Psychological correlates of the French sound system*

ALISON d'ANGLEJAN, W. E. LAMBERT, and G. R. TUCKER
McGill University, Montreal 110, P.Q., Canada

and
J. H. GREENBERG
Stanford University, Stanford, California 94305

Six samples of CCVC phoneme sequences were devised to represent linguistically specifiable distances from existing French words, distance being measured in terms of number of substitutions needed to make an existing French word. Fifty-four native speakers of French rated the sound sequences for their subjective proximity to French, using ungraded rating scales. Results showed a general correspondence between the linguistic and psychological measurements, although certain phoneme sequences did not follow the predicted order. These were examined to see if their displacement could be attributed to the number of different French words reached through substitutions.

Each language is subject to linguistic constraints which limit the possible phoneme sequences that make up its specific sound system. Both linguistics and psychology find this matter of interest. Linguists, on the one hand, can formulate rules to identify those sequences which do exist in a language; those which could exist according to the rules but which are, in fact, *not* found in actual words of a language; and those which would be incompatible with the linguistic constraints of the language. Naive native speakers, on the other hand, accurately perceive existing sequences (e.g., English /spɛl/, or French /spɔr/) as being familiar or close to English or French words. In contrast, a phoneme sequence which cannot be generated by the rules of English or French (e.g., /ʒgɪx/ or /bzʌ/) would probably seem strange or distant to a listener, while sequences such as /klaeb/ or /prym/, which could exist but do not, would be perceived as permissible.

This study—a systematic examination of the French native speaker's sensitivity to the sound system of French—should be of theoretical interest to those concerned with speech perception and of practical value to those who may wish to extend the technique to assess the language skills of students of French. The study focuses on the relationship between the linguistic and the psychological distance from French of a series of phoneme sequences. A procedure developed by Greenberg and Jenkins (1964) for their study of the measurement of linguistic distance from English was adapted for this experiment. For most of the English phoneme sequences which they devised, measures of

subjective distance correlated well with the actual linguistic distance as measured by a formalized substitution procedure.

Our study also attempts to examine the hypothesis that phoneme sequences which generate more French words through substitution will tend to appear "closer" to French than those generating fewer French examples. This factor could, in certain cases, upset the correlation between the objective and subjective estimates of "Frenchness."

METHOD

Subjects

Fifty-four native French speakers were tested. The sample included both males and females, from 18 to 20 years of age, from lower middle class backgrounds. All Ss had had some experience with a second language, but those having more than one home language were excluded from the analysis.

Materials

Twenty-four CCVC sequences representing various points along a mathematical scale extending from 1 (for actual French words) to 16 (for sequences which do not produce words even if we substitute sounds in one, two, or three positions simultaneously) were devised. Sequences were constructed so as to have scale values similar to those used in the previous English study, that is, four exemplars were chosen at each of six distances from French. As an illustration, consider the sequence /pwɛs/ with a linguistic rating of 2, which is very close to a French word. The sequence /pwɛs/ does not occur as a French word, but real words do exist when one substitution is made in any position (e.g., *coince*, *prince*, *poisse*, *pointe*); when the various combinations of two substitutions are made (e.g., *grince*, *poire*, *fouace*, *plainte*, *jointe*, *place*); three substitutions (e.g., *prude*, *choir*, *grimpe*, *brosse*); and of course with four substitutions, many possible CCVC words exist.

Other sequences may not produce

Table 1

Category	Linguistic Rating	Subjective Rating $\bar{X}$	Analysis of Variance		
			Average	F	df
I	pjeʒ	1	2.09	13.80**	3/220
	krɛt	1			
	floer	1			
	spɔr	1			
II	prym	2	7.71	88.25**	3/220
	pwɛs	2			
	grus	2			
	fien	2			
III	steʒ	4	10.52	35.19**	3/220
	tjaz	4			
	fjɔs	5			
	blɪɪ	5			
IV	psal	8	10.63	26.48**	3/220
	snɔg	8			
	kroef	9			
	sɥef	9			
V	bʒɔr	12	15.95	2.28	3/220
	kvœp	12			
	zben	13			
	tves	13			
VI	mvuy	16	16.24	0.02	3/220
	bzʌ	16			
	pɪɪx	16			
	ʒfɪɪ	16			

*This study was supported, in part, by grants from the Canada Council and Defense Research Board to W. E. Lambert and G. R. Tucker.

Fig. 1. Subjects' estimates of the "Frenchness" of CCVC syllables.

French words with substitution in one position at a time, but will do so with simultaneous substitution in two places, e.g., /zbɛn/ with a rating of 13. However, a sequence such as /bza/ with a rating of 16, will not produce a French word, even if we substitute simultaneously in two positions. The 24 sequences used as stimuli are listed in Table 1.

Two random orders of the list were prepared and tape-recorded by a French linguist. Each word was pronounced twice with a 3-sec delay between repetitions and an interval of 15 sec between the last occurrence of each word and the first occurrence of the next word.

Answer sheets with 24 ungraduated rating scales were prepared. The end points on the scales were defined by the adjectives *très rapproché* and *très éloigné*.

Procedure

Approximately one-half of the Ss received Order 1 followed by Order 2. The rest were tested with the reverse order. They were instructed to listen to the words presented by tape recorder and to rate each one according to its apparent proximity or distance from French. They were to indicate their rating by making a vertical mark at a point of their choosing along the horizontal rating scale. It was stressed that no "correct" or "incorrect" responses were involved, rather that subjective responses which would vary from person to person were called for.

Method of Analysis

To quantify each rating, a 19-cm ruler was superimposed on the ungraduated rating scale. Mean distance values for each phoneme sequence were obtained by combining scores of the two groups of Ss over the two trials.

Two types of analysis were used. First, average ratings for all exemplars within

each of the six stimulus categories were plotted in a manner similar to those of Greenberg and Jenkins (1964). Second, the ratings given by all Ss to similar stimuli were combined and six one-way analyses of variance were performed to determine for each of the six stimulus levels whether the four exemplars chosen according to linguistic substitution rules were actually rated by Ss as subjectively similar.

RESULTS

The results summarized in Fig. 1 indicate that, in general, subjective impressions of native speakers of French coincide with the linguistic rating of the sequences. These results, similar to those of Greenberg and Jenkins, reveal that native speakers do have a sensitivity for the sound system of the language.

The results of the six analyses of variance, however, indicate that there were significant variations in Ss' ratings within four of the six categories of exemplars. That is, the Ss did not perceive the sequences within these four categories to be homogeneously close to French. It is clear from Table 1 that the significant differences occur in the four categories with sounds nearest to French, whereas the exemplars in Categories 5 and 6 are judged to be homogeneously distant.

While a general trend is evident, on closer examination, the mean scores for each word taken individually rather than by group reveal a surprisingly large deviation from the predicted pattern in a few individual cases. For example, /flœr/, an existing French word with a linguistic value of 1 was rated more distant from French than /prym/, which is not a French word. In this case, /prym/ may have been misperceived as /pryn/, an actual French word, by a sufficient number of Ss to move it out of order. Another possible explanation takes account of the comparative frequency of occurrence of the initial sequences /pr/ and /fl/ in French. In the *Dictionnaire Petit Larousse* (1959), there are approximately five times as many French words beginning with /pr/ as with /fl/.

Consider also the word /sqef/ which had a linguistic value of 9, making it much closer to French than expected (i.e., 6.75, a rating more characteristic of the words with a linguistic value of 2). This word contains the semivowel /ɥ/, which corresponds in point of articulation to the typically French vowel /y/ found in such words as /brym/ and /grym/. The difference between the sounds /ɥ/ and /y/ is a subtle one: as a rule, /y/ becomes /ɥ/ when followed by another vowel (e.g., *tue* /ty/ becomes *tuer* /tye/). Considering the proximity of these two sounds, it may be

that the semivowel does not actually conform to the prescribed CCVC form and consequently its rating on the linguistic scale would not be comparable to that of other words.

The word /snɔg/ with a linguistic value of 8 was rated slightly more distant from French than predicted. Its subjective distance rating of 14.59 would be characteristic of words having a linguistic value of 12. An examination of the possible substitutions from the word /snɔg/ shows that they lead to very few actual French words. The initial sequence /sn/ is found in only one commonly used French word, *snob*, a direct import from English. As suggested earlier, the frequency of occurrence of a particular initial phoneme sequence in the language may play an important role in determining the degree of familiarity or "closeness" of a given word.

In general, the results of this study corroborate Greenberg and Jenkins's (1964) findings: There is a linear relationship between the psychological and linguistic distance from French of the 24 experimental phoneme sequences as shown in Fig. 1. Individual sequences which deviate notably from the expected pattern tend to be associated with high or low frequencies of occurrence of the initial or final phoneme pairs. Such frequencies, however, are not reflected on the linguistic scale. It may be that when we restrict our study to the CCVC format we are dealing with values which no longer reflect the characteristic frequency patterns of the language.

This study should be viewed mainly as a step toward the refinement of a potentially useful technique to measure native speakers' sensitivity to the sound system of their own language and of bilinguals or FL students toward their second or subsequently acquired languages. Before extending this study to bilinguals, it should be replicated with *monolingual* speakers of French, since their responses would provide a more reliable baseline. In Montreal, the majority of French speakers are exposed to varying amounts of English; all Ss in the present experimental groups did report some familiarity with English, and occasionally an additional foreign language.

REFERENCES

- GREENBERG, J. H., & JENKINS, J. J. Studies in the psychological correlates of the sound system of American English. *Word*, 1964, 20, 157-177.
- Petit Larousse*. Auge, Gillon, Hollier-Larousse, Moreau et Cie. Paris: Librairie Larousse, 1959.

(Accepted for publication August 31, 1970.)