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AN EXPERIMENTAL STUDY OF ACCENT IN FRENCH AND ENGLISH

VARIOUS attempts have been made to express the difference which is felt between French and English accent; for example, French accent has frequently been described as a *caress*, while English accent has been compared to a *blow*. Such rather impressionistic terminology has been found suggestive and helpful in teaching, but it represents an attempt to treat the complex phenomenon of accentuation as if it were more simple than it is. In order to make a quantitative study of accent, it is necessary to measure the various elements which constitute it. The object of the present paper is to describe the method used in making a comparative study of the nature of accent in French and English and to present a summary of the results of this investigation.

The term "accent" is here used to mean that prominence which is given to one syllable or phrase over the adjacent syllables, and which consists in rise in pitch, increase in intensity, increase in quantity, or a combination of these modifications. The study here presented is concerned with determining to what extent pitch, intensity, and quantity are elements of accent in each of the two languages. The investigation included selection of material, choice of subjects, recording of speech vibrations, measurement, graphing, and interpretation.

The material selected was a passage of narrative prose. It was read by the French subject in 36.7 seconds and by the English subject in 36.0 seconds. The texts follow.

L'ARABE ET LES PERLES

Un Arabe, égaré dans le désert, n'avait pas mangé depuis deux jours, et se voyait menacé de mourir de faim. En passant près d'un de ces puits où les caravanes viennent abreuver leurs chameaux, il voit sur le sable un petit sac de cuir. Il le ramasse et le tâte. "Allah soit béni, dit-il. Ce sont, je crois, des dattes ou des noisettes." Plein de cette douce espérance, il se hâte d'ouvrir le sac. Mais à la vue de ce qu'il contient: "Hélas, s'écrie-t-il douloureusement, ce ne sont que des perles."

THE ARAB AND THE PEARLS

An Arab, lost in the desert, had not eaten for two days, and was in danger of dying from hunger. Passing near one of those wells where caravans water their camels, he sees on the sand a small leather sack. He picks it up and feels it. "Allah be praised," he says. "It must be dates or nuts." Filled with this pleasant hope he hastens to open the sack. But at sight of what it contains: "Alas!" he exclaims sadly, "It is only pearls."

The passage was read in French by a native of the northwestern part of France, who had spent the greater part of his life in Paris, where he attended the Sorbonne. He had been in America five years. Although he uses English in business, he speaks it with a decidedly French pronunciation. He and his family use French at home. It was the opinion of the investigators that the pronunciation of this subject represented normal, cultured French without any noticeable peculiarities. The subject who read the English passage was an American of middle-western parents. He had lived in Chicago since the age of three, was a student of engineering at Armour Technical Institute, and had studied no foreign language. There is nothing exceptional about his pronunciation; it might be called normal Chicago speech. Throughout this report the term "French" will be used to mean as read by the French subject; the term "English" will mean as read by the American subject.

A record of the reading of each passage was made by means of an oscillograph.[1] The method of making and measuring oscillograph records in the Phonetics Laboratory of the University of Chicago has been described in two articles.[2] A brief summary follows. Seated before a microphone, the subject reads his selection in as natural a fashion as possible. The impulses of the speech sounds are picked up by the microphone and carried through a low-pass filter which cuts off the frequencies above three hundred cycles, that is, three hundred vibrations per second, leaving only the fundamental tone. The circuit leads from the filter into an oscillograph where the impulses actuate a small mirror. This mirror casts the reflection of a beam of light from an arc lamp on a strip of motion picture film. On the edge of the film the vibrations of a one-thousand-cycle oscillator are photographed simultaneously as a timer.

The developed film is placed over an illuminator, where the speech sounds are identified, the end of each sound marked, and its length determined in thousandths of a second. Average pitch is then found by dividing the number of vibrations by the length expressed in thousandths of a second.[3]

The measure of intensity used in this study represents relative physical intensity. It is based on the formula: Intensity varies as the product of amplitude squared times pitch squared. Amplitude here means the swing to one side or the other from a line which is run through the center

[1] The oscillograms were made by Professor S. N. Treviño.

[2] C. E. Parmenter and S. N. Treviño, "Italian Intonation," *Italica* (September, 1930), pp. 80–84; and "A Technique for the Analysis of Pitch in Connected Discourse," *Archives Néerlandaises de Phonétique Expérimentale* (1932), pp. 1–29.

[3] Each position was measured twice. The maximum observed error was .001 seconds, a difference of 2 per cent in pitch. This difference is not significant on the graph.

of the vibrations and which represents the point of rest. The distance from this line to the peak of each vibration was measured and average intensity was computed.[4]

In order to facilitate interpretation of the results, intonation and intensity curves were prepared. Figure 1 shows a section of the French and English graphs. The lower curve gives the changes in pitch of the fundamental and represents, therefore, the speech melody. Pitch is graphed on semi-logarithmic paper. The ordinates indicate intervals of pitch ranging from 100 to 250. Where the pitch fell below 100 cycles, it was recorded on an extension of the graph. In the upper graph, which represents the intensity curve, the ordinates indicate intensity units ranging from 40 to 71. The abscissas of both graphs represent units of time, which are indicated beneath in seconds.

Each vowel was divided into three sections, and average pitch and intensity found for each section. The two extremes in method are to find one average for the whole sound or to construct a curve from measurement of individual vibrations. The plan of dividing the vowels in three parts was adopted because it combines the advantages of both methods. It indicates the tendency within the sound; that is, the pitch at the beginning is shown, the direction in which it moves, and whether it rises or falls at the end. This analysis of the change within the vowel is clearer than by individual vibrations since the main trend is not obscured by too much detail. Moreover time and labor are saved. Each of the horizontal lines, then, in the intonation curve, represents the average pitch of one third of the vowel sound; and in the intensity curve, represents the average intensity of one third of the vowel. The shorter vowels are graphed in two sections or are undivided.

The completion of these graphs was the final step in the preparation of the material upon which the study of accent was based. The findings will be presented under the following headings: (1) Pitch and intensity; (2) time; (3) concurrence of accents; (4) influence on rhythm; (5) effect of increased speed.

1

In the reading of the French passage, pitch is more important as an element of accent than intensity. In the English reading, on the contrary, intensity is the more important element.

The phrase shown in Figure 1 may be used as an example of normal unemotional reading. The upper graph, which is the intensity curve for

[4] Amplitude was measured with a tenth of a millimeter Nachet scale. Each vibration was measured twice and the maximum observed error in measurement does not exceed .2 millimeters, which makes no significant change in the results.

the phrase, "En passant près d'un de ces puits," rises and falls gradually. There is no great distinction between the strongest syllables, *pas-* and *d'un*, and the neighboring ones. Furthermore, the final syllable, which is usually considered tonic, bears no greater intensity than the syllable preceding it. In the intonation curve, however, the word

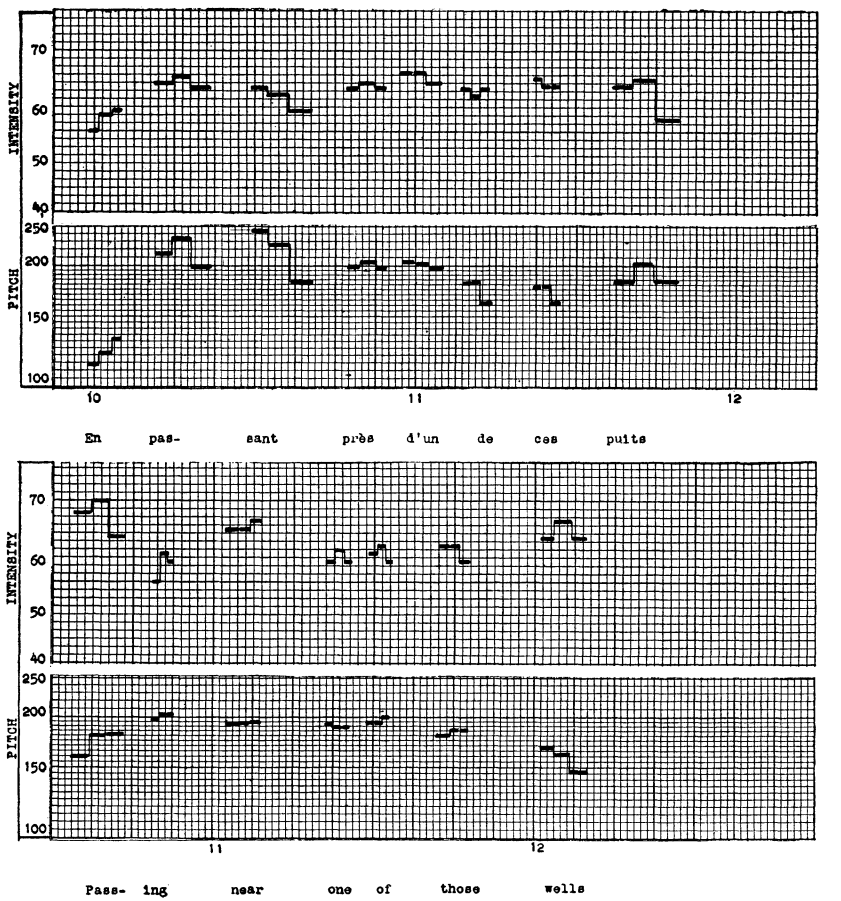

FIG. 1.—Intensity and intonation curves for "En passant près d'un de ces puits" and "Passing near one of those wells."

passant is brought into prominence by a rise of over eighty cycles to the first syllable, *pas-*, and then another of nearly fifty cycles to the tonic syllable, *-sant*. Though not so high, *puits* is also a definite summit, rising forty cycles above the low tone preceding it.

In the English reading, on the contrary, intensity is the more impor-

tant element. The intensity curve for the phrase, "Passing near one of those wells," has three definite summits: *Pass-*, *near*, and *wells*, which may be considered accented syllables, since, according to our definition of the term, accent is prominence given to a syllable over the adjacent ones. The intonation curve rises at the beginning, and drops at the end, of the group; but it describes a comparatively smooth curve with no syllables brought into prominence by a sharp rise in pitch. The highest pitch in the group is found on *-ing* and *of*, syllables which obviously would be least expected to bear the accent.

This phrase exemplifies the general tendencies of the two readings. French is characterized by a greater variation in pitch, 41.6 per cent greater than in English. Whereas, English is distinguished by a variation in intensity which exceeds that in French by 41.7 per cent.

2

The next consideration is the distribution of time. In French the pitch summits, *-sant* and *puits*, are also the longest vowels, that is, they have the greatest duration. The time accent coincides with the pitch accent. But there is not so great a distinction between long and short syllables in French as in English. In this phrase the length of the accented syllables exceeds that of the unaccented ones by 63 per cent.

It will be noticed that in English the time accent coincides with the intensity summits, *Pass-*, *near*, and *wells*. There is, moreover, a marked difference between the length of the accented vowels and that of the unaccented ones. In this phrase the average length of the accented vowels exceeds that of the unaccented ones by 97 per cent.

3

A further examination of this phrase shows that the French intensity curve has a tendency to follow, within a more limited range, the direction of the intonation, although it does not rise with it on the tonic syllable. In the English graph intensity and pitch seem to rise and fall independently of each other.

Another phase of the concurrence of accents is exemplified in the phrase graphed in Figure 2. The French phrase, "et se voyait menacé de mourir de faim," is characterized by a scattering of the elements of accent; that is, although the pitch summits, *voy-*, *cé*, and *-rir*, are somewhat longer than the surrounding syllables, not one of them is reinforced by an intensity accent. In fact, they are accompanied by a drop in intensity, and the highest intensity is found on a syllable preceding the pitch summit. That is, the highest intensity falls on the syllables *se*, *me*, and *mou!*

This scattering of the elements of accent probably explains the even-

ness which has been mentioned as characteristic of French. Viëtor's comparison of a group of French syllables to a row of pearls on a string is supported by experimental evidence. For, whereas the syllables vary in pitch, in intensity, and in length, these elements are so distributed that

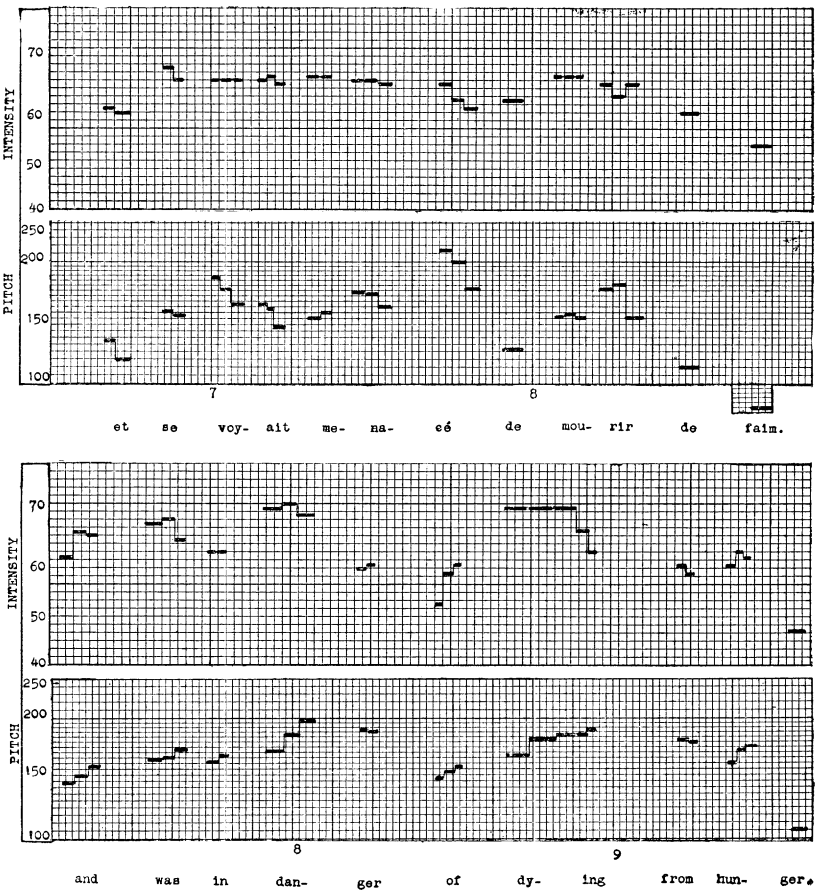

FIG. 2.—Intensity and intonation curves for "et se voyait menacé de mourir de faim" and "and was in danger of dying from hunger."

within the group the syllables tend to give an impression of equality, as compared with English.

In English the syllable receiving the intensity accent and having the greatest duration is sometimes reinforced still further by a rise in pitch. In the phrase, "and was in danger of dying from hunger," Figure 2, the syllable *dan-* is an intensity summit, has the greatest duration, and

has the highest pitch in its group. Farther on, *dy-* is marked by a sustained high intensity, by exceptional length, and also by a considerable rise in pitch, though not the highest in the group.

4

Another difference between French and English is the position of the accented syllable in the group. In French the last syllable, excepting unaccented *e*, is regularly marked by a pitch summit; for example, *mena*CÉ and *de mou*RIR. The last group of the sentence, however, falls very low. The low final frequently receives a time accent. Occasionally the pitch summit occurs earlier in the group; for example, *et se* VOY*ait*, which is an instance of the "désaccentuation" characteristic of French.

In English no such regularity is noticeable. The rhythmic pattern is determined by the fixed word accent or by the position of the important word in the group. In the phrase, "and was in danger of dying from hunger," the rhythm is determined by the fixed word accent on *dan-*, *dy-*, and *hun-*. Of the twenty polysyllables in the passage, nineteen have an intensity summit on the syllable normally accented when the word is pronounced in isolation.

5

As a final step, in order to observe the effect of an increase in speed, graphs were prepared based on oscillograph records of these same passages read in a little more than half the time of the first reading; that is, the French passage was read in 19.7 seconds and the English in 20.9 seconds. The characteristics which had been remarked in the first reading were even more noticeable in fast speech.

Figure 3 shows the first page of the French graph for fast speech. Here the pitch summits stand out, occurring regularly at the end of the sense groups. It is to be noticed that the intensity curve describes a line which is almost straight. The first page of the graph for English fast speech may be seen in Figure 4. Here the intensity summits are more prominent than when the rate of speech was more nearly normal. Moreover, after the rise on the first phrase, *An Arab*, the pitch tends to straighten out.

For the purpose of comparing variation in intensity and pitch in the two languages, the curves of the first sentence were smoothed off and superposed. These are shown in Figure 5. It will be noticed that in the intensity curves the unbroken line, representing the French reading, deviates only slightly from a straight line; whereas, the dotted line which describes the English curve is marked by definite summits. The average variation in intensity in the whole passage of English fast speech exceeds that in French fast speech by 65 per cent.

Of the intonation curves, it is the French reading which is marked by summits; whereas, the dotted line representing the English reading

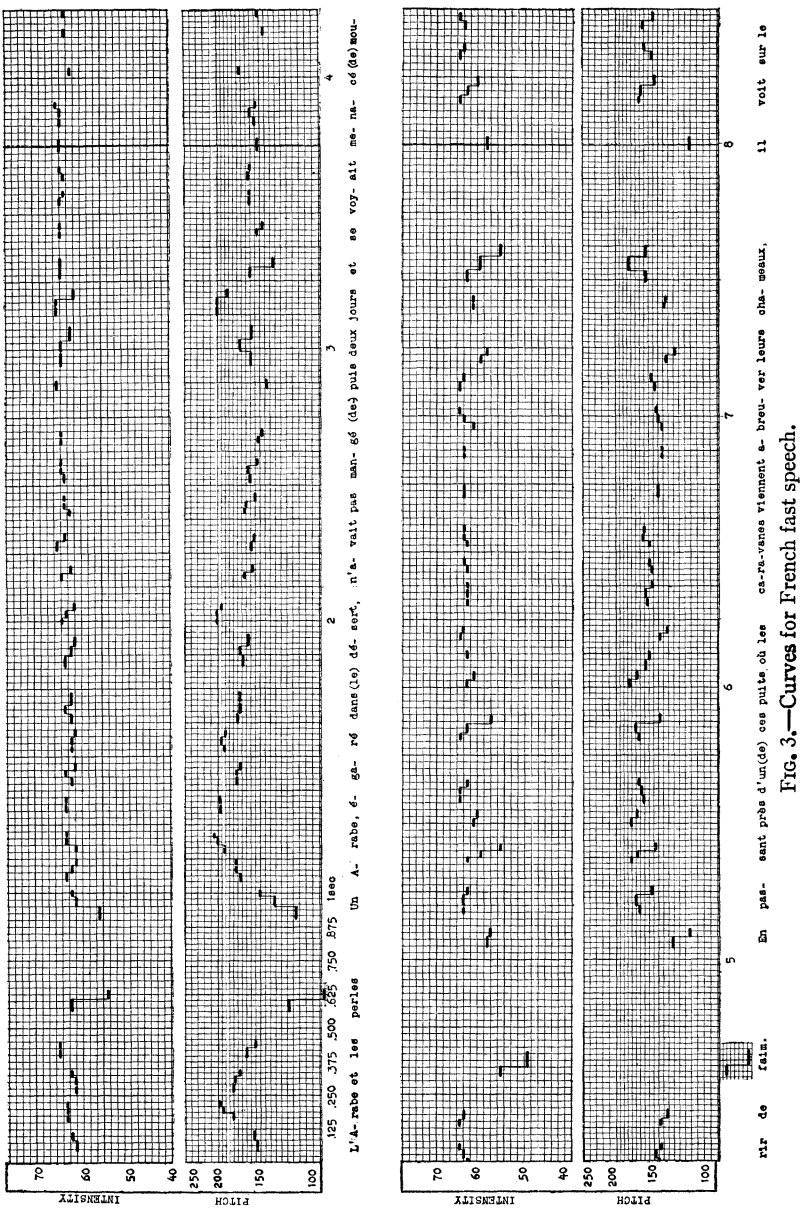

FIG. 3.—Curves for French fast speech.

varies within a relatively narrow range. The average variation in pitch in the whole passage of French fast speech exceeds that in English by 85 per cent.

In this study of accent in French and English, an attempt has been made to measure objectively time, pitch, and relative intensity and to

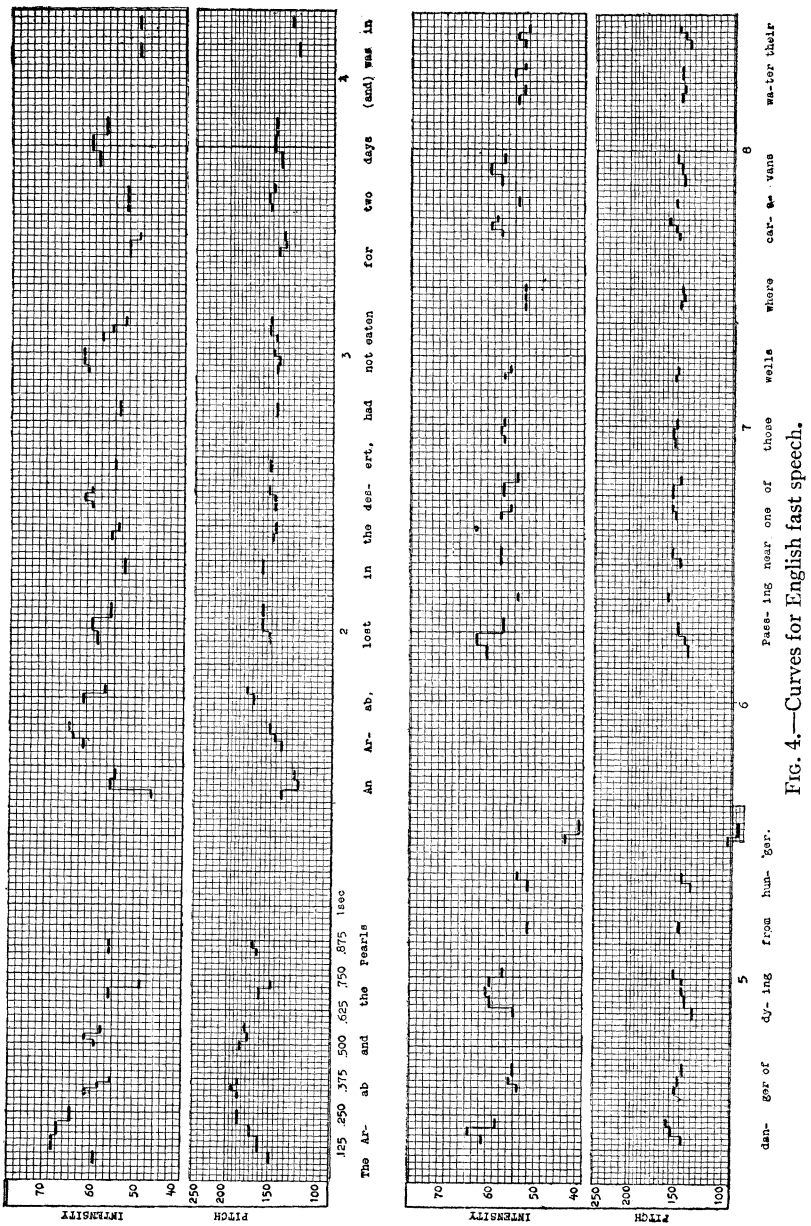

Fig. 4.—Curves for English fast speech.

present the findings graphically. One of the values of a graph of this kind is that it brings before the eye at one time a measure of the three

elements which may be factors in accentuation. The results are based on an investigation of only two subjects; but the findings for these subjects point to the following characteristics in each of the two languages.

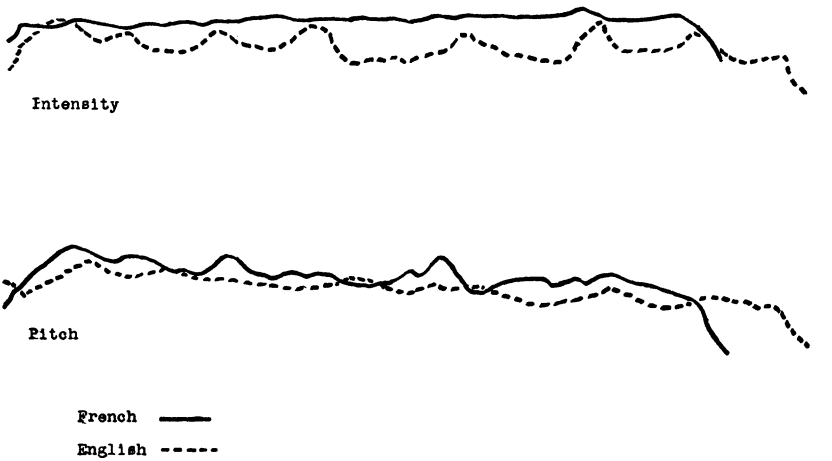

FIG. 5.—First sentence of fast speech.[5]

1. Pitch is the principal means of accentuation in French; intensity, in English.

2. In French the time accents usually coincide with the pitch summits. Time is, however, more equally distributed throughout the group than in English, where it usually coincides with the intensity summits and is more important as an element of accent.

3. The French reading is characterized by a scattering of the different elements of accent, which coincide more frequently in English.

4. In French, excepting in the final syllable of the sentence and cases of "désaccentuation," the highest pitch is found on the last syllable of the group, the tonic syllable. In English rhythm is dependent on the fixed word accent or on the position of the important word in the phrase.

5. The characteristics which distinguish accentuation in each of the two languages apparently become more noticeable when the rate of speech is increased.

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[5] The relationship between the two intensity curves is not intended to indicate that the Frenchman spoke at a higher level of intensity than the American, since the intensity values are not absolute.