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Effects of Prosodic Features on Judgements of Intelligibility and Accentedness

Kate Owens

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ABSTRACT

Effects of Prosodic Features on Judgements of Intelligibility and Accentedness

Kate Owens

The role of the prosodic features in the perceived intelligibility and accentedness of non-native speaker language is investigated, using samples of French Canadian university students' spoken English. The speech samples are rated by linguistically unsophisticated native English university students for 1) the intelligibility and 2) the degree of accentedness of the speech. Linguistic analyses provide ratings of the native-like performance of three prosodic features: word stress, juncture and sentence rhythm/intonation.

The ratings are subjected to statistical analysis to determine the relative importance of each independent variable to the prediction of the dependent variables.

The results suggest that the three prosodic features account for more of the reliable variance in the judgement of intelligibility than for that in the judgement of accentedness. Correlational analysis yields juncture as the most positively correlated feature with both intelligibility and accentedness. Multiple regression analysis shows that juncture is the most heavily weighted variable in the equation for both dependent variables.

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This thesis is dedicated to Paul Cranston, for a spirit that prevails.

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INTRODUCTION

This thesis is based on a study of the effect of three prosodic features on the intelligibility and accentedness of the English spoken by French Canadians as perceived by native English speakers. The study was undertaken in view of an observed lack of research into the phonological correlates of the intelligibility of the English spoken by French Canadians. The three prosodic features selected are word stress, sentence rhythm/intonation and juncture. It is presumed that these three phonological elements are identifiable and can be taught by well-trained ESL teachers of French Canadians. The prosodic features were rated by linguists with training in phonetics, who listened to speech samples of French-accented English and assigned ratings on a scale of 0-7, where 0 was native-like control of the feature and 7 was non-native-like performance of the feature.

The judgements of both accentedness and intelligibility are used in the study to examine 1) how closely related they are, and 2) whether the same kinds of phonological behaviour have an effect on them. These judgements were made by university students from Trent University in Peterborough, Ontario, who listened to the same speech samples as the linguists heard, and assigned ratings based on ease of understanding (for intelligibility) and degree and relative pleasantness or unpleasantness of the accent (for accentedness).

INTELLIGIBILITY

Non-native speaker (NNS hereafter) language has been investigated from many angles in the research in applied linguistics. The intelligibility of non-native speaker speech has been assessed by a variety of methods. Johansson (1978) used ratings of the intelligibility of NNS speech to determine the relative effects of deviant grammatical forms, lexical errors and phonological errors. The ratings were done on five-point scales with bipolar adjectives relevant to the type of judgement required. Palmer (1973) also used graded scales for the judgement of how well the NNS communicated (p. 56). Palmer's interest was in the attitudes of native speakers to NNS speech, and the goal of his investigation was to "investigate the relationship between natives' subjective judgements of non-native speech samples and linguistic (and extralinguistic) cues which affected those judgements" (p. 42). In addition to ratings of intelligibility, researchers have used procedures to determine the intelligibility of NNS speech and writing more objectively. Olsson (1977) had informants perform two tasks on the utterances: grammatical operations and repetition with corrections. These were done to obtain assessments of how easy the deviant texts and sentences were to understand. Olsson's experiments were concerned with the kinds and degrees of error involved in NNS language, and her hypothesis was that she could predict the effect of a given error by its "distance from well-formed-

ness" (p. 34). She devised a model to calculate the distance of a deviant utterance from well-formedness and NS reactions to deviant speech and writing were evaluated in terms of this model.

Bansal (1969) was also interested in objectively determining the intelligibility of accented speech. In his research, the rating of the intelligibility of Indian English was done by listeners of different native languages. The listeners heard and either repeated or wrote down stretches of spoken language. Bansal determined the intelligibility of the Indian English by the number of words or sounds repeated or transcribed incorrectly.

ACCEPTABILITY

Another form of NS reaction to language errors is the judgement of the acceptability of the deviant language. Acceptability is a construct of language attitude, and since an utterance can be intelligible without being acceptable, standards for NS recognition of what constitutes acceptability are necessary. Quirk and Svartvik's (1966) study of acceptability focussed on deviant syntax, word order and verb complementation. The judgement of acceptability was derived from corrections made by informants who followed instructions to change the utterances in specified grammatical ways. For example, a stimulus sentence in the present tense was followed by the instruction "Turn the verb of the sentence into the past tense" (p. 22). This procedure was called the

"operation test" (p. 18).

Johansson (1975, 1978) also conducted experiments to assess acceptability with ratings on graded scales. In Johansson's (1978) research, the "irritating" aspects of deviant speech are under scrutiny in his attempt to establish degrees of error gravity.

LINGUISTIC ANALYSIS

There are different ways of measuring the traits of NNS speech. Subjective ratings, in terms of graded scales, attempt to quantify reactions to speech on specific dimensions. Objective determination of the intelligibility of speech is made by tests of comprehension of the NNS speech. In addition to subjective ratings and objective determination of the intelligibility and/or acceptability of NNS language, the research has included descriptive linguistic analyses of the particular features of language under scrutiny, whether syntactic, lexical, phonological or stylistic. Palmer (1973) used linguistic analysis to establish some linguistic correlates to judgements by NS of the language ability of NNS. Linguistic analysis has also contributed to the selection of errors for inclusion in stimuli by researchers who use specific deviant forms when assessing the communicative effect of learners' errors (Johansson, 1978; Olsson, 1977). A benefit of linguistic analysis is that it serves to isolate the form in time and space, and, by comparing the interlanguage of a given learner or group of learners with the accepted or standard form of the target language one begins to define,

albeit narrowly, the synchronic state of that language.[1]

The works cited represent progress in the description and explanation of the relationship between grammatical and lexical deviance and how they relate to judgements of intelligibility and acceptability. Certain researchers have also suggested that phonology, and in particular, prosody should be investigated for effect on intelligibility (Johansson, 1978; Bansal, 1969). The results of one of Johansson's experiments showed that individual words were judged as more native-like than strings of words. Johansson's conclusion is that "non-segmental errors cause a greater degree of deviance than segmental ones" (p. 111). Johansson suggests that, where his stimulus was artificial, disconnected language, "it would certainly be important to examine if [sic] the same results appear in more natural language situations" (p. 112). In addition to the experimental work, applied linguists who are concerned with intelligibility seem overwhelmingly convinced that the individual segmental errors that occur in non-native speech do not present a large threat to the comprehensibility of the message, simply because the native speaker's intuitive knowledge of phonology allows him or her to guess the intended word (Nelson, 1982; Palmer, 1974; Bannert, 1983). This fact of furnished context, whether phonological or textual, leads the listener to posit the right assumption about what must be meant (Halliday,

1. But see Mackey (1970) for an argument against synchronic analysis.

McIntosh and Strevens, 1965). The very presence of a foreign accent is enough to cause the native listener to attend a little more carefully to the speech than she or he might normally. However, it may be that this closer attention is the source of potential irritation to native sensibilities, due to the increased effort of listening to unfamiliar sounds and the resultant confusion if misinterpretation occurs.

Some of the research surveyed for this project illustrates the attention paid to the relationship between both subjective and objective assessments of NNS speech and writing: Dimitrijevic and Djordjevic (1971) discovered that subjective assessments of learner language differ in degree from group to group of raters, depending on the raters' predisposition to the learners' language ability. Using a group of native English speakers and three groups of Serbo-Croatian speakers (university students, secondary school teachers and phoneticians) as judges of pronunciation, Dimitrijevic and Djordjevic found that university students were the most demanding raters and teachers were the most lenient. Of even greater relevance to the present study was the finding that, of the three modes of speech tested, namely isolated sounds, sentences and texts, the highest ratings were given for individual sounds and the lowest for texts (p.258).

PROSODY AND INTELLIGIBILITY

Although deviant prosody has been compared to segmental deviance for effect on intelligibility in some work (Johansson 1978), and phonological deviance has been compared to lexical and grammatical deviance in other work (Palmer 1973), in none of the research consulted for this project were individual prosodic features tested for their relative effects on judgements of intelligibility or acceptability.

Prosodic features are those elements of sound that "are, in a way, a secondary, overlaid function of inherent features" (Lehiste, 1970, p.2). Prosodic features include word stress, sentence rhythm, intonation, juncture and pitch contours. Prosody is the British label; 'suprasegmental' is the American term, which is clearly distinguished from segmental or individually articulated sounds. According to Halliday et al (1965), "A phonetic feature which, whether or not assignable to a specific phonological unit, occurs distinctively with any stretch other than a phoneme is called a PROSODIC feature, or simply a 'prosody'" (p. 47).

Word stress is characterized acoustically by intensity, frequency and duration (Lehiste, 1970, p. 125-27). It has been defined from the receptive end as "those variations in linguistically contrastive prominence primarily due to loudness" (Crystal, 1969, p. 156). It is a learned and phonemic characteristic of English. Halliday et al (1965) suggested that "it is theoretically possible to isolate stress as an independent variable, to be correlated with what is perceived

as variation in loudness" (p. 71).

The combination of sentence rhythm and intonation into one feature for analysis has been done to make for a more global approach to the assessment of the qualities of speech tone shifts and beats that fall on the sentence. Crystal (1969) defines rhythmicality thus: "This prosodic system accounts for those linguistic contrasts attributable to our perception of regularly occurring peaks of prominence in utterance" (p. 161). As Ladefoged (1975) said "The intonation of a sentence is the pattern of pitch changes that occurs" (p. 93). The combination of words into utterances necessitates examination of the features that prevail in sentences and phrases.

Juncture is the third feature chosen for analysis of effect on intelligibility and accentedness. Following Trager and Smith (1951), the different degrees of juncture are "manners of terminating or going from parts of utterances" (p. 46). Juncture is considered a word boundary, (external) and a syllable boundary (internal). An example illustrating juncture is the difference between <u>that skate</u> and <u>that's Kate</u>.

The intrinsic problem with studying prosodic features is that they raise several dilemmas in terms of separation and distinction, in the perception of oral stimulus. According to Lehiste (1970), the independence of a trait is determined by its being analyzable without reference to any other trait

(p. 3). This is a difficult prerequisite to fulfill for prosodic feature analysis. The nature of prosody is such that vocal and acoustic qualities, i.e., tone, tempo, prominence, rhythmicality and pitch (to name a few defined by Crystal and Quirk, 1964) are superimposed on tone groups, which can be as small as a syllable or as long as a few words. Ladefoged's (1975) definition of tone group is "the part of a sentence over which a particular pattern [of pitch changes] extends" (p. 93). Prosodic features are not distinctive features, that is, they are not the identifying characteristics of sound units. They only become distinctive when the units are strung together. In order to examine their influence on the communicative process more systematically, they must be teased apart and assigned different roles. Thus we have word stress, operating at word level, and juncture operating at both intra- and inter-word level. Rhythm and intonation are assigned to tone units, phrases and longer strings. By assigning the features of vocalization to operative distinctions, the process of prosodic clarification becomes a little more manageable.

In the present research project, three prosodic features are under investigation: word stress, sentence rhythm and juncture. Two ratings by naive listeners are elicited: intelligibility and accentedness. The ratings of the three prosodic features will be analysed in terms of how much they account for the ratings of intelligibility and accentedness.

RATIONALE AND RESEARCH QUESTION

In view of the lack of detailed research into the prosodic features and their effects on intelligibility (Bannert, 1983), the present project has been designed to assess, under experimental conditions, the relative effect of three selected features of prosody and to investigate, to some degree, how rater judgements of related features compare. This strategy follows Johansson (1975), who stated that more studies of NS reactions to learners' errors are needed, and replicates in part the empirical procedure used by Palmer (1973), whose aim was "to predict the speech ratings from the results of the linguistic analyses and the questionnaire data to determine what combination of factors significantly affected respondents' evaluations" (p. 46).

The judgement of specified traits of speech has been undertaken using different methods in different studies. Subjective and objective tasks may require respondents to react in some designated manner to the stimulus and these reactions are recorded. Linguistic analysis is a form of assessment which is different from these types of tasks and entails degrees of objectivity and subjectivity.

In the approach employed in the present study, a rating scale with a pair of bipolar adjectives was used for the assessment of both dependent and independent variables. The graded scale was considered an appropriate instrument for this study because this research sought responses from both

naive and sophisticated listeners derived from impressions of speech. Speech perception occurs at many levels, and that level at which listeners attend to the interplay of the accent and the content was being tapped. Linguists with training in phonetics were used to analyse the speech samples. The constraints of time and cost were factors in the decision to use linguists rather than ESL teachers or instruments for the speech analysis. It was also felt that linguists with a specific interest in phonetics had the necessary aural discrimination for the task of separating the features in question.

In the research on the intelligibility of NNS or deviant speech different kinds of instruments have been used to measure native speaker reactions. These include operation tests (Quirk and Svartvik, 1966) and open-ended questions referring to either respondents' impressions of the speaker or about what was said or written (Albrechtsen, Henriksen and Faerch, 1980). The operation test is an objective measure designed to show the degree of irritation imposed by certain errors. The procedure is to listen to the deviant utterance and to change it in the specified grammatical way. Any changes in the grammatically altered version not demanded by the operation are considered evidence of how irritating the original utterance was. It is objective in terms of the instrument; that is, it sets a straightforward task for the respondent, to change the sentence from past to present, or to

perform some such operation. But in terms of using the corrected version of the sentence as an indication of how wrong the original was, a subjective judgement must be made by the researchers to decide on what exactly comprises hypercorrection, and how syntactically or lexically distant the corrected version is from the original. This method would be ineffective in phonological surveys, as it would be misleading to assume that overcorrection of elements in the stimulus is due to irritation caused by the pronunciation.

The use of open-ended questions to obtain respondents' attitudes to either the stimulus or the speaker is not recommended for the assessment of intelligibility. Speech is a personal characteristic. Where people are judging other people's speech, an evaluative judgement is performed. An attitudinal judgement seeks different kinds of information, and is prevalent in sociolinguistic research. The present work requires only one facet of attitude, namely, the degree of discomfort experienced by the listener. (The question of intelligibility is more evaluative than attitudinal.) The instrument was designed to focus attention on a single attribute of the speech heard by the listener. In terms of subjectivity and objectivity, the use of one numbered scale and its attached set of bipolar adjectives as a tool for measurement is as objective an instrument as can be devised to reflect an essentially subjective judgement.

With regard to the present work, the measurement of the intelligibility of and accent awareness caused by accented

English is necessarily subjective, and does depend on respondents' attitudes. The procedure for analysing the results was to use pooled ratings to minimize individual rater differences. The rating scale is justified for intelligibility research by its effective use in some major studies: Johansson (1978); Dimitrijevic and Djordjevic (1971). It has often been combined with operations tests, repetition tasks, commentaries on ratings, or comprehension questions about the topic of the speech sample (Palmer 1973). The length of the scale, 0 to 7, yielding eight gradations, was chosen as having enough range to allow for variety in one rater's judgement of all twelve speakers, but not being so wide that it was unmanageable. Following Johansson (1975) a scale with an even number of points is used to preclude judgements that are neither positive or negative. That is, where there is no middle point, respondents cannot opt to remain neutral. The bipolar adjectives chosen for the intelligibility scale were based on understanding, emphasizing the possibility that the accent's affect on the message could be graded in quantifiable terms. For the accent impression scale, the adjectives were negative and positive correlates of pleasantness. Instructions prior to the scales indicated how the respondent was to judge what she or he heard. For an example of the rating scales, see Appendix A.

Linguistically naive raters were used to make judgements of the two dependent variables, intelligibility and discom-

fort. Linguists with training in phonetics analysed the same speech samples for the three independent variables. Naive raters were used to satisfy the following prerequisites: that the listening approximate as closely as possible an actual situation involving NS reception of an NNS message; that listeners not make linguistic assessments, but rather impressionistic reactions. Palmer (1973) mentions "previous bad experience with trained raters" (p. 43), and Johansson (1978) suggests that "linguistic sophistication may be an obstacle rather than an advantage in judgements of acceptability" (p.22).

Word stress has been selected as one potential kind of error because it has been anecdotally observed as a "typical" problem of French Canadians speaking English, it is a salient error, and its mispronunciation is one source of obstruction to intelligible speech. Contrastively analysed, word stress can be predicted to pose a problem to the French Canadian's spoken English, since in French stress is systematically word-final, whereas in English it seems, to the ESL learner, to occur arbitrarily in words. The two strategies that seem to be in effect for incorrect stress are 1) transfer from L1, which induces the Francophone to pronounce English words with word-final stress, and 2) overgeneralisation of some learned rules, which leads the learner to assign stress to another, incorrect syllable. This seems to occur universally, so that the most familiar mispronunciation of the word development invariably has stress on the third syllable. The knowledge

that the stress pattern is different in English does not seem to be sufficient to control for correct stress placement in all words; it appears that the first step of the learning process is to assign the stress penultimately.

Another observed tendency in the Francophone's spoken English is the lack of reduction of unstressed vowels. This factor may indeed have more significance than the simple assignment of stress to the prominent syllable.

In this study linguistically unsophisticated English speakers rated samples of English speech recorded by French Canadians. The ratings were done in terms of relative degrees of intelligibility and impression, positive or negative, of accent, but each naive rater did only one of the two types of rating. It was felt that a rater's reliability in making subjective judgements would be jeopardized if the rater listened to the same speech samples more than once. As each sample was two minutes long, and there were twelve of them, a rater's patience and effective listening power had to be taken into account.

Native English linguists with training in phonetics listened to the tapes and rated them in terms of the native-like production in their speech of three phonological features: word stress, sentence rhythm/intonation and juncture. The prosodic features were narrowed to these three for simplicity and manageability. The linguists heard the corpus three times through, once for each feature being assessed. They rated

for features in different orders; that is, as linguist A was rating the corpus for word stress, linguist B was listening for juncture. It was assumed that, whereas linguistically naive raters' judgements would suffer the effects of fatigue from more than one listening, the linguistic analysts' judgements required three listenings in order to assign independent grades for each feature. There was no alternative but to subject the linguists to a more demanding regimen of listening.

The research method is based on the hypothesis that deviant prosodic feature production impairs the intelligibility of, or causes the listener to direct his attention away from the message. The objective of the experiment is to ascertain which of the three prosodic features named has the largest effect on the intelligibility and perceived degree of accentedness of French-accented English.

In the interpretation of results for this study, the three described features of prosody are the independent variables. The two dependent variables are intelligibility and accent impression. It can be argued that judgements of the intelligibility of speech are often highly subjective and induced by attitudes towards the speaker (Edwards, 1982). Others have given adequate evidence that subjective evaluations of intelligibility are distinct from and independent of judgements made about the speaker (Johansson, 1978; Gynan, 1984). In either case, the effect of studies using both measures is that assessments of tolerance levels can differ

from those that determine what makes speech hard to comprehend. Research gains to be made include the determination of how much prosodic features can account for native listener judgements of the intelligibility and the accentedness of NNS speech, how these two judgements are related to each other, and how the three prosodic features interrelate.

The design of this study is correlational. The data include two sets of scores: one set of reported native speaker reactions to the intelligibility and to the degree of accentedness of samples of the English spoken by French Canadians; and another set of ratings of the prosodic features of the same samples of speech. The design of the study is modelled on research done by Palmer (1973) and Albrechtsen et al (1980), where linguistic features of speech are correlated with native informants' reactions to that speech. The reactions reported in Palmer's research were to language ability, subjects' personality and handling of the task; the subjects in the study by Albrechtsen, et al responded to speech samples by answering comprehension questions and giving assessments of the performance in terms of how the speaker sounded. For example, questions were posed to elicit listener reactions to what the speaker said in addition to how proficiently the speaker handled the communication.

The addition of the accentedness judgement in this study was suggested by the work of Johansson (1975) and Gynan (1984) who investigated the relationship between judgements of intel-

ligibility and degree of irritation caused by the accented or deviant speech. The present study concerns both intelligibility judgements and accentedness judgements, and how prosodic feature analysis can be used to account for those judgements.

The research question is: To what degree will the assessment of the prosodic features of the phonologically deviant English spoken by French Canadians by linguists with training in phonetics account for the judgements by linguistically naive English listeners of 1) intelligibility and 2) accentedness?

Some questions implied by the major question are:

1) How independent are the prosodic features?

2) How independent are the judgements of intelligibility and accentedness?

3) Which of the two dependent variables is better predicted by the prosodic features?

4) Is there a different order of importance for the predictor variables of intelligibility versus accentedness?

The initial step in the study was to record samples of French-accented speech. These samples were then presented to two groups of linguistically naive listeners, one group listening for intelligibility (N = 10) and the other group listening for accentedness (N = 9). The taped samples were also presented to six applied linguists with training in phonetics, who rated each sample for the prosodic features. The ratings provided the data used in addressing the above questions.

SUBJECTS AND PROCEDURES

SPEAKERS

The subjects for samples of speech were solicited from several ESL 207 classes at Concordia University in October 1984. Subjects were selected from one proficiency level in order to limit, insofar as possible, variations in oral fluency, which could easily distort judgements of intelligibility and accentedness. Six females and six males volunteered. These twelve students were drawn from four different sections of ESL 207, which is the first ESL course in a series of four offered to students whose native language is not English who have been admitted to Concordia University to study in any discipline. The course is a combination of four hours per week of class time focussing on writing and reading skills and one hour per week of language laboratory time, focussing on listening skills. These students do not get much opportunity to talk during their ESL courses, so they were quite willing to talk and be taped for the researcher. They were offered remedial assistance with their pronunciation in exchange for their participation. Two of the participants accepted the offer, but only one followed up.

ELICITATION

Upon arrival in the recording lab, each was asked if she or he had any special interests she or he could talk about for five minutes. Two people chose to speak on subjects they

had researched for class presentations. All others spoke spontaneously on studies, jobs or issues they knew about. Students were recorded on a Tandberg System 500 tape recorder at the Concordia University language laboratory.

The researcher tried to give prompts and vocabulary as seldom as possible, but the incidence of that help varied with the individual speaker. They were told that the experiment was being conducted to determine how certain accents affected Anglophone listeners. Many of the subjects misinterpreted the study as having to do with their own regional variations in French, and how those regional variations would affect their accent in English. After five minutes of taping, speakers were asked to complete a questionnaire giving information about themselves, and especially details of their language learning experience. The results of this questionnaire are reported in Appendix B. These students were all responsive and eager to help.

TAPE

Each speaker's five-minute sample was edited to delete interviewer comments and questions, and to simulate continuous speech from the subject. The researcher extracted a two-minute sample, in each case the longest stretch of continuous speech from the speaker. Where interviewer questions occurred in the original, or where the speaker's hesitations, errors or incomprehensible sounds resulted in lack of production, these were deleted to allow for as much speaker produc-

tion as possible. Editing was done on a Sony Stereo Deck TC-K22 recorder from the Tandberg unit. The sound is free of distortion and noise. The taped stimulus presented to the linguistically naive raters consists of two minutes of connected discourse from each subject. There is a five-second pause between each sample. The complete tape is twenty-five minutes long.

The sample length of two minutes was chosen to satisfy two requirements. The first is that speech samples need to be long enough to provide representative samples of a speaker's competence, and the second is that they must not be so long as to result in listener fatigue. The minimum length of connected discourse used in the studies of oral intelligibility consulted for this project is two minutes. There is as yet no empirically determined optimum length for speech samples, but concern for listeners' patience is a deciding factor.

The order of speakers on the stimulus tape was pseudo-random within sex with alternation of male and female speakers. This alternation was made to offset any effects that one or the other sex might have on a listener. There were six male and six female voices, each speaking on different topics. Appendix C contains transcripts of the speech samples. No attempt was made to order the topics in any other than random sequence.

PILOT TEST

A pilot test using the full five-minute speech samples had led to a decision that shorter samples would be better stimuli for the judgement of intelligibility. Pilot test subjects reported that the original five-minute length was too long to maintain interest in the subjects' topic, and gave the listener time to acquaint herself with idiosyncratic pronunciation, so that perceived errors or incomprehensibility at the beginning of the sample would be discounted after hearing enough of the speaker. As noted by Brodkey (1972), "accomodation to the speaker over time is a crucial variable" (p. 203). Since the judgement of intelligibility was supposed to be made on the basis of the speaker's pronunciation, it was felt that context and accomodation would have a significant effect. An alternate stimulus tape was constructed, composed of thirty-six samples of speech of twelve to nineteen seconds in length. These thirty-six were from the twelve original samples and were ordered as three sets of twelve, in different sequences. As reported below, an insufficient number of listeners rated these samples to warrant analysis.

LISTENERS

The linguistically unsophisticated Anglophone listeners were recruited by contacting the Department of Modern Languages and Literatures at Trent University in Peterborough,

Ontario. Trent was chosen because, as an English university in a town of 65,000 where the predominant language is English, and where there is little foreign language input, it was presumed to be a good source of the kind of respondents required. Peterborough is a major center for the testing of consumer products, being representative of "middle Canadian" attitudes and habits, a fact that recommended it for testing. It was arranged for forty-eight students who were not studying Linguistics or TESL to be available on Friday January 25, 1985 in two sessions at the Trent language laboratory. They were all native English speakers, ranging in age from 18 to 25. For a detailed report of their profiles, see Appendix D.

Based on the projected number of listeners, the researcher organized the listening to be done in the following format:

SESSION 1

24 listeners, listening to the two-minute samples described above:

12 listening for the relative intelligibility of each speaker.

12 listening to give an impression (positive or negative) of each speaker's accent.

SESSION 2

24 listeners listening to a second set of samples by the same speakers, three samples of twelve to nineteen seconds each by every speaker:

12 listening for the relative intelligibility of each speaker.

12 listening to give an impression (positive or negative) of each speaker's accent.

The actual test samples were smaller than predicted. There were nineteen subjects for the first session, ten of whom received rating scales for intelligibility, and nine of whom received rating scales for accentedness. The subjects were told that they were to listen to speech samples and to rate them according to the instructions on the sheets they had been given. They did not know that half of the group was listening for one kind of judgement, and half for another. (Appendix A contains both rating scales.) Two example samples twenty seconds long were played at the beginning of the test tape to illustrate a range of the voices to be heard. It was made clear to participants that these two voices had been judged to be at opposite ends of the scale, but that they might not seem extremes of pronunciation to all listeners. For each example heard, subjects were provided with a blank rating scale, which they were invited to fill in for "practice" or leave blank, as they wished. No indication

was given as to which of the two examples heard was the more or less intelligible or accented. After hearing the examples they were instructed to listen to the ensuing twelve speech samples and complete the forms. After the listening was finished and the scales collected, the subjects were asked to complete questionnaires giving details of themselves, their language learning experience and contact with speakers of other languages. Attitudes were not elicited. Factual information was the only data collected.

The second session, where listeners were to hear twelve- to nineteen-second samples of the same speakers' speech, was poorly attended. Six students appeared, and consequently the results from this session are not reported or analysed.

LINGUISTS

Six linguists with training in phonetics rated the two-minute samples for each of the prosodic features, in different sequences. Each linguist heard the tape four times, the first time for familiarization and the next three times to rate native- or non-native-like production of each prosodic feature. The rating of prosodic features was done in different orders, so that as one linguist listened for word stress, the other listened for sentence rhythm. The rating scale was from 0 to 7, where 0 was native-like performance and 7 was non-native-like.

ANALYSIS

Descriptive statistics and reliability estimates for all measures were computed. Intercorrelations, with and without correction for attenuation, were computed among all measures. Multiple regression analysis was performed to examine the relation between prosodic features and ratings of intelligibility and accentedness.

RESULTS AND DISCUSSION

The rating scales collected from two groups of naive listeners, one for intelligibility and one for accentedness, resulted in 120 scores for intelligibility and 108 scores for accentedness. Each speaker was rated on a scale of 0 to 7 for intelligibility, where 0 is easily intelligible and 7 is difficult to understand. Each speaker was also rated on a scale of 5 to 0 to 5 for accentedness, where 5 at the left end of the scale represented an accent that was pleasant, 5 at the right end of the scale represented an accent that was unpleasant, and 0 represented no perceived accent to the listener.

The raw scores for these two judgements are presented in Tables 1 and 2.

TABLE 1

INTELLIGIBILITY RATINGS

	SPEAKERS											
LISTENERS	A	B	C	D	E	F	G	H	I	J	K	L
1	2	4	6	0	4	7	0	5	0	3	7	5
2	1	4	5	4	7	6	0	4	2	1	7	5
3	0	0	0	0	5	7	4	1	1	0	7	0
4	2	5	4.5	1	6	4	2	3	5	6	7	5
5	3	6	6	5	5	6	7	5	4	4	7	6
6	1	3	2	1	0	3	0	4	2	3	4	3
7	0	2	5	3	4	5	2	6	4	3	7	2
8	5	6	5	6	6	7	3	6	6	6	7	6
9	4	2	3	2	6	4	1	5	5	6	7	5
10	1	2	2	2	2	3	0	3	1	1	4	2
MEAN SCORE	1.9	3.4	3.8	2.4	4.5	5.2	1.9	4.2	3.0	3.3	6.4	3.9
S.D.	1.7	1.9	2.0	2.1	2.1	1.6	2.3	1.5	2.0	2.2	1.3	2.0

TABLE 2

ACCENTEDNESS RATINGS

	SPEAKERS											
LISTENERS	A	B	C	D	E	F	G	H	I	J	K	L
1	-3	2	3	-3	3	3	-5	3	-2	-3	4	-4
2	2	-1	-1	-2	3	3	-1	-2	2	-1	3	-3
3	-3	-3	-2	-3	-2	-5	-1	-2	-3	-4	-4	-4
4	-3	1	2	3	2	-2	-4	3	3	2	5	4
5	-2	-4	5	-5	5	3	-5	4	5	-2	-3	-2
6	-1	-2	1	-3	2	-4	-1	-2	-3	-5	4	2
7	-2	3	2	3	4	5	-1	3	3	-3	4	4
8	2	-1	4	-2	1	2	-3	-2	3	-2	1	1
9	-4	-5	3	-1	3	-5	-1	3	-2	-4	4	-3
MEAN SCORE	-1.5	-1.1	1.8	-1.4	2.3	0	-2.4	.8	.6	-2.4	2	-0.5
S.D.	2.2	2.7	2.3	2.7	2.0	4.0	1.8	2.7	3.1	2.0	3.3	3.3

Linguistic analysis resulted in raw scores for three prosodic features: word stress, sentence rhythm and intonation, and juncture. These scores were obtained from the ratings made by six phonetic analysts who used a rating scale (0 - 7) for each feature per speaker. 0 on the scale represented native-like production of the feature, and 7 represented non-native-like production. These scores are presented in Tables 3, 4 and 5.

TABLE 3

WORD STRESS RATINGS

	SPEAKERS											
ANALYSTS	A	B	C	D	E	F	G	H	I	J	K	L
1	3	2	5	2	2	5	2	2	6	4	4	3
2	4	3	3	3	4	5	3	5	4	4	3	3
3	4	6	6	4	4	5	2	4	4	6	7	7
4	4	4	6	5	4	5	5	5	4	6	6	4
5	3	5	5	3	2	5	2	3	5	5	7	6
6	4	2	3	3	1	2	2	3	4	4	5	3
MEAN SCORE	3.6	3.6	4.6	3.3	2.8	4.5	2.6	3.6	4.5	4.8	5.3	4.3
S.D.	.5	1.6	1.4	1.0	1.3	1.2	1.2	1.2	.8	1.0	1.6	1.7

TABLE 4

SENTENCE RHYTHM/INTONATION RATINGS

	SPEAKERS											
ANALYSTS	A	B	C	D	E	F	G	H	I	J	K	L
1	6	3	5	3	6	5	4	6	5	6	7	6
2	5	5	5	4	6	3	2	4	4	3	4	6
3	7	7	4	5	6	7	2	5	6	7	3	5
4	5	4	3	4	5	5	3	6	6	6	7	6
5	2	5	5	4	7	5	2	5	6	7	7	6
6	4	2	2	4	4	3	0	6	4	5	6	7
MEAN SCORE	4.8	4.3	4	4	5.6	4.6	2.1	5.3	5.1	5.6	5.6	6
S.D.	1.7	1.7	1.3	.6	1.0	1.5	1.3	.8	1.0	1.5	1.7	.6

TABLE 5

JUNCTURE RATINGS

	SPEAKERS											
ANALYSTS	A	B	C	D	E	F	G	H	I	J	K	L
1	2	5	3	3	3	3	4	2	2	4	5	7
2	5	5	4	4	4	3	5	4	3	4	6	6
3	5	5	6	3	4	6	2	7	3	4	7	3
4	2	2	4	5	5	4	4	4	4	4	5	4
5	1	3	4	2	1	2	1	1	1	2	2	2
6	0	0	5	2	1	2	0	5	1	0	3	4
MEAN SCORE	2.5	3.3	4.3	3.1	3	3.3	2.6	3.8	2.3	3	4.6	4.3
S.D.	2.1	2.1	1.0	1.2	1.7	1.5	2.0	2.1	1.2	1.7	1.9	1.9

Means were normalized to allow comparison among features. The z scores of the mean for each speaker on each variable are presented in Table 6.

TABLE 6

z SCORES FOR SPEAKERS ON ALL VARIABLES

SPEAKERS	VARIABLES				
	INTEL	ACCENT	W.STRESS	S.RHYTHM	JUNCT
A	-1.3	-0.8	-0.4	0.2	-1.1
B	-0.1	-0.5	-0.4	-0.3	0
C	.2	1.3	.8	-0.7	1.3
D	-0.9	-0.7	-0.8	-0.7	-0.2
E	.7	1.5	-1.4	1.0	-0.4
F	1.2	.1	.6	0	0
G	-1.3	-1.3	-1.6	-2.5	-0.8
H	.5	.5	-0.4	.7	.6
I	-0.5	.6	.6	.5	-1.3
J	-0.2	-1.4	1.0	1.0	-0.4
K	2.1	1.4	1.6	1.0	1.7
L	.2	-0.2	.4	1.3	1.3

The research question which prompted this investigation was: To what degree will the assessment of the prosodic features of the phonologically deviant English spoken by French Canadians by linguists with training in phonetics account for the judgements by linguistically naive English listeners of 1) intelligibility and 2) accentedness? The analysis is limited to three noteworthy elements of prosody: word stress, sentence rhythm and juncture. The method used to answer the research question is correlational. Two kinds of statistical operations were used to analyse the data: zero-order correlational analysis, to investigate the independent relationship between each independent and dependent variable, and multiple regression, to determine the relative importance of each of the predictor variables.

RELIABILITY

Reliability for these five variables was found to be as follows: (according to a Kuder-Richardson formula for intra-class correlation)[1]

TABLE 7

RELIABILITY

INTELLIGIBILITY	.87
ACCENT IMPRESSION	.77
WORD STRESS	.73
SENTENCE RHYTHM	.80
JUNCTURE	.51

1. See Ebel, 1971, p. 419-20.

Reliability for the dependent variables, intelligibility and accentedness, and for two of the independent variables, word stress and sentence rhythm, is established at acceptable levels. For the measure of juncture, the coefficient, .51, indicates that this trait has relatively poor inter-rater agreement.

Because of wide differences in reliability, correlational analysis will also include coefficients corrected for attenuation.

CORRELATIONAL ANALYSIS

Pearson product-moment correlations were computed using total scores for each variable, per speaker. The correlation coefficients are reported in Table 8, where it may be seen that a partial answer is found to the research question: Which of the three prosodic features analysed correlates most highly with each of the dependent variables?

TABLE 8

PEARSON CORRELATION COEFFICIENTS

	ACCENT	W.STRESS	S.RHYTHM	JUNCT
INTEL	.70	.56	.54	.69
ACCENT		.25	.39	.48
W.STRESS			.50	.50
S.RHYTHM				.30

The correlation among traits, that is, word stress, sentence rhythm/intonation and juncture, is less than the maximum which might obtain, based on their reliabilities. This shows that they are somewhat distinct. (See also, below, that intercorrelations among all but one pair of variables, when corrected for attenuation, are less than 1.00.) The correlation coefficient for the relationship between word stress and sentence rhythm/intonation is .5, for word stress and juncture it is also .5, and for sentence rhythm/intonation and juncture it is .3. Therefore, their low degree of correlation establishes the difference of these traits; the mastery of these traits can occur partially independently; and multiple regression analysis is warranted.

CORRECTION FOR ATTENUATION

The extent to which the relative size of zero order correlations is affected by reliability is illustrated when correlations are corrected for attenuation, following the principle that, since scores in the obtained correlations are unreliable, a comparison of true scores can be made by supposing perfectly reliable ratings. The computed correlations, when corrected for attenuation, are based on the reliability that does exist for a set of scores. That part of the variance that is reliable input to the correlation is used in the calculation. The resultant correlation coefficient is an index of the relationship between the variables. Table 9 gives correlation coefficients, corrected for attenuation.

TABLE 9

CORRECTED CORRELATIONS AMONG MEASURES

	ACCENT	W. STRESS	S. RHYTHM	JUNCTURE
INTEL	.87	.70	.65	1.04
ACCENT		.34	.51	.79
W.STRESS			.66	.83
S.RHYTHM				.47

This matrix shows that the order of the predictors' correlations with both intelligibility and accentedness does not change when corrected for error variance. The corrected coefficient for the correlation between juncture and intelligibility is greater than 1.00. This indicates that the reliability of at least one variable may be underestimated. The coefficient for juncture, .51, is most likely a low estimate.

MULTIPLE REGRESSION

A multivariate multiple regression analysis was performed on the data to account for the proportion of the variance in each of the dependent variables contributed by each of the independent or predictor variables. The relative importance of each independent variable to the dependent variables can be computed by this statistical procedure, which yields a prediction equation:

$$Y' = a + b_1 x_1 + b_2 x_2 + b_3 x_3 \quad (1)$$

where Y' = predicted dependent variable scores, a = intercept constant of Y, b = regression coefficient or weight, and x = standardized score for each independent variable. In this study, there are three independent variables, namely, word stress, sentence rhythm and juncture. For the two dependent variables, intelligibility and accent impression, the equation is calculated separately.

Equation (1) was computed for each dependent variable by the Multiple Regression program of the SPSS package, in a forward entry system. The order of entry of independent variables into the analysis is based on the magnitude of the correlation with the dependent variable for the first entry. The variable showing the next greatest increment to R (the coefficient of multiple correlation), after taking the first variable into account, is next entered.

The coefficient for each independent variable is an estimate of that variable's relative weight in the determination of the dependent variable. Beta weights are the normalized coefficients, and are thus used to report on the overall effect of trait on each of the dependent variables. Table 10 summarizes the results of the analyses of regression of all predictors on both dependent variables.

TABLE 10

BETA WEIGHTS

	INTELLIGIBILITY			ACCENT IMPRESSION		
	BETA	F	P <	BETA	F	P <
WSTRESS	.13	.22	.646	-.13	.13	.722
SRHYTHM	.30	1.4	.259	.32	.9	.368
JUNCTURE	.53	4.3	.071	.45	1.8	.213

This matrix indicates that, for both intelligibility and accentedness, a tentative hierarchy of prosodic predictors can be established. The suggested order of importance is juncture, sentence rhythm, word stress, according to Beta coefficients. The F values and associated significance levels are indicators of the probability that a predictor and criterion variable are truly correlated in the population from which a sample was drawn. They take into account the amount of data upon which the analysis was performed. Of the F values for these three variables, only that for juncture surpasses F critical. Therefore, juncture would appear to be the only judgement that is not random, and at the same time, the most heavily weighted variable. This calculation is based on 3 and 8 degrees of freedom, however, which is an underestimation due to the fact that each data point in the correlations analysed represents 54 to 60 independent ratings.

An analysis of variance performed on the regression of the three predictor variables on intelligibility scores yielded the information in Table 11.

TABLE 11

ANOVA FOR LINGUISTIC AND NS RATINGS OF INTELLIGIBILITY

Source of variance	SS	d.f.	MS	F
Between groups	1189.7	3	396.5	4.22*
Within groups	750.9	8	93.8	

* $p < .05$

F is greater than critical F to .05 level of significance in this case, which indicates that there is treatment effect, and that the judgements are not random.

FOLDED SCALE

The scale for accentedness was -5 to +5, and the question of what differences might come about from folding or reflecting this scale was investigated. Where an unfolded scale represents subjective appraisal of the pleasantness or unpleasantness of the accent, the folded scale is in essence a more representative indicator of the existence of accent. The scale was folded so that a -5 and a +5 represent the same value, that pertaining to non-native accentedness, and 0 retained its original meaning of no perceived accent. This was done to derive scores that had only to do with accentedness, excluding positive or negative judgements of accents.

Differences were found when results from the folded and unfolded scales for accentedness were compared. F came closer to significance for the regression when the folded scale was employed. Tables 12 and 13 illustrate this comparison.

TABLE 12

ANOVA FOR LINGUISTIC AND NS RATINGS OF ACCENTEDNESS
(Folded scale)

Source of variance	SS	d.f.	MS	F
Between groups	57.8	3	19.2	2.04*
Within groups	75.1	8	9.3	

* p > .05

TABLE 13

ANOVA FOR LINGUISTIC AND NS RATINGS OF ACCENTEDNESS
(Unfolded scale)

Source of variance	SS	d.f.	MS	F
Between groups	575.7	3	191.9	1.23*
Within groups	1241.1	8	155.1	

* p > .05

However, critical F for 3 and 8 degrees of freedom is 4.07, so the increment in F when the scale is folded is not enough to establish significance, based on these underestimated degrees of freedom. As noted above, (See p. 38) since each

data point is an aggregate of 54 or 60 independent ratings, many more degrees of freedom would be appropriate.

The folded scale for accentedness yields a different hierarchy of correlations: word stress, then sentence rhythm, then juncture. (See Table 14) The two dependent variables also correlate more closely. Where the independent variables are concerned, it may be interpreted that, since the folded scale has only to do with accentedness, deviant word stress occurs more regularly as speech is perceived as more accented, pleasantly or unpleasantly. This is a more substantial difference than those between the coefficients computed from the unfolded scale for sentence rhythm and juncture, and may direct attention to the kinds of listener awareness that operate when making judgements about accent. The higher coefficient for the correlation between

TABLE 14

CORRELATION COEFFICIENTS WITH FOLDED AND UNFOLDED SCALE FOR ACCENTEDNESS

	FOLDED	UNFOLDED
INTEL	.78	.70
W.STRESS	.63	.25
S.RHYTHM	.46	.39
JUNCTURE	.40	.48

intelligibility and accentedness when the scale is folded suggests that these two judgements may be based on the same fundamental decision.

Beta weights for the three independent variables change as the scale is folded. When the calculation was carried out for the regression using the values from the unfolded scale, word stress was negatively weighted for effect on accent pleasantness. That is, the more unpleasant the speech was judged, the less deviant word stress appeared. As can be seen in Table 15, folding the scale results in a greater Beta weight for word stress, and a greatly reduced weight for juncture. A possible interpretation of this outcome is that, while deviant prosody affects positive and negative accent judgements in one way, namely, with emphasis on the junctural aspect (a feature that had low inter-rater agreement) the exclusion of the positive-negative contrast for accent finds the more salient and reliably rated feature word stress to have larger effect.

TABLE 15

BETA WEIGHTS

	UNFOLDED SCALE	FOLDED SCALE
Word Stress	-.13	.48
Sentence Rhythm	.32	.19
Juncture	.45	.09

The R square value for the regression of the prosodic features on the folded scale determining accent impression, .434, raises important questions about other features that explain perception of accent. R square for the unfolded scale was .316, accounting for even less of the variance in the judgements of accentedness where they are negative and positive. .434 is fifty-six per cent of the reliable variance in judgements of accentedness; what accounts for the other forty-four per cent? This kind of judgement comprises a range of evaluative factors, some of which are suggested below.

The R square for intelligibility is somewhat more substantial, at .61, or seventy per cent of reliable variance. This value reveals that, as with judgements of accentedness, judgements of intelligibility reflect the presence of features other than the three prosodic ones selected. Since thirty per cent of the variance is unaccounted for, postulations can be made as to what other factors have effect on these judgements.

QUALITATIVE ANALYSIS

A qualitative survey of the stimulus suggests other factors that may be in effect for judgement. Certain speakers, most notably E and K, have several idiosyncracies in their speech that would jeopardize any but the most generous judgement. Speaker K was rated least native-like on three variables: intelligibility, word stress and juncture; he was rated second least native-like on accentedness and sentence rhythm.

Speaker E was rated least native-like on accentedness, third least native-like on intelligibility, fourth least native-like on sentence rhythm, but second most native-like for word stress, and fifth most native-like for juncture. These two speakers exhibited similar speaking styles. Hesitation phenomena, repetition of the same vocabulary, distortion of the meaning caused by deviant syntax, and general disfluent production were all in operation with these two speakers. For a comparison of their scores with those of two favorably rated speakers, see Table 16.

Of the favorably rated speakers, Speaker G was most consistently rated as native-like. He was most native-like in intelligibility, word stress and sentence rhythm, second most native-like for accent and third most native-like for juncture. Speaker G illustrates the most native-like sentence rhythm by a wide margin, 1.9 units from the next most native-like production of sentence rhythm.

Speaker J is about average for intelligibility, the most pleasant to listen to, rather non-native in her word stress and sentence rhythm and about average for juncture. A postulation as to why her accentedness score was so low, i.e., not irritating, is that her speech was textually coherent, her choice of vocabulary sophisticated and articulate, and her delivery informed and concerned. She is a "good" speaker, in the sense of knowing what she has to say and saying it with fluency. She is, however, the student who has spent the most

time (1 1/2 years) in a totally English environment, and perhaps her fluency derives from that experience. (See Appendix B).

TABLE 16

FOUR CONTRASTING SPEAKERS' SCORES

	INTEL	ACCENT	W.STRESS	S.RHYTHM	JUNCT
GROUP	$\bar{X}$ = 3.6	$\bar{X}$ = 4.3	$\bar{X}$ = 3.9	$\bar{X}$ = 4.7	$\bar{X}$ = 3.3
GROUP	SD= 1.3	SD= 1.4	SD= .8	SD= 1.1	SD= .7
SPEAKER					
J	3.3	2.4	4.8	5.6	3.0
G	1.9	2.5	2.6	2.1	2.6
E	4.5	6.4	2.8	5.6	3.0
K	6.4	6.2	5.3	5.6	4.6

DISCUSSION

The intention of this research was to establish a hierarchy of the prosodic features that could predict the judgements of the intelligibility and accentedness of non-native speech. Correlational analysis provides the following order in terms of the highest correlation to intelligibility: juncture, word stress, sentence rhythm. The order suggested by correlation to accentedness is: juncture, sentence rhythm, word stress.

Multiple regression analysis yields results that support the finding of juncture as the most significant variable in the determination of intelligibility, followed by sentence

rhythm and word stress. For accentedness, the same order of predictor variables obtains until the scale for accentedness is folded to reflect absolute values, resulting in a reversed order for the relative significance of each variable. The folded scale also results in a changed order for correlations: word stress correlates most positively with accentedness, followed by sentence rhythm and juncture. When all correlation coefficients are corrected for attenuation, juncture and word stress are found to correlate quite highly, with the possible interpretation that they are actually more closely related than originally assumed.

The research question that prompted this research was: To what degree will the assessment of the prosodic features of the phonologically deviant English spoken by French Canadians by linguists with training in phonetics account for the judgements by linguistically naive English listeners of 1) intelligibility and 2) accentedness? The research project yielded results that allow the following conclusions: for intelligibility, the combined contribution of juncture, sentence rhythm, and word stress accounts for seventy per cent of the variance of the judgements. The other thirty per cent is unaccounted for.

For the judgement of accentedness, the effect of other, untested variables is greater. Fifty-six per cent of the total variance in judgements can be explained by the combined contribution of the three prosodic features. The

remaining forty-four per cent is attributable to factors that are involved in the complex activity of listening.

CONCLUSION

Whereas this research looked at the prosodic features individually for their effect on two other judgements, other research reports consulted for this project compared phonological features with grammatical or lexical deviance, to obtain predictions about intelligibility or acceptability. Bansal (1969) suggested that prosodic features were largely responsible for the lower assessments of the intelligibility of accented texts, as compared to the assessments of sentences and words, but he did not investigate the prosodic features individually. The results of Johansson's (1978) final experiment suggest that prosodic feature errors are more striking than errors in the pronunciation of individual sounds. (p. 111) Of others who studied linguistic correlates to judgements of the foreignness of NNS language, Palmer (1973) found that familiarity with certain foreign accents leads to greater consistency in judgements of linguistic fluency, but again, he did not examine which particular features of accent were responsible. Albrechtsen et al (1980) were interested in the factors contributing to judgements of how a NNS sounded in English. They identified four important factors: language, content, personality and comprehension. The present research attempts to narrow the scope of just one of these factors, namely listening to accented speech.

Listening to accented speech is a task that is affected by many speaker characteristics. Listeners, consciously or unconsciously, hear the fluency with which the speaker expresses the content, and are influenced by the context of the topic, the speaker's accent and vocal quality. Fluency is itself a composite attribute, comprising rate of delivery, interval timing of speech, occurrence of hesitation phenomena, as well as linguistic factors. The context presumably affects listeners in that it seems likely that the listener attends more closely to topics of interest to him or her. The accent, including segmental and suprasegmental sounds, elicits some kind of response in the listener, or at least informs the interlocutor of some underlying fact about the speaker or the exchange. The tone of a person's voice can influence the listener's attention. Repetition, false starts and mispronunciations all have an effect on the listener's predisposition to listen, comprehend and care about what is being said.

The relationship between the judgements of intelligibility and accentedness is of consequence to the main question. The results of correlation between the dependent variables when the accentedness scale is folded support the notion that these may be two versions of the same judgement. This finding agrees with that of Edwards (1982) and disagrees with those of Johansson (1978) and Gynan (1984). Linguistically naive informants, as judges of the intelligibility and the accent-

edness of speech, are perhaps likely to base their judgements less on the phonological attributes than upon reactions to content and voice quality. Since these listeners were not required to explain why they made the judgements they did, one may only guess at the criteria for these judgements. It may be that the complex activity of listening to speech (irrespective of linguistic proficiency and slightly affected by the foreignness of the listening situation) leads listeners to rate highly those samples that are interesting or easy to listen to for other non-phonological reasons, and to give poor ratings to those that were hard or fatiguing to listen to. The influence of the halo effect on listening to speech cannot be discounted here. It is very likely that a person's preconceived notion of the speaking ability of French Canadians, regardless of the situation, will have some impact on the judgement she or he makes of the speaker.

The question of the independence of the three predictor variables is answered by the results of the correlational analysis, and, when corrected for attenuation, is further explained. Whereas the three prosodic features appeared quite independent in the initial analysis, they lose some of that independence when the variance attributable to reliability is taken into account. Table 17 shows this comparison.

TABLE 17

ZERO-ORDER AND CORRECTED CORRELATIONS OF INDEPENDENT VARIABLES

	ZERO-ORDER	CORRECTED
WORD STRESS/JUNCTURE	.50	.83
SENTENCE RHYTHM/WORD STRESS	.50	.66
SENTENCE RHYTHM/JUNCTURE	.30	.47

It is reasonable to find higher coefficients when the correlations are corrected for error variance, but the increment in the coefficient for word stress and juncture indicates that these two variables are more closely aligned than the other correlations of independent variables. This result suggests that juncture may not be as robust a determiner of the accentedness of the English spoken by French Canadians as originally found. Support for this possibility comes from the fact that juncture is not as salient a feature as the other two to listen for, coupled with the observation that these speakers, if they know how to word what they have to say, seem able to speak fluently. This fluency results in the judgement that some speakers can approximate the English junctural system. In contrast, however, are the high correlation coefficients for juncture and intelligibility, the high Beta weight of juncture as a predictor of intelligibility, and the precedence of juncture in correlation with accentedness before the scale is folded.

Another significant finding is the reversal of the order of variables in the determination of accentedness, when the accentedness scale is folded. Beta weights for the three prosodic features indicate the order of importance is word stress, sentence rhythm, and juncture, when the scale is folded, as opposed to the opposite order when the unfolded scale is used. A possible interpretation of this reversal is that, given positive and negative values for accent, juncture has a large effect on the unpleasant end of the accentedness spectrum, but when the scale is folded to reflect values for both kinds of accentedness, word stress is the salient feature. This presumably occurs because deviant word stress can have both positive and negative effects on listeners.

The folded scale yields results that indicate that the original scale for accentedness, with its negative and positive poles, was probably used by the raters as a scale of native-like to non-native-like accentedness, on the continuum from -5 to +5. This finding derives from the facts that significance is higher when the scale is folded; the prosodic features are found to correlate in a different order of importance when the scale is folded; and Beta weights show a different order of precedence when the scale is folded.

IMPLICATIONS

The implications of this research project for the teaching of pronunciation are, as suggested by Palmer (1974), Johansson (1978) and Bannert (1983), that more attention should be paid to the role of the prosodic features in the

perceived intelligibility of NNS speech. Consequently the classroom pronunciation teacher has a responsibility to ensure that overly stringent demands are not made of students' pronunciation, but that errors affecting communication be priorities in error analysis and remediation. To the sociolinguist, the implications of this work seem to be that, when the individual rating forms in this study are surveyed, noticeable tolerance for French-accented English is suggested by the high incidence of positive or native-like ratings.

SUGGESTIONS FOR FURTHER RESEARCH

The preceding research indicates that, for studies of intelligibility, the exploration of phonological constructs requires more investigative work, with both manipulated and natural language as stimuli. Prosody as a composite entity requires refining, in terms of effect on judgements of NNS speech. Sample lengths and contexts must be juggled to find the optimum kinds and degrees of input stimulus. Where linguistic analysis is to be carried out, speakers might be better tested by their recital of the same, phonetically balanced passages, unless, as in the present study, speakers' spontaneous performance is the focal point. The results of instrumental studies, including spectrographic analyses, could profitably be applied to this domain, particularly recent work on speech analysis and synthesis for artificial intelligence systems (see, e.g., the extensive bibliographies

in De Mori, 1983 and Suen and De Mori, 1982). Speakers of different L1s should be recorded reciting the same text, to allow for comparisons between languages. The prosodic features should be more closely analysed to determine their interaction in the target language.

Recommendations for continued study of the prosodic features come from many directions. As Johansson (1978) said, "An error involving a general rule reveals a weakness that may affect an indefinite number of cases and may therefore have more serious consequences for communication than errors involving individual items (words or grammatical exceptions)" (pp. 6-7).

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Appendix A

Rating Scales

QUESTIONNAIRE 1

You will hear 12 samples of English spoken by some students studying at Concordia University. You will be listening for how easy or difficult it is to understand the speakers because of the pronunciation. Your task is to assign them a grade on a scale of 0 to 7. 7 on the scale means that the speaker's pronunciation makes it virtually impossible for you to make out the words and sentences. 0 means the pronunciation does not make it at all difficult to understand.

Please listen to the following two examples. These have previously been evaluated as being at extreme ends of the scale.

EXAMPLE A: EASY 0----1----2----3----4----5----6----7 DIFFICULT

EXAMPLE B: 0----1----2----3----4----5----6----7

These are representative of the range of voices you will hear. Assign your values by circling the appropriate point on the scale.

SPEAKER 1. EASY 0----1----2----3----4----5----6----7 DIFFICULT

SPEAKER 2. 0----1----2----3----4----5----6----7

SPEAKER 3. 0----1----2----3----4----5----6----7

SPEAKER 4. 0----1----2----3----4----5----6----7

SPEAKER 5. 0----1----2----3----4----5----6----7

SPEAKER 6. 0----1----2----3----4----5----6----7

QUESTIONNAIRE 2

Accented speech is, to some listeners, very pleasing to the ear. Other listeners find accents distracting or unpleasant to listen to. You will hear 12 samples of English spoken by some students studying at Concordia University. Your task is to listen to the samples, and to assign each sample a number on the scale. The 5 at the extreme left means that you find the accent pleasant to listen to. The right-hand 5 means that you find the accent unpleasant to listen to. 0 in the middle means that, to you, there is no perceptible accent in the speaker's English.

Please listen to the following two examples. They have been previously evaluated as being at extreme ends of the scale.

EXAMPLE A:

PLEASANT NO ACCENT UNPLEASANT

5---4---3---2---1---0---1---2---3---4---5

EXAMPLE B:

5---4---3---2---1---0---1---2---3---4---5

These are representative of the range of voices you will hear. Assign your values by circling the appropriate point on the scale.

SPEAKER 1

PLEASANT NO ACCENT UNPLEASANT

5---4---3---2---1---0---1---2---3---4---5

SPEAKER 2

5---4---3---2---1---0---1---2---3---4---5

SPEAKER 3

5---4---3---2---1---0---1---2---3---4---5

SPEAKER 4

5---4---3---2---1---0---1---2---3---4---5

SPEAKER 5

5---4---3---2---1---0---1---2---3---4---5

Appendix B

Speaker Profiles

ID	SEX	AGE	YEARS STUDYING ENGLISH	TIME SPENT IN ENGLISH PLACE	SUBJECTIVE ESTIMATE OF % OF ENGLISH
A	M	26	.6	4 months	5%
B	F	22	.3	2 months	5%
C	M	27	.3	2 months	5%
D	F	27	9.0	2 weeks	70%
E	M	21	1.0	3 months	30%
F	F	23	1.0	2 months	30%
G	M	21	2.0	4 months	35%
H	F	23	.3	0	35%
I	M	20	2.0	6 weeks	10%
J	F	26	.3	1 1/2 years	5%
K	M	20	.3	0	30%
L	F	22	.3	3 weeks	10%

Mean age: 23.1

Mean years studying English: 1.4

Mean time spent in English place: 3.1 months

Mean percentage of day spent in English: 22.5%

Native cities: Gaspe: 1
Montreal: 7
Quebec: 3
Trois-Rivieres: 1

Appendix C

Transcripts of Speech Samples

SPEAKER A

Ok I like to work in the restaurant because I like to work with the public (?) and I like to serve the people, because I like to give my service, my personal service, ok, and I think that everybody in the life have to go in the restaurant for to eat something and I meet a lot of people and I like to work for, just for the weekend, because I go to the school and because I meet a lot of people. I'm very enjoy when I, when I work like waiter and I would like after my university, I would like to be a management hotel(?) ok, because I think it's very important for... I would like to do it uh another kind of restaurant, something special, with it's like uh a little /ostel/(?) ok somewhere in the when the environment is beautiful and I would like to have a hotel with maybe 10 rooms and a little dining room and something special you know with a little farm with chicken and something like that you know what I mean? But I can be alone for to for to do /dis/ restaurant because it, it's too big for me. I will work 24 /howerz/ in a day. And uh, I don't know, I would like something like when you go in England or in France you know? You can meet something like that. It's calling...farming holiday or something like that? OK and when I went in En/gland I saw that, and that's why I would like to have something like that. And uh, for the moment...

SPEAKER B

Amnesty International is an unpolitical groups and it's not supposed to work for the government. It's just some members of uh of, are working for the prisoner politics. I mean the prisoner are, who not use violence, who are in the prisoned, what is prison? penitentiarie? - for their believe like uh their sex or ethnic or color and especially for their believe politic. And what we do in Amnesty International it's we write a lot of letter to uh the government of the country where from the prisoner, and we try with our letters to to ... liber(?) tq to to get out the prisoner of the prisoned, penitentiary. Then often we write a letter and it's not useful because the government didn't take care about it but we try. And we are not supposed to help a prisoner if he is in /hon/ country, I means I can't help a prisoner if he is in Canada because I'm in Canada. We have to help the people, the prisoner out of our country. After we make a lot of conference and we make a lot of, I means uh, I can explain it.

SPEAKER C

Oh boy, that is very, it's not necessary difficult but it's a personal, a personal way of working. I can do some editing and /dey/ can be very different /dan/ some /uder/ people can do /dis/ editing. And uh it's a penesse- personal

choice. It's sometimes is difficult to choose the exact scene of what you want really because there is some problem. Sometime the voice is less, the [violume] less loud than you want, or uh something like that, the music is too loud, or a you know, the music doesn't fit with the next scene of what you want. No, 30 second is very short....

Oh boy. Ok the film is, it's film, it's like picture; ok you have grain, grain on the picture, you have unh, /tawzan/ of /tawzan/ of /tawzan/ of grain, in the picture, and video is line. You can have 500 lines per inch for video, so the qualities is very different then film. That's the reason why your video it's look like cheaper /dan/ film, because it's line. But in probably 10 years, oh no less than that, 2, 3, 4 years, I don't know, you will have uh video with uh ...

SPEAKER D

Up to date my life has been quite uh qui- quiet life and I was working, good girl, nothing happened and I didn't travel and I was feeling bored, really bored by my life. And I've many questions too about life: Why do we live? Why we are here? So because when I see all the bad things in the world, all over the world, I just feel unhappy. When I heard about /hacid/ rain, when I heard about nuclear armaments, when I heard about fights and wars between countries, when I heard about people, murders like the big one we had last week in India, and uh, I'm just wondering, what's happening now around us? I feel very sad about that. I would like to

escape this world to go on on an /dizert/, on a /dizert/ islan and forget everything you know....don't know... alone, ok, I'm sure I'm not alone to feel like that, many people feel that, are very sorry for what's happening in this world who is completely crazy, and they are there is so viol, violence now. You just look...

SPEAKER E

My job is not only to sale, it's to organize the store, uh all stock we receive you know, you see everything that we receive /ir/ in sports uh every kind of things and it gave me more knowledge about every kind of sport, ts'what I like from that from that job. Before I know only about major sport like baseball, hockey, everything, now it's more about camping yeah, and we import many tents from Europe, and we are the only store here in Quebec to do it, so everybody who wants new tents, new models, they come to us. So we uh know about our stock, it's easy to sale about and uh I.. I like it. Uh... no no no running shoes, only few model because it's too complex, oh, if you, if you, don't know how, f'you have a running shoe from each company, ts'a definite one, you know like uh, Gagnon Sport, who have I don't know, a hundred kind of running shoes too.

SPEAKER F

Because what I what I study in course sometime I think what I did in CEJE- in like teacher and it's help me. The behaviour of certain co- some kid in class and answer or /de/

one after- and one years I met a little girl, 5 years old I think, and the morning she was really really sad, always the tear on /haiz/ and I didn't know what she had. Before she left the house the morning their parents said to her than they was divorce and she was really sad for the day. I really don't understand when the parent lef her to go to school. She didn't listen what we said, and uh at the first recreation she lef the school and run to the house. And I'd like to work with that.

If you don't help this kid right now I think always always they will carrier that with them. So we have to do something pretty soon.

The, what's happen with that, example the sociable, or something, like in in class, the teacher sometime can know oh something wrong, going wrong with this kid but he doesn't have the time to take care. He know, he know he have to do something, but what? Maybe 5 minutes /er/ day and this kid need maybe tree hours a day, it's for that, and so I think it's like sociable in Quebec. The kid can be in the group sociable but something, sometime that is help him, but sometime he need more, more attayshun, more exception, just for him, just to improve...

SPEAKER G

And I been practicing track and /fiel/ since 1978, what's been 6 years. I really like it, I'm training about 5-7 hours a day.

It's not too bad, could be better. Wa, it's improving every year. We're having more administration problem than any other problem. Facilities are good, it's just, they like try to, they try to, I don't know, to don't let us do whatever we want. It's always problems to get whatever we would like to do. Like we have to do gymnastic, the city is there, aaah, you should not do gymnastic, it's not really good, you know, gymnastic is for the gymnastic athletes. But gymnastic is the most important part of the training so we have to do gymnastic all the time. And we're having problem with that. We need new mats and this is thousand of /bu/- dollar. And they don't want to buy it. You need it, without training you not going really far. It's fun. It's why I'm doing it.

The trip. Cause I'm always going all over United State, Canada and Europe. It's really fun and uh I wanna make the Olympic, that's you know, after that we'll see. I don't know if I would like to get a /worl/ record or whatever, but I'd like just to get in a certain point where I'll be happy and see what's there, what is different. It's really fun because you meet people all the time and they, you meet people who are want to the same thing than you want, and they are human like you are, you know, you watch them on TV and you think they are not human but when you meet them it's like, I really like you, they train in the same thing, they do the same thing, they drink the same thing, they dream about the same thing. It's really fun. It's really a lot like life too,

it's, life you have to, the training is like going to school, anyway after you achieve your school you can go for your goal what is having, you know, doing your life whatever it is, could be professional or anything else.

SPEAKER H

...it's very easy to /ir/ /im/ because he /av/ a, not a poor vocabulary, but uh he speak little bit in En/glish, so no-where, and no French, but I did well in the class. I don't know wow, how to I did it, but... and in my other class, it's damage(?) it's umm, I would like to talk more En/glish but we are almost French that's why and before I finish my [bac] I would like to talk, I should talk English because if I do a [bac] for /tri/ years and I don't, when I go, I finish, I don't talk English, it's very /kerius/.

The design - for now I prepare an exhibition to Palais des Congres and I have something on on the exhibition, it's a little chair for children. You can't built wit uh plywood, cheap plywood, should be built wit cheap plywood, and to the storage, should very and um small space, took small space and I think I did something well. And uh last night I spent some time in the exhibition and I met some interesting people, and take my name and my phone numbers to maybe, I don't know, I don't thinks I have, I going to have a job, but... yes, I hope so.

SPEAKER I

Ok. Uh right now I'm looking for a summer job for /neks/ uh /neks/ summer and I thought to to try to find a job in the environmental study. I went to the to Parc Canada and I /hask/ uh ask to the guy who was there uh, what kind of job than I can get in a park so he told me than they are 3 /difren/ jobs and the one who interest more me is the /wi/ is a guide in a park. But it's an exchange between the provinces and you, the goal of this job is to go in one other province and uh they exchange the guy so like this I will be able to learn English and uh to see a different country, not country but uh different area and it's why this afternoon I will have a, I will have to meet a person from Parc Canada for uh, ha- he will give me all the paper and the information for uh /fiel/, uh, the sheet for the job, and I have also to give him my curriculum vitae. And he will explain me where I can work and what kind of job exactly, what it will be. Up to now...

SPEAKER J

Even though the United States is the most, is the world richest nation and the most sophisticated one about a medical care, about forty thousand babies perish every every year, and nine out of ten die because they are either premature babies or low-weight babies, which is about, uh which is under 5 pounds. The, uh, in the United States they don't have the medi- the medical care /haz/ we /av/ here. The

government doesn't pay for it so the people have to pay for visiting a doctor, which is not quite expensive, but for a lot of people it is expensive. And uh, most of the people get an insurance /haz/ they work, but /hif/ /dey/ lose /der/ job, /de/ insurance will be over after thirty days. So for a lots of people, visiting a doctor is a /look/ a /looksari/(?) So uh if most of the mothers had seen a doctor during, well at the beginning of her pregnancy, he could have detect [signes] of trouble, and could have prevent, prevented the premature labor.

SPEAKER K

Because I like this. Since I have uh 10 years old I want to make an animator and uh that's why....I like the wonderful uh imagery, imaginary trip we can we can make when we uh when we make this thing. I think uh animation is is a good way of expre- of express myself and uh I want to I want to study the /ai:d/ way how I can I can make that. And that's why in, I'm in Concordia.

Here I study 2 way in Concordia we study 2 ways of thinking. We have the American thinking and the Canadian thinking. The Canadian is the National Film Board's way and American is the Disney way. And in the Disney way we study, like, we make animation in a 24 image per seconds and that's why we draw on cells and we put gouache on the other side on the sheet, of the sheet, and after we make, we film that and uh this is uh just right but uh National Film Board's is more

artistics.

SPEAKER L

She's good. But, she treating us like kids, and you know when we pay for the course and we are student, university student, and we have the right to do what we want with the course, I think so. And I'm not the only one, the majority of the people in the class think that and uh when we uh we are late you know, she look at us with uh big eyes and, you know, she's very repressive with us when we are late and when we miss classes and all this. And somebody this morning tell /er/ uh ok, she uh begin to talk about, you know, the people who were late and she just not, you know, she don't like it and she was telling us that she don't like it and somebody tell /er/, but you know, somebody tell /er/ that we have the right to you know arrive when we want to. And she don't wa- she didn't want to talk about. She became uh very nervous and didn't want to talk about it you know, and tell in front of the class that she don't want to you know,...um, but more than that, that, I don't know how to say it, but she tell the ah, Elise that she didn't want to insult /er/, that's it, insult /er/ in front of the class, but she did it all the time.

Appendix D

Trent University Informants' Profiles

(INTELLIGIBILITY RATERS)

ID	AGE	SEX	BIRTH PLACE	STUDY OTHER LANG. # YRS.	LIVED QUEBEC ?	FRENCH FRIENDS ?	PARTIC. KATIMAVIK ?	UNIVERSITY PROGRAM ?
1	18	F	LONDON ENG.	5	NO	YES	NO	MATH
2	19	M	TORONTO	5	NO	NO	NO	BUS.
3	22	M	TRINIDAD	2	NO	NO	NO	BIOL.
4	20	M	ONTARIO	3	NO	YES	NO	HIST.
5	20	M	TORONTO	7	NO	YES	NO	EDUC/ HIST.
6	21	F	TORONTO	9	NO	YES	NO	ENG/ CNDN.STUDIES
7	20	M	TORONTO	5	NO	YES	NO	BIOL.
8	20	M	NEW DELHI	6	NO	YES	NO	INT'L POLITICS
9	22	M	TORONTO	3	NO	YES	NO	PHILOS
10	25	M	HAMILTON	4	YES	YES	YES	GEOG.

(ACCENTEDNESS RATERS)

ID	AGE	SEX	BIRTH PLACE	STUDY OTHER LANG. # YRS.	LIVED QUEBEC ?	FRENCH FRIENDS ?	PARTIC. KATIMAVIK ?	UNIVERSITY PROGRAM ?
1	24	F	NOVA SCOTIA	7	YES	YES	YES	CANADIAN STUDIES
2	20	F	MONTREAL	12	YES	YES	NO	NATIVE STUDIES
3	20	F	OSHAWA	5	NO	YES	NO	ENG.
4	20	M	NIAGARA	7	NO	YES	NO	HIST.
5	22	F	ONTARIO	7	NO	NO	NO	ANTHRO.
6	20	F	OSHAWA	11	NO	NO	NO	GEOG.
7	20	F	SCOTLAND	13	NO	NO	NO	PSYCH.
8	22	M	LONDON ENG.	(YES)	NO	NO	NO	HIST.
9	20	F	TORONTO	5	NO	YES	NO	GEOG.