Correspondence Analysis Applied to the Evaluation of Aphasic Patients

Gastão Coelho Gomes
DME – IM – UFRJ, Caixa Postal 68530 cep:21945-970, RJ – gastão@im.ufrj.br
Sergio Camiz
Dip. di Matematica, Sapienza Università di Roma - Piazzale Aldo Moro 5, I - 00185 Roma, Italia
sergio.camiz@uniroma1.it
Fernanda Duarte Senna
Pós-Grad. Linguística, UFRJ - Cidade Universitária, RJ - fonofernandasenna@gmail.com
Christina Abreu Gomes
Dep. de Linguística, UFRJ - Cidade Universitária, RJ - christina-gomes@uol.com.br

The study of aphasic patients is currently performed by asking them to verbalize a set of names that identify a set of images proposed to them. In a previous paper (Camiz *et al.*, 2011) a set of 161-items was selected and adapted to Brazil from those studied by Snodgrass et. al. (1980).

In this paper we discuss the results of this test submitted to 46 judges, of which 23 where aphasic individuals and 23 were control subjects. The test data were submitted to Multiple Correspondence Analyses (MCA, Benzécri *et al.*, 1973; Greenacre, 1983), considering first three different subsets: one on the words' characters (length, position of accent, meaning, etc), one on the individuals' conditions (age, sex, type of disease, therapy type etc), and one on the interaction individual/word (time and kind of response etc). Eventually some analysis involving items from all three subsets was performed.

1. Words characters

The first analysis took into account a set of characters to qualify the chosen set of images/words to identify and pronounce: their length, the accent position, the kind of object represented (part of human body, object, fruit, animal, food), the frequency of the words and their familiarity according to Brazilian studies, the visual complexity, and both the agreement among judges and the degree of primitiveness, according to Camiz et al. (2011a; 2011b). Albeit the first two factors were attributed around 45% of the total inertia, the eigenvectors could not be considered significant, according to the Ben Ammou and Saporta (1998) test. Thus, no significant structure resulted in the words data set. Indeed, this is not a drawback for our purposes, since the absence of a particular structure in these date ensures that the experiment would not be biased by any words structure *per see.* In Figure 1 the pattern of the considered items is shown.

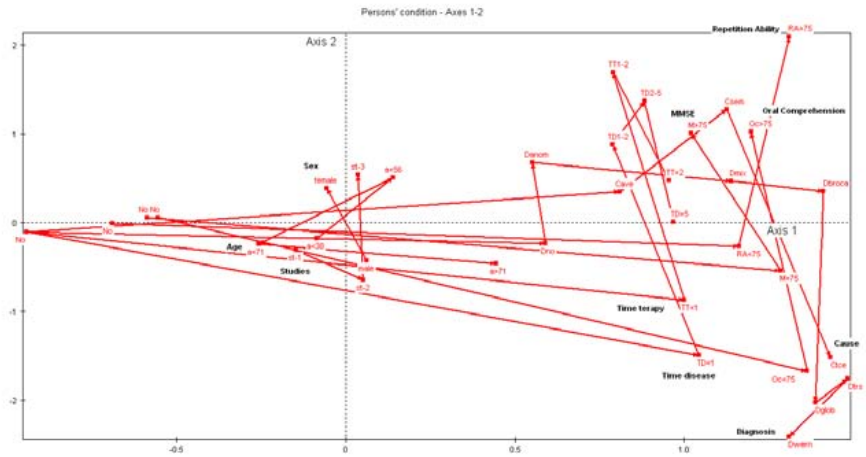

Figure 1 - The pattern of the judges characters on the first factor plane of MCA.

3. Individual characters

The second analysis studied the characters concerning the individuals: for all of them, age class, sex, and degree of studies; then for the ill ones, diagnosis, cause, times of disease and therapy, and some indexes of their ability. In this case two factors resulted significant, summarizing 70% of total inertia. The first factor distinguished very clearly the control judges from the ill patients, whereas the second one distinguished the ill patients according to their gravity, as described by the specific items. In Figure 1 the pattern of each item is shown.

2. Test results

Eventually the last analysis distinguished the kind of response, according to its time, the kind of error and the amount of substitutions. This time also two significant factors resulted, accounted for a total of 70% of inertia. The first factor distinguished clearly the kind of response, putting on the right side all the possible errors and the substitutions, leaving on the left side the good answers with a little of the wrong, corresponding to wrong recognitions of the control judges. The second factor distinguished the different kind of wrong responses and related them to the substitutions. In Figure 2 the pattern of the test results is shown.

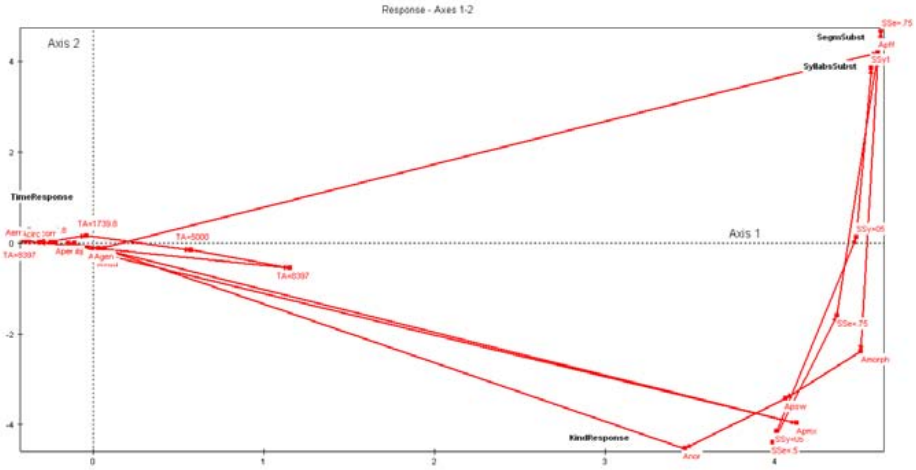

Figure 2 – The pattern of the responses on the first factor plane of MCA.

3. Interaction

The study of the interaction between the different characters is still in progress. Indeed, it can be said already that a certain agreement, in terms of correlation between the first factors of the second and third analyses could be found, but deeper analyses are still in progress, in particular trying to ascertain the relation between both kind and gravity of the disease and the kind of bad response. In addition, we shall search to what extent some particular words could be particularly difficult to be pronounced.

4. References

Ben Ammou and Saporta (1998). *Revue de Statistique Appliquée*, Vol: 46(3): 21-35.
Benzécri *et al.* (1982). *L'Analyse des Données*, 2 vol., Paris, Dunod.
Camiz *et al.* (2011). *Proceedings of XLIII SBPO*, Ubatuba, São Paulo: 1014-1033.
Greenacre (1983). *Theory and Applications of Correspondence Analysis*. London, Academic Press.
Snodgrass and Vandewarts (1980). *Journal of Experimental Psychology*, Vol. 6(2): 174-215 .