Multisensory integration's effects in phonological acquisition of a foreign language

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The perception of spoken language is a complex phenomenon which involves different processing fields related to phonetics, phonological organization, lexical structure, morphological and syntactic verbal expression. In this composite process, phonetics plays a preliminary role in language learning, because the perception, the production and the size of acoustic-articulatory speech sounds are presented, in order of importance, even before any other analysis which presupposes an elaboration of meaning. In the context of acquisitional linguistics, the study of phonetic-phonological processes allows a better understanding of both the processes of production of speech sounds, both of the mechanisms underlying the receipt and therefore the understanding of a foreign language in its various aspects (Archibald: 1995). This research aims to deepen the study of the processes underlying the learning of pronunciation by adults, particularly Chinese native speakers. Studies devoted to learning the phonology of a foreign language by adults highlight the typical mistakes and major phonetic obstacles, while it is not yet determined a unique way of teaching practice also applied to languages typologically distant from Italian (Rastelli: 2010). The present hypothesis consists in showing the improvement of perception and pronunciation by different sensory modalities (audio training of verbal stimuli with the addition of related video-labial: Miller & D'Esposito: 2005, Markham 1997; Dalton & Seidlhoffer: 1995). Authors will also seek to put light on the cognitive processes underlying the phonetic productions in Italian language belong to beginners adult learners in relation to such stimuli. The study will: a) evaluate the accuracy of the reproductions related to the construction's parameters of the stimuli; b) compare the numerical value resulted from the evaluation made by teachers of Italian L2 and phoneticians; c) analyze and categorize the types of errors of accuracy (James 1998), committed by subjects according to their mother tongue; d) recognize the measure of latency in preparation for the phonetic re-production of the Chinese learner. Authors will finally calculate the correlation between the spectrogram of the native speaker and those of subjects, analyzed with the program Praat (Boersman & Weenink, Institute of Phonetics Sciences of the University of Amsterdam, 2011).

Method

The first phase of the research presents the development of a list of meaningless words created taking into account the following parameters: length of the words, syllabic complexity, presence of difficult phonemes in eterosillabica or tautosillabica position, presence of labial phones (b, p, f, v, m), pronounced with an articulatory gesture visible from the outside. These phones, where present, were placed in the initial position, median and final word, in coexistence with geminate consonants, vibrant, liquid, and consonant eterosillabici and tautosillabici clusters. Furthermore, according to the literature produced on creating nonsense words as similar as possible to those semantically full (Christiansen: 2011), a representative of Italian alternation consonant / vowel, more than that vowel / consonant has been elected. Vowels are equally distributed in the different positions, except 'u' that was not used in final position, as in Italian words ending with this letter are very rare and have a functional role. Finally, the different possible interactions between these parameters led to the establishment of a provisional tripartite complexity index, used in the pre-trial order to present to the subject batteries of stimulus with homogeneous complexity. The stimuli were presented in random order in three different sessions (ie 108 stimuli x 3 sessions), each of which is characterized

by a presentation format: only audio(SA), audio-ortography (SAO), audio-labial (SAL).

Stimuli and procedure

A list of 108 stimuli (36 non-words x 3 levels of difficulty) has been reproduced in three different presentation formats. For session SA (audio stimulus) and SAL (audio-labial stimulus), author made use of the collaboration of a native Italian speaker, recording voice and articulation gestures when she was reading non-words. The 108 stimuli were presented in random order in three different sessions (respectively 108 stimuli x SA session, SAO session and SAL session). The order of the three sessions was counterbalanced between subjects to avoid effects related to the habit. The tests were administered by a laptop (display 17 ") and headphones (impedance range and Frequency = 32). Each trial began with the presentation on the screen of a warning signal (a green flashing cross, duration = 1 sec), which was followed by the stimulus. Just finished, a special visual signal (a red circle, duration = 6 sec) invited subjects to reproduce verbally stimulus directing the voice to the microphone of the same laptop. The reproduction time was recorded for a window of 6 sec (ie, the duration of the red circle), after which a new test began.

Participants

a) 10 Chinese subjects of both sexes, aged between 18 and 29 years, enrolled in the Italian language courses at University for Foreigners of Perugia, with a level of expertise of Italian Elementary (A1 / A2 CEFR) .

b) control group of 10 Italian subjects of both sexes, aged between 18 and 29 years, enrolled in the graduate program ITAS (Italian for Foreigners), the University for Foreigners of Perugia.

Data analysis

The data collected have been exported to WAV. audio files (3 files for each subject, corresponding to each session) distributed to three different evaluators, with an evaluation table. The table has four columns: stimulus, session1 score, session2 score, session3 score. The numbers awarded ranged from 1 (minimum accuracy) to 5 (highest accuracy). Importantly, the evaluators were not aware of the relationship between session and modality of administration (SA, SAO or SAL).

Preliminary results

The first data, especially emerged from records of 70% of the control group, showed that the syllable length is not the maximum parameter of difficulty for a stimulus; the knowledge of other foreign languages influenced, for some people, the memory of some phonological stimuli (eg pido, breca recalls Spanish words); the vision of the articulated gestures especially helps in maintaining the positions of articulatory phones placed in initial position, while the only audio authorizes the visual distraction from the screen and a reproduction entirely subjective regarding the prosodic rhythm. A first analysis of the data on the group of Chinese showed at the same time a significant improvement in the ability of articulation of some phones and facilitating a consistent development in the articulation of difficult phones, such as vibrant and liquid, especially in eterosillabic position (eg pilernuca, cadarmota). The vision of lip movements seems to be a valuable help for all groups of subjects tested in the reproduction of doubles phones. The spelling represents a positive anchor for memory. Authors expect that subsequent analysis (including that on spectrograms), may give further confirmation of the evidence emerged so far.

Keywords: phonological acquisition, multisensory integration, perception of audio-visual stimuli, prosody, foreign language, spectrograms.

References:

Archibald, J., *Phonological Acquisition and Phonological Theory,* Lawrence Erlbaum Associates, New Jersey, 1995.

Christiansen, T. U., *A Danish nonsense syllable speech material*, Forum Acustic, Aalbory, 2011.

Dalton C., Seidlhofer B., *Pronunciation*, Oxford University Press, 1994.

James C., *Errors in language learning and use, Exploring error analysis*, Applied Linguisties and Language Study, Longman, 1998.

Markham D., *Phonetic Imitation, Accent, and the Learne*r, Lund University Press, Sweden, 1997.

Miller L. M., D'esposito M., *Perceptual fusion and stimulus coincidence in the Cross-Modal Integration of the Speech*, appeared in The Journal of Neuroscience, June, 22, 2005, pp. 5884-5893.

Rastelli S., *Italiano di cinesi, Italiano per cinesi. Dalla prospettiva della didattica acquisizionale*, Guerra Edizioni, Perugia, 2010.