aspects of a regional dialect such as, "a southern accent" or "a Boston accent." Accent or foreign accent refers to the carryover of the phonology from a native language to a second language (Flege, 1995; Lowe, 1996, Strange, 1995, Wolfram, 1997).

Research in AAE phonology has been primarily in the articulatory domain that involved contrastive analyses of AAE and MAE phoneme production (Bleile and Wallach, 1992; Cole and Taylor, 1990; Craig and Washington, 2000; Haynes and Moran, 1989; Moran, 1993; Laing, 2003; Seymour and Ralabate, 1985; Seymour and Seymour, 1981; Stockman, 1993; Washington and Craig, 1992). The majority of stimulus protocols used in past studies were either articulation tests that presented target phonemes in citation form words in three word positions, initial, medial, or final, or sentence closure tasks in which the target phoneme was either in word-initial or word-final positions (Bleile and Wallach, 1992; Cole and Taylor, 1990; Craig and Washington, 2000; Haynes

and Moran, 1989; Moran, 1993; Laing, 2003; Seymour and Ralabate, 1985; Seymour and Seymour, 1981; Stockman, 1993; Washington and Craig, 1992). AAE speaking participants were overwhelmingly from low socioeconomic environments with less education than the comparison group, white middle class MAE speakers. Limited investigation of the perceptual skills of AAE speakers has been conducted (Ambrose, 1978; Baran and Seymour, 1976; Clark and Richards, 1966; Eisenberg & al, 1968; Felder and Strange, 2002; Gottesman, 1972; Moran, 1993; Terrell, 1975). Although acoustic and perceptual variables have been suggested to account for production differences between the two dialects, little research exists on AAE phonology in these two domains to support currently held assumptions about AAE. For example, AAE speakers demonstrate a high incidence of deletion of the final consonant in consonant clusters when the consonant is followed by a consonant rather than a vowel (Baran and Seymour, 1976; Stockman, 1993, 1996; Williams and Wolfram, 1977). Further investigation of the phonological features of AAE utilizing robust perception and production methods will fill in some of the gaps left by previous AAE phonological research, and might confirm or deny assumptions made about certain AAE phonological rules.

Description of African American English

The majority of AAE speakers are African American from the low and working socioeconomic classes. However, members of other ethnic groups and income levels speak the dialect and not all African Americans speak AAE. Age, gender, geographic location, education, income, and occupational status influence the frequency of use of the dialect (Labov, 1972; Stockman, 1996; Smitherman, 1977; Terrell, 1975; Terrell and Terrell, 1983; Fasold and Wolfram, 1970). An individual's ethnic identity with the AA

community also influences use of AAE (Smitherman, 1977; Terrell, 1975). English language learners (ELL) and speakers of other regional and ethnic AE dialects share certain phonological and grammatical features with AAE (Flege and Eefting, 1986, 1987b). The primary difference between AAE and other AE nonmainstream dialects is the frequency of occurrence of particular features. Wolfram (1987) reported several instances of overlap in the use of certain phonological, morphological, and grammatical features by speakers of four major nonmainstream varieties of American English; Northern White Nonstandard English (NWNS), Southern White Nonstandard English (SWNS), African American English (AAE), and Appalachian English (AppE). For example, the word-initial substitution of /d/ for ð, [ð/d] occurs in all nonmainstream AE dialects including AAE. However, the substitution occurs more frequently in AAE compared to other AE dialects. In addition, the word-final substitution [θ→f] occurs more frequently in AAE than other AE dialects and not at all in some AE dialects (Williams and Wolfram, 1977; Wolfram, 1987).

The grammatical and phonological features of AAE emerge in the speech of children at approximately 3 to 4 years of age (Stockman, 1996; Washington & Craig, 1994) with a sharp reduction in AAE feature use occurring between 7 to 8 years (Isaacs, 1996). This radical change in use of AAE features is referred to as dialect shifting (Isaacs, 1996). However, many AAE speaking children maintain some of the dialect features throughout adulthood with more males than females retaining AAE features. Isaacs (1996) stated that a shift in AAE use is unlikely to take place if the shift does not occur by the elementary grades. The author further stated that dialect shifting usually

occurs when children have a certain level of exposure to MAE in school. Isaacs did not state why the shift does not occur in all children who have the same level of exposure to MAE.

Considerable variation exists in the number and type of features that have been listed as part of the AAE dialect pattern. This variation in description of AAE features appears to be based on the researchers' interest, the sociodemographics of the participants, and the specific component(s) of language under examination. Stockman (1996) and Craig & al. (2003), for example, refer only to the phonological features of AAE (see Appendix A for a list of AAE phonological features). Baran and Seymour (1976) focused on three phonological rules of AAE: 1) substitution of /ɪ/ for /ɛ/ before nasal consonants; 2) deletion of the final consonant in consonant clusters; and 3) devoicing of the final voiced stops [b, d, g]. The details of the three rules will be discussed later in this paper. Baugh (1983), Labov (1970), Rickford (1998), and Cole and Taylor (1990) included primarily morphosyntactical and some phonological AAE features in their studies, whereas Washington and Craig (1994, 1998) included selected grammatical, morphological, and phonological AAE features in child speakers of the dialect).

Oetting and McDonald (2001) provide the most inclusive list of morphosyntactic AAE features, reporting on 35 grammatical features (see Appendix B). The reader is referred to Oetting and McDonald (2001) for a detailed description of each listed feature. According to Oetting and McDonald (2001), their catalogue of AAE features differs from other investigators' lists because they isolated items that were usually categorized

inclusively by other researchers. For example, zero regular past tense, zero irregular past tense, over-regularization, and past as participle features are usually included in a general past tense category.

With respect to the grammatical and phonological features of AAE, the dialect follows a variable rule system with specific contextual constraints on consonant and vowel production (Stockman, 1996; Haynes & Moran, 1989; Labov, 1970; Moran, 1993; Rickford, 1998; Seymour and Seymour, 1981; Williams &Wolfram, 1977; Wolfram, 1997). The variable rule paradigm suggests that language-external, as well as language-internal conditions determine the frequency of occurrence of an AAE feature. Wolfram (1987) posits that all dialects vary by quantitative and qualitative patterns. He defines quantitative differences as linguistic forms that are found in one dialect that are relatively absent in another. For example, the AAE grammatical form "habitual be" is an example of a quantitative difference (e.g., "She always be home."). This form is frequently found in AAE, but occurs infrequently in other AE dialects. Qualitative differences are regionally defined forms that exist in some dialects, but never or rarely in others. For example, use of the word "anymore" in Appalachian English to mean "now" (e.g., "He's angry a lot anymore."). Dialects are not differentiated solely by discrete sets of features, but also by the frequency with which certain forms or rules occur (Wolfram, 1997). Sociocultural factors such as language environment, age, gender, and standing of the communicative partners can affect the frequency and type of AAE features produced (Isaacs, 1996; Rickford, 1998; Stockman, 1996; Terrell, 1975; Terrell and Terrell, 1983; Washington & Craig, 1998; Wolfram, 1997).

Dialect Density

Speakers of AAE may evidence one or more phonological or grammatical features of the dialect. Thus, AAE speakers are generally classified by their amount of feature use. Several researchers have used rating scales or percentages to determine the amount of AAE feature use (Baugh, 1983; Proctor, Wilson, & Hallett, 2000; Washington & Craig, 1994; Wyatt, 1996). One major problem with interpreting scales from past studies is a lack of consistency among the researchers in the criteria used to determine the frequency of feature occurrence. In addition, as stated previously in this paper, the inventory of features examined has been different for each investigator. For example, Proctor et al. (2000) used frequency of use of six selected AAE grammatical features. The authors used the criteria: low, the feature is used occasionally; moderate, the feature occurs approximately 50% of the time; and heavy, the feature appears more than 50% of the time. The complete inventory of AAE grammatical features was not included in this study, nor were any phonological features included.

Wyatt (1996) used a 7-point rating scale that measured the number of dimensions of AAE present in a language sample (1 was the highest level and 7, the lowest). The 4 dimensions measured were syntax, lexicon, phonology, and stress/intonation. A rating of 1 equaled heavy use of AAE on 3-4 dimensions and a 7 rating meant no AAE features were observed.

Codeswitching in African American English Speakers.

Although there are a number of studies on codeswitching in AAE speakers (Baratz, 1969; Baugh, 1983; DeBose, 1992; Terrell, 1975; Terrell & Terrell, 1983), there is a considerable lack of consensus in the literature on the definition of codeswitching as it relates to AAE. AAE speakers have been described as codeswitching to MAE when

they demonstrate a reduction in the use of any AAE feature and increased use of MAE features (Baratz, 1969; Baugh, 1983; DeBose, 1992; Hester, 1996; Isaacs, 1996; Stockman, 1996 Terrell, 1975; Terrell & Terrell, 1983; Washington & Craig, 1998). Although descriptions of AAE speakers' codeswitching in previous research usually include morphophonemic, grammatical, lexical, and syntactical changes, phonological changes were rarely reported or discussed (Hester, 1996). The AAE phonological features most often described during codeswitching to MAE were the word-initial substitution [ð→ d], word-medial substitution [ð→v], and word-final substitution [f→θ] DeBose, 1992; Craig et al. (2003); Hester, 1996).

Hester (1996) described the codeswitching behavior of two AAE speaking children during three different communicative tasks, relating personal experiences in conversation, retelling a movie, and independent story generation from a picture. Both children demonstrated use of grammatical and phonological AAE features in conversation. However, during story retelling and story formulation tasks, they both decreased their use of syntactical and morphological AAE features, but maintained the frequency of phonological features. Although variability in codeswitching proficiency among AAE speakers has been acknowledged in past studies, the focus has been exclusively on the morphological and syntactical features of the dialect. Phonological changes during codeswitching have been overlooked in descriptions of the behavior. Subjects have been described as switching completely from AAE to MAE, even though they retained AAE phonological features such as [ð→v, θ→f] in word-medial and final positions (Hester, 1996). Early researchers appeared to approach codeswitching in AAE

speakers from an observational orientation rather than through empirical study (Baratz, 1969; Baugh, 1983; DeBose, 1992; Craig et al. (2003); Hester, 1996; Isaacs, 1996; Stockman, 1996 Terrell, 1975; Terrell & Terrell, 1983; Washington & Craig, 1998). Superficially, codeswitching by AAE speakers is similar to codeswitching in bilingual/second language learners. However, the behavior differs in L2 and D2 (second dialect) learners because AAE and MAE are dialectal variations of AE rather than two distinct languages. Valdes-Fallis (1981) defines codeswitching as the alternation or switching of two different languages at the word, phrase, clause, or sentence level. Codeswitching in bilinguals implies fluency or proficiency in both languages, which is not always the case for AAE speakers. Lowe (1996) defines codeswitching as a deliberate act that involves changes in the phonological, morphosyntactical, and syntactical dimensions from one language to another by an individual who is proficient in both languages.

The varying definitions of codeswitching as it pertains to AAE speakers result in confusing interpretation of the behavior. According to this author's experiences, the majority of AAE speakers is unaware of their AAE phonological use and rarely learns MAE formally. This observation especially applies to speakers of the dialect who only demonstrate AAE phonological features. AAE speakers' exposure to MAE does not appear to affect their AAE phonological productions. In addition, it is unclear how, or if, the amount of MAE exposure affects their perception of AAE or MAE. When phonological differences in AAE and ELL speakers remain in codeswitching, the differences are usually described as dialectal interference, second language influence, or foreign accent (Flege, 1995; Valdes-Fallis, 1981; Rochet, 1995; Strange, 1995).

African American English Phonology

AAE phonology contains an inventory of vowels and consonants that is similar to the inventory of MAE. According to Stockman (1996), there are 24 consonants in the AAE repertoire. The exact number of vowels and diphthongs that exist in AAE has not been subjected to empirical study. Stockman (1996) cites 13 vowels occurring in AAE, whereas the MAE vowel inventory contains 14. In addition, Stockman reported that AAE diphthongs are reduced (e.g.. aɪ/ɑ, eɪ/e, aʊ/ɑ. Since AAE diphthong and vowel repertoires are less specified than the consonants and little research exists on the phonemes. It is unclear how many vowels and diphthongs actually occur in AAE.

Three primary AAE phonological rules specify how AAE differs from MAE (Baran and Seymour, 1976; Seymour and Seymour, 1981; Labov, 1972; Moran, 1993; Williams and Wolfram, 1977; Wolfram, 1997): 1) substitution of word-final linguadental fricatives with labiodental fricatives or alveolar stops (/θ/ & /ð/ produced as /d/, /t/, /v/, or /f/); 2) deletion of final consonants in monomorphemic word-final consonant clusters (e.g., best →"bes", cold→"col", and mask→"mas"); and 3 devoicing or deletion of final voiced stops (mob→mop & tote→toe) (see Appendix A for a list of AAE phonological rules). The high frequency of occurrence of the three rules is unique to AAE (Lowe, 1996; Labov, 1970; Stockman, 1996; Wolfram, 1977). AAE consonants affected by the first phonological rule (substitution) involve the interdental fricatives /θ/ & /ð/. The phonemes /θ/ & /ð/ frequently are produced as /d/, /t/, /v/, or /f/ by AAE speakers, depending upon the lexical or sentential context (Stockman, 1996). According to Felder and Strange (2000), AAE speakers typically maintain the voicing and manner gestures of

/θ/ and /ð, but change the place gestures (linguadental fricative to labiodental fricative). The exception is the word initial substitution of d/ ð. In this substitution pattern, the only gesture maintained is voicing, while the place and manner gestures are changed (Felder & Strange, 2000).

In accordance with the second rule, consonant cluster deletion may occur whether the cluster is followed by a vowel or a consonant (e.g., old man →ol' man) (Fasold and Williams, 1970; Williams & Wolfram (1977) initially stated that this cluster reduction rule occurs when both phonemes in the syllable are voiced. The authors add that when one phoneme is voiced and the other is voiceless, the rule does not operate (e.g., jump, belt, and rent retain the stop consonants). Wolfram (1997) later revised the constraints of this rule to include occurrence of final cluster reduction under any combination of voiced/voiceless conditions.

The voiced stops /b/, /d/, and /g/ are affected by the third rule (devoicing/ deletion), most often in the final position of monosyllabic words. When the devoicing rule is applied, AAE speakers' productions of words ending in voiced and voiceless stops may be perceived by MAE listeners as homophones (e.g., cap & cab→cap, pig & pick→pick, and bag & back→ back). Although Fasold and Wolfram (1970), Williams and Wolfram (1977), Wolfram (1987) and Lowe (1996) claimed that the devoicing rule is unique to AAE, this is likely based on a comparison with other dialects of AE. The AAE devoicing/deletion rule is of particular interest to this study because of the high incidence of final consonant deletion and/or devoicing, especially in word-final voiced stops, in AAE (Haynes and Moran, 1989; Moran, 1993; Seymour and Seymour, 1981; Stockman, 1996; Williams and Wolfram, 1977). According to Williams and Wolfram (1977),

deletion of word-final /d/ occurs more frequently than /b/ and /g/. The phoneme /d/ is more likely to be deleted when it is followed by a consonant. In conjunction with the substitution or deletion of a voiced stop, the preceding vowel is lengthened. Presumably, the unvoiced stops, /p, t, k/ are not affected by this rule. Flege and Eefting (1986, 1987b) and Flege (1995) also observed final stop deletion and devoicing of /b, d, g / in the productions of non-native English speakers. The final consonant deletion and devoicing rules will be further explored later in the text in relationship to their effect on AAE speakers' perception and production of MAE contrasts.

Contrastive Analysis Studies on AAE Word-Final Stop Production

Language researchers have traditionally performed contrastive analyses of AAE and MAE (Cole & Taylor, 1990; Haynes & Moran, 1989; Labov, 1972; Ratusnik & Koenigsknecht, 1975; Washington & Craig, 1992), comparing the productions of AAE speaking children to the productions of white MAE speaking children using elicited articulation tests. Seymour and Seymour (1981) examined the articulation of 80 African American (AA) and white children, 4 and 5 years of age from Springfield, MA using the Goldman-Fristoe Test of Articulation (GFTA). Their contrastive analysis of consonant productions revealed that the AA children of both age groups made more production "errors" on all consonants except /r/, /l/, /dʒ, and /tʃ/ than their white peers. The AA children's most frequently occurring "error" was final consonant deletion, which occurred primarily on voiced stops. Haynes and Moran (1989) administered the GFTA to 222 AA children in rural eastern Alabama who ranged in grade from preschool through 3rd grade (ages 3;5 to 9;11 years). Haynes and Moran found that the most

frequently occurring phonological process produced by their subjects was final consonant deletion, primarily deletion of final voiced stops.

Acoustical and Perceptual Research on African American English

Review of the literature on AAE phonology revealed few studies that examined the acoustics of AAE productions or the perceptual ability of AAE speakers. The populations studied were either children from low socioeconomic environments (Cole & Taylor, 1990; Haynes & Moran, 1989; Ratusnik & Koenigsknect, 1976; Washington & Craig, 1992; Stockman, 1996) or adults in captive environments, such as prisons (Walton and Orlikoff, 1994; Washington, McCardle, Crowe, and Wilson, 1990. The AAE features examined were limited. Although differences in consonant and vowel productions were found in contrastive analyses of AAE and MAE, explanation of the differences was limited to the variable phonological rules of AAE (Cole & Taylor, 1990; Haynes & Moran, 1989; Ratusnik & Koenigsknect, 1975; Washington & Craig, 1992; Stockman, 1996).

Early research in auditory discrimination of AAE focused on AA children's poor performance on auditory discrimination tests, in particular, the Wepman Auditory Discrimination Test (ADT) (Wepman, 1973). The majority of these studies suggested that AAE speakers had poor or inadequate discrimination ability because of their consistent discrimination errors on certain MAE minimal word pairs (Ambrose, 1978; Baran and Seymour, 1976; Clark and Richards, 1966; Eisenberg & al, 1968; Terrell, 1975).

Eisenberg, Berlin, Dill, and Frank (1968)

In a test of both perception and production, Eisenberg et al. examined the

intelligibility of monosyllabic words spoken in the final position of a carrier sentence. The sentences were recorded by 4 adults who represented speech characteristics of their respective populations; educated white, educated AA, uneducated white, and uneducated AA. The rationale for this study was the poor performance of some AA children on "a nationwide speech-language examination." Neither the details of the examination nor which children were considered "some" were specified. The ADT was one of the tests administered in the speech-language evaluations.

Eisenberg et al. presented the four speakers' recordings to sixty 3rd grade children aged 8 to 10 years. The children were assigned to 4 groups, lower class AA, lower class white, middle class AA and middle class white. Social class was determined by the fathers' occupations and the neighborhoods in which the children lived. The listeners had to indicate what words were heard on the tapes. The method used to indicate the words perceived was not stated, nor was the method of recording the children's responses. According to Eisenberg et al., intelligibility of the speakers' productions was based on the accuracy with which the listeners correctly perceived the recorded words. The listeners' responses were recorded as listening accuracy scores and reported in percent correct. The authors reported the following significant findings:

the educated (E) speakers of both races were more intelligible than the

1. uneducated (U) speakers (mean accuracy 94% (E) vs. 87% (U),
2. the white (W) speakers were more intelligible than the AA speakers (mean accuracy 92% (W) vs. 90% (AA),
3. the AA listeners were poorer listeners than the white listeners (mean accuracy 89% (AA) vs.92% W).

4. the lower class (LC) listeners were poorer listeners than their middle class (MC) peers (mean accuracy 89% LC) vs. 92.5% (MC), and
5. the lower class listeners of both races had fewer errors when listening to the uneducated speaker of the same race. The LCAA group had a mean accuracy of 83% listening to the UAA speakers and a mean accuracy of 82% listening to the UW speakers. The LCW listeners had a mean accuracy of 86% listening to the UAA speakers and a mean accuracy of 89% listening to the UW speakers.

Eisenberg et al. performed a second experiment in which the 60 children who served as listeners in the first experiment recorded 25 monosyllabic words in citation form. The recordings were played to 40 inner-city teachers, 19 AA and 21 white. The teachers wrote down the words identified in the children's recordings. Eisenberg et. al. wanted to see if there was a correlation between the children's listening accuracy and their productions as perceived by the teachers. The results of the second experiment were similar to the first. The teachers more accurately identified the intended words in the white speakers' recordings (93.2 mean intelligibility score) than the AA speakers' (89.77 mean intelligibility score) and middle class children were better understood than lower class children (93.35 vs. 89.62 respectively). Eisenberg et al. presented a table of rank-order correlations of the speaking (intelligibility) scores and listening (accuracy) scores of the children who participated in the study (64 total, 16 LCAA, 16 LCW, 16 MCAA, 16 MCW, 32 AA, and 32 W). According to the authors, there was a significant correlation between the AA children's intelligibility as speakers and their listening accuracy. The correlation for all 64 children was 0.26 and 0.43 for the 32 AA children. Eisenberg et al. (1968) stated that the significant correlations ($p<.05$) were derived primarily from

the AA participants' scores. No further discussion of these findings was provided.

Eisenberg et al. performed acoustic analyses of selected isolated monosyllabic words produced by two participants from the first study, the educated white speaker (presumably an MAE speaker) and the uneducated AA speaker (presumably an AAE speaker). The spectrograms revealed that the uneducated speaker produced the word "pond" with increased vowel duration and the final stop /d/ was produced with decreased energy compared to the educated speaker.

Considerably less was known about AAE when this study was conducted compared to the present, especially the phonological rules of the dialect. Eisenberg et al. seemed to confuse the variables race, education, and socioeconomic status with dialect. Dialectal differences were not overtly considered as a variable separate from the other variables. Although not stated, Eisenberg et al. appeared to associate the educated white and middle class classifications with SAE. The uneducated AA and lower class categories appeared to be connected with AAE. It is not clear which dialect may have been spoken by the uneducated white and educated AA participants. Nonetheless, the authors determined that listeners were better able to perceive words produced in the dialect with which they were most familiar. Eisenberg et al. did not refer to this study as a perceptual study; however, from the authors' descriptions; it appears that was the case.

The acoustic properties of the voiced final /d/ in "pond" as spoken by the educated white speaker and the uneducated AA speaker were only superficially discussed by Eisenberg et al. The authors suggested that the difference in acoustic characteristics of the educated and uneducated speakers' productions was due to differences in specific motor movements that resulted in intelligibility difficulty for SAE listeners. However,

according to the devoicing phonological rule in AAE, the speakers were devoicing the /d/ in "pond" and increasing the preceding vowel /ɑ/ and the MAE listeners were unable to detect that cue. This study provided the earliest suggestion that listeners who are unfamiliar with AAE show greater perceptual inaccuracy in discriminating productions by AAE speakers. The study also suggests that the acoustic cues produced by AAE speakers differ from the cues produced by MAE speakers and the nature of those cues need to be further investigated

Auditory Discrimination Studies

The concept of dialect interference as an explanation for the discrimination difficulty of AA children could be inferred from the results of the Eisenberg et al. study, even though the concept was not discussed or considered. Subsequent studies that focused on auditory discrimination present further evidence that dialect interference is a factor in the perception of phonological variations between AAE and MAE (Gottesman, 1972; Baran and Seymour, 1976; Terrell, 1975; Ambrose, 1978; Moran, 1993). Each of these studies provides a little more insight into the perceptual abilities of AAE speakers and listeners.

Gottesman (1972) examined the auditory discrimination of first grade children from the NYC public school system: AA speakers of AAE ("Negro" dialect), AA speakers of MAE, and white MAE speakers, on two sets of minimal pairs recorded by AAE speakers and MAE speakers. One set contained pairs that were contrastive in both dialects (contrast items), the second contained pairs that were contrastive in MAE but presumed to be non-contrastive in AAE (homonym items). All of the consonant contrast

items were in the word-initial position, whereas the homonym items included contrasting consonants and vowels in CVC syllables in both initial and final positions (Appendix C). Gottesman found that both groups of MAE listeners scored higher overall than the AAE listeners did and significantly higher than the AAE listeners on minimal pairs that were perceived as non-contrastive in AAE (homonym items), but produced contrastively by MAE speakers. There was no significant group effect in discrimination of word pairs that were contrastive in both dialects regardless of the dialect of the speakers. No significant group difference was found on perception of word pairs spoken by AAE speakers. However, all groups incorrectly judged more of the AAE speaker word pairs as being identical than any other contrasts on the total test.

The results of this study suggest that the AAE speakers' productions /homonym items/ were different than the MAE speakers' productions of the same words. Gottesman concluded that the group differences in performance were related to differences in exposure to certain phonemic contrasts in the listeners' native dialect. The author added that the auditory discrimination of AAE speaking children was not "inferior" to MAE speaking children, but rather reflected their lack of discrimination of phonemes that are non-contrastive in their dialect.

Terrell (1975) examined the ability to recognize AAE features on a cloze task by four groups of middle class AA boys, aged 9 to 12 years. The participants were assigned to one of four groups according to race, AA or white, and high or low association with lower class AA boys (AAE speakers). The groups with a high level of association with AAE speakers showed greater accuracy in completing AAE sentences than the groups with low association. However, both groups of AA participants (high and low

association) performed better overall than the corresponding white groups. The author hypothesized that the AA low association group outperformed the white low association group because they were exposed to the AAE via their parents (Terrell, 1975). Thus, the AA boys who did not speak AAE and had limited association with AAE speakers were able to detect differences between MAE and AAE whereas the white low association group could not.

Baran and Seymour (1976) examined AA and white children's discrimination of the meanings of minimal word pairs without contextual cues (Appendix D). The researchers also examined the effect of three AAE phonological rules (devoicing of final consonants, final consonant cluster reduction, and substitution of /ɪ/ for /ɛ/ stop before nasal consonants) on the perception of the minimal pairs.

The participants were 20 AA and 20 white 5-year-old children (no age range was provided) from the Springfield, MA area. The AA children spoke AAE and the white children spoke a regional non-standard English (NSE) dialect that differed from AAE. Recordings were made of each participant's labels of single pictures that corresponded to the words in the minimal pairs. The AA children listened to randomly selected recordings of their word productions and the word productions of the other participants and had to match each word to a picture presented in a set (the pictures corresponded to a minimal pair). The white participants only listened to the recordings made by the AA participants. Baran and Seymour (1976) hypothesized that without contextual cues, both AAE and MAE listeners would experience perceptual confusion on the minimal pairs when the three selected AAE phonological rules were in effect. For example, the NSE listeners would experience perceptual confusion when listening to the AAE productions

of minimal pairs, e.g. "col" produced for both coal and cold; cap produced for both cap and cab; and pin produced for pin and pen.

Baran and Seymour (1976) found that the white listeners experienced a greater mean percentage of perceptual errors when listening to word pairs produced by the AAE speakers (41.9%) than did the AAE listeners listening to themselves (20.67%), to other AAE speakers (26.8%), and to the white NSE speakers (30.7%). Finding no significant differences for AAE speakers listening to themselves, other AAE speakers or white NSE speakers, the researchers posited that the perceptual errors followed predictable patterns when influenced by the three AAE phonological rules. Spectrographic recordings of the AAE children's productions of minimal pairs with word-final stops revealed mean differences in vowel duration when vowels preceded voiced rather than voiceless stops (See Appendix D). The AAE speakers also used vowel duration as a contrastive feature when producing minimal pairs in which both final stops were omitted. For example, bat and bag may be produced as "ba:" and "ba::". The authors suggested vowel duration might constitute a phonemic cue that AAE speakers use to differentiate word pairs that are perceived as homophones by non-AAE speakers.

Ambrose (1978) used biased test results from the Auditory Discrimination Test (ADT) as a basis for initiating research on auditory discrimination skills in nonstandard English speaking children from the northeast Georgia-Piedmont area. Children were selected from this area because they all spoke a dialect that was indigenous to the region and was a regional variation of AAE. Ambrose examined the potential bias in using the ADT with this population of nonstandard English speakers. Ambrose randomly administered Form 1 and Form 2 of the ADT to sixty children in grades 1 through 3. The

children were assigned to 1 of 4 groups, black boys, white boys, black girls, and white girls. Results showed that using Form 1, 40% of the children (24 of 60) would have been classified as having inadequate auditory discrimination abilities based on the norms of the test. Twelve percent of the children (7 of 60) would have been classified as performing in the below average range. Similar results were obtained on Form 2, 22 children (35%) were in the inadequate category and five (8%) fell in the below average classification. The children in all four groups made consistent "errors" on minimal word pairs that were considered homophones in AAE (e.g., "rub/rug, cope/coke, shot/shop"). Ambrose suggested a modification in the scoring to adjust for responses that were incorrectly counted as errors because the listeners were not able to discriminate certain MAE contrasts that were not contrastive in their native dialect.

The findings of Gottesman (1972), Terrell (1975), Baran and Seymour (1976), and Ambrose (1978) suggest that; 1) AAE speakers' production of certain MAE phonemes are perceived as homophones by MAE listeners, 2) AAE listeners have difficulty with the perception of MAE contrasts that are presumed to be non-contrastive in AAE, and 3) AAE listeners use different acoustic cues to produce and discriminate AAE contrasts produced by AAE speakers.

A previous study that is a precursor to the present research was Moran (1993), who investigated whether AAE speaking children marked the presence of word-final stops by using cues that would not be detected during a speech-language evaluation. One cue was lengthening the preceding vowel before voiced consonants, as suggested by Seymour and Baran (1976). The author examined 10 AAE speaking children, aged 4;2 to 9;10 years, from rural Alabama. The children were referred by their classroom teachers

because they "left off sounds at the end of words" but were not enrolled in speech therapy. Referral of participants was also made by speech-language pathologists (SLPs) from the area's public schools following speech-language screening. The 10 children finally selected for the study were screened by the examiner and another SLP to determine whether the children deleted at least 20% of consonants during the labeling task for the experiment. The children had to label 40 pictures using the carrier phrase, "This one is _____". The 40 pictures consisted of 20 minimal pairs; 10 pairs contained CVC(+V) and CVC(-V) contrasts and 10 pairs were CVC(+V) and CV contrasts (see Appendix E). The target word-final stops occurred at the end of the carrier sentences. The productions were recorded and played to three white graduate students in the Communication Disorders program at the Auburn University. The listeners were considered to be naïve with respect to AAE by this examiner's definition. The number and percentage of final consonants perceived by the 3 judges as deleted was computed.

Moran performed acoustic analyses on the minimal pairs in which all 3 judges agreed the stops were deleted. The minimal pairs that contrasted by voicing CVC(+V) and CVC(-V) were analyzed only if both stops were perceived as deleted. The mean preceding vowel length was measured when the stops were perceived as deleted. Moran found that the mean vowel length in the CVC(+V)/CV pairs was not significant. The mean vowel durations ranged from 178 ms to 390 ms (CVC) and from 176 ms to 368 ms (CV). The overall mean vowel durations for the CVC words was 273.80 ms and 256.40 for the CV words. However, the mean vowel length in the CVC(+V) and CVC(-V) minimal pairs was significant. The duration of the vowel preceding the voiced stop was longer. The mean vowel durations ranged from 211 ms to 444 ms for the CVC(+V) and

from 164 ms to 341 ms for the CVC(-V). The overall mean vowel durations were 349.67 (CVC(+V) and 229.89 (CVC(-V).

Following the first experiment, the three original listeners were given training in narrow transcription along with exposure to tapes and text of allophonic variations of stop production (unreleased stops, partially devoiced stops, unaspirated stops, and partially aspirated stops). The recordings of the 10 children's productions were replayed to the newly trained listeners. After training, the three listeners changed 69% – 74% of their initial perceptions from deleted stops to unreleased stops. The judges also perceived some of the originally deleted stops as being fully present (includes target stops or other consonant), partially devoiced, or partially voiced stops. Percentage of changes for the last three categories and definitions were not given. Moran concluded that the children had knowledge of word-final stops that was demonstrated in their use of vowel duration as a contrastive cue. Moran also found that listener training in narrow transcription improved their perception of AAE word-final stop production from deletion to unreleased. The author cautioned against generalizing this study because of the small number of listeners and speakers.

Ambrose (1978), Baran and Seymour (1976), Gottesman (1972), and Terrell (1975) used children as participants in their research. Few studies of AAE speaking adults' perception of initial, medial, or final stop consonants were identified in the literature. One study that examined bilingual and bidialectal adult speakers' perceptions of final consonants is Felder and Strange (2000), who investigated the perceptual accuracy of adult bilingual Haitian-Kreyol/AAE (HK/AAE) speakers and bidialectal AAE/MAE speakers on a categorial discrimination task.

Minimal pairs were constructed of words with the interdental fricatives /θ/ and /ð/ and consonants that each language group typically substitutes for the fricatives. These pairs contrasted θ/ð versus /d/, /t/, /f/, /v/ in initial, medial, and final word position and were presented in the carrier sentence, "Say __for me". The HK/AAE speaker typically substitutes /t/ for /θ/ and /ð/ in word initial, medial, and final positions, whereas the AAE/MAE speaker would more likely substitute /d/ for /θ/ and /ð/ in the word-initial position, /d/ or /v/ for /ð/ in word-medial and final positions, and substitute /f/ for /θ/ in the word-final position. The minimal sentences were presented in an oddity format. The listeners selected the odd member of word triplets.

The results showed that the HK/AAE speakers had significant difficulty in the discrimination of θ/ð and their substitution phonemes as well as with the AAE substitution patterns. Their discrimination accuracy differed with context, i.e. the fewest errors occurred in word-initial position, while the most errors occurred in the word-final position. The AAE/MAE listeners, on the other hand, were able to discriminate easily the HK/AAE patterns, showing almost no errors. However, this group also demonstrated discrimination errors on their substitution pattern that varied by word position. The AAE/MAE listeners produced few errors in the word initial and medial positions, but showed more errors in the word-final position. Both groups experienced the greatest discrimination errors on the AAE/MAE word-final substitution pattern [ð→v & θ→f]. The subject who was classified as a heavy AAE speaker had the greatest difficulty of all the AAE/MAE participants differentiating all pairs. This participant's overall performance was close to the performance accuracy of the best HK/AAE listener. This

finding suggests a possible correlation between amount of dialect use or dialect density and perceptual accuracy of contrasts not produced in the native dialect.

Summary

Research on AAE phonology presents a tentative view of the differences between AAE and MAE. The majority of early studies were based on contrastive analyses and observations of selected phonemes, which have resulted in broad inferences about AAE phoneme production. What is known about AAE phonological rules, as related to this study, is the following: AAE speakers:

1. delete word-final consonants, primarily voiced stops when the stops are followed by a consonant rather than a vowel;
2. increase the preceding vowel duration when deleting word-final voiced stops, and,
3. devoice word-final voiced stops (conditions unknown)

The limited perceptual and acoustic detail in previous research makes it difficult to confirm or deny the above assumptions about AAE phonological rules. Little is known about speech perception and acoustic specification of consonants in AAE, including but not limited to, voice onset time, stop closure and release, suprasegmentals, and allophonic rules. This is especially evident in the AAE phonological rules of deletion or devoicing of final stops. Moran (1993) suggests that instead of omitting or devoicing word-final stops, AAE speakers may be making incomplete stop gestures (e.g. unreleasing final voiced stops) which results in allophonic variations or contrasts that listeners unfamiliar with the dialect cannot accurately perceive. That is, final voiced and voiceless stops may be contrastive in AAE, but AAE speakers use different acoustic cues

than MAE speakers to mark the contrasts (Baran & Seymour, 1976; Moran, 1993).

The importance of context-dependent variation is apparent in adult cross-language speech perception research, as well as in research on AAE phonology. It appears that part of learning a second language (L2) or a second dialect (D2) involves learning the language-specific phonetic variation that occurs within a phonological category as a consonant is produced in different contexts. The challenge for future AAE research is to understand the mapping that occurs between MAE and AAE by gathering detailed analyses of the phonetic variation that occurs within AAE. Variables such as dialect density and its effect on perception of MAE contrasts, the relationship between perception and production of AAE, effects of syllable and phonetic context, language background and experience, and age of second dialect acquisition should be explored along with their effect on perception and production of non-native dialect segments or contrasts These areas are by no means exhaustive; however, they present a new direction in AAE phonological research.

Previous research methodologies on AAE phonology do not examine the contextual effect of the AAE final consonant deletion and devoicing. The present study investigated the perception of final voiced and voiceless stops /b, d, g, p, t, k/ in AAE as a function of: a) the dialect experience of the listeners and b) the context in which the consonants were produced. The research questions were:

1. Do AAE and MAE listeners differ in their ability to identify voiced and voiceless word- final stops produced by AAE speakers? The stimuli included words ending in the six stop consonants (e.g., “mob”, “mop”, “pod”, “pot”, “league”, “leak”) plus words ending in vowels (e.g., “ma”, “pa”, “Lee”).

2. What are the effects of the following phonetic context (consonant vs. vowel) on the listeners' perception accuracy of word-final AAE stops? Stimulus words were presented in two sentence contexts: "Say __ for me" and "Say __ again".

3. Do the perceptual errors made by each listener support or refute previous descriptions of AAE phonological rules of final stop deletion and devoicing of voiced stops? For instance, AAE listeners' misidentification of intended voiced stops as voiceless ("mob"→"mop") would support the hypothesis that voiced stops are devoiced". Misidentification of words with intended voiced stops as open syllables (e.g., "mob"→ "ma") would support the hypothesis that voiced stops are "deleted". Differences in the error patterns across listener groups, with AAE listeners correctly identifying the intended consonants more often than MAE listeners, would support the hypothesis that word-final stops in AAE are produced according to dialect-specific phonetic realization rules.

Method

Research Design

This study tested the perception of AAE word-final stops produced by two AAE speakers in two sentence contexts by two groups of adult listeners, aged 18 to 40 years; (E) experienced with AAE and (N) naïve to AAE. These categories were chosen because the majority of people in NYC have some exposure, directly or indirectly, to both AE dialects, AAE and MAE. That exposure may have been through the media, in educational and social settings, and/or in the workplace.

The E group was defined as individuals who were raised in and currently living in homes or communities where AAE is the dominant dialect. The listeners did not have to

be speakers of AAE. This classification eliminated the challenge of determining dialect density and codeswitching behavior of the listeners. The substantial exposure of the adult E listeners to AAE should have provided heightened sensitivity to AAE contrastive cues. The N group consisted of individuals who were raised in homes and/or communities where MAE was the dominant dialect spoken and they were themselves speakers of MAE. The hypothesis was that the E listeners will demonstrate greater perceptual accuracy than the N listeners in identifying word-final stops produced by AAE speakers. The literature suggests that AAE listeners can detect cues in AAE productions that are not perceived by listeners unfamiliar with the dialect.

A between-groups design with repeated measures was used to compare the perceptual accuracy of listener's identification of the six word-final stops and open syllables produced by AAE speakers. The classification variable was the listener groups defined by their experience listening to AAE. Two independent variables were examined within groups; 1) AAE speaker (one male and one female) and 2) sentence context; ("Say__ again" vs. "Say_ for me"). The dependent variable was the identification errors, using seven response categories, /b, d, g/, /p, t, k/, and v (for open syllable/vowel). Errors are defined as a response other than the one for the intended consonant or vowel. That is, if the speaker intended to produce the word "mob", the correct response is "b". A selection of any of the other six responses was considered an "error". Error analysis was then performed to test the hypotheses about the phonetic realization rules of the speakers regarding devoicing and deletion.

This design tested the hypotheses that, 1) AAE word-final stops are more likely to be perceived as deleted when followed by a consonant than a vowel context, 2) word-

final voiced stops will be perceived as devoiced (more errors for intended /b, d, g/ than for intended /p, t, k/), and 3) the voiced stop /d/ is more likely to be perceived as deleted or devoiced than the other five stops. The condition(s) in which devoicing rather than deletion of AAE final stops has not been specified in previous AAE research.

Data Reduction

Between and within group mean percentage of errors were measured across all conditions using a three step analysis. Errors were sorted by speaker, sentence context, and intended consonant or vowel (six stops and open syllables). An item analysis identified particular tokens misperceived by the N listeners, the E listeners, and by both groups. Then, the types of perceptual errors made by each group were divided into the following categories: a) voicing errors of two kinds, voiced stop for an intended voiceless stop or voiceless stop for an intended voiced stops; b) place, incorrect perception of a stop as a labial, alveolar, or velar; c) deletion, vowel response for an intended word-final consonant and; d) addition, consonant response for an intended CV word.

Participants

Speakers.

One AA female and one AA male were recruited to record the stimuli for the experiment. Recruitment was through personal contacts by the experimenter. Both speakers were native New Yorkers in their mid-twenties and had taken some undergraduate college courses. They were judged to be moderate to heavy speakers AAE by the experimenter. A 5-minute informal conversation with each speaker was recorded and analyzed for degree of AAE feature use (dialect density). The experimenter, who is a licensed speech-language pathologist familiar with AAE and a bidialectal AAE/MAE

speaker, developed a rating scale specifically for this study to determine the dialect density of the speakers (see Table 1). The scale rated the frequency of occurrence of any combination of AAE features identified in a 75-word portion of the taped conversations with the 2 AAE speakers. Morphosyntactic, phonological, and any combination of morphosyntactic and phonological features were included in the feature inventory. A rating of 1 indicated that 30 occurrences (40%) of AAE features were observed in the language sample, a 2 rating indicated that 25 feature (33%) combinations were produced. A 2 rating was the criterion for the moderate to heavy category. Both speakers satisfied the criterion. The speakers received monetary compensation for their participation and they signed informed consent forms prior to testing.

Listeners.

A total of 24 (12 experienced and 12 naïve) listeners were recruited for the perception part of this study. The age range for the E listeners was 22 to 40 years, with the mean age of 24 years. The N listeners ranged in age from 23 to 36 years. The mean age was 26 years. The participants were recruited through personal contact with the experimenter or via flyer distributions (see Appendix H). All participants satisfied the following general requirements; native of New York between the ages 18 to 40 years, monolingual English speaker, no advanced training in phonetic analysis, transcription, or formal speech improvement training, college graduate or student. In addition, all passed a hearing screening at 20dB and were able to use a computer mouse. Participants were classified as members of two groups, experienced (E) or naïve (N). The criteria for assignment to the E group was; individuals were either speakers of AAE or resided in

Table 1. *Dialect Density Rating Scale*

Rating 1 – heavy AAE speaker – produces 30 or more combinations of AAE features in a 75 word sample (40%)

Rating 2 – moderate to heavy AAE speaker – produces 25-29 AAE features in a 75 word language sample ((33%)

Rating 3 – moderate AAE speaker – produces 20-24 AAE features in a 75 word language sample (26%)

Rating 4 – mild to moderate AAE speaker – produced 15-19 AAE features in a 75 word language sample ((20%)

Rating 5 – mild AAE speaker – produces 10-15 AAE features in a 75 word language sample (13%)

Rating 6 – minimal AAE speaker -produces fewer than 10 AAE features in a 75 word language sample (6%)

Rating 7 – produces no AAE features (0%)

Note. The ratings and percentages were determined by totaling the number of any morphophonemic, morphosyntactic, or phonological AAE feature divided by the number of words in the language sample (75). This scale was developed by Lynda Felder, the experimenter, specifically for this study

a household or community where AAE was the dominant dialect. For assignment to the N group, the participants were MAE speakers who lived in homes and communities where MAE was the dominant dialect. All participants were paid for their participation in the study. Prior to testing, each participant signed an informed consent form.

Stimuli

The experimenter compiled a list of 72 monosyllabic words consisting of 13 open syllables (CV), 21 word-final voiced stops (CVC +V), 26 word-final voiceless stops (CVC -V), and 12 word-final fricatives /ð/ and /θ/ (included as fillers). The 12 filler sentences were not included in the final data analysis. Table 2 lists the words, organized into minimal triplets that contrast by voicing (ma, mob, mop) and minimal triplets or pairs that contrast by place of articulation (hop, hot, hock). Two words from the list were nonsense words to fulfill the voicing minimal triplet criterion. The vowel context included words with one instance each of the vowels, /ɑ/, /i/, /o/, /u/, and /e/. The place contrasts were organized by labial, alveolar, and velar place of articulation, e.g. rape/rate/rake. The 72 words were placed in two carrier sentences, "Say __again" and "Say __for me". Sentences were randomly placed on 12 lists containing 24 sentences each for a total of 144. Each of the 72 target words appeared 2 times in both contexts. Table 3 lists the frequency of occurrence of the stops and open syllables. The target phonemes and open syllable words were unequally distributed in the experimental tests due to the design of the minimal word sets for the stimulus word list.

A second set of 15 words were used for the familiarization test. Five sets of minimal triplets were constructed, three contrasted by voicing and two contrasted by place. A female MAE speaker recorded the familiarization stimuli (see Table 4 for the familiarization word list). The female MAE speaker produced and released all final stops and the speaker produced all stops with a louder volume than the rest of the phonemes in the sentences. The familiarization results were not included in the final data analysis.

Table 2. Stimulus words used in experimental tests

Stops – Voicing minimal triplets

	p/b	t/d	k/g	
/a/	ma/mop/mob	pa/pot/pod	ha/hock/hog	
/o/	roe/rope/robe	toe/tote/toad	bro/broke/brogue	
/u/	Lou/loop/lube	**Lou**/loot/lewd	flu/fluke/*floogue*	
/i/	he/heap/*heeb**	see/seat/seed	Lee/leak/league	
/e/	gay/gape/Gabe	**lay**/late/laid	lay/lake/leg	43

Stops – Place minimal pairs and triplets

/a/ – unvoiced	hop/hot/**hock**	e/ - unvoiced	rape/rate/rake	
voiced	cob/cod/cog	voiced	**laid/leg**	
/i/ - unvoiced	seep/**seat**/seek/	/o/ - unvoiced	cope/coat/coke	
voiced	lead/**league**	voiced	**robe**/road/rogue)	
u/ – unvoiced	**loop/loot**/Luke			
voiced	**lube/lewd**			17

Fricative Contrasts

θ/f	death/deaf	wreath/reef	Ruth/roof	
ð̃/v	clothe/clove	breathe/*breve*	lithe/live	12
Total words – 43 stops for voicing, 17 place stops, 12 fricatives			72	

Note: words in boldface are repeated once in the list and words in italics are nonsense words

Table 3. *Response alternatives for stimulus words on experimental tests, organized by intended consonants or open syllables*

/v/	CV	/b/	/d/	/g/	/p/	/t/	/k/	
/a/	ma	mob			mop			
		cob	cod	cog				
	pa		pod			pot		
	ha			hog	hop	hot	hock	
/o/	roe	robe	road	rogue	rope			
					cope	coat	coke	
	toe		toad			tote		
	bro			brogue			broke	
/u/	Lou	lube	lewd		loop	loot	Luke	
	flu			*floogue*			fluke	
/i/	he	*heeb*			heap			
	see		seed		seep	seat	seek	
	Lee		lead	league			leak	
/e/	gay	Gabe			gape			
					rape	rate	rake	
	lay		laid	leg		late	lake	
Occurrence of open syllables and word-final stops**								
	13	6	8	7	9	8	9	Total = 60 words
			(21 voiced/ 26 voiceless)					

Note: *italics = nonsense words. **each word presented once in each sentence context per test

Procedure

Recording

Two adult AAE speakers (one female and one male) were recorded in a sound-

attenuated chamber in the Speech Acoustics and Perception Laboratory at the Graduate Center of the City University of New York. The speakers were instructed to read sentences on from 12 lists at a normal conversational rate. Each list contained of 24 carrier sentences. Six of the lists contained the carrier sentence, "Say _____ again" and 6 contained the sentence, "Say ____ for me". The speakers read each of the 12 lists four times for totaling 1152 sentences.

Table 4. *Familiarization test stimuli*

Voicing Contrasts	Place Contrasts
1. weigh/ wait/wade	1. sheep/sheet/sheik
2. low/lope/lobe	2. knob/nod//nog
3. sue/suit/sued	

Word List

1. weigh	9. sue
2. sued	10. lope
3. sheet	11. sheep
4. wade	12. nog
5. nod	13. knob
6. sheik	14. low
7. wait	15. suit
8. lobe	

The experimenter, a bidialectal speaker of AAE and MAE, conversed in MAE with the speakers and monitored the recording sessions. If the target word within a

sentence was incorrectly read (unrelated to dialect variation) or the speaker used a rate that was too slow, the experimenter had the speaker repeat the sentence. The stimuli were recorded on a Tascam DAT recorder via a Shure (SM48) microphone placed approximately 12 inches from the speaker's mouth. The DAT recordings were copied onto a CD and digitized into .wav files using Soundforge software. A sample rate of 22,050 Hz, 16-bit resolution, on a mono channel, was used to digitize the files.

The experimenter chose the "best" instance of each target word in both sentence contexts from each speaker's utterances. Stimuli were considered to be in the "best" category when there were no reading errors, the rate was similar to a conversational rate and the sentence was read as a unit with no pauses between the words. A New York State licensed speech-language pathologist familiar with AAE was consulted to judge whether the chosen tokens were good instances of the target words. A total of 480 files were selected to use in the identification task. The 12 sentences containing filler words were not included in the final stimulus protocol.

Familiarization Test

Prior to the experimental trials, the familiarization test trained listeners to choose appropriate response alternatives and to become familiar with the makeup of the stimuli in this test. Listeners were presented with two blocks of 15 sentences recorded by a female MAE speaker. The word-final stops or word-final vowels in each sentence were stressed in the recording to alert the listener to the target phonemes. The computer screen displayed the 7 phoneme choices, /p/, /b/, /t/, /d/, /k/, /g/, and /v/. After listening to a sentence, the listener used a computer mouse to select which final sound they heard. A replay button was at the bottom of the computer screen. If the listener wanted to hear the

sentence again, she/he had to click on the replay button. There was no feedback provided The listener's response time was not limited. Each sentence was presented 1 sec after the previous response selection was made.

Experimental Tests

The identification experiment began with the same instructions used in the familiarization tests (see Appendix I for Instructions to Participants). Instructions were given by the experimenter and also presented on the computer screen. Participants listened to each sentence, paying attention to the sound at the end of each target word in the middle of each sentence. They were asked to focus on the word-final sounds and choose the sound heard. Listeners were instructed to not repeat words or try to make words meaningful because some words were nonsense words. The computer screen displayed the 7 phoneme choices, /p/, /b/, /t/, /d/, /k/, /g/, and /v/). After listening to a sentence, the listener used a computer mouse to select the final sound heard. A replay button was displayed at the bottom of the computer screen. If the listener wanted to hear the sentence again, he/she clicked on the replay button once for each sentence. There was no feedback provided. The listener's response time was not limited and the next stimulus sentence was presented 1 sec after the previous response was made.

Each participant listened to four separate subtests consisting of four blocks of 30 sentences each as shown in Table 5. The total number of blocks presented was 16 and the total number of sentences was 480. Each of the 240 items was repeated (60 words x 2 contexts x 2 speakers). Two subtests contained sentences recorded by the male speaker and two subtests contained recordings made by the female speaker. Within each subtest,

Table 5. *Experiment Design*

Test 1		
	Block 1 – Female Speaker - 30 sentences in Again Context	
	Block 2 – Female Speaker - 30 sentences in Again Context*	
	Block 3 – Female Speaker - 30 sentences in For Me Context	
	Block 4 – Female Speaker – 30 sentences in For Me Context*	120 sentences
Test 2		
	Block 1 – Male Speaker - 30 sentences in Again Context	
	Block 2 – Male Speaker - 30 sentences in Again Context*	
	Block 3 – Male Speaker - 30 sentences in For Me Context	
	Block 4 – Male Speaker - 30 sentences in For Me Context*	120 sentences
Test 3		
	Block 1 – Female Speaker - 30 sentences in Again Context	
	Block 2 – Female Speaker - 30 sentences in Again Context*	
	Block 3 – Female Speaker - 30 sentences in For Me Context	
	Block 4 – Female Speaker - 30 sentences in For Me Context*	120 sentences
Test 4		
	Block 1 – Male Speaker - 30 sentences in Again Context	
	Block 2 – Male Speaker - 30 sentences in Again Context*	
	Block 3 – Male Speaker - 30 sentences in For Me Context	
	Block 4 – Male Speaker - 30 sentences in For Me Context*	120 sentences

Note:* Each of the 60 stimulus words was presented once in Again context and once in For Me context

two blocks included sentences with the Again context in which each of the 60 test items occurred one time across the two blocks. In the remaining two blocks, one instance of each of the 60 test items token occurred in the For Me sentence context. The sentences were randomized within each block separately for each listener. The four blocks were randomly presented within each subtest differently for each listener. The four subtests were counterbalanced across all listeners using a partial Latin Square.

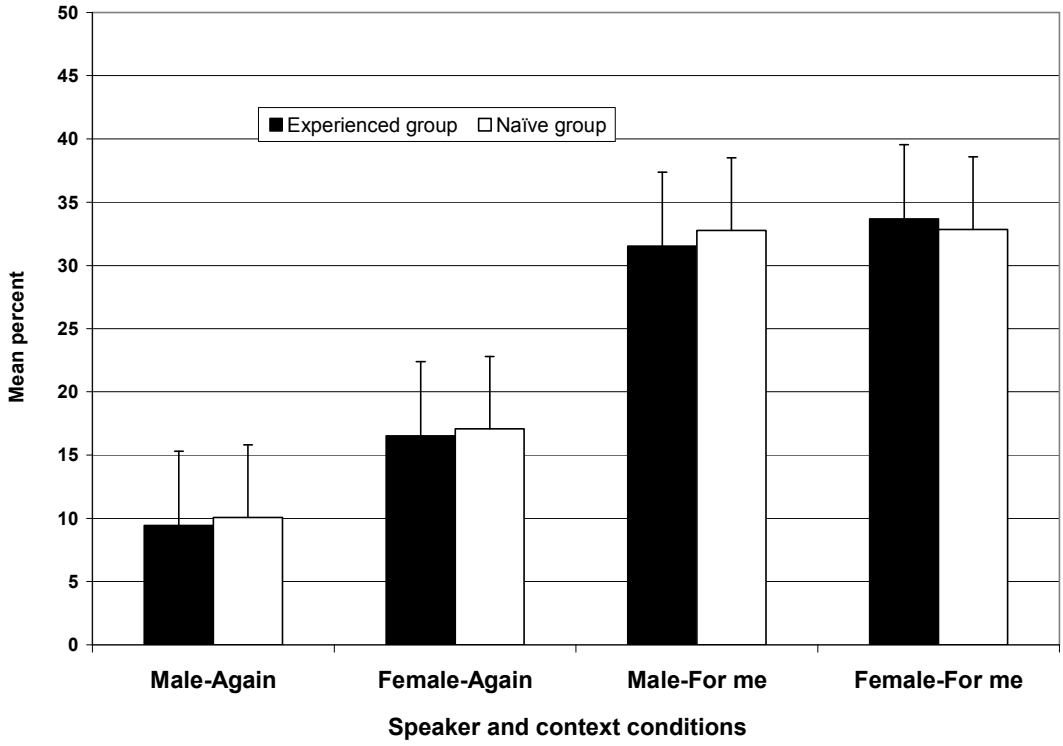
Results

The results were analyzed by the number of errors for each participant in each listener group, type of errors summing over participants within groups, and individual phoneme errors in both speaker and context conditions. The overall number of errors were converted to percentages for display in figures and tables.

Figure 1 illustrates the group mean percentage of errors in each listening condition. Mean error percentages for each group were computed by dividing the total number of error responses in each listening condition by the number of listeners (12) and then dividing the result by the number of trials in each condition (120).

Summing over both speakers and both contexts, the E group made 22.8% errors, while the N group made 23.1% errors. Both groups misperceived more targets in the sentence context in which a consonant followed the stop (For me) than in the context in which a vowel followed the stop (Again). The E and N listeners made more errors on the female speaker's productions than on the male speaker's productions. Table 5 lists the group mean number of errors by context and speaker.

Figure 1. Group mean percentage of error and standard error by speaker and context



Analysis of Variance (ANOVA)

A nested 2x2x2 ANOVA was computed with group as the between groups variable and speakers and contexts as the within group repeated measure variables. A level of .05 was used to determine the significance of all analyses. The ANOVA revealed no significant difference in the identification of errors by the E and N listeners, $F(1, 22) = 488.357$, $p > .05$. No significant interactions were found for group x context, group x speaker, or group x context x speaker.

There was a significant main effect of context, $F(1, 22) = 636.761$, $p < .001$. As predicted, there were more errors across groups in the For Me context than in the Again context. Although the possibility of a speaker effect was not included as an original

research question, it is reported here because there was a significant main effect of speaker $F(1, 22) = 13.197$, $p < .001$. A significant interaction between speaker x context was also found, $F(1,22) = 23.439$, $p < .001$. Paired-sample t-tests with Bonferroni adjustments showed that the comparison between the female and male speakers in the Again context was significant at the .001 level. The comparison between the female and male speakers in the For Me context failed to reach significance.

The E and N listeners misheard more of the female speaker's productions than the productions by the male speaker. Overall, the E and the N groups made 25% errors on the female speaker's productions. The male speaker's productions were misperceived by the E listeners on 20% of the trials; the N listeners made 21% errors.

There was considerable variability in the listeners' responses within each group. Appendix J lists individual errors by context and speaker. The range of errors for E listeners was 85-192 out of 480 trials, for N listeners, 84-156 of 480 trials. There was one listener in each group whose total errors were considerably greater than the rest of the group. Listener E7 had a total number of 192 errors and Listener N1 had a total of 156 errors. However, all 24 listeners perceived more errors in the For Me context. In terms of misperception of the speakers' productions, all 24 listeners perceived more errors in the female speaker in the Again context. Eight of 12 E listeners and 11 of 12 N listeners misheard more of the female speaker's productions in the For Me sentence context.

Error Analysis

Table 6. *Between group means and standard deviations for number of errors on all tests by speaker and context.*

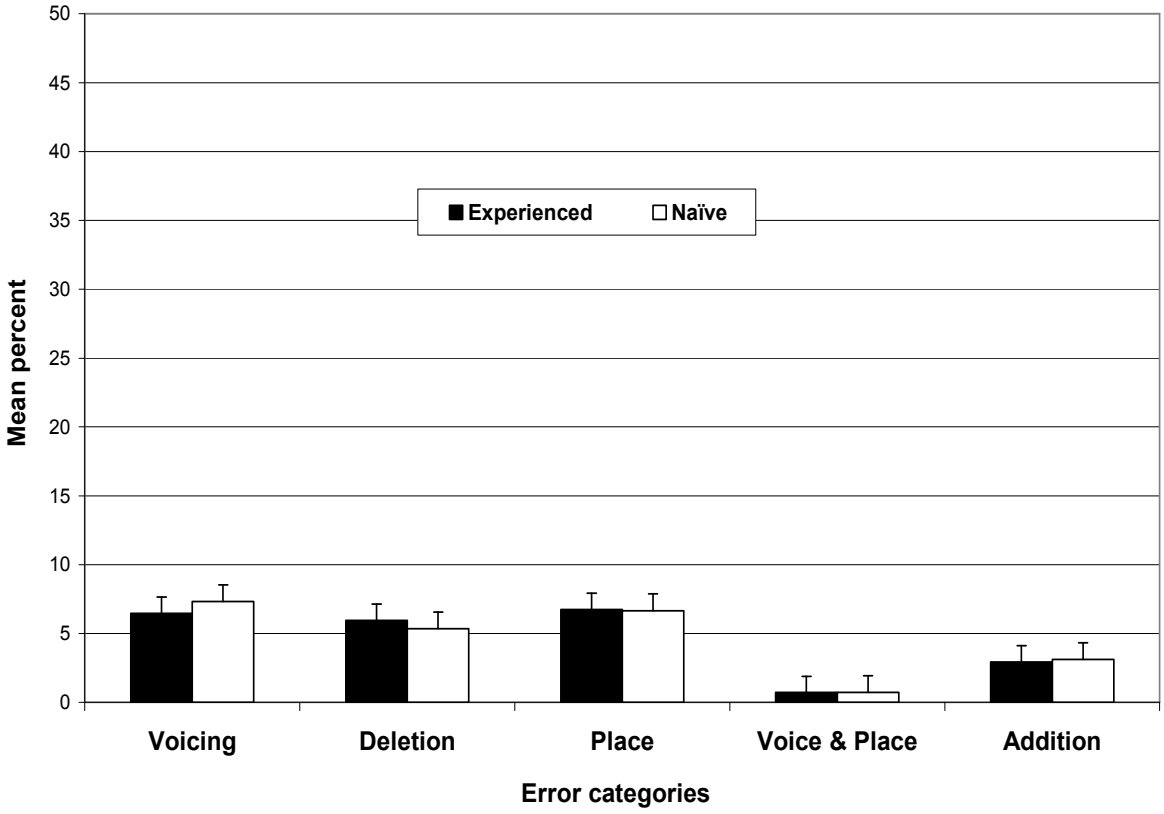
	E Group (n=12)		N Group (n=12)		Both Groups (n=24)	
	M	SD	M	SD	M	SD
Again						
Male	11.33	(8.67)	12.08	(4.87)	11.71	(7.01)
Female	19.83	(6.29)	20.50	(7.20)	20.17	(6.62)
Both	15.58	(8.68)	16.29	(7.39)	15.94	(7.99)
For me						
Male	37.83	(7.65)	39.33	(7.32)	38.58	(7.36)
Female	40.42	(8.77)	39.42	(8.40)	39.92	(6.42)
Both	39.13	(8.16)	39.39	(7.71)	39.25	(7.77)
Overall	109.42	(28.46)	111.33	(19.69)		

Note: E= Experienced Group. N= Naïve Group. Again = Sentence context in which a vowel follows the stop. For Me = sentence context in which a consonant /f/ follows the stop.

The listeners' responses were organized into five categories of error; voicing, place, voice and place, deletion, and addition. Figure 2 shows the mean percentage of errors of each type made by the E and N groups. Mean percentages of errors were calculated by summing the total number of errors over all speaker and context conditions of each category for each listener group, dividing the total by the number of listeners in each group (12), and then dividing by the number of opportunities for each listener (480).

Voicing errors included intended voiced stops perceived as voiceless stops, e.g.

Figure 2. Group mean percentage and standard errors by category of error



mop for mob, and intended voiceless stops confused as voiced stops, e.g., pod for pot. Deletion errors were those in which a word containing a final stop was perceived as a

vowel, e.g. see for seat. Place errors consisted of misperceptions of the place of articulation of stops; labial (labial to alveolar or velar) e.g., rape for rate, alveolar (alveolar to labial or velar) e.g., rate for rake, and velar (velar to labial or alveolar) e.g., lake for late. Voice and place errors were responses that combined a voiced or voiceless error and a phonetic place error, e.g. b>t = a voiced labial stop misperceived as a voiceless alveolar stop. Open syllables misheard as words with a final voiced or voiceless stop were classified as addition errors, e.g., pot for pa.

As Figure 2 shows, the E group made more errors of deletion than the N group on average. The N group made more voicing and addition errors than the E group. Both groups made a similar number of place and voice and place errors. However, overall differences across groups were very small. A detailed analysis of errors made within each of the categories is discussed separately.

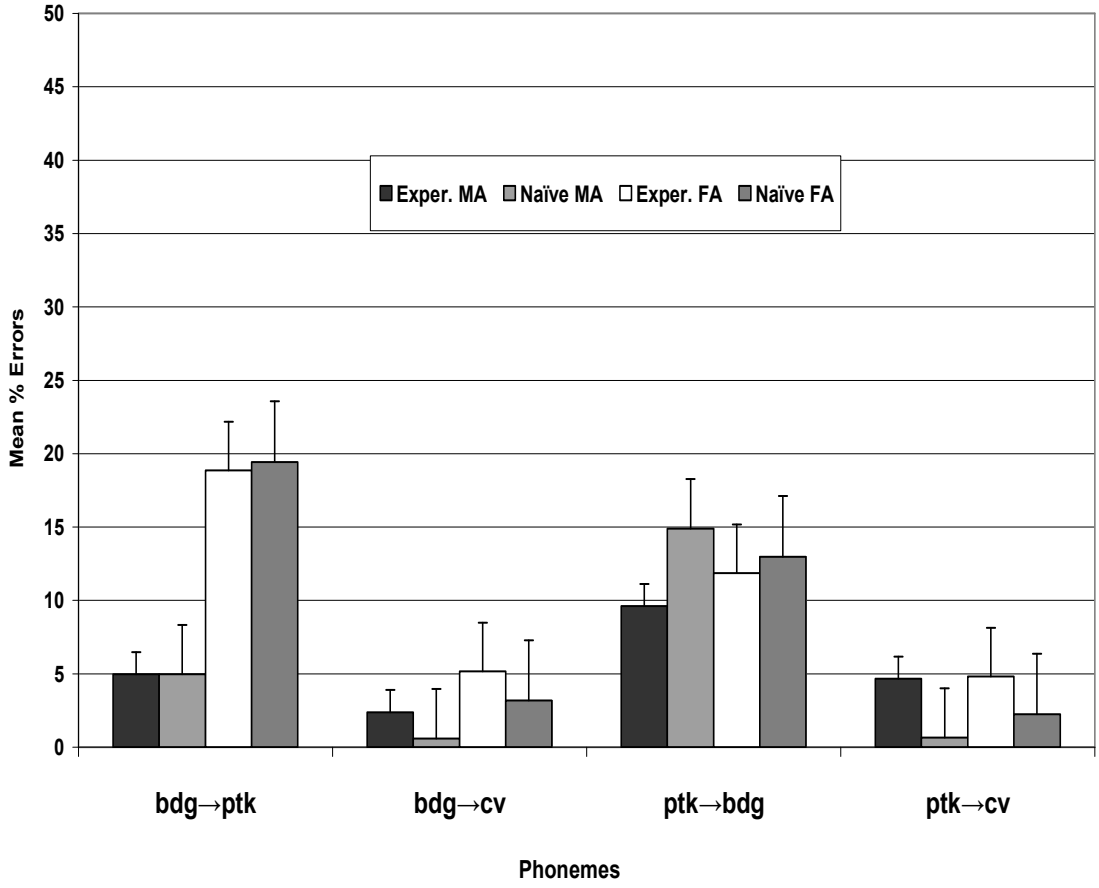
Voicing and Deletion Errors.

The listeners' error responses in the voicing category were separated into two groups, voiced (VD) that included the phonemes /b, d, g/ and voiceless (VL) stops that included /p, t, k/. The VD and VL errors were then organized into four subcategories; VD stops misheard as VL stops, VD stops misperceived as open syllables (CV), VL stops misheard as VD stops, and VL stops misheard as a CV. Because there was an unequal distribution of phonemes and open syllables across the four experimental tests as presented in Table 3, the method used to compute the mean percentages for the five error categories was as follows. The number of incorrect responses for each phoneme was totaled across listeners in each context and speaker condition to obtain a total number of errors for that condition (numerator). Next, the number of occurrences of each phoneme

was multiplied by the number of participants (12) (denominator). The numerator was divided by the denominator to obtain a mean percentage of error score. Figure 3 shows the mean percentage of voicing errors in the four subcategories by speaker in the Again context. The same conditions are illustrated in the For me context in Figure 4.

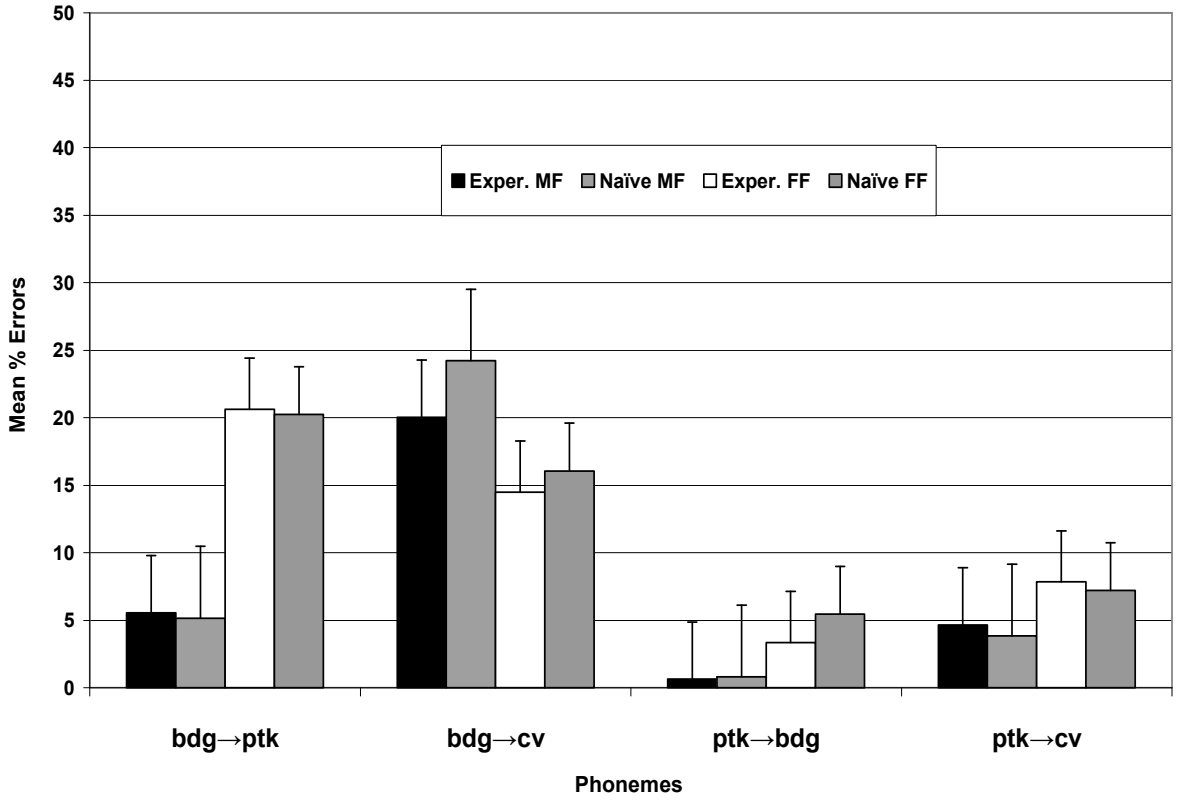
Overall, VD stops were misperceived as voiceless or deleted more frequently than VL stops were misperceived as voiced or deleted by both listener groups. The E group made 50% errors out of 504 opportunities for VD stops and 25% errors out of 624 opportunities for VL stops. The N group made 50% errors out of 504 opportunities for

Figure 3. Group mean percentage of voicing errors and standard error – Again context



VD stops and 33% errors out of 624 opportunities for VL stops. In the Again context, there was a clear speaker difference for the VD→VL error type (devoicing). Both groups misheard more of the female's productions as devoiced (mean group error of 19%) than the male's productions (mean group error of <5%). Both groups perceived the female speaker as producing more VD→CV (deletion) errors than the male speaker, although the mean group error rate was small (<5%). Other errors made in this context were similar across listener and speaker groups. The naïve group made slightly more VL→VD errors than the E group for the male speaker (mean group error rate of 15% for the male (N)

Figure 4. Group mean error percentage of voicing errors and standard errors - For Me context



versus 10% for (E) and 13% for the female speaker (N) versus 12% (E).

In the For Me context (Figure 4), the VD→CV (deletion) subcategory had the most errors across groups with the male speaker's productions being the most frequently misperceived deletions. The N group misheard more deletions in the male and female speakers than the E group. There was a distinct speaker difference in the VD→VL error type in the For Me context. Both groups misperceived more of the female's productions as devoiced (mean group error rate of 20%) than the male (mean group error rate of 5%). Very few errors of either type were made on voiceless stops in this context (<8%).

Figures 3 and 4 illustrate three prominent error patterns (context effects) across groups. Both groups made a similar number and pattern of devoicing (VD→VL) errors in both sentence contexts. The phonemes on which devoicing occurred most frequently were /b/ and /d/. Second, more deletion errors were made in the For me context. The stops most frequently misperceived as open syllables were, /b/, /d/, and /t/. Third, both groups made more VL→VD errors in the Again context. The voiceless stop most frequently misheard as a voiced stop was /t/. A detailed description of the specific words containing word-final stops that were most frequently misperceived as devoiced or deleted are presented in the following paragraphs.

All listeners heard each stimulus word on 24 trials per speaker across all tests. Final /b/ was more frequently misperceived as devoiced (VD→VL) by the N and E listeners in both sentence contexts when produced by the female speaker. All 24 listeners confused the female speaker's production of /b/ for /p/ in four of the six /b/ words; <u>mob</u>, <u>heeb</u>, <u>Gabe</u>, and <u>robe</u>. In the Again context, the number of errors per number of trials

were; mob - 23/24 opportunities (95.83%) (E group) and 22/24 (91.67%) (N group), heeb – 18/24 (75%) (E) and 14/24 (58.33%) (N), and robe – 10/24 (41.67%) (E) and 15/24 (62.5%) (N). In the For Me context, /b/ was misheard as /p/ in; robe – 14/24 trials (58.33%) (E) and 16/24 (66.67%) (N), and Gabe – 12/24 (50%) (both groups).

The stop with the second highest voicing error rate was /t/(VL→VD) across speakers. Both groups confused /t/ for /d/ most frequently in the words; tote, seat, late, rate, loot, and coat. In the Again context, both groups misheard /t/ produced by the female speaker as /d/ in four of the eight /t/ words; tote – 11/24 (45.83%) (both groups), seat – 17/24 (70.83%) (E) and 18/24 (75%) (N), rate – 16/24 (66.67%) (E) and 14/24 (58.33%) (N), and late – 13/24 (54.17%) (E) and 15/24 (62.5%) (N). The male speaker's productions of /t/ in the Again context were misheard as /d/ in four of the eight /t/ words; tote – 19/24 (79.17%) (E) and 15/24 (62.5%) (N), coat – 16/24 (66.67%) (N), loot – 16/24 (66.67%) (N), and seat – 11/24 (45.83%) (N).

The final stop /d/, the phoneme with third highest voicing error rate, was most frequently confused as /t/ in the male speaker in the Again context by both groups. Of the eight words with final /d/, the word laid was the most consistently misperceived word in the VL→VD subcategory. The E listeners misperceived the word laid - 12/24 (50%) and the N listeners, 11/24 (45.83%).

Overall, both groups made minimal deletion errors in the Again context and the highest number in the For Me context. Appendix K, Figures K1 and K2 illustrates the mean percentage of errors on final stop deletions by the E and N listeners. Both groups more frequently misperceived the phonemes /b/, /d/, and /t/ as deletions than the other three stops. The words with final /b/ that were misheard as open syllables most often in

the male speaker's productions were; Gabe, mob, robe, and lube. Both groups misperceived Gabe 22/24 opportunities (91.67%). The word mob was misheard 24/24 (100%) by the N group and 16/24 (66.67%) by the E group. The E listeners errored on robe 10/24 (41.67%), the N group 13/24 (54.17%). The N group misheard lube as an open syllable 11/24 opportunities (45.83%).

Deletion errors made on final /d/ were misheard for both speakers in the For Me context. The words most frequently misperceived as open syllables were; road, toad, laid, and lead. The female's /d/ productions were misperceived in toad – 20/24 opportunities (83.33%) (E) and 15/24 (62.5%) (N), road was misheard 19/24 (79.17%) (E) and 14/24 (58.33%) (N). The male speaker's production of toad was misheard as open syllables 18/24 trials (75%) (N) and 12/24 (50%) (E), laid was misheard 14/24 (58.33%) (E) and 13/24 (54.17%) (N). The N group errored on lead – 14/24 (58.33%). The E group misheard /t/ as an open syllable in the female speaker in the word tote – 16/24 opportunities (66.67%).

Addition Errors

The open syllable (CV) targets occurred more frequently than the voiced and voiceless stops across all tests (13 words). In spite of the increased frequency, few errors were made in the addition category compared to the other four error categories by both listener groups. The majority of addition errors were made in the For Me context. Appendix M presents the group mean percentage of addition errors. Three stops were confused with the CVs; /d/, /g/, and /k/. The words most consistently errored were; roe (v→g), see (v→d), and flu (v→k). The E listeners misperceived the male speaker's production of roe- 21/24 opportunities (87.5%); the N listeners, 22/24 (91.67%) Both

groups misheard the female speaker's production of flu – 18/24 (75%) (E) and 21/24 (87.7%) (N), and see – 15/24 (62.5%) (E) and 18/24 (75%) (N). In this category, listener N1 made the most errors of all others listeners, 61 out of 104 trials across speakers and contexts.

Place Errors

The overwhelming number of place errors was made in the For Me context in the labial to alveolar (L→A) subcategory by both groups. Minimal place errors were made in the Again context. Appendix L shows the between group mean percentage of place errors by context and speaker. All 24 listeners consistently confused /p/ for /t/ produced by the male speaker in four of the nine /p/ words; cope, gape, heap, and seep. Cope was misheard 22/24 opportunities (91.67%) (E) and 14/24 (58.33%) (N), gape - 22/24 (91.67%) (E) and 20/24 (83.33%) (N), heap -24/24 (100%) (E) and 19/24 (79.17%) (N), seep - 22/24 (91.67%) (E) and 18/24 (75%) (N).

The place subcategory with the second highest errors was velar to alveolar (V→A). In this class, The N group misheard /k/ as /t/ most frequently in the female speaker. The specific words that were misperceived were; Luke – 10/24 opportunities (41.67%), fluke – 9/24 (37.5%), and hock – 8/24 (33.33%). The E listeners made few errors in this category.

V*oice and Place Errors*

This category contained negligible errors compared to the voicing, deletion, place, and addition categories. The majority of errors were made in the For Me context by both listener groups. Mean error percentages were not computed for errors in this category.

Discussion

This experiment examined the perceptual accuracy of two groups of adult listeners (E and N) on an identification task involving real and nonsense words ending in six final stop consonants /p, b, t, d, k, g/ and open syllables (CV). The research questions addressed were: 1) Do listeners experienced with AAE (E) and listeners with limited experience with AAE (N) differ in their ability to identify voiced and voiceless word-final stops produced by AAE speakers, 2) What are the effects of the following phonetic context (consonant vs. vowel) on the listeners' perception accuracy of word-final AAE stops and, 3) Do the perceptual errors made by the listeners support or refute previous descriptions of the AAE phonological rules of deletion and devoicing of word-final voiced stops?

Between Group Performance

The E and N listeners did not differ significantly in the identification of AAE word-final stops. Therefore, on the surface, the findings do not support the prediction that E listeners would be better able to detect dialect-specific features of AAE than N listeners. However, the participants in this study differed from the listeners in previous AAE perceptual research. Past studies used young children from a low SES background as listeners. The listeners in this study were middle class college educated adults with 20+ years of exposure to AE dialects including MAE and AAE. Their experience with different AE dialects was either through direct contact with speakers (primarily the E listeners) or indirectly though some form of media (television, radio, movies). The listeners in both groups appear to have been sensitized to dialect specific productions by their language experience, which resulted in improved identification of dialectal

phonological differences. This result is comparable to adult cross language research findings that experience with non-native speech improves the perception accuracy of phonemes not present in the listener's native language phonological repertoire (Flege, 1995; Flege & Eefting, 1986, 1987b, Rochet, 1995; Strange, 1995). Replication of this current study with participants of different ages, educational and socio-economic levels might provide further insight on this issue.

The computer based identification program used in this study recorded the listeners' responses to intended phoneme targets and not the actual phonemic productions of the speakers. The actual productions would include allophonic variations from the standard or intended phonemes. However, in order to determine the E and N groups' true accuracy of perception, a detailed acoustic analysis of the speakers' actual productions is warranted, possibly combined with narrow phonetic transcription (Moran, 1993). A re-examination of the groups' performance accuracy on identification of the speakers' actual productions might reveal fewer overall errors than are indicated in the results of this current research. Until the actual speaker targets are known, it would be presumptuous to make any conclusive statements about either group's accuracy in identification of AAE word-final stops.

Within Group Performance

There was considerable variability in the E and N listeners' responses across all tests. The variability may have been a reflection of the listeners' general perceptual skills as well as their individual linguistic backgrounds. Even though all of the listeners had 20+ years of either direct or indirect exposure to regional AE dialects and AAE, it was difficult to measure the effect of direct versus indirect exposure. Another possible

explanation for the listener variability is the effect of fatigue on their identification accuracy. There were seven forced choice alternatives presented in each of the four tests from which the listeners had to select a perceived phoneme. Upon completion of the experiment, the majority of listeners expressed fatigue along with difficulty concentrating by the third test. Although all listeners were given an opportunity to take a break between tests, all refused. It is possible that fatigue and memory load combined resulted in an increased number of "guesses" by the listeners.

Context Effects

Even though definitive conclusions cannot be drawn from the current results about the E and N listeners' degree of perceptual accuracy, error patterns were revealed that support assumptions held about AAE phonological production rules. The AAE phonological rule that AAE speakers are more likely to delete word-final voiced stop consonants when they are followed by a consonant (For Me context) is supported by the results of this study. The listeners from both groups made more overall errors and perceived more consonant deletions in the For Me context. The second error pattern observed was that voiced stops were perceived as voiceless more frequently than the reverse. Both groups misperceived voiced stops as devoiced with about equal frequency across contexts. There was no context effect for devoicing based on the results of this study. The final context effect was that both groups misheard /t/ as /d/ in the Again context. The listeners more than likely perceived the speakers' production of /t/ as a flap /ɾ/. The coarticulatory phenomenon of flapping commonly occurs in MAE when /t/ and /d/ occur in a VCV context (Again context). In MAE, the words, writer and rider may be

produced the same /raɪɾər/. A flapped stop consonant is produced with short closure duration, reduced pressure, and no release or burst. The preceding vowel may be lengthened /raɪːɾər/. Stop consonant flapping may not be a feature of AAE.

Speaker Effects

The male and female speakers in this study demonstrated significant variability in the frequency of their dialect specific feature production. The female was perceived as producing devoiced final voiced stops in both the Again and For me sentence contexts. The male speaker was perceived as deleting more final voiced stops in the For me sentence context. Both speakers were perceived as voicing the final stop /t/ in the Again context. The listeners in each group were consistent in their perceptions of the speaker differences.

However, it is possible that the speakers were using other acoustic cues in their productions than devoicing and deletion. An acoustical analysis of the speakers' productions would identify the parameters of their productions, e.g. devoicing vs. unreleasing voiced stops or flapping final voiceless stops.

Limitations and Clinical Implications

One primary limitation of this study was the inclusion criteria for the speakers because their performance may not be representative of the targeted populations and precludes generalization of the findings to all AAE speakers. The two speakers used in this study were middle-class adults, native New Yorkers, and had some college education. Both demonstrated similarities in their language backgrounds and in their level of AAE dialect density (moderate to heavy) during informal conversation. Yet, the

listeners perceived distinctly different error patterns in the male's and the female's recordings of the intended targets. It is unclear whether the perceived speaker differences were solely a reflection of the speakers' individual differences, a reflection of AAE variable rules, a gender based difference, or a combination of all the factors. Increasing the number of speakers may provide insight based on the speaker differences. In addition, a detailed acoustic analysis of the speakers' productions would provide information on the speaker differences as well.

Follow-up studies should use listeners who vary by age, socio-economic status, dialect experience and density, and education. The inclusion criteria for the listeners in this experiment, particularly the E group, differs from previous research populations (adult, middle-class, college educated, native New Yorkers) and may not be representative of the MAE and AAE speaking populations. The E listener inclusion criteria should be modified to reflect more homogeneity. In this study, the criteria allowed for listeners who were AAE speakers or who lived in homes were AAE was spoken. A more sensitive measure of the E listeners' perceptual accuracy may be obtained by specifying that all E listeners be AAE speakers.

The stimulus sets need to be simplified and balanced (number and type of stimuli presented) to reduce listener fatigue and to make statistical analysis possible on categories of errors. The current stimulus sets used an unequal number of voiced and voiceless word-final stops and open syllables as voicing and place contrasts. Future experiments should reduce the number of stimulus words, especially the open syllables, since there were no vowel context effects. This modification would reduce the number of different voicing and place contrasts and thereby reduce fatigue. The listeners had to

select one of seven forced choice alternatives displayed on the computer screen after hearing a sentence. Any sentence could be repeated by pressing a replay button at the bottom of the screen. Because the Paradigm ID program allows either no repetition of stimuli or unlimited number repetitions, listeners in this study were instructed to use the repeat option once to control the number of repetitions. The computer identification program needs to be modified to allow a set number of repetitions of stimuli. In addition, a variation in the current response method should be made to enable the Paradigm ID confidence rating feature. The confidence rating scale would provide a more sensitive measure of the listeners' response accuracy.

The recording procedure needs to be modified to simulate conversation. The speakers in this study produced more AAE features during informal conversation and the pretest interview than during sentence reading. Even though they recorded the stimulus lists 12 times, both speakers attempted to read the target words "correctly". Their articulation became less controlled as the recording progressed, but never simulated their informal and spontaneous speech patterns that contained more AAE features. A challenge for a future follow-up study would be to devise a context that more closely simulated conversation and that could be controlled for the test variables. Using such a suggested method may result in a higher incidence of AAE feature use by the speakers.

Information from this study and any follow-up research may assist educators and speech-language pathologists who teach SAE as a second dialect to AAE speakers since there appears to be a close relationship between AAE production and perception. The exact nature of perceptual differences between AAE and SAE needs to be specified. Once the differences are determined a more accurate protocol can be devised for auditory

discrimination tasks (perceptual training). In addition, dialect specific auditory discrimination protocols can be used in pre-literacy and literacy training programs for AAE speakers.

Appendix A

List of AAE Phonological Features

1 Word-final consonant clusters in monosyllabic words that end in a stop can be reduced, e.g., tes' (test), des' (desk), han' (hand), and buil' (build)

2. Word-final consonant cluster reduction takes place when a consonant is followed by a vowel, a pause, or a consonant, e.g., wes' en' (west end), bes' apple (best apple)

3. Plural formulations follow the consonant reduction rule in which words such as desk, test, ghost, and wasp become desses, tesses, ghosses, and wasses. The underlying structure of consonant clusters in the word-medial position remain when the suffix begins with a vowel, e.g., testing, scolding, tester, and coldest

4. Substitution of d/ð word-initial, f/θ and v or d/ðword-medial, and v or t/ð word-final

6. Voiced fricatives /ð/, /z/, and /v/ become stops before a nasal, e.g., idn't for isn't, sebm for seven

7. /r/ absence following /o/ and /u/ with a vowel change e.g., four (foe), door (doe) and /r/ absence when it follows a consonant in unstressed syllables, e.g., p'otect for protect

8. /r/ or /l/ may be absent when they occur between vowels, e.g., Carol becomes Ca'ol

9. Word-final /b/, /d/, /g/ may be devoiced at the end of a syllable

10. Deletion of /d/ occurs more frequently when followed by a consonant

11. Vowels are nasalized when followed by a nasal consonant, e.g., man becomes "ma"

12. Word-initial /w/ in unstressed verbs or auxiliaries may be deleted and/or the following vowel may be deleted, e.g., He'uz going or He'z going for He was going

13. Word-initial unstressed syllables may be deleted, e.g., 'bout for about, 'member

Appendix A Continued

List of AAE Phonological Features

for remember

14. Cluster /str/ may be substituted by /skr/, e.g., street becomes skreet

15. ɪ/ɛ substitution before nasal consonants, e.g., pen becomes pin

List adapted from Baran & Seymour (1976), Labov (1972), Stockman, (1996), and Williams & Wolfram (1977)

Appendix B

AAE Grammatical and Morphological Features

AAE feature	Examples
Zero be (copula)	“Mary in the house”.
Be (habitual be)	“It be on the table”.
I’ma for I’m going to	“ I’ma do my homework first”.
Subject-verb agreement (be forms)	“We was going to the movies”.
Omissions of auxiliary do	“ How you make it?”
Omissions of auxiliary has	“He only been there three times”.
Zero regular third person	“He go to the doctor a lot”.
Zero irregular third person	“She do it all by herself”.
Subject-verb agreement with don’t	“Mary don’t like Sarah”.
Zero regular past	“Jerry play ball after school”.
Zero irregular past*	“Yesterday he fall down”.
Use of Had + past tense	“I had came home”.
Over-regularization	“I likeded long hair”.
Past as participle	“Her pocketbook got took”.
Use of ain’t as an auxiliary	“She ain’t going home”.
Multiple negation	“He don’t never be good”.
Indefinite article	“Tommy ate a apple”
Zero present progressive	“Bobby make a mess”.
Zero plural	“I gave him five quarter”.
Zero possessive	“That Harry car”.
Zero infinitive to	“Lee want me bake her a cake”.
Use of for to/to	“I mean for to get a job”.
Zero of	“She know too much the details”.
Use of what/that or zero that	“The lady eat all what you give her”.
Bin and been	“I bin had this dress”.

Appendix B Continued

AAE Grammatical and Morphological Features

AAE feature	Examples
Use of fixing + verb	"He fixing to go to shopping".
Undifferentiated pronoun	"Me and him like to shoot hoops".
Reflexive	"He got dressed all by hisself".
Demonstrative	"He paint them old chairs".
Dative	"I take me a shot sometimes".
Y'all varieties	"Y'all comin' over today?"
Appositive	"The woman, she have a big dog".
Existential it and they	"I change clothes when it's only women".
Wh-non-inversion	"Why you do that?"

List adapted from J. B. Oetting & J. L. McDonald (2001) Nonmainstream dialect use and specific language impairment. *Journal of Speech, Language, and Hearing Research*, Vol. 44, pp 222-223.

Appendix C

Auditory Discrimination Test - Minimal Pairs (Gottesman, 1972)

Contrast items	Homonym items	AAE Feature
chop-shop	mow-more	final /r/ deletion
cap-cup	pass-pas	cluster reduction
mat-mate	law-low	ɔ/o neutralization
pat-pit	den-then	d/ð substitution
met-net	not-night	diphthong reduction
van-fan	guard-god	cluster reduction
beg-leg	scream-stream	str/skr substitution
deed-bead	lock-like	diphthong reduction
ax-ox	hear-hair	ɪ/ɛ neutralization
zoo-shoe	ten-tin	ɪ/ɛ neutralization

List adapted from Gottesman (1972)

Appendix D

Minimal Pairs Perceived as Homophones (Baran and Seymour, 1976)

According to Baran and Seymour (1976) when the AAE phonological rules, devoicing final voiced stops, consonant cluster reduction, or substitution of /ɪ/ for / ɛ/ before nasal consonants, were in effect, the words from list A and List B were perceived as homophones by inexperienced listeners.

List A	List B
cab	cap
feed	feet
pig	pick
robe	rope
seed	seat
bag	back
belt	bell
six	sick
toast	toes
pen	pin

Note :List adapted from Baran & Seymour (1976)

Appendix E

Mean Vowel Durations of AA Children's Productions of Minimal Pairs with Final Voiced and Voiceless Stops Affected by the AAE Devoicing Rule.

Voiced Stops	Voiceless Stops	Duration Differences
cab - 298.2	cap - 240.9	57.3
pig - 363.4	pick - 179.7	183.7
feed - 375.3	feet - 248.9	126.4
seed - 369.3	seat - 225.2	144.1
robe - 325.9	rope - 308.1	17.8
bag - 367.4	back - 318.0	49.4

Note :List adapted from Baran & Seymour (1976)

Appendix F
Minimal Pairs (Moran, 1993)

CV/CVC(+V)	CVC(+V)/CVC(-V)
boat/bow	cub/cop
bead/bee	cab/cap
tube/two	bag/back
pipe/pie	seed/seat
toad/toe	robe/rope
goat/go	log/lock
hoop/who	bug/buck
boot/boo	pig/pick
bike/buy	dog/dock
seed/see	sad/sat

Lists adapted from Moran (1993)

Appendix G

Recruitment Flyer

My name is Lynda Felder and I am a doctoral student at the City University of New York (CUNY) Graduate Center in the Speech and Hearing Sciences Department. I am looking for individuals to participant in a listening study that examines how listeners who speak different American English dialects hear certain sounds spoken by African American English speakers.

Volunteers for this study must be:

- between the ages of 18-40 yrs.
- a college student or graduate
- a native New Yorker
- a monolingual English speaker
- have normal hearing
- have no speech improvement training or advanced training in phonetic transcription

  and have no speech or language disorder

The study takes approximately 45 minutes and all participants will be paid $10.00. If you meet the above requirements and are interested in participating in this study, please contact me at (212) 961-5740 me by email at lfelder@gc.cuny.edu.

Appendix H

Language/Dialect Background Questionnaire

Name of Experiment: Perception of African American English Final Stop Consonants

Date: _____

Name: _____Age: _____Gender: _____

Address: _____

Telephone: (Home) _____ (Work) _____

Birthplace: _____

Town/City State/Country

Father's birthplace: _____

Language(s) your father speaks fluently:

_____

Mother's birthplace: _____

Language(s) your mother speaks fluently: _____

Places in which you have lived for more than 1 year:

City/State/Country: _____

Years_____ from _____ to _____

If you have lived in more places, please check here _____ and continue on the back

A. Do you know what African American English (AAE), also known as Black English or Ebonics, is? If so, describe the dialect or give an example of AAE

B. What languages or dialects were spoken in your home when you were a child? (parents, relatives, grandparents, babysitters). _____

C. Do you speak any language or dialect other than English? 1. _____

2. _____ 3. _____

D. What dialect do you speak now? _____

E. What language(s)/dialect(s) were used in your classrooms in elementary school?

1. _____ 2. _____

F. What language(s) or dialect(s) were spoken in your community when you were a child?

1. _____ 2. _____ 3. _____

G. What language(s) did you study as a foreign language in school?

1. _____ 2. _____

Appendix H continued

Language/Dialect Background Questionnaire

H. Have you ever studied Phonetics (the scientific study of speech sounds) in high school or on the college level in a linguistics, speech science, speech language pathology, or foreign language class? Yes ____ No ____

If Yes, have you ever done phonetic transcription? Yes ___ No ___

If Yes, how much? _____

L Have you received speech-language therapy at any time? Yes ___ No _____

If Yes, for what speech or language problem? _____

_____

Interview Questions:

1. If you are employed, describe your job responsibilities.
2. If you are a college student or graduate what is (was) your major?
3. What do you like most about your job? Least?
4. What kind of social activities do you enjoy?
5. Do you talk on the telephone a lot? Do you have to repeat your statements because the listener doesn't understand you?
6. What do you think about Michael Jackson and the child abuse accusations?

Appendix I

Instructions to Participants

You will be listening to series of two different sentences. The sentences will be either “Say ____ again” or “Say ___ for me”. A word will replace the blank space in each sentence. The word will change and so will the sound at the end of the word. You will be listening for the sound said at the end of each word. The sounds will either be a p, b, t, d, k, g, or a vowel. The seven choices of sounds will be displayed on the screen before you hear a sentence. You will use the computer mouse to click on the sound you think you hear at the end of the words. If you are not sure what sound you heard after listening to the sentence, you can click on the replay button on the bottom of the screen to hear the sentence again. Only replay each sentence once. Then chose the sound heard. There is no time limit on making a selection. The next sentence will not play until you make a selection. Once you pick a sound, you will not be able to change it, so take your time in selecting the sound. Some times you will have to guess which sound you heard. That is okay. The first group of sentences will be a practice. You will become familiar with the sentences and the sounds that you should focus on. If you have any questions during the practice, ask the examiner. Once the test begins, you will not be able to stop. The same instructions will apply to the practice and the test. Click on the begin button when you are ready to start.

Appendix J

Profiles of experienced (E) and naïve (N) listeners' number of errors across all conditions

	MA	FA	MF	FF	Total		MA	FA	MF	FF	Total
E1	15	14	46	49	124	N1	24	27	53	52	156
E2	11	23	36	50	120	N2	15	44	15	30	104
E3	9	20	35	32	96	N3	12	41	35	47	135
E4	6	20	39	45	110	N4	10	43	13	39	105
E5	12	20	35	38	105	N5	13	36	14	29	92
E6	11	18	33	32	94	N6	15	38	18	34	105
E7	38	37	57	60	192	N7	12	36	16	40	104
E8	8	19	35	36	96	N8	8	31	30	48	117
E9	7	11	34	33	85	N9	9	45	22	51	127
E10	6	16	35	39	98	N10	10	36	25	32	103
E11	7	20	42	34	103	N11	4	25	15	40	84
E12	6	20	27	37	90	N12	13	44	16	31	104
T	136	249	454	474	1313	T	145	446	272	473	1336
M	11.33	20.75	37.75	39.5	109.42	M	12.08	37.17	22.67	39.42	111.33
SD	35.80	109.44	67.51	116.14	19.69	SD	8.49	6.77	7.28	8.45	28.42

Appendix K

Figure K1. Group mean error percentages of deletion errors by speaker - Again context

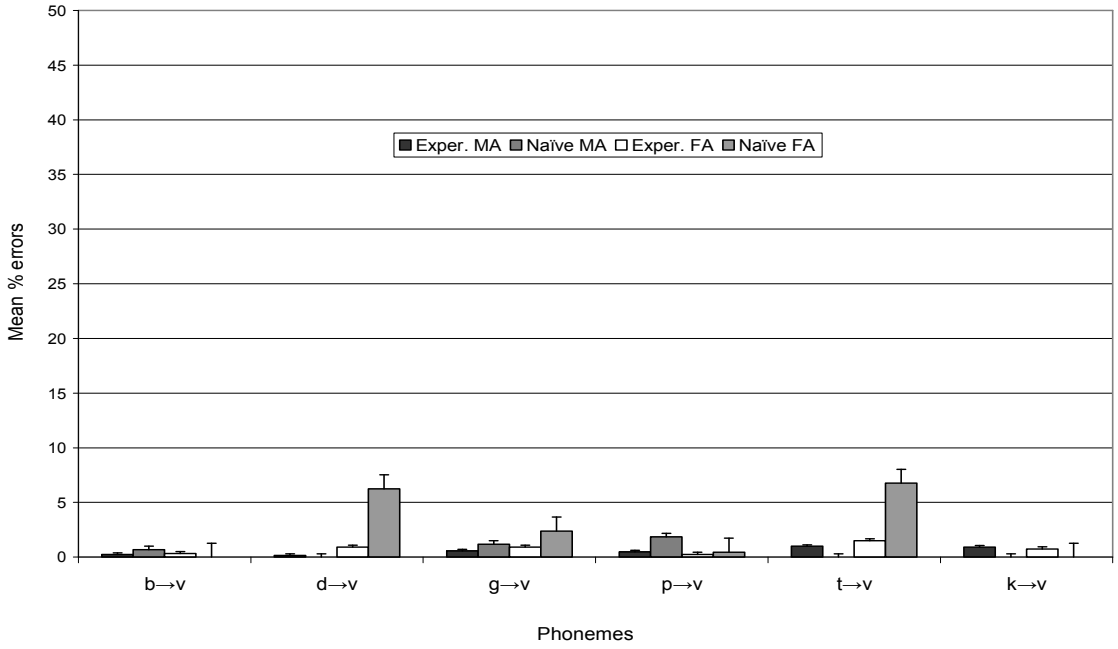
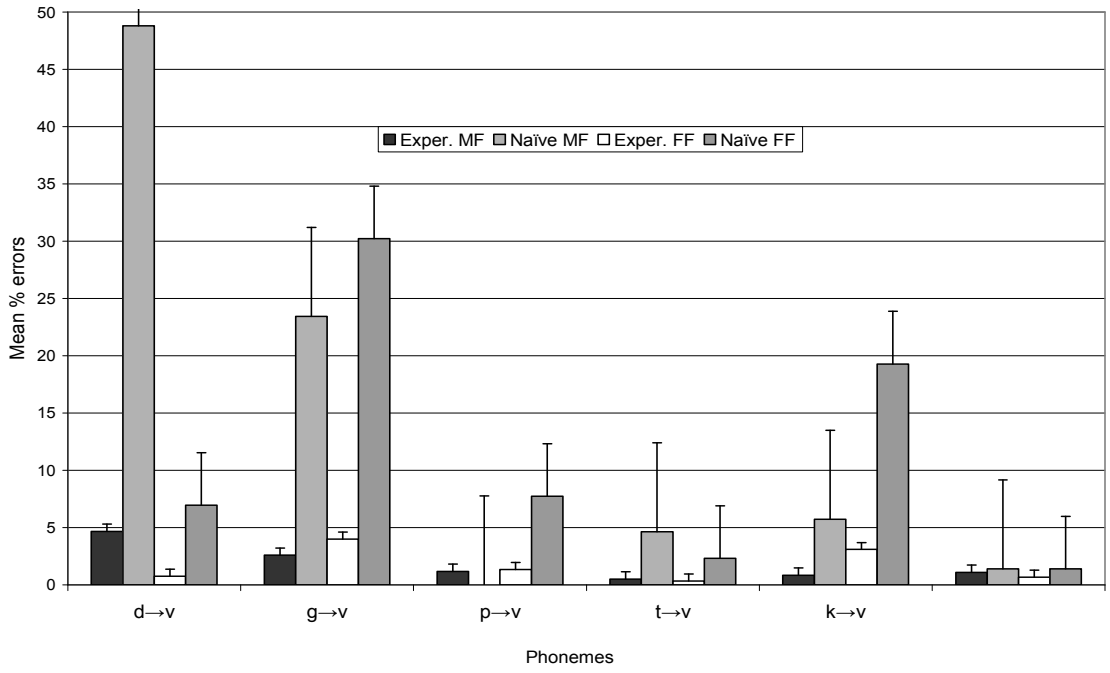


Figure K2. Group mean error percentages of deletion errors by speaker - For me context



Appendix L

Figure L1. Group mean percentage of place errors by speaker - Again context

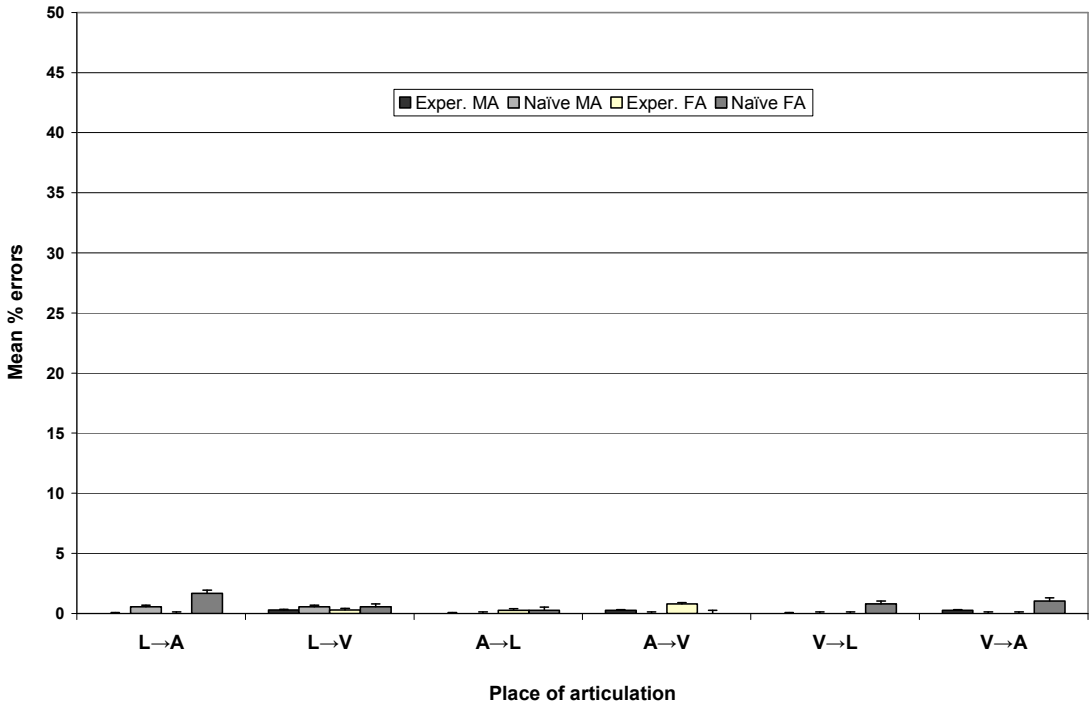
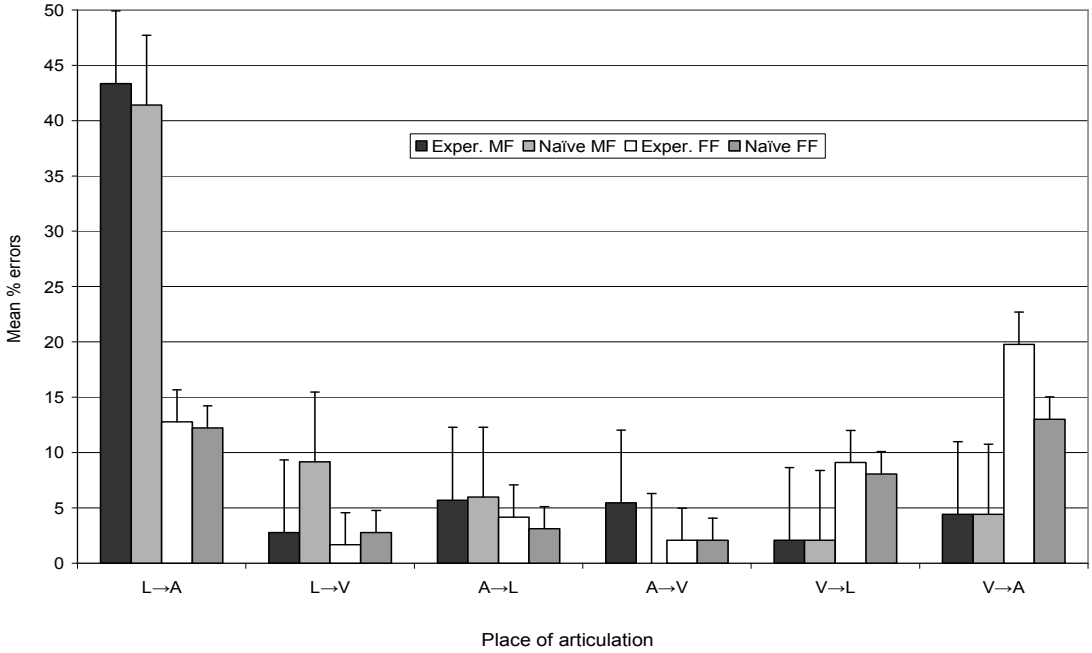


Figure L2. Group mean percentage of place errors by speaker - For me context



Appendix M

Figure M1. Group mean percentage of addition errors by speaker – Again context

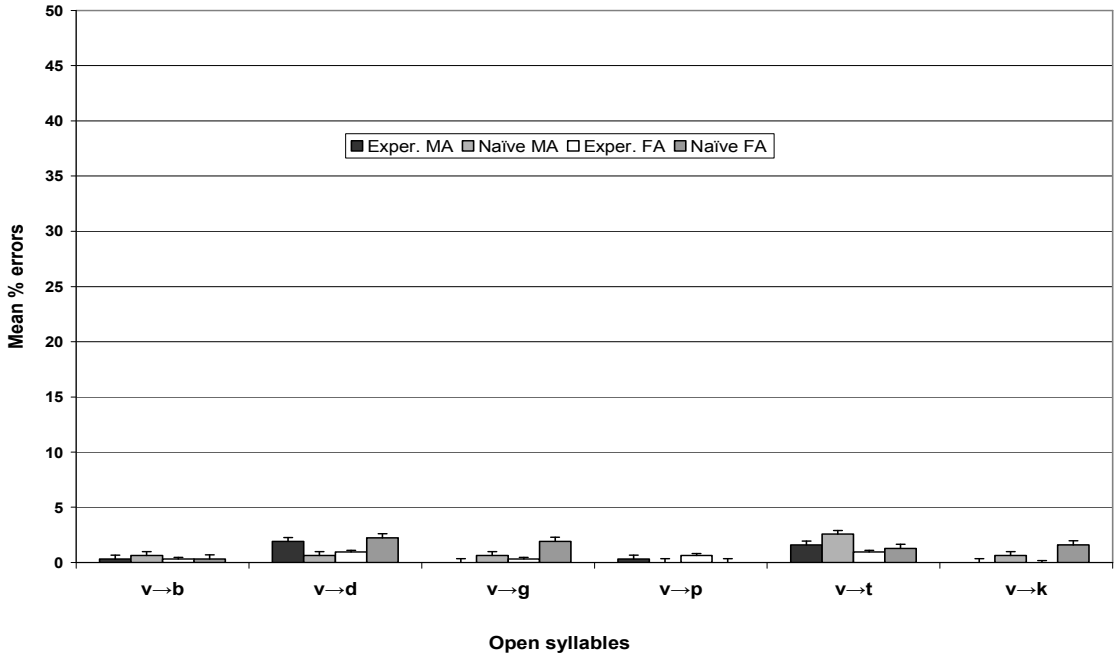
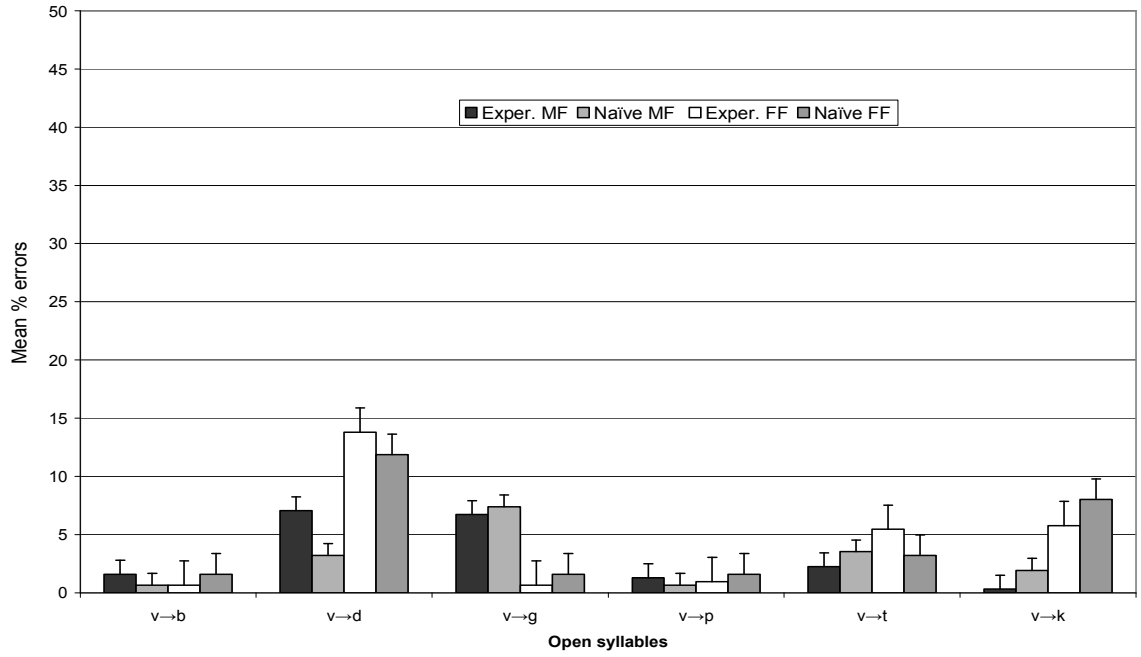


Figure M2. Group mean percentage of addition errors by speaker – For me context



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