The great amount of variation in speech production is an heterogeneous phenomenon which can be explained by many different factors. One of them could be the way phonological systems are structured. Thus structural variations may be determined by the characteristics of each phonological system (number de phonemes, architecture of features in the system, prosodic structure, syllabic structure, phonotactics, phoneme frequencies, etc). The objective of the present paper is to understand whether the density of a vowel system, in other words the large or small number of vowels in the language, plays a significant role in vowel production. One hypothesis could be that speakers adapt their productions as a function of the number of vowels in their system, to occupy the entire space. A study performed by Manuel and Krakow (1984) showed that the tolerance for variation in the production of a vowel is lesser in a language with a filled vocalic system. On the contrary, Maddieson & Wright (1991) observed very few variation in a low density system (three vowels).

We plan to compare the production of vowels by French, Spanish and English speakers. In English, there are between 13 and 15 oral vowels while French distinguishes some 10 or 12. The density of these two systems is therefore similar, but the specific vowels in each differ considerably. In contrast, Spanish has a relatively sparse inventory, with only 5 vowels, but within this inventory we find the same vowels as in French and English (/a/, /e/, /i/, /o/ and /u/). These three languages thus offer the opportunity to distinguish the effects of density, without a concomitant difference in the phonological nature of the vowels present in the two systems (French and Spanish), from the effect of differing inventories of vowels within comparably dense systems (French and English).

In a previous study (Meunier, 2003), we observed that Spanish speakers produced smaller category areas than English ones. For Spanish speakers, there was basically no overlap between vowels as their number is lesser within the same global space: the density of the vowel system does not appear to have an impact upon the production of vowels. This observation goes against the hypothesis which predicted a larger production area for systems with fewer vowels. Nevertheless, this study was based on the analysis of isolated vowels: the controlled nature of the situation should have reduced variation.

In the present study, we compared vowels (Spanish, English and French) in three different contexts: isolated, in monosyllabic words, in two short texts. This corpus allowed us to evaluate the variability of vowel production according to the degree of control in speech production. First results show that, English vowel variation does not increase in less controlled situation (word and text) while Spanish and French vowel variation increased in text context. These results suggest that, in lesser controlled speech, the entire space of vocalic system is occupied whatever the density is. Density may be one of the parameters which can play a role on vowel variation. We hypothesize that vowel variation could be due to several properties of the phonological systems.
References

