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ABSTRACT

Controlling the rate of oral delivery in the second language classroom has been demonstrated as beneficial to the learner, whose information-processing capacity is an important factor in listening comprehension. Rate of information delivery can be controlled by limiting the actual rate of words per unit of time, or by maintaining content difficulty within certain boundaries. Time-altered recordings have been used with success at both the secondary and university levels. Rate of delivery has also been demonstrated to be a useful tool for testing language proficiency. The manipulation of rate-controlled speech is a promising research technique as well. For example, such manipulation could facilitate studies of the kinds of information lost by student listeners and the probable causes of such loss. (JIB)

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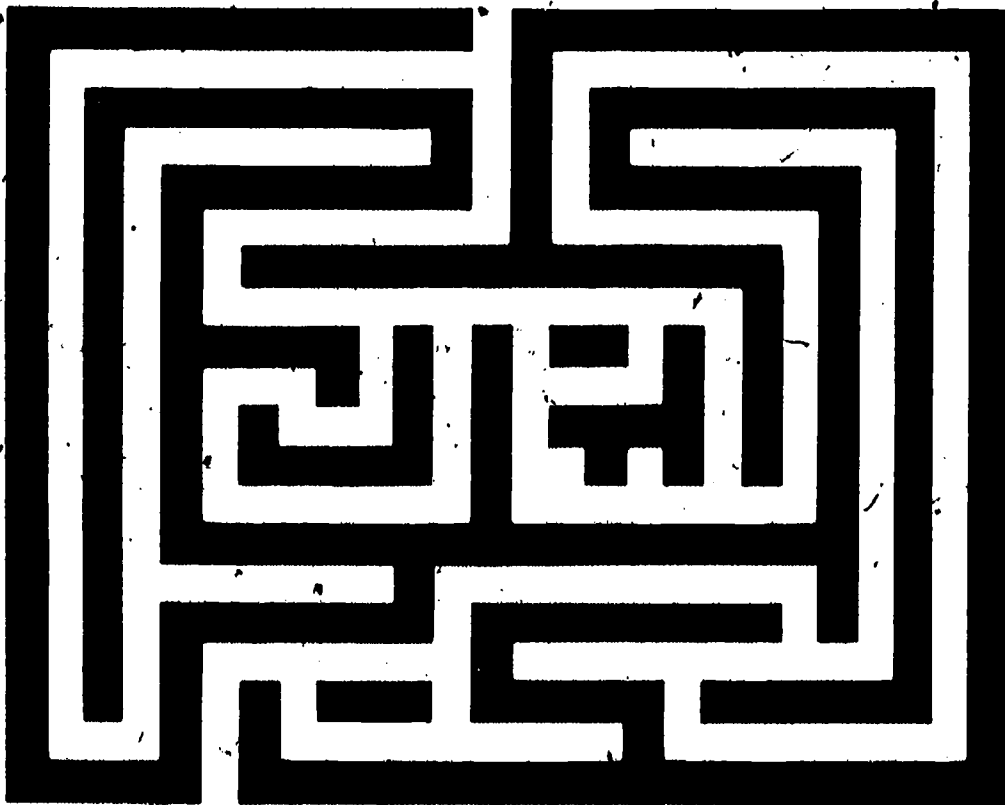
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Rate-Controlled Speech in Foreign Language Education

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INTRODUCTION

Though conscious of the necessity of preparing students to cope with the pace set by the native speaker, language educators have also been aware of forces that make attainment of the goal difficult. Performance in aural comprehension is adversely affected by factors associated with the listening process, the capabilities of the listener, the content of the message, and the nature of recorded sound. The temporal parameters of the stimulus interact with all of these. The centrality of the matter of rate becomes more apparent when one examines the problem areas.

It is possible to underestimate the difficulty of listening. Listening is an integral part of many commonplace activities and is performed without conscious attention to the process and with no apparent effort. Since aural comprehension is almost wholly a matter of covert operations, its complexity is masked. There is a tendency to overstress the most evident aspect, hearing, and to regard it as nothing more than perception of sounds, a kind of passive absorption, with the sound source performing the essential function. Because the listener receives a string of phonemes and a sequence of words, we are tempted to think in terms of linear operations. More probably, the listener must process at several levels at the same time. In fact, A.P. Van Teslaar likens the operation to shooting at several moving targets simultaneously.¹ Scientists are cautious in their

statements about the process of listening comprehension since it cannot be directly observed. They are in agreement, however, on the fact that perception is not instantaneous. They recognize that listeners are *active processors* rather than passive receivers in the stages between presentation of the language stimulus and comprehension, and that there are limits to the amount of oral language they can deal with in a given length of time. Dominic W. Massaro, for example, proposes a model based on the assumption that perception cannot take place as the stimulus is arriving, since a sound pattern of some length is necessary for recognition to occur.² This approach presupposes that listeners have some form of auditory retention at their disposal which holds the first part of the utterance until the pattern is complete enough for recognition to occur. If a second pattern is presented too soon, it presumably interferes with recognition of the first. It is important, therefore, that sufficient time be available to the listener so that a backlog of incompletely processed items will not accumulate to cause information overload. On the other hand, too slow an input rate can impair comprehension by prolonging the time a pattern must be held in the short-term memory and allowing more time for memory traces to fade, since rate affects mnemonic processes.

LISTENING COMPREHENSION

Speaking rate and listening rate interact regardless of the language used for communication. The *information-processing capacity* of the students affects

1. "Learning New Sound Systems: Problems and Prospects," *IRAL*, 3(1963), 84.

2. *Understanding Language* (New York: Academic Press, 1973), p. 8.

how efficiently they receive a message in a second language. They engage in many activities as they receive a speech stream in their mother tongue, but comprehending foreign speech is more complex and time-consuming. Robert Lado has cited research that found memory span shorter in the foreign language than in the native language, but capable of training.¹ Paul Pimsleur reported a pilot study done with high school students, native speakers of English learning French as a second language. The data he gathered indicated that in the first months of study the student's ability to remember utterances in French reached about half of what it was in English, that progress was slow, and that two full years of instruction in French only improved memory span a little.²

Listeners differ in what they know of the sequential probabilities of the language, information they use to anticipate what is forthcoming in speech signals. When they are able to predict with some degree of accuracy, an item requires less processing. Prior knowledge of the linguistic system and familiarity with the cultural context also aid the listener in separating the essential cues from the irrelevant and redundant elements of the message. Especially in the early stages of language study, the student-listeners are unable to distinguish between the essential and the redundant: all elements of the utterance take on equal importance. Because their knowledge of the foreign language and culture is so limited, they are not yet able to anticipate the message. Furthermore, they lack the skills to reconstruct what they may have missed and to deduce the whole of a message from bits and pieces of it. They are also disadvantaged by the fact that they react to target language stimuli largely in terms of native-language perceptual habits and utilize the referents of their own cultural background. Allowance must also be made for whatever additional time they may need to invest in translation, since they very likely arrive at comprehension of the target language through their first language. The limited-capacity memorial system may, for all these reasons, prove inadequate for coping with the incoming sensory data in an unfamiliar language.

Individuals differ not only in the knowledge and perceptual capacities they bring to language study but also in affective approach and response. Learning is closely related to the kind and degree of success or failure experienced by learners: they are generally not highly motivated by the very easy task, but they tend to avoid the one which is excessively difficult and does not give them a reasonable probability of success. Rate is one characteristic of an oral message that determines whether the comprehension task is at the intermediate level of difficulty which encourages perseverance.

Judicious manipulation of rate can help to maximize achievement motivation. Sometimes the initial reaction to a new and unexpected stimulus is such that there is little question of perseverance. M.D. Steer has found evidence that inefficient listeners are overwhelmed by the number of elements with which they must grapple. They concentrate on individual words rather than on the entire message or on larger units of it. They become so overly tense and preoccupied with the part they have missed that they miss further portions of the message and become hopelessly lost.³

Listener panic may, however, have more than an emotional base. Listening for meaning, rather than concentration on specific words and details, is a special skill apparently possessed by those who are field independent. Field independence is a theoretical construct based on the ability to keep things apart in a perceptual field, to see patterns, and to respond without stress in novel situations. Field dependent people are unable to disregard the more superficial aspects in order to detect order in the unfamiliar.⁴ Noting that some listeners, when faced with rapid speech, tend to concentrate more on rate and less on content, Carver, Johnson, and Friedman utilized speeded speech in conjunction with measures of field dependency. They concluded that the ability to comprehend highly speeded speech probably involves being field independent.⁵ Friedman and Johnson have also found that listening comprehension at high rates does not correlate with comprehension at normal speech rate and is dependent upon another special competence. They recognize a general language aptitude which appears to be involved in comprehension at normal-rate presentation, a concept very familiar to those concerned about second language learning; that aptitude seems to be relatively less important at higher rates. On the other hand, an ability marginally involved, at slower rates becomes significant as a correlate of comprehension at rapid rates. They singled out the ability to infer semantic relations, to compare ways in which verbal concepts are meaningfully connected, as a source of individual variations.⁶ There is, of course, no empirical evidence that research dealing with individual differences in ease of processing speeded speech in the mother tongue has any relevance to problems of language learners coping with foreign speech which seems too fast to them. Findings of such research do, nonetheless, point to rate as a dimension of speech having links to individual variations in listening proficiency.

1. "Memory Span as a Factor in Second Language Learning," *IRAL*, 3(1965), 128.

2. "Some Aspects of Listening Comprehension," in *Language Laboratory Learning: New Directions*, ed. Louis J. Chatagnier and Gilbert Taggart (Montreal: Aquila, 1971), p. 113.

3. "Speech Intelligibility in Naval Aviation," *Journal of Speech Disorders*, 10(1945), 215-19.

4. H. A. Witkin et al., *Psychological Differentiation: Studies of Development* (New York: John Wiley, 1962), p. 2.

5. "Factor Analysis of the Ability to Comprehend Time-Compressed Speech," *Journal of Reading Behavior*, 4(1971-72), 40-49.

6. Herbert I. Friedman and Raymond L. Johnson, "Compressed Speech: Correlates of Listening Ability," *Journal of Communication*, 18(1968), 207-18.

The nature of its content is another of the many factors which combine to determine comprehension of a message. Topic, structural and lexical complexity, length, and style are all important considerations. To arrive at an understanding of a printed sample of the foreign language, students may scan, read, check on the meaning of an unfamiliar word, and reread, proceeding at their own pace. When the same material is enfolded in a human voice, the cues of the graphic form are gone, and they must adopt different strategies. Content seemed all-important in print. Rate, which is controlled by the speaker, now becomes significant. Content and rate are separate aspects of the oral message: proficiency in aural comprehension is, however, a function of both, and the difficulty of an utterance can be determined by manipulation of content and/or rate. Robert M. Gagné defines learning as an event that happens under conditions which can be observed and which can also be altered and controlled.⁹ The use of contrived materials is an accepted way of managing learning conditions for the beginning language student.¹⁰ As a rule, contrivance consists in control of content. For oral language, variation in difficulty can be achieved without altering content by changing rate. Such a technique gives a flexibility which is particularly valuable when students work with a limited store of lexical, morphological, and syntactic items.

Students, whose objective is ability to comprehend all forms of native speech with ease, must become skilled in a number of complex operations. Prior experience, aptitude, and personal qualities may hinder or assist them in acquiring the various auditory skills, and they must be assured of sufficient practice with materials of increasing difficulty before they can master the desired terminal behavior. Very likely, much of that practice will be with taped speech; and the nature of recorded sound will create further obstacles. Persons who make recordings read prepared texts, and the speaker who has a prescribed script to follow tends to maintain a more even tempo than one who composes spontaneously. It is not surprising that the rate of oral reading is faster than that of spontaneous speech and that it is less fragmented and discontinuous. It must also be remembered that languages are characterized by a certain amount of redundancy: processing time is provided for the listener by such means as hesitation and repetition, which reduce the amount of information in a given sound sequence. Speech contrived and recorded for listening practice omits these elements and therefore delivers information at a faster rate. Spoken language lacks the cues of printed language—spacing, punctuation, capitalization, and underlining. Recorded speech does not provide the visual cues of face-to-face communica-

tion—the setting is seldom adequately portrayed by recorded materials. Gestures, facial expressions, and all other non-verbal clues which help to give meaning to the speaker's words are absent. Furthermore, the recorded voice moves relentlessly on from start to conclusion. In direct oral communication, there is an exchange of messages between the speakers and listeners. The latter somehow indicate whether or not they understand what the other is saying, and speakers make adjustments when they see that the listener is not following. Thus, student-listeners must cope with a speech stream composed almost entirely of items essential to understanding, and they have to depend on aural perception alone. "We may well be demanding more of our foreign-language listeners in the exercises we present than is demanded in native-language listening," suggests Rivers.¹¹

Although the ultimate objective is comprehension of native speed, one must guard against confounding the goal and the process by which the learner reaches the desired level of competence. Since speed is a key quality of oral language, the use of variations in rate as a means to the end seems justified. Explaining the hierarchical nature of the learning process, Robert Glaser and James Reynolds insist that "attainment of terminal behavior is achieved by teaching sub-objectives, which taken together comprise mastery, and sub-tasks which represent successively finer approximations to the terminal behavior."¹² How can language educators implement such learning theory as far as rate is concerned?

RATE-CONTROLLED SPEECH

There are several ways in which control can be exercised over the rate of an oral message. First, speakers can determine the speed of delivery. They can also shorten or prolong utterances by regulating the length and frequency of the pauses. Then, recorded sound can be mechanically accelerated and retarded by the speed-changing method, playback at a speed different from that of the original recording. This change in rate, however, is accompanied by a shift in pitch which is clearly perceptible and which affects intelligibility. Finally, there is modification by a speech compressor/expander which yields rate-controlled or time-altered speech. The device provides pitch correction as it changes rate. Deceleration is termed time-expansion and its accelerated counterpart, time-compression. The earlier model speech compressors were large and costly, but significant advances have been made in the technology of time-alteration. The rate-changing processor is now an integral part of inexpensive cassette recorders, and listener control of rate is possible. Equipment with varied speed and pitch correction controls also permits viewing and hearing audiovisual displays at

9. *The Conditions of Learning*, 2nd ed. (New York: Holt, Rinehart and Winston, 1970), p. 2.

10. Simon Belasco, "Toward the Acquisition of Linguistic Competence: From Contrived to Controlled Materials," *Modern Language Journal*, 53(1969), 183-205.

11. Wilga M. Rivers, *A Practical Guide to the Teaching of French* (New York: Oxford Univ. Press, 1975), p. 63.

12. "Instructional Objectives and Programmed Instruction: A Case Study," in *Defining Educational Objectives*, ed. C.M. Lindvall (Pittsburgh: Univ. of Pittsburgh Press, 1964), p. 69.

a variety of rates from slow motion to faster-than-normal. Groups or individuals may work with materials at a rate commensurate with their ability to absorb and comprehend. The viewer-listener has complete control of the medium.

While the whole continuum of rate-controlled speech will doubtless one day be of service to language educators, they will probably find more uses for slowed than for speeded speech despite long-standing bans on use of artificially slow speech. Most second-language methodologists who have frowned upon its use have done so because they wished to exclude unnatural and distorted language. They were, in general, thinking of word rate as it is controlled by the speaker. In reducing the articulation rate, a speaker will tend to falsify the sound stream. Changing the overall speaking rate by manipulating pause time has the advantage of leaving segmental and suprasegmental elements unchanged; hence, it is an acceptable method of regulating pace. Playback at a slower speed than the one used during the recording can hardly be considered useful for language practice since the reduction in velocity destroys all semblance of naturalness. Time-alteration is a more satisfactory and efficient method than any of the alternative ways of modifying speed.

The feasibility of instructing and evaluating in the native language with rate-controlled speech is already well documented by research, and experimentation in both areas is keeping abreast of technical advancements. Information about the process, representative research, and practical application is readily available in a three-volume anthology and bibliography on rate-controlled speech.¹³ Proceedings of three conferences held at the University of Louisville under the aegis of its Center for Rate-Controlled Recording are also valuable resources.¹⁴ The *CRCR Newsletter*, which is published periodically by the Center, gives its readers current information related to rate-controlled speech. With portable instruments commercially available at costs within the reach of educational institutions and individual researchers, the utility of the device is no longer restricted to those able to purchase and maintain expensive bulky equipment and to those working in laboratories.

Ever since a crude manual cut-and-splice technique produced the first samples of time-altered speech, investigators have been wondering about how to use such speech. They have raised many questions, answered

some, and suggested others which have not yet been addressed. Most experiments have concerned subjects' first language, generally English. More attention has been given to speeded than to expanded speech. Consequently, many of the unanswered questions deal with alteration of languages other than English, with foreign language signals, and with the uses of expanded sound. A brief review of the few second-language experiments done with time-expanded and time-compressed speech will serve as a state of the art report and as a medium for suggesting other uses of the technique.

Herbert Friedman and Raymond Johnson have utilized compressed speech in two ways with students of Russian and Vietnamese. They used it, first of all, as a training device. The students were exposed to gradually increasing rates of compressed speech for four hours a week for eight weeks in an effort to improve ease of comprehension at normal speed. Although subjective feedback from students and instructors suggested that the experiment had been helpful, tests did not yield significantly better performance. The experimenters feel that the exposure was too limited and the performance measures too broad to get at possible listening changes.¹⁵ In a second study, they used compressed speech as a research tool to examine the interplay of the temporal and structural aspects of speech samples in an unfamiliar language. Spaces were introduced into Russian and Vietnamese sentences at various points, and some of the sentences were compressed to compensate for the time added by pausing. In addition to the recall data they collected, the researchers found that the compression did not interfere with accurate recall.¹⁶

Both time-expanded and time-compressed speech were used in another Russian program to control the error rate and the challenge of taped drills. Expanded speech was employed to minimize task overload and assure greater success to the beginner and the slower learner, and compressed speech was utilized to sustain the challenge for the more advanced student and the faster learner. Since the rate-controlled recordings were not used systematically in the experimental course and time-alteration was only one of the techniques adopted, no meaningful conclusions could be drawn regarding its effectiveness. Program evaluators, however, reported better listening comprehension and a lower dropout rate among students who had used the rate-controlled tapes.¹⁷

13. Sam Duker, ed., *Time Compressed Speech: An Anthology and Bibliography* (Metuchen, N.J.: Scarecrow Press, 1974).

14. Emerson Foulke, ed., *Proceedings of the Louisville Conference on Time-Compressed Speech*, October 19-21, 1966 (Louisville: Center for Rate Controlled Recordings, Perceptual Alternatives Laboratory, Univ. of Louisville, 1967); Emerson Foulke, ed., *Proceedings of the Second Louisville Conference on Rate and/or Frequency Controlled Speech*, October 22-24, 1969 (Louisville: Center for Rate Controlled Recordings, 1971); Emerson Foulke, ed., *Proceedings Third Louisville Conference on Rate-Controlled Speech*, November 4-5, 1973 (New York: American Foundation for the Blind, 1977).

15. "Some Actual and Potential Uses for Rate-Controlled Speech in Second Language Learning," in *The Psychology of Second Language Learning*, ed. Paul Pimsleur and Terence Quinn (Cambridge: Cambridge Univ. Press, 1971), p. 160.

16. "Rate-Controlled Speech and Second Language Learning," in *Proceedings of the Second Louisville Conference on Rate and/or Frequency Controlled Speech*, October 22-24, 1969, ed. Emerson Foulke (Louisville: Center for Rate Controlled Recordings, 1971), pp. 323-27.

17. Frank Ingram, James Nord, and Donald Dragt, "A Program for Listening Comprehension," *Slavic and East European Journal*, 19(1975): 1-10; James R. Nord, "Shut-up and Listen: A Case for Listening Comprehension," (Arlington, Virginia: ERIC Document Reproduction Service, ED 122 839, 1976).

Time-altered recordings have also been used as aural pacers. Mary Neville and A.K. Pugh had university students learning to read English as a second language listen to a recording of a passage while reading it silently. Speech expanded to 115 and 120 percent of the original recording time allowed more time and facilitated the reading of new and more difficult material. Speech compressed to 80 percent of the original speaking time gave variation in difficulty without increasing the complexity of the printed text. All subjects in this investigation made statistically significant improvement in reading comprehension. This was, however, a pilot study involving a small number of students, all of whom were living and studying in an English-speaking environment.¹⁸

Gisela Huberman and Vadim Medish have adopted a multi-channel approach to language learning. One of the techniques they have devised is a language laboratory experience known as controlled listening. Recorded sound is controlled by an added-parts system, time-compressed speech, and temporal spacing. A core section of a passage is presented at normal speaking rate in a first exposure. Successive presentations repeat what the students have already heard and add something new until they have heard the entire passage. The repetition is done without prolonging listening time by means of compressed speech. Brief pauses are inserted into recordings to provide some additional processing time and to assist with structural analysis. The three procedures used jointly have improved listening comprehension and reduced the time which students spend in listening. Controlled listening has been used in basic, intermediate, and more advanced language courses and with several languages including German, Russian, Spanish, French, Modern Hebrew, and Japanese.¹⁹

All of the experiments described thus far were carried out in college and university settings. Katherine Littell designed an instructional program for middle school students of German which used rate-altered speech. The study examined acquisition in listening, speaking, reading, and writing, and involved time-expansion and repetition by successive approximations to normal rate. Three treatments were used. One group of subjects was trained with taped materials expanded to the point where comprehension was assured. A second group heard three repetitions of each item proceeding in increments from the expanded rate used with the first treatment group to normal speed. A third group practiced with speech presented at the normal speed. Language ability, sex, content difficulty, and treatment were all reflected in listening, writing, and reading performance. Speaking skills were not differentially af-

ected by treatment, but less practice had been provided in speaking than in the other skills. The results were interpreted as an indication that there is a need for using a variety of teaching strategies directed to specific groups of students and to individual skills. Time-expanded speech is regarded as one valuable tool for differentiating activities even though its use will not automatically result in superior achievement.²⁰

Researchers have shown that during the learning phase variations in difficulty can be achieved by expanding and compressing the speech stream rather than by altering the complexity of the message itself. The same technique can be adopted for setting the difficulty level in the evaluation process. The affect of expansion on listening comprehension of high school French students was examined by Sr. Etienne Flaherty who used the technique in a testing context rather than in an instructional one. Multiple-choice items of the completion and rejoinder types were presented to subjects who had had no prior experience or training with time-expanded speech. Identical content was used with three groups of subjects while rate was varied using the original recording time and two expanded rates. Students who listened to time-expanded test items outperformed to a statistically significant degree those who listened to the unaltered rate of the original recording. Rate, it appeared, could serve as a basis for testing degrees of competence in listening comprehension. Data also showed that performance was related to the testing mode and perhaps to the amount of time material had to be held in the auditory memory. Subjects in all rate groups found the completion items more difficult. A major implication of this study for instructional purposes was the finding that all percentages of time-expansion were not equally effective, that improvement at some point ceases to be proportional to the time devoted to listening.²¹

Other studies are in progress. Laura Heilenman, for example, is investigating the effects of rate and structure on the processing ability of college French students as reflected in performance on a dictation test. Variations in rate are being accomplished by time-expansion of the signal and by alteration of the pause time. Different sentence types are being used to vary the difficulty of the test.²² David Siegrist is preparing a training program designed to allow students of English as a second language to proceed from use of expanded to normal to compressed speech. Students will control the equipment so that the speed used will be at the discretion of the listener.²³

20. "The Role of Repetition through Successive Approximations in the Acquisition of the Four Basic Language Skills," *Foreign Language Annals*, 9(1976), 338-45.

21. "The Effect of Time-Expansion on Listening Comprehension of High School Students in Second-Year French Classes," Diss. Ohio State 1975.

22. "The Effect of Rate and Structure on the Processing of Spoken French by Third-Semester College Students," *CRCL Newsletter*, 12, No. 1 (1978), 1-2.

23. Personal letter, 1977.

18. "An Exploratory Study of the Application of Time-Compressed and Time-Expanded Speech in the Development of the English-Reading Proficiency of Foreign Students," *English Language Teaching Journal*, 29(1973), 320-29.

19. "A Multi-Channel Approach to Language Teaching," *Foreign Language Annals*, 7(1974), 674-80; "Spanish Multi-Channel Instruction in Operation: A Progress Report," *Foreign Language Annals*, 8(1975), 49-52.

SUMMARY

Rate-controlled speech has been successfully used to some extent in language education for research, instruction, and testing. Its usefulness for accommodating the ability of individual listeners and for sustaining their motivation has been demonstrated. It has also been used effectively with groups. The possibilities for further exploration are virtually unlimited. Experiments could be undertaken with other levels of language learners, rate of delivery, languages, kinds of listening tasks, and practice techniques. Research aimed at discovering the optimal rates for various groups of learners and for different learning tasks could be useful. Analyses could be performed with a number of listener variables. The interaction of speaker variables and message variables with comprehension could also bear exploration. The manipulation of rate-controlled speech could facilitate studies of the kinds of information lost by student-listeners and the probable causes of such loss. It would permit the examination of the related but distinct phenomena of intelligibility of individual words and the comprehension of connected discourse. The speech

compressor/expander could play a significant part in the production of good software, because experimentation with the device would focus attention on the rate of target language recordings and facilitate measurement of their temporal features. It could be an effective tool for grading recorded learning and testing materials and for specifying levels of performance. Even a cursory study of the research done with native language would indicate many other directions for fruitful research and application.

The recommendation that time-expanded or time-compressed speech be used in foreign language education should not, of course, be construed as advocacy of a change in the ultimate goal, ability to comprehend speech of native at their normal conversational rate. On the contrary, it should be viewed as an effort to promote attainment of that goal. As such, it is offered, not as a replacement for other instructional, evaluative, and research techniques, but as an additional means for helping language students to develop listening comprehension. It is also proposed as an instrument for facilitating acquisition of the other language skills.