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## **Perception of European Portuguese Minimal Pairs by Chinese Speakers: First Approaches**

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From the vast amount of literature on the process of second language acquisition (SLA) in the past decades we can adduce two undeniable facts which are independent of the theoretical framework – that it is complex and that it is highly variable (Ellis, 1994: 139-141; Rothman & Iverson, 2008: 284; Slabakova, 2009: 56). Yet, the consensus on L<sub>2</sub> development and acquisition goes no further, since different theoretical stands identify different factors as those that best contribute to a clear explanation of such a complex process.

The theoretical debate in the field of SLA has been centred on several specific aspects: (i) the context of acquisition; (ii) the type and quality of input; (iii) language transfer (usually L<sub>1</sub>); (iv) the existence of a critical period of SLA.

One of the most striking characteristics of L<sub>2</sub> learners' interlanguage<sup>1</sup> has to do with speech production (Archibald, 1998: 2), a feature of L<sub>2</sub> language that is probably the most permeable to L<sub>1</sub> transfer (Edwards & Zampini, 2008: 2).

Albeit its importance in SLA studies, language transfer is far from being the most important factor in explaining L<sub>2</sub> acquisition and development processes, even those focusing exclusively on L<sub>2</sub> phonology. Recent research approaches on SLA have taken individual and contextual differences into account, since it has been attested by some studies that they contribute to a great extent to the variation found in L<sub>2</sub> acquisition. Age of onset of L<sub>2</sub> acquisition has long been debated in the literature, mainly from some of the generative hypotheses of SLA. Access to UG after puberty – considered as a critical period for language acquisition (Scovel, 1988) – may be partial or non-

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<sup>1</sup>Cf. Selinker (1972).

existent, imposing limitations on SLA, and affect its development and constraints on L<sub>2</sub> ultimate attainment.

Most of the studies on SLA have concentrated on production as evidence of the learners' linguistic competence.

Our study concentrates on the perception of phonological features – minimal pairs – as we hypothesize that phonemic perception may affect not only the production of phonological segments, but also comprehension of utterances and discourse (Strange & Shafer, 2008: 153).

In section 2 we start by reviewing the literature on L<sub>2</sub> speech perception. In section 3 we briefly describe the phonological features of Portuguese and Mandarin Chinese, and in section 4 we describe the data and the methodology. Section 5 will be dedicated to the analysis of the data, and section 6 to the final considerations and future research perspectives.

## **L<sub>2</sub> Phonological Perception**

According to several studies it is clear that significant perceptual problems exist in beginning L<sub>2</sub> use late, some problems will persist over a long period of time. But it is still necessary to understand and discuss some of the stimulus and task conditions under which non-native perception is easier, and to know also the stimulus and tasks where significant perceptual problems appear.

Perception is by definition an internal mental and physiological process, perception of phonetic segments/contrasts involves detection of acoustic differences that differentiate phonetic categories and accessing of internalized phonetic categories to make a decision about the identity of the stimuli.

All experimental tests include the presentation of stimuli selected in a special sequence to the participants, they will have to answer based on their phenomenological experiences. Perception of phonetic segments/contrasts often use two general types of tasks: identification and discrimination. Identification tasks comprehend recorded stimulus material that are presented (in a random order) and listeners have to indicate their categorization (for instance phonetic category), providing some sort of oral or written response, or selecting one of a few possibilities, provided by the researcher (some even measure the reaction time). In a discrimination task, two or more stimuli are presented and listeners have to make their decision with special attention to the relationship between the stimuli (are they the same or different). According to Strange and Shafer, (2008), different tasks have been used in L<sub>2</sub> speech perception studies with adults.

Till now most of the studies of non-native phonetic perception have used materials in which nonsense syllables or real words are produced and presented in isolation or in speech context (phrases or sentences). These tasks yield different results. Acoustic phonetic parameters differ substantially according to the speech style (Strange *et al.*, 2007). Reading tasks can also be used in phonology acquisition studies. Yet, such tasks also yield considerably different results when considering spontaneous speech in terms of acoustic structure.

Nevertheless, the experiment on perception of phonetic segment/contrasts in read speech contexts may be generalized to some daily situations.

It is important to underline that even when a perception test imposes a considerable concentration level, late L<sub>2</sub> learners may achieve good results if they have favourable listening conditions: a quiet environment, no distractions, and if the task is well defined from the very beginning. Native speakers can, obviously, tolerate better the non-optimal situations (noise, distractions) than the late L<sub>2</sub> learners.

One common characteristic of adolescents or adults who learn a second language in a late stage is the different way that they accent some phonetic segments and sequences of the new language. The phonetic realization of phonological structures in the L<sub>2</sub> is different from native language patterns. When producing sentences in L<sub>2</sub>, speakers often produce phonetic segments and sequences that appear to be a product of complex interaction between L<sub>1</sub> and L<sub>2</sub> phonetic realization rules (Spanish accented English Speakers; American-accented Japanese speakers).

These late L<sub>2</sub> learners also have difficulties with the receptive aspects of the phonological process. If some phonetic segments are phonologically distinct in the L<sub>2</sub> but not in their native language, these won't be recognized and categorized correctly, what leads to difficulties in comprehension of spoken L<sub>2</sub> language. There are several phonetic perception difficulties for late L<sub>2</sub> learners and that affect L<sub>2</sub> speech production.

All phonetic features that can serve to distinguish phonological segments (contrasts in certain languages) can be differentiated acoustically. For example voicing contrasts between oral stops consonants in English) *pet - bet; bet - bed*, are differentiated by temporal parameters, like VOT – Voice Onset Time for initial stops, duration of consonant closure for medial stops, preceding vowel duration for medial and final stops and also by spectral characteristics. Speech as an acoustical signal is a code in which the phonetic segments and sequences are specified by context-dependent and each language specific acoustic parameters.

Speech perception involves decoding the acoustic signal to recover the phonetic message (Lieberman *at al.*, 1967; Liberman & Strange, 1985). Cross-language studies with infants that were exposed to different languages were examined to determine if acoustic parameters associated with non-native phonetic contrasts were discriminated. For example voiced and unvoiced, aspirated syllable – *p* and *b* – for English and the stop phones /p/ and /b/ for Spanish). The monolingual Spanish speakers showed good discrimination of the aspirated consonants but the same did not happen with the other contrasts. Several studies, for example comparing infants with adults with contrasts in Hindi and English languages, showed that infants perform better and can discriminate better the place of articulation contrast.

In adults it seems that native-language phonetic perception is robust and mechanic. The ability to extract the phonetic message from the acoustical signal even in non-optimal situations (noise, unfamiliar talkers, and distracting

tasks) requires cognitive resources on the part of the native listener, on a perception task.

According to the authors these findings corroborate that very young infants appear to be language-general perceivers.

Language-specific patterns of performance are not related to differences in basic auditory capabilities of adult speakers of different languages, they reflect the language-specific patterns and the acoustic-phonetic relation that they know. All the sequences and their categorization have become automatic even if the listening conditions are not optimal. Strange (2006) refers to these automatic language-specific patterns of perception as Selective Perceptual Routines (SPRs). L<sub>2</sub> SPRs differ from those of native speakers and may never be as fully automated as L1 SPRs.

Studies concerned with vowel contrasts are less well documented, but it seems that the same happens. Applying a perception test, Polka & Bohn (1996) compared the vowels [u/Y] phonologically different in German but not in English [E/ae]. Both pairs were discriminated relatively well depending on the context. The more central vowel [Y, E] were harder to discriminate. The case of these vowels it is in fact a language specification that still needs to be studied.

Many non native contrasts are very difficult for adult listeners on perception tasks, some of these perceptual difficulties are resistant to change even after years of experience with L<sub>2</sub>.

Studies have shown that adult listeners' perception of non-native consonant and vowel contrasts have demonstrated a poor performance when compared with native language listeners for several of the phonetic contrasts. On a study carried out by Flege & Wang (1989) it was reported that native Chinese learners of English could perceive voicing contrasts in final stop consonants in contexts where they had a preceding vowel, closure voicing and release cues. However, when the final consonants were unreleased their performance wasn't so great, and the native speakers could maintain their perceptual differentiation. Pikser (2003) had similar results for native Spanish-speaking learners of English on final stop consonant voicing contrasts; performance on the released stops was below native-speakers levels.

It is also stated by Strange *et al.* (2004, 2005) and Levy (2004) that L<sub>2</sub> phonetic segments that are very different from the L<sub>1</sub> phonetic category will be perceived relatively better. On the other hand, L<sub>2</sub> phonetic segments that are more similar to L<sub>1</sub> will continue to be "misperceived and mispronounced". According some studies done with American and German listeners, in continuous speech contexts, English L<sub>2</sub> learners of German will have much more difficulties differentiating vowel contrasts.

According to Stange *at al.* (2004, 2005) it was surprising to see, when comparing German and English American vowels, that the "front vowels were more similar to front unrounded English American vowels in terms of spectral structure when produced in citation-form syllables, while perceptually they were considered much more similar to English American back rounded vowels in this context. When acoustic comparisons of American English (AE) and

German vowels produced in labial, alveolar and velar contexts were performed, German front rounded vowels were more similar to back rounded AE vowels which are alveolar and to a lesser extent in velar contexts. This means that perceptual similarity judgments appear to be based on context-independent similarities between distributions of native language categories”.

## **Transfer**

According to Major (2008: 63-64), the role of transfer has been the focus of research not only in SLA, but also in education and psychology. In the field of SLA research, the role of transfer was first seen as the main factor affecting L<sub>2</sub> development by the Contrastive Analysis hypothesis (CA). The main tenets of the CA were, basically, that: (i) contrasting the linguistic features of L<sub>1</sub> and L<sub>2</sub> could predict the type of errors produced by the learners; (ii) all errors were due to L<sub>1</sub> transfer.

Selinker's (1972) work produced clear evidence against CA's claims that all errors were due to transfer. Selinker identified errors in L<sub>2</sub> learners' speech that were not due to transfer. Such evidence paved the way to a new concept in the field of SLA research – interlanguage – defined as an intermediate developmental linguistic system, defined according to the following features: (i) language transfer; (ii) rule generalization; (iii) learning strategies; (iv) communication strategies; linguistic universals. Ellis (1985: 50-51), for instance, identifies three main characteristics of the interlanguage continuum: (a) permeable – interlanguage rules are not rigid as in any natural language; (b) dynamic – since interlanguage is a developmental continuum, it changes as the learners incorporate new linguistic elements into the system; (c) systematic – although we can define the interlanguage system as dynamic and variable, it is also possible to identify cross-linguistic systemic features.

The concept of interlanguage is rooted in the generativist framework. Within this theoretical perspective the role of transfer is inextricably related to the degree of access learners have or do not have to UG<sup>2</sup>.

As for the role of transfer in L<sub>2</sub> phonology acquisition, Major (2008: 68) mentions the work Weinreich (1953) who identified different types of phonological transfer: (i) sound substitution; (ii) phonological processes; (iii) under differentiation; over differentiation; (iv) reinterpretation of distinctions; (v) phonotactic interference; (vi) prosodic interference.

## **Background**

As teachers of Portuguese as a foreign language having as students Chinese native speakers we wanted to investigate the obstacles that these

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<sup>2</sup>White (2003) discusses the different hypotheses within the generative framework that propose different roles to transfer due to more or less access to UG in SLA.

students may have when discriminating minimal pairs in European Portuguese. It is supported by the literature that activities such talking and listening are close. In the public domain it is important that the speaker knows if the listener can perceive clearly what is being said. The relation between speech production and speech perception is also important in the private domain in which ‘articulatory mechanisms support talking, and perceptual mechanisms support listening to speech’ (Fowler & Galantucci, 2008: 633). As teachers of L<sub>2</sub> we felt that our students had problems when writing and speaking. Based on these facts we hypothesized that they would probably have the same obstacles on perception of some minimal pairs.

It is known that the phonological elements have their primary differences in the vocal tract and not in the mind (production versus perception) in linguistic terms there are significant actions of the vocal tract that are called gestures (Fowler & Galantucci, 2008: 634). Those different actions or gestures are dynamic and show the difference between pairs like [t] and [d]; [p] and [m]; [p] and [b] and also between [f] and [v]. The differences between minimal pairs are simple to understand if listeners perceive gestures. Nevertheless the pairs that we present just differ on the voiced/unvoiced parameter and not that much on the articulation for European Portuguese.

This is the focus of our study, since to understand someone’s speech (according to Mitterer & Cutler, 2006) and to learn a language it is necessary to recognize words. This means being able to distinguish between words that are very close such as for European Portuguese: [pato] and [bato] or [faca] and [vaca].

According to a study carried out by McQueen & Cutler (2006) ‘listeners come equipped to deal with variability in speech sounds – whether that variability arises from differences among speakers or within a given speaker over time’ meaning that listeners can modify their own perception of utterances produced by a speaker if they feel some unusual characteristics on their speech. When carrying out this study it is important to know that spoken Chinese has nineteen consonants plus three palatals and some syllabic consonants and even when a ‘syllable begins with a vowel, there is sometimes a consonant-like articulatory gesture before the vowel’ (Duanmu, 2007). Some differences that we notice is that Chinese has aspirated sounds of the consonants [p, t, k, ts] what does not happen in European Portuguese. It is also interesting to notice that in Chinese according to the findings of Zhou & Wu (1963: 22), the tongue tip when pronouncing the dentals [ts, ts<sup>h</sup>, s, t, t<sup>h</sup>, n, l] can be on “either the upper or the lower teeth”, which may perhaps help understand why Chinese students do not grasp the correct articulation of some sounds. In a study by Fu (1956: 4) notes that some Beijing speakers use interdental instead of the dentals [ts, ts<sup>h</sup>, s] (Duanmu, 2007), those articulation differences do not cause any distinction between words, since those distinctions are tonal.

This is exactly the main disparity between the consonants in European Portuguese and Chinese. For what we could analyze based on some phonetic transcriptions of Chinese words, it was noticeable the similarity between

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sounds in Chinese that in European Portuguese are minimal pairs therefore representing different words. For example in Chinese (written in Pinyin) we may have<sup>3</sup>:

**Table 1.** *Examples from Chinese Language*

Word	Phonetic transcription	meaning
bin1	[p <sup>j</sup> , in]	guest
pin1	[p <sup>h</sup> , j , in]	piece together
dai4	[tai]	bag
tai1	[t <sup>h</sup> , ai]	embryo
guai4	[k <sup>w</sup> , ai]	strange
kuai4	[k <sup>h</sup> , w , ai]	fast

Those examples come to show that the difference between consonants that in European Portuguese are considered completely different and are minimal pairs in Chinese is not so clear. The difference between *dai4* and *tai1* is tonal. By the phonetic transcription we can see that such difference is given by the aspiration of the consonant. This phenomenon does not occur in European Portuguese, where we do not have tones or aspiration of consonants. According to Duanmu (2007), there is no agreement as to whether we can consider [tai] and [t<sup>h</sup> , ai] as a minimal pair, since this depends on if [t<sup>h</sup> , ] is considered a single sound. The idea of a minimal pair is that two words only differ in a single sound. Even though we consider that these examples can probably help us to explain the confusion that Chinese learners of Portuguese make with pairs like *tia* (aunt) and *dia* (day) or *gola* (collar) and *cola* (glue) where they present difficulties on perceiving the initial sounds. In European Portuguese the contrast is on the voiced – unvoiced characteristic; [p, t, k], (unvoiced) [b, d, g] (voiced).

## Methodology

### *Participants*

The thirty five listeners were all undergraduate students at the University of Macao with an average age between 20 and 24 years old. They are all native speakers of Chinese without diagnosed hearing problems. They were attending the third year of the Portuguese Studies Bachelor during the Academic year of 2010-2011.

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<sup>3</sup>Examples from *The Phonology of Standard Chinese* (2007: 319-329) the number near the Pinyin word represents the tone.



The third year students were selected once that at this point we already expect them to have a better and deeper knowledge of the language.

*Material and Procedure*

According to our knowledge and the studies that we analyzed a first *corpus* for this type of study using European Portuguese minimal pairs to be perceived by native speakers of Chinese was created having in consideration the more common minimal pairs, especially at the beginning of the word, but other contexts were also contemplated such as CCV, VCV and VCC (where C = consonant, and V = vowel).

The *corpus* was constituted by 32 different words, having 16 minimal pairs. Those pairs were selected taking into consideration the difficulties that we have noticed in our students when they write or talk and also knowing that the same words may also be difficult to differentiate by a native European Portuguese speaker when talking on the phone, especially distinguishing [p] from [b] and vice-versa.

Participants were submitted to a perception test. Listeners heard the 16 pairs only one time in a classroom context. At the same time that they were listening they had to immediately select the word that they perceived.

**Table 2.** *Corpus*

Baco		bago	
bala		mala	
bata		pata	
caçada		casada	
chato		jato	
fila		vila	
gola		cola	
inferno		inverno	
já		chá	
mota		moda	
pó		mó	
quadro		quatro	
quando		quanto	
teus		Deus	
tia		dia	
vez		fez	

For this first study we did not take in account minimal pairs with stressed or unstressed vowels or in final position. We also have to report that the students only had audio information. They did not have visual reference.

## Results

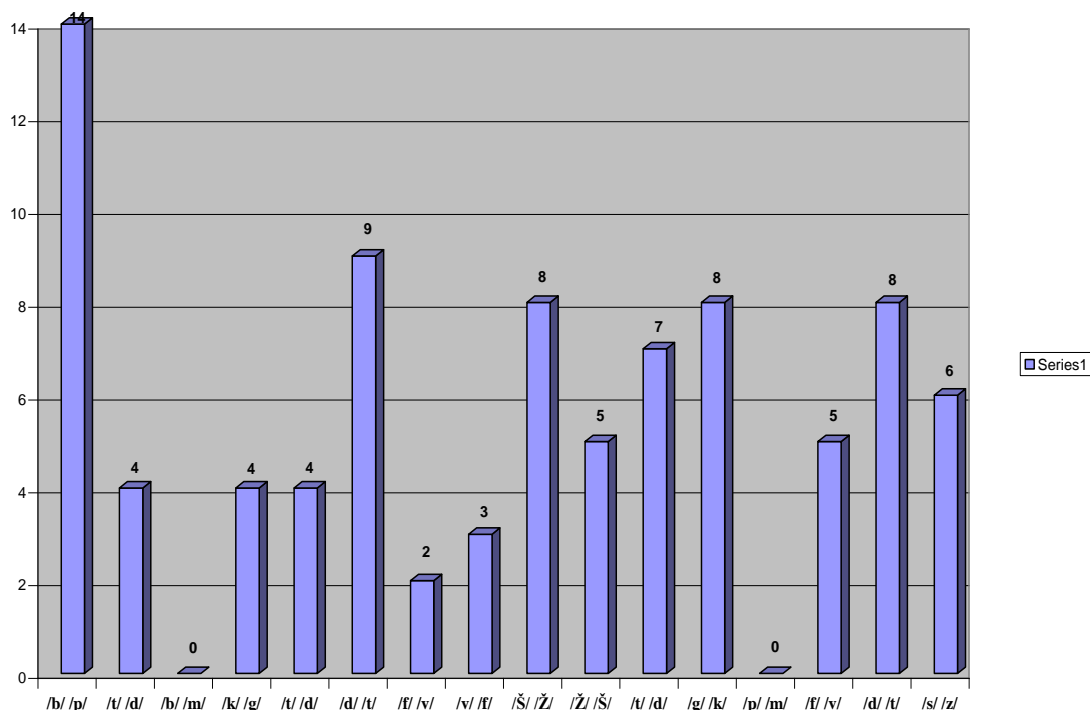
First of all, we have to refer that this is a pilot study which, to the best of our knowledge, is the first on the acquisition of phonological features of European Portuguese by native speakers of Chinese.

We started this work as teachers of Portuguese as L<sub>2</sub> because of the difficulties that we felt our Chinese students have, the reason why we focused our study on minimal pairs. Yet, Spanish learners of Portuguese, for instance, due to the proximity between both languages, show difficulties in terms of perception of these minimal pairs. According to Nunes *et al.* (2006) the proximity of languages can represent an obstacle to the acquisition of the vowel system, namely of European Portuguese. Phonological similarities favour transfer.

We underline here that the *corpus* is very limited; being only a pilot study we expect it will conduct us to the creation of several well supported and different *corpora* to sustain and explain some of the first ideas that we can comprise here. This work is the beginning point of a future and more accurate investigation. This starting point will reveal other aspects that we should concentrate on subsequently.

Analyzing the graphic we can see that some of the problems referred before that we have noticed on written texts of these students are also present on perception tasks, especially the difficulty on distinguish the pair [t], [d].

**Graphic 1.** *Wrong Answers per Case*



From our experimental data we can observe that the pair [b], [p] is the most difficult to distinguish, even if we only have an example this also allows to compare with the pairs [b], [m] and [p], [m] that were the easiest ones and no one failed. Here we can probably assume, and is this that we want to carry out with our future studies, that the difference is better perceived when we have to bilabials. Even if one is nasal, in those cases students did not show any problems.

The results also show that it is more difficult for these learners to distinguish the pair [d], [t] in VCC, VCV and CCV contexts than in initial position. The same happens with the pair [f], [v]. The opposite phenomenon can be seen for the pair [k], [g] that seems to be easier to perceive in initial position.

The distinction between the voiced and unvoiced affricate [Ž], [Š] appear to be also complicated causing some doubts, even if it refers exactly to the same context (even the stressed vowel context) the answers were different. For the last pair that we presented we do not have a comparison but we can notice that there is also confusion on perceiving the difference between [s] and [z].

## **Conclusion**

We may now observe some preliminary results to several of our raised questions as teachers of Portuguese as L<sub>2</sub>. Based on this overview we may create a first and well supported work on the acquisition of minimal pairs of European Portuguese by native Chinese speakers.

This type of research work may well help both teachers and students and it is also necessary to the scientific community serving to know better and understand the differences and similarities of these two languages that can signify an obstacle on the acquisition of a second language.

## **Future Work**

As we already referred, we now want to create a larger *corpus* based on the information that was found in this preliminary study. This new *corpus* will be more vast with several and different examples of all the minimal pairs and contexts (words and text), taking also in consideration the presence or absent of stressed or unstressed vowels and even its articulation.

It will be important to test not only perception but also production (oral and written) and compare the results of both tasks. Comparing results of each test between students from the very first year and the third and fourth year on Portuguese studies, it will also be interesting to compare if Mandarin and Cantonese speakers present the same difficulties.

We also want to observe if there is a difference on the results if the students are submitted to the same test with and without video information, to understand if gestures may or not help on this perception and differentiation.

## References

- Archibald**, John (1998) *Second Language Phonology*, John Benjamins Publishing Phonology, Amsterdam/Philadelphia.
- Cholin**, Joana; Levelt, Willem J. M. (2009) *Effects of syllable preparation and syllable frequency in speech production: Further evidence for syllabic units at a post-lexical level*, *Language and Cognitive Processes*, 24, pp.662-684, Psychology Press, Taylor and Francis group,.
- Doughty**, Catherine J. (2003) *Instructed SLA: Constraints, Compensations, and Enhancement*, pp.256-310, *The Handbook of Second language acquisition*, edited by, Catherine J. Doughty and Michael H. Long, Blackwell publishing.
- Duanmu**, San (2007) *The Phonology of Standard Chinese*, Oxford University Press, Second edition.
- Eckman**, Fred R., Elreyes, Abdullah, Iverson, Gregory K. (2003) *Some principles of second language phonology*, *Second Language Research*, pp.169-208.
- Fowler**, Carol A., Galantucci, Bruno (2008) *The Relation of Speech Perception and Speech Production*, pp.633-652, David B. Pisoni and Robert E. Remez (Eds.) *The Handbook of Speech Perception*, Blackwell publishing.
- Ellis**, Rod (1994) *Variability and the Natural Order Hypothesis*. Ronald M. Barasch and C. Vaughn James (eds.), *Beyond the Monitor Model – Comments on Current Theory and Practice in Second Language Acquisition*, pp. 139-158. Heinle & Heinle Publishers.
- Hayes-Harb**, Rachel, *Lexical and statistical evidence in the acquisition of second language acquisition of second language phonemes*, *Second Language research*, 23, pp.65-94, SAGE publications, 2007.
- Lehtonen**, Annukka; Treiman, Rebecca, *Adult's knowledge of phoneme-letter relationships is phonology based and flexible*, *Applied Psycholinguistics* 28, pp.95-114, Cambridge University Press, 2007.
- Major**, Roy C. (2008) *Transfer in second language phonology*. Jette G. Hansen Edwards and Mary L. Zampini (Eds.) *Phonology and Second Language Acquisition*, John Benjamins Publishing Company, Amsterdam/Philadelphia.
- McQueen**, James M. 2005 *Spoken-Word recognition and production: Regular but not inseparable bedfellows*, *Twenty first century psycholinguistics, four cornerstones*, edited by Anne Cutler.
- Nunes**, Ana Margarida Belém; Duarte, Helena Margarida Vaz; Teixeira, António (2006) *Experimental Phonetics Applied to Portuguese as Second Language: When the distance is not na obstacle*.
- O'Brien**, Irena; Segalowitz (2007) Norman; Freed, Barbara; Collentine, Joe, *Phonological memory predicts second language oral fluency gains in adults*, *SSLA*, 29, pp.557-582.
- O'Brien**, Irena; Segalowitz, Norman; Collentine, Joe; Freed, Barbara; Collentine (2006) *Phonological memory and lexical narrative, and grammatical skills in second language oral production by adult learners*, *Applied Psycholinguistics* 27, pp.377-402.
- Roodenrys**, Steven; Nimmo, Lisa M., *Syllable frequency effects on phonological short-term memory tasks*, *Applied Psycholinguistics* 23, 643-659, Cambridge University Press, 2002

- Rothman**, Jason et al. (2008) Poverty-of-the-Stimulus and SLA Epistemology: Considering L2 Knowledge of Aspectual Phrasal Semantics. *Language Acquisition*, 15:270-314, Psychology Press.
- Schiff**, Rachel; Calif, Sharon, *Role of Phonological and Morphological awareness in L2 oral word reading*, *Language learning* 57, pp.271-298, 2007.
- Scott**, Sophie K., *The Neurobiology of Speech Perception*, Twenty first century psycholinguistics, four cornerstones, eddited by Anne Cutler, 2005.
- Slabakova**, Roumyana (2009) How is inflectional morphology learned? Leah Roberts, Daniel Véronique, Anna Nilsson and Marion Tellier (Eds.) EUROSLA Yearbook, volume 9, Annual Conference of the European Second Language Association, John Benjamins Publishing Company, Amsterdam/Philadelphia.
- Williams**, John N.; Lovatt, Peter, *Phonological memory and rule learning*, *Language Learning* 53, pp.67-121, 2003.