Phonological Awareness Impact on Articulatory Accuracy of the Spanish Liquid [r] in Japanese FL Learners of Spanish

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Abstract
Foreign language learners tend to avoid phonological difficulties and simply transfer sounds whether from their L1 or any pre-existing L2. Phonological awareness (PA) gives students an active role in understanding their own potential in improving pronunciation through several methods. However, such methods are likely to be restricted to only passive learning methods, such as repetition, reading and lectures. In this study, 118 Japanese students of Spanish were tested in their articulation ability of the Spanish liquid [r] segment; the students were divided into two groups: the control group (GA), composed by 59 students, which did not undergo any special PA training, and the PA trained group (GB), composed as well by 59 students, which underwent only one PA intervention. The articulatory accuracy rate of GA for such segment after their first year of language acquisition was 27.16, while for GB it was 72.54 after the PA intervention. The improvement of GB after the PA intervention was highly significant in regard to the learners' phonological accuracy ($p < 0.001$)

Keywords: Phonological Awareness, Articulatory Accuracy, liquid segments, Spanish, Japanese, Foreign Language Learning

Introduction

In linguistics, Phonological Awareness (PA) is a person's sensitivity to the structure of sounds in oral language (Anthony & Francis, 2005); however, in the field of Foreign Language Education (FLE), PA is an instructional approach, especially for young kids, that accompany the students in their path of learning how to read and manipulate segments of speech, including words, syllables, and phonemes (Gillon, 2004); normally at the stage of kindergarten or at the first years of elementary school. Unfortunately, the terms *phonological awareness*, *phonetic awareness*, *phonemic awareness* and even *phonics* have been used interchangeably during the history of oral linguistic research and, although it seems possible to find some more consensus today about them, there is still some ambiguity in their use, especially in the Education field, where authors use these terms unorthodoxly.

Phonological awareness is a broader term including all the other terms and it can be defined depending on the phonological level it is being analyzed. Bernhardt and Stoel-Gammon's model (1994) explains how PA is divided in these levels in relation to its development process: word → syllable → onset-rime → segmental. Furthermore, Phillips *et al.* (2008) and Anthony *et al*. (2003) add a continuum (no-sequential-stage) view to Bernhardt and Stoel-Gammon's model, meaning that students do not need to master a skill of a level before they develop the next level skill, but that they can develop them at the same time. On the other hand, PA mainly oversees the articulatory aspect of the speech, whether or not learners are aware of the place and manner of articulation, voicing, lips use, muscular tension, and other specific concerns. Phonemic awareness, on the other side, relates to how learners segment, blend and manipulate phonemes in order to create and modify word or phrase phonological structures (Gillon, 2004). Finally, Phonics is a learning method to help students understand the relationship between phonemes and

morphemes through sound patterns in prints, mainly with the purpose of preparing learners to be able to accurately read such patterns (Burns *et al*., 2003). However, the latter is a common methodology used in languages with a low degree of grapheme-phoneme correspondence, as it is the case of English, but not of Japanese and Spanish, which have high phonemic orthographies.

Traditionally, and perhaps because some foreign languages own well defined phonemic orthographies, many language instructors tend to reduce or omit language pronunciation contents in their classes, mainly because they consider it as the least valuable compared to other language skills (Elliot, 1995). This is the reason why learning a foreign language (FL) for young adults has resulted in students being forced to utter certain number of foreign sounds without instruction or knowledge about them. Trubetzkoy (1971) explains how FL learners struggle by trying to deal with such load of phonological information carrying on a 'phonological filter' from their mother tongue (L1), resulting most of the time in direct phonological transfers from their L1 or in phonological interferences; and depending of which pair of languages the learners go through as L1 and L2 (i.e. FL), the level and complexity of this phonological phenomenon can widely vary in their oral performance. Thus, Dziubalska-Kołaczyk *et al* (2013) emphasize the importance of PA training of a FL, as well as of L1, so that students are able to overcome several pronunciation problems that are likely to become more evident later in their oral performance. Even if a FL student has phonological awareness skills in their mother tongue, it does not mean they will also be able to transfer such skills to their L2, or if it is the case, to L3 or L4 (Durgunoglu & Onëy, 2002). This has always been an indicator leading to unintelligible speech coming from articulatory inaccuracy and has produced a feeling of frustration and disappointment in both, the FL learner and the interlocutor; therefore, it is recommended to start developing PA skills in students within the first stages of the learning process (Kenworthy, 1987), in order to avoid an eventual counter-productive motivational effect in the learner.

Young children learning Spanish as a first language tend to take longer in acquiring liquid sounds compared to other consonant segments, because it involves a more complex articulatory lingual coordination (Proctor, 2010). Therefore, it is expected for FL learners to take some time in acquiring such phonemes into their phonological repertoire, especially the trill segment [r], due to its intrinsic complexity (Hammond, 2000). However, adult university learners are likely not to have this required time of phonological acquisition, due to the reduced length of the language learning programs they study (unless their major consists of a given foreign language). The time invested teaching foreign sounds can play a big difference in students' motivation and further beyond if learners will be able to get closer to a more native pronunciation (Gilakjani *et al.*, 2011).

Japanese and Spanish are quite different in regard of their origin, syntax, lexicon, writing systems, among many other areas. However, at phonological level, Japanese and Spanish have some similarities (Ueda, 1978), both have five vowel sounds, shared the same stops, most of the fricatives, and more. Nevertheless, as in any other pair of languages, there are some segments not shared in both sound systems, such as the trill segment [r], which is the main subject of this study. Considering the phonetic level, there are also several differences, such as the case of Japanese syllable structure, which certainly interferes in the pronunciation of FLLs (Carruthers, 2006), intonation, rhythm, and other aspects.

The Spanish rhotic [r] is an alveolar apical voiced trill which is one of the three liquid consonant sounds any average Spanish speaker can distinguish; besides the other apical rhotic (tap) [ɾ] and the only lateral [l]. Both Spanish rhotics are only found in contrastive distribution in intervocalic position, while in other word positions they are in complementary distribution; trill [r] prevails in word initial position and in onsets following [n], [l] and [s] segments. On the other

hand, Japanese has only one liquid sound, generally uttered as an apico-alveolar tap [ɾ] (Hattori, 1951) and it occurs only in a CV onset structure. However, it is possible to find the segment [r] in free variation, but culturally its utterance bears a strong 'gangster' stereotype for listeners and is sometimes being used by Tokyo-area male speakers to connote 'toughness' (Vance, 2008); however, because of its connotation of 'vulgarity', it tends to be avoided (Labrune, 2012).

Therefore, it is of high importance that Spanish SLLs are trained to identify the FL distinctive segments; otherwise, minimal pairs, such as *pelo* [pe**l**o] (hair) - *pero* [pe**r**o] (but) - *perro* [pe**r**o] (dog), could lead to numerous misunderstandings when sharing the same contextual environment, as in the following example:

*Ni siquiera tengo ni un **pelo*** (I do not even have a hair)
*Ni siquiera tengo ni un **pero*** (I do not even have a 'but' [objection])
*Ni siquiera tengo ni un **perro*** (I do not even have a dog)

This study intends to unwrap the impact that PA training methodology has on the articulatory accuracy of liquid segments, specifically the Spanish liquid trill [r], of Japanese students of Spanish as a FL. In order to achieve this, the use of traditional instructional methodology for language learning and PA training (using active learning methodology) will be compared in regard of the phonological accuracy achievement of students. Even though the methodology applied is not the main focus of this study, active learning techniques were chosen in order to maximize students' participation and because they are not just student-centered but also highly motivational (Mccarthy & Anderson, 1999). Furthermore, Bernhardt and Stoel-Gammon's traditional PA model footpath will be modified and applied, in order to reach the best achievement possible from learners, avoiding the need to go through each one of the model stages in training of young-adult/adults subjects.

Research Questions

The questions to be addressed within this research paper are the following:

Q1. Do students improve their phonological accuracy of the Spanish liquid trill [r] in a natural FL environment and without any explicit phonological training?

Q2. How much phonological awareness affects the phonological accuracy of FLL after one single PA training intervention?

Methodology

Participants

Subjects recruited were 123 Japanese university students (18+ years old) learning Spanish as a foreign language and being within their first year of language training (considering that only 1 year of FL training is required in their university program; further levels are optative courses). From the students recruited 118 were selected; the rest were discarded due to several factors (lack of material, absences to activities, quality of material recorded, among others). The subject were divided in two groups: Group A (GA) or control group, and Group B (GB) or phonologically trained group. Each group consisted of 59 students; GA group was composed of 27 male and 32 female subjects, and GB group of 29 male and 30 female. Both GA and GB were subdivided in two subgroups (GA1, GA2, GB1 and GB2 respectively); each subgroup represented a university Spanish course (i.e. 4 class groups in total). Even though each subgroup did not consist of an equal number of male and female subjects, both GA and GB seemed to have a statistically fair

number of both gender subjects (Table 1); thus, distinction between GA and GB was analyzed in terms of the gender variability.

Table 1. *Participant distribution by gender*

GENDER	**GROUP A: CONTROL**		**GROUP B: PHONOLOGICALLY TRAINED**	
	Males	Female	Male	Female
GA1	8	18		
GA2	19	14		
GB1			23	8
GB2			6	22
SUBTOTAL	27	32	29	30
TOTAL	59		59	

Assessment Criteria

Both, the control group and the trained group, were assessed throughout their Spanish course, under to the corresponding university course syllabus, which included periodic vocabulary quizzes, compositions, oral presentations and reading video recordings. For the latter, a communicative approach was used in order to assess the students' progress, considering the assessment of fluency, pronunciation, intonation, among others. No examination was specifically prepared to assess the students out of their planned curriculum for both the GA group and the GB group (before training), except for the 5-minute one-to-one interview session used to assess students' achievement after PA training, where the main and only criteria considered for assessment and analysis was the students' phonological accuracy of the liquid sounds.

Data Collection

The control group (GA) did not received any kind of PA training, learning under a language traditional methodology and following the informed university course syllabus. During two terms, students prepared audio/video recordings, mainly for evaluating students' reading and pronunciation skills. As a matter of confidentiality, all recordings were collected in audio format (omitting the video image of students). Such audios were oral examinations based on a set of given texts (Excerpt 1) studied during their program, where structures, vocabulary and others were previously analyzed in class, so that students were familiar to them at the time of recording. Students were able to record their oral examinations as many times as they considered necessary (within a given time) and, therefore, submit the version they felt satisfied with. As a result, an actual 7-months span of 12-audio sets per student was collected and analyzed.

Excerpt 1.

Ramos: *Sí, pasen*
David: *Buenas tardes, señor Ramos.*
Ramos: *Buenas tardes.*
David: *Quiero presentarle a la nueva estudiante, Silvia López.*
Silvia, el Señor Ramos es el director de la escuela.
Silvia: *Mucho gusto, señor Ramos.*

Ramos: *Es un placer, Silvia.*
Bienvenida a Montebello High.
Eres de Ecuador, ¿verdad?
Silvia: *Sí, señor, de Quito.*

The PA Trained group (GB) was assessed before and after the training session. For assessing students before the training, a similar methodology used for GA was chosen; students recorded some audios as part of their course oral assessments and such material was revised and classified. Later on, the students were trained in a 20-minute theoretical-practical session, where they were phonologically instructed on the Spanish liquid segments [ɾ], [l] and [r]. The session was prepared and carried out using active learning methodology, with activities such as crowdsourcing, fishbowl and peer reviewing. After the session, each student had a 5-minute one-to-one interview session with Spanish native speakers (two licensed language instructors), where students were able to reinforced the content learned in the PA training, using re-modeling, minimal pairs and reading activities. At the end of the interview, after students recognized the studied segments in certain lexical units (words), they were asked to utter and differentiate the contrastive segments: [ɾ], [l] and [r] in some selected lexical units. Finally, students' utterances were analyzed by the direct perception method using a checklist, where only five lexical units were selected from the whole set used in the interview session.

Data Analysis

For GA, each audio was analyzed by the direct perception method, supported by a speech analysis software (PRAAT) and spectrographic representation, as recommended by Pearce (2011). From the audio sets, 7 lexical units with the target segment [r] were identified; such lexical units had different utterance distributions varying from 1-4 times per unit (Table 2). Then, after the articulatory accuracy was determined per lexical unit, the data was schematized and rates of accuracy frequency were estimated per subgroup and as a whole. Such rates were compared along the learning process and it was possible to estimate the improvement mean of each GA group. Fisher's exact tests were conducted to verify the statistical significance of both group performances and if there were any difference between male and female subjects.

For GB, audio samples containing the segment were selected from the pool of oral examinations available previous to the PA training, and underwent a similar analysis than those of GA. Different lexical units were assessed for both groups, this because the assessment texts varied in GB1 and GB2. For GB1 most units had the target segment in middle word position: *pizarra* [piˈsara], *borrador* [boraˈðoɾ], *terrible* [teˈ**r**iβle], *Ramos* [ˈ**r**amos] and *perro* [ˈpe**r**o]; while for GB2 the target segment was in word initial: *Raul* [ˈ**r**aul], *regular* [reɣuˈlaɾ], *recreo* [**r**eˈkɾeo] and *aburrido* [aβuˈ**r**iðo] (x2). Articulatory accuracy rates were also estimated. A chi-squared test for independent samples was carried out to ensure there was no difference between GB1 and GB2 articulatory accuracy performances.

For the interview session, five lexical units were selected from the sample: *Ramos* [ˈ**r**amos], *rico* [ˈ**r**iko], *aburrido* [aβuˈ**r**iðo], *perro* [ˈpe**r**o] and *restaurante* [**r**estauˈɾante]; all of them were previously reviewed by students during the course of the term subject and had equal distribution and frequency per student. Checklists were used to determine articulatory accuracy per student and per group. Following the same pathway, chi-squared tests for independent samples were conducted to determine whether there was any statistical significance between both groups (GB1 and GB2) and also between male and female subjects. Finally, in order to analyze

how significant the impact of PA training was within the GB group, a paired unilateral *t* test was performed considering the articulatory accuracy rates before and after the training.

Table 2. *Lexical Units Frequency*

Lexical units	Group A : Average Frequency	Group A : Total Utterances	
		GA1 (26)	GA2 (33)
restaurante	4	99	129
Ramos	3	78	99
Rico	2	50	62
Riqui	1	26	31
guitarrista	1	25	32
Rosa	1	25	32
aburridas	1	26	29
SUBTOTAL	13	329	414
TOTAL		**743**	

Finally, both GA and GB were compared in terms of their articulatory accuracy rates, considering both the initial and final means, in order to analyze in parallel the articulatory accuracy improvement of both groups and the impact of PA training in a FL phonological environment. A Fisher's exact test was conducted to verify the significance of the impact of PA training on the groups' articulatory accuracy improvement.

Results

The phonological accuracy rate varied during the 7-month learning span (see Figure 1) for GA, from the first assessment session ($\bar{x}$ = 18.98) to the last ($\bar{x}$ =27.16). Each one of the oral assessments analyzed was represented with the lexical unit(s) found in the assessment texts. Both subgroups followed a relatively similar progression, even though GA1 performed slightly better than GA2; however, considering their final accuracy rates, such difference had no statistical significance (p = 1.0). Considering an individual achievement level (see Table 3), 30.51% of GA subjects could not utter the target segment [r] in any of the assessment sessions.

Table 3. *General and individual phonological accuracy rates*

General achievement			**Initial individual achievement**			**Final individual achivement**		
	Initial	Final	Accuracy subjects (%)	Partially accurate subjects (%)	Inaccurate subjects (%)	Accuracy subjects (%)	Partially accurate subjects (%)	Inaccurate subjects (%)

GA1	21.79	34.00	7.69	38.46	53.85	0.00	73.08	26.92
GA2	16.16	20.32	3.03	24.24	72.73	0.00	66.67	33.33
GA	18.98	27.16	7.69	38.46	53.85	0.00	69.49	30.51
GB1	12.90	74.19	3.23	35.48	61.29	70.97	9.68	19.35
GB2	16.43	70.71	7.14	32.14	60.72	60.71	14.29	25.00
GB	14.58	72.54	5.08	33.90	61.02	66.10	11.87	22.03

From the other 69.49% of subjects who could partially utter the target segment in at least in one or more sessions, only a 36.59% was above its accuracy mean ($\bar{x}$ = 24.76); in this regard, all subjects who could not utter the segment were discarded, because there was no accuracy involved whatsoever. In relation to gender distribution, there was no statistical difference in their performance (p = 0.262).

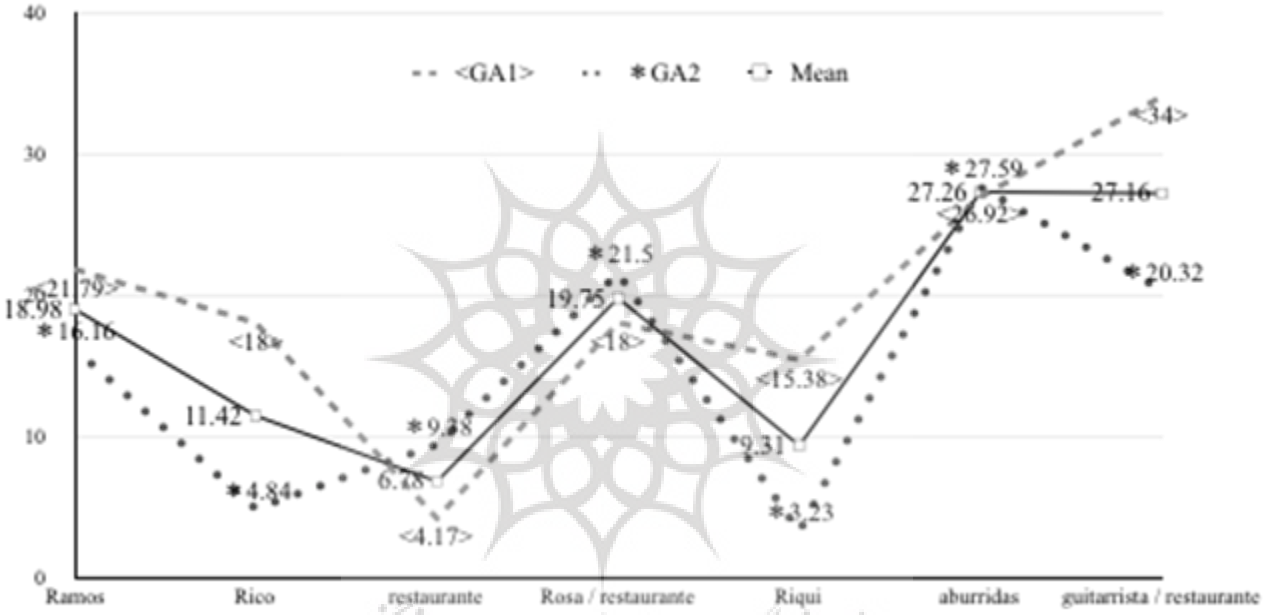

Figure 1. *GA Phonological accuracy rate / learning span*

It was possible to find a slightly better performance in lexical units with [r] in middle position, in the units *aburridas* [aβuˈ**r**iðas], with an articulatory accuracy rate of $\bar{x}$ = 26.92, and *guitarrista* [gitaˈ**r**ista] with $\bar{x}$ = 40.35 (see Figure 2); possibly because their double grapheme *rr* eases its recognition; however, the number of units which such position is not even to the other cases and, therefore, the data is not conclusive. Finally, only an 8.18% of general accuracy improvement could be found for GA after the whole FL learning span.

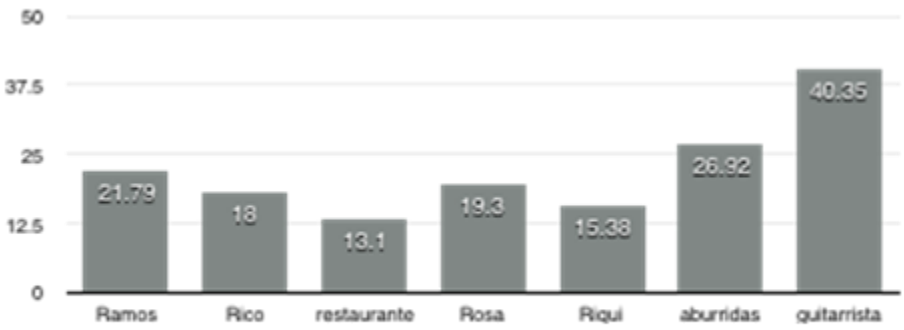

Figure 2. *Phonological Accuracy / Lexical Unit*

GB was measured similarly to GA in terms of phonological accuracy before PA training. As expected, the general phonological accuracy rate followed the same tendency than that of GA ($\bar{x}$ = 14.58). From the latter, 47.83% was above this group's accuracy mean ($\bar{x}$ = 37.39). Only 5.08% of this group was phonological accurate in all the given utterances. Even though there was a different predominance in word position of the target segment, there was no statistical significance (p = 0.781) between GB1 and GB2 performance, considering their general phonological accuracy rates, $\bar{x}$ = 12.90 and $\bar{x}$ = 16.43, respectively. After the PA training session, GB general articulatory accuracy mean had a sharp increase, from $\bar{x}$ = 14.58 to $\bar{x}$ = 72.54, which translates into an immediate high significant impact on FL learners' phonological acquisition (p < 0.001). Moreover, there was no statistical significance comparing both sub-groups (GB1 and GB2), in regard of their accuracy performance (p = 0.701) and gender distribution (p = 0.103).

Furthermore, it is also possible to notice how significant the impact of PA training was when comparing GA and GB's accuracy means. Although both groups started in a very similar articulatory rate, the line progression of phonological articulatory improvement of the target segment is consistent with the results found (see Figure 3), considering that there was only a single PA intervention during the process.

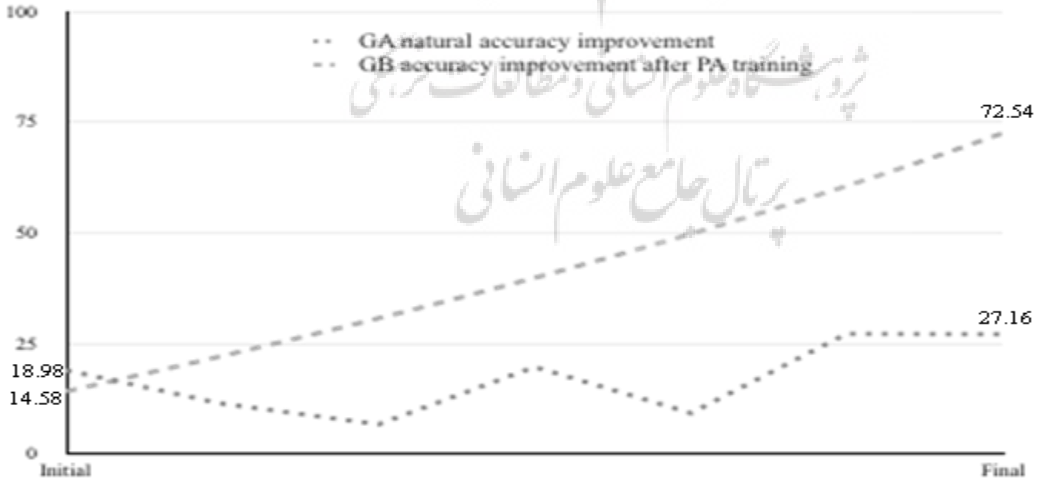

Figure 3. *Phonological Accuracy Improvement*

Therefore, comparing the accuracy improvement means, $\bar{x}$ = 27.16 for GA and $\bar{x}$ = 72.54 for GB, the null hypothesis of phonological improvement in a natural FL environment during the

learning process is rejected ($p < 0.001$), proving that phonological training needs to be included within the FL learning span.

Even though the main aim of this research was to analyze the phonological accuracy of the trill segment [r] after individuals were PA trained, it was remarkable to notice the influence the PA training in the articulatory rates of the other two liquid segments [l] and [ɾ]. Based on Trubetskoy's (1971) 'phonological filter' theory, it was expected that subjects, being all Japanese native speakers, may have not been able to perceive, identify or differentiate between liquid segments (Goto, 1971; Mochizuki, 1981; MacKain *et al*., 1981). However, 96.61% of GB subjects had no difficulty whatsoever in accurately articulating the aforementioned segments after the PA training session.

Discussion & Conclusions

Based on the results found, there is a high significative relation between PA training and the phonological accuracy performance of learners. The more students are aware of the phonological mechanism of their L1 and target FL, the more their phonological accuracy will improve, as it was possible to notice in the results of this study in regard of the Spanish liquid segments. Similar results were found in the phonological skills improvement of FLL university students who received PA training (Huang, Lin & Su, 2004; Moran & Fitch, 2001). Also, other research authors have found that periodical short training could be effective in the development of phonological skills (Bennett & Ottley, 2000; Torgesen & Mathes, 2000); unfortunately, these studies have been only based on young children students. Moreover, it is necessary more evidence to project this results into long-term phonological accuracy performance, which wound need to include other group of segments as well. For it, the design and development of a model that fits these needs has to be implemented in the learners' learning and assessment processes.

Bernhardt and Stoel-Gammon's model seems to fit for instructional PA in L1 young learners, but it lacks a more systematic and reflective (metacognitive) instructional approach for adult FL learners. Not even a continuum view (Phillips *et al.*, 2008; Anthony *et al*., 2003) of the model provides such approach. Furthermore, as most of the PA methodology is based on a phonological hierarchical processing, most activities are designed to address the initial stages of the aforementioned model.

According to the CEFR, students should be able to develop a phonological competence which includes the understanding and use of FL phonemes and their particular contextual realizations, as well as all their distinctive features. In order to achieve this, a wide offer of instructional methodology, including explicit phonetic training, should be provided to (FL) language learners (Piccardo, 2016). Indeed, "PA training has been shown to have an impact on tests of PA and pronouncing words in isolation" (Krashen & Hastings, 2011); even though they did not show any improvement in reading comprehension in L2; therefore, there is the need to implement the enough methodology to make it happen, scaling up from the smallest linguistic level to the ones with more cognitive complexity. Thus, and taking into account the impact PA training could have, based on this study results, an inverted sequential follow-up of Bernhardt and Stoel-Gammon's model seems to suit and fulfill better adult learner's linguistic needs; starting addressing the model levels from segmental → onset-rime → syllable → word → syntactical structures, within the methodological planning of the learning process.

As Japanese and Spanish are languages with high phonemic orthographies and their sound systems share several segments (Ueda, 1978), the understanding of how segments work in both learners' L1 and the target FL, will ease the phonological processing of the students in an initial stage. It seems more logical to have the model backwards, because this fundamental knowledge

may help understand the rest of the levels implicit in the model reviewed, and it might fit the natural processing of language learning students had while learning their L1.

Gatenby (1956) sustains that at the adulthood stage learners have already lost the ability to "hear, identify, imitate and remember groups of human sounds" and therefore are more likely to learn a new language in a more intellectual and explicit way. That is one of the main reasons a model including this systemic phonemic-explicit approach would improve learners phonological capabilities in learning any foreign language.

Adult FL learners, start their language learning path for various reasons but, at the adulthood stage, they might convey into lone communicational purposes. Not all PA skills require to be trained for this aim, but from each one of the PA levels, starting from the phonemic level, it is possible to intentionally extract the most useful ones according to the phonological assessment results found in a learners given group.

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