

THE USE OF A CATEGORY-PERCEPTION TEST IN THE STUDY OF ONGOING SOUND CHANGE

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ABSTRACT

In this paper, I study the relationship between the category-test perception of subjects (dependent variable) and the sociolinguistic independent variables. I show that, for minimal pairs with a merging tendency of acoustical realizations or spelling mistakes by pupils, category perception of two successive generations is different [1].

PURPOSES

Janson [2] showed that category perception can reveal the ongoing changes between two phonemes by comparing two populations which represent two successive generations. According to him, when there is an ongoing change, the two populations present different results as to the categorization of the same stimuli: the phonematic frontier in the continuum joining up the two phonotypes is not the same for the two groups of ages.

To emphasize a tendency of merging of the /ø/-/o/ opposition, I chose to study all the pairs of oral mid round vowels of French, to which I added the /a/-/O/ opposition. I thought that this pair might be subjected to an ongoing sound change as the /ä/-/ɜ/ one [3, 4]. The category perception test consists of five identical tests on the five following oppositions of French vowels: /æ/-/ɔ/, /ø/-/o/, /y/-/u/, /a/-/o/ and /a/-/ɔ/.

METHODS FOR THE STIMULI'S SYNTHESIS

The stimuli's synthesis was realized by Gérard Bailly at the Institut de la Communication Parlée (Grenoble). For each test, we used two typical vowels, synthesized by the 24 parameters defined in COMPOST [5, 6]. An interpolation program was built to produce 19 intermediate stimuli. It is a linear interpolation of the 24 parameters between the typical values of the two

phonotypic vowels. The 21 stimuli obtained were tripled. The 63 stimuli were randomized. The computer file with all these sounds was reproduced on a Sony HS60 cassette with a Marantz CP162 portable recorder.

METHODS FOR THE PERCEPTION TEST

a) Medium: The test consists of series of 63 stimuli separated by 3 seconds of silence. For each pair, the test lasts about 3 minutes 15 seconds, that is to say that the global test lasts about 16 minutes. A musical signal is played after each 9 stimuli to facilitate the test's progress. I chose not to propose a number before each stimulus: it could have influenced the subject's choice. On the five answer sheets given to the subjects the responses are presented in blocks of 9.

b) Orders: The subject has imperatively to circle one of the two solutions which are proposed for each stimulus. I make him alive to the fact that he will not necessarily hear the two types of vowels the same number of times. He cannot come back on his choice after he heard the following stimulus.

c) Material: The test is presented to all subjects on a Marantz CP162 portable recorder and Philips SBC3155 headphones.

d) Subjects: The 29 subjects who passed this test are described in [1] (groups A: 5-15 years old; B: 16-25; C: 26-35 and D: 36-45, table 1).

Table 1. Number of subjects according to age group and gender

	males	females
group A	5	2
group B	6	2
child génération	11	4
group C	2	3
group D	3	3
parent génération	5	6

QUANTIFICATION

Front's index of the perception for each opposition (F)

A value (N) is given to each stimulus, that is the number of times that it was perceived as the front vowel of the pair ($0 \leq N \leq 3$). Front's index (F) for each pair fit, for each subject, with the sum of the 23 (N). Hence, the bigger is the index, the nearer of the back vowel is the category cut.

Recoding of rough data (F')

In certain subjects, the zone of variability of the perception is very large, and it is difficult to determine the category cut. Then, I considered that 0 and 1 value of (N) corresponded to a back perception, recoded 0, and 2 and 3 values of (N) corresponded to a front perception, recoded 3. So, (F') is the recoded index (F).

RESULTS

Mid/height vowels: global result

The structuralist construct of correlation provides the same treatment of the three vowel oppositions /ø/-/o/, /æ/-/ɔ/ and /y/-/u/ about a possible backing of the articulation. One may suppose that, in the perception test, the three pairs will present similar results. The statistical analysis, carried out on these three pairs considered two by two, shows for the front's index the same treatment for the pairs /ø/-/o/ and /æ/-/ɔ/, and a difference in the treatment for each one of these two oppositions compared with /y/-/u/.

The gender variable

The variationist theory of sound change [7] predicts a difference in the treatment of the dependent variables related to gender. Nevertheless, in this category-perception experiment, this factor is not significant. The front's index is not related to the independent variable 'gender of the subject', neither in the global population nor in each generation of children and parents. In other words, none of the 5 vowel oppositions I studied presents genderly differentiated treatments (figure 1).

The age variable

Most theories on linguistic change appeal to the concept of successive generations to explain or describe changes. The variationist model of change predicts a significant difference in the production of a vowel which is subjected to an ongoing change between two successive generations. Janson [2] also showed this for perception. In this study, I considered groups A and B as the child generation, and C and D as the parent generation. The generation factor is statistically significant in term of the front's index (F and F') for /ø/-/o/ and /æ/-/ɔ/ oppositions. More precisely, these dependent variables are higher in the parent generation. In the same way, the space taken up by /ø/ and /æ/ is larger in the parent generation than in the child generation. For /æ/, this difference is significant only with recoded values.

This study brings to the fore a difference in the category cut of the [ø_o] and [æ_ɔ] continuums in two successive generations. The category cut is backer in the oldest (figure 2).

If we look at a finer stratification of age groups - A (5-15), B (16-25), C (26-35) and D (36-45) - the age factor is significant for the /ø/-/o/ and /æ/-/ɔ/ oppositions for front's index. particularly, for this index, we see an increase in the means of ranks for groups A, B and C followed by a decrease in group D, where by the generation factor is linked to a significant superiority of the values in the oldest (figure 3). A simple linear regression analysis for this independent variable shows that it can explain itself, between 37% to 52% of the front index's variation (rough and recoded) when we consider groups A, B and C. These coefficients drop to 19 (minimum) or 31 (maximum) when we add group D in the treatment.

Unlike /ø/-/o/ and /æ/-/ɔ/ oppositions, the /y/-/u/ one presents different features in terms of the statistical significance of the rough values of front index in regard to the recoded ones.

The categorization of the [y_u] continuum is statistically linked to the generation variable only for the rough values. I can add that this generation factor presents the

same categorization features than the two precedent oppositions: a larger area of the front category perception in the parent generation. This factor is not statistically significant for the recoded dependent variables. The recoding of rough data aims to limit the weight of the intra-individual variation. One could set out the hypothesis that the uncertainty area of this categorization is linked to the generation factor. But this is not checked by the statistical analysis. At last, the front index is not linked to the age variable.

The weight of the other independent variables in the category perception

Geographical origin of the subjects, family membership and level of education do not act upon phonemic cut. Indubitably, individual strategies are implemented in the perception of sound continuums. However, statistically, the individual factor is not significant: the subjects in this study, taken as a whole, do not present any differential behaviour for the rough index (F). Nevertheless, the examination of the category-perception curves - (F) index - of each subject brings to the fore behavioural differences: subject D6, for example, has a much more regular perception than D5. Likewise, the variation area for each of the oppositions can stretch upon few (B8) or many stimuli (B5) [1].

PERCEPTION AND PRODUCTION

This category-perception test confirms the existence of an ongoing change in French in the /Ø/-/O/ opposition, and that, in its two dimensions /ø/-/o/ and /œ/-/œ/. Moreover, the results of these tests allow me to present a hypothesis about the production of this opposition's vowels. If the oldest subjects have a backer phonemic cut, one can suppose that the production of the /Ø/ vowel will be backer also. If the eighth stimulus, in the two continuums, is perceived /o/ or /ɔ/ by the children but /ø/ or /œ/ by the parents, it is because the /Ø/ produced by the oldest partly merges with the /O/ produced by the youngest, and vice versa, that the /O/ produced by the youngest partly merges with the /Ø/ produced by the oldest. Indeed, if the phonemic cut is different, the direction of

the evolution of change in this opposition is not elucidated by this perception's study. The fact that the youngest present the frontest cut would tip the scale to the tendency described by Martinet [8]. I cannot compare this test with another one realized ten years ago because such a study - based on the same kind of stimuli - does not indeed exist.

ACKNOWLEDGEMENT

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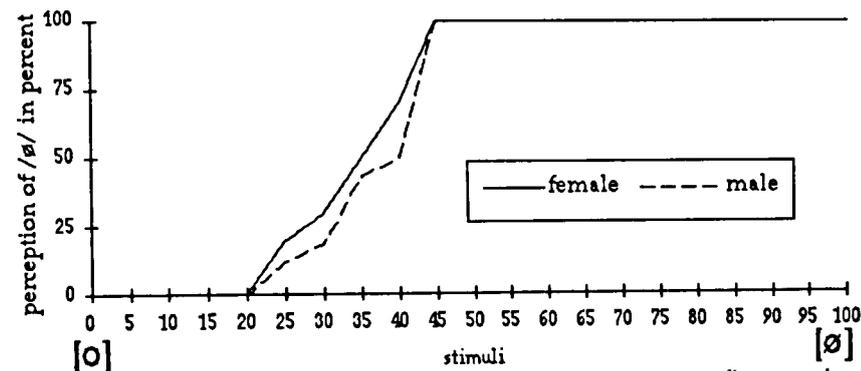


Figure 1: Category-perception curves (index F') of the /ø/-/o/ opposition according to gender

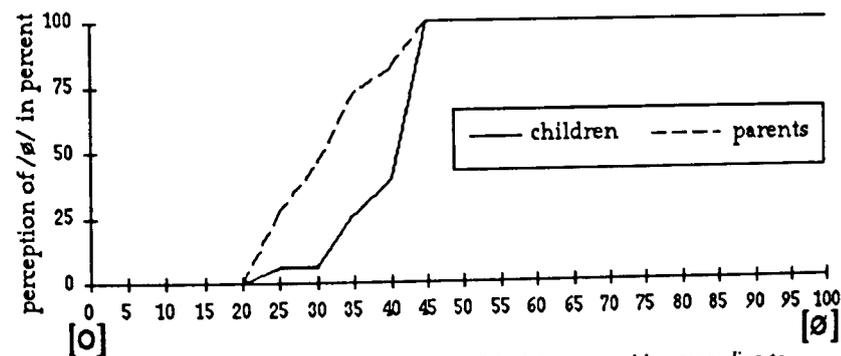


Figure 2: Category-perception curves (index F') of the /ø/-/o/ opposition according to generation

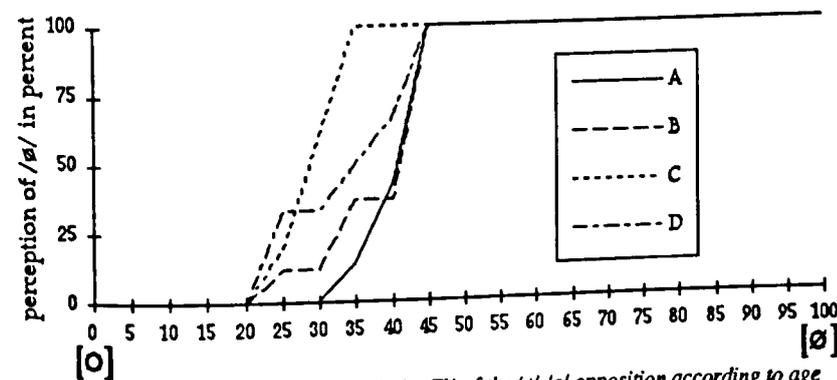


Figure 3: Category-perception curves (index F') of the /ø/-/o/ opposition according to age group