

A corpus-based sociophonetic analysis of open-mid vowels uttered by young male and female speakers of the Pisan variety

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Abstract

Most of the studies in the field of experimental phonetics have focused on male speakers, since they represent the unmarked choice (Ferrero et al.: 1996). On the contrary, female speakers have been the subject of less research attention, both in acoustics and in speech perception, for various reasons. Firstly, the original contributions of Fant (1960), that showed the source-tract interaction and paved the way for subsequent surveys, were mainly based on the examination of male physiological characteristics. Furthermore, women's higher fundamental frequencies often hinder an accurate description of the formant-frequency locations, making it more difficult to detect phonetic contrasts (Klatt & Klatt: 1990). So, the first aim of this paper is to investigate whether there is a male-female difference with respect to the [ɛ] and [ɔ] vowel quality variation in the Pisan variety of Italian.

The lowering of open-mid vowels [ɛ] and [ɔ] has long been noted in literature, especially as far as the Pisan and the Leghorn varieties are concerned. This phenomenon has already been defined as an actual feature for the identification of these two regional varieties of Italian, as well as a cue of vernacularity (Giannelli: 2000; Calamai: 2001, 2004; Nocchi & Calamai: 2009; Marotta et al.: 2004). However, the majority of the studies that contributed to the analysis of the above-mentioned lowering of [ɛ] > [æ] and [ɔ] > [ʌ] did not take into consideration gender specific variation. Moreover, most of them investigated isolated words or target words within frame sentences.

The novelty of this work is two-fold. On the one hand, we built a small *ad-hoc* corpus of spontaneous and semi-spontaneous speech produced by young Pisan speakers. On the other hand, we analyzed, compared and contrasted vowels uttered both by young male and female speakers. We opted for young subjects for two reasons: firstly, because this approach could allow us to focus on the lowering of low-mid vowels in a more homogeneous group; secondly, and most importantly, we wanted to find whether there was experimental evidence supporting this thoroughly investigated phenomenon, as far as the new generation of young Pisan speakers is concerned. Therefore, it seemed challenging to assess whether the lowering is affected by sociocultural factors.

Methods and tools

As regards the settings and the procedures, such a research requires a thorough review of various methodological issues. Several questions have been raised, from the evaluation of the elicitation methods of semi-spontaneous speech, to the appropriate procedures, respectively for the acoustic and perceptual analysis, and the statistical methods for data interpretation. In addition to this, it is often problematic to describe the place of articulation of vowels, because they produce a minor and less consistent narrowing of the vocal tract, with respect to consonants (Calamai: 2004).

Since there are not any speech databases available for the Pisan variety of Italian, the first step of this work was to build a small *ad-hoc* corpus. We chose 6 young people, aged 18-20 years old, that were born and have lived in Pisa all their lives. In order to ensure the well-balancedness of the corpus we recorded 3 male and 3 female speakers. Before each recording, subjects were given a self-report socio-cultural questionnaire, so as to gather relevant information about their linguistic background, their level of education, their parents' level education and occupation, and their daily use of the dialectal variety.

With regard to the data, the speech is entirely spontaneous and semi-spontaneous, collected by means of the map-task elicitation technique. The reason why we opted for this approach is mainly because we wanted to avoid read material and scripted dialogues, which have already been employed in several other studies of this kind (Calamai: 2001; 2004). Moreover, the use of a map-task could increase the likelihood of occurrence of the linguistic phenomena we are interested in, and allows us to perform original analyses both at the acoustic and the sociolinguistic levels. Furthermore, and not less importantly, this elicitation technique seems to better control context effects, such as anxiety and distress. Regarding the sampling, the speakers were recorded with Praat software, using a Samson METEOR MIC cardioid pickup microphone (condenser diaphragms: 25mm). The sampling parameters are the following: mono channel, 16-bit, 16,000 Hz, linearly encoded WAV.

The study we present here solely concerns stressed vowels (differently from Calamai: 2001), so as to reduce the number of dependent variables and to pay more attention to other sociophonetic features, i.e. gender and age, diastatic, diatopic and diaphasic connotations. The vowel extraction and the acoustic data processing were performed with Praat and ELAN software. Then, we computed the following: the single values, the means, and the standard deviation for the fundamental frequency (f_0) and for the first three formants (F_1 , F_2 , F_3) of the low-mid vowels expressed in Hz. For this purpose, we employed two different Praat scripts to extract the fundamental frequency and the formant frequencies,

respectively. In addition to this, since only few studies aim at combining both acoustic and perceptual dimensions, we included in this work the computation of these markers: $F2-F1$, expressed in Hz and $Z3-Z2$, $Z3-Z1$, and $Z2-Z1$ expressed in Bark, following the method already used by Ferrero et al. (1996). Therefore, the diversity in terms of anatomical features among male and female speakers might be studied and resized, according to whether the aim is to maximize or minimize the differences between the two systems (Maisano: 1996).

Furthermore, the open-mid vowels produced by our speakers were compared with the data available on CLIPS corpus. We segmented the audio material produced by 4 young speakers (2 males and 2 females) from Florence, and subsequently we performed the same analyses carried out on the Pisan speakers. This procedure, that was already employed by other authors, such as Calamai (2004), allowed us to obtain a contrastive analysis. Once we calculated all relevant markers we plotted the vowels using the R language and environment. Finally, we performed the ANOVA for speaker means on our datasets.

In conclusion, our ongoing research has focused respectively on the inter-linguistic and the intra-linguistic dimension. Our purpose was to collect as much information as possible within and between the groups, trying to make explicit at the sociophonetic level the link between age-, region- and gender-specific variation, and lowering of open-mid vowels produced by young speakers of the Pisan variety of Italian. The first conclusion we came to is that results seem to be visibly distorted and negatively affected by the creaky voice (Melvin & Clopper: 2015), which we encountered among the Pisan male subjects. Based on our data, it seems that there are not any significant differences, as far as [ɔ] is concerned, neither within the male/female group of Pisan speakers, nor within the control group. Moreover, the female groups both from Pisa and Florence apparently show more internal variation with respect to the male groups. On the other hand, as regards the single tokens, it appears to be relevant the difference $F2-F1$ in assessing the lowering of [ɛ] uttered by the male speakers from Pisa, as suggested by Lisker (1948). However, the overall analysis of the material did not reveal significant differences in terms of vowel quality among the four groups we took into consideration. These data might suggest that the lowering of open-mid vowels is not markedly frequent among young educated Pisan speakers. However, this work is only a pilot project, and therefore it needs to be extended to a larger group of subjects. Moreover, indicators such as duration and stress could be taken into consideration for further sociophonetic investigations with regards to the Western area of Tuscany. A more thorough research might be useful for clarifying why the lowering of open-mid vowels and the gender specific variation have not been confirmed by this study.

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