

PRONUNCIATION PROFICIENCY AND MUSICAL APTITUDE IN SPANISH AS A FOREIGN LANGUAGE: RESULTS OF AN EXPERIMENTAL RESEARCH PROJECT

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Abstract: *This paper examines the correlation between musical aptitude and pronunciation proficiency in an experiment with 29 university students of Spanish as a foreign language. The 29 participants took a test in Spanish pronunciation and prosody as well as in musicality. The pronunciation and prosody test consisted of two parts. The first part was a receptive phonemic discrimination test and the second part was a productive test in which they had to repeat words and sentences chosen for their prosodic characteristics. The musical aptitude test also consisted of a receptive part on musicality in general, as well as a productive part, which included the reproduction of tones, tone intervals, rhythms and the singing of a melody. The statistical analysis with Pearson's correlation-coefficients revealed a positive correlation (although not for all aspects) between the musical and foreign language pronunciation proficiency aptitudes. The results are commented on in the discussion. Relevant teaching implications are included in the conclusion.*

Keywords: *pronunciation and prosody proficiency in a second/foreign language, musical aptitude, Spanish as a second/foreign language research, experimental research, Spanish as a second/foreign language teaching.*

1. INTRODUCTION

With respect to language pronunciation and prosody in a second/foreign language, several recent studies with musician and non-musician adults confirm a positive transfer of musical expertise acquired by nurture to pronunciation aspects, such as, e.g. linguistic pitch discrimination (Marques, Moreno, Castro & Besson, 2007; Lee & Hung, 2008; Cooper & Wang, 2012), segmental and tonal processing (Marie, Delogu, Lampis, Belardinelli & Besson, 2011), and congruous prosody discrimination (Wong, Skoe, Russo, Dees & Kraus, 2007). Similar studies were conducted with babies and children who received musical training before taking a language test in contrast with a control group (Magne, Schön & Besson, 2006; Forgeard, Schlaug, Norton, Rosam, Iyengar & Winner, 2008; Moreno, Marques, Santos, Castro & Besson, 2009; Chobert, Clément, Velay & Besson, 2012; François, Chobert, Besson & Schön, 2013). The results leave no doubt about the fact that music training brings about physical changes, especially regarding motor skills such as unimanual and bimanual responses, as well as cognitive and behavioural changes, e.g. with respect to reading ability and phonemic awareness.

However, the questions we address in this paper do not concern the nurture aspect in the first place. Rather we want to investigate whether musicality in general is related to pronunciation proficiency in a foreign language. It is well known that the term “musicality” has been described in several ways, from a human universal attribute, copying Chomsky's idea of an innate cognitive equipment for language, to the ability to attain high levels of musical expertise, or even simply the ability to enjoy music (Levitin & Tirovolas, 2009). In other words, there is considerable debate among scientists, musicians, and the population at large, as to whether musicality is based on talent, experience or some combination of both. A complicating factor is that “musicality” can manifest itself in diverse – and sometimes no overlapping – forms: one can be expert in compositions, performances, improvisations, listening, editing, etc. Within a given subdomain, expertise can exist primarily for rhythm, pitch or timbre. As a consequence of these very diverse definitions, certain individuals describe themselves as “naturally musical” or “musically talented”, while others do not. With respect to the relationship between this ‘natural’ musicality/musical

talent and pronunciation proficiency in a second/foreign language, several recent studies indicate that persons with a musical aptitude are more proficient when it comes to pronunciation in a foreign language, both on the perceptual and the productive level (Gilleece, 2006; Milovanov, Huotilainen, Välimäki, Esquef & Tervaniemi, 2008; Milovanov, 2009; Milovanov & Tervaniemi, 2011). However, these studies were conducted with school-aged children, whereas our target group consists of young university students aged between 18 and 24. The reason why we focus in this study on young adults, rather than school-aged children, is that we want to examine if this target group, that often undertakes the learning of a new foreign language during higher education, also manifests positive correlations between musicality and pronunciation. More specifically, the bi- and cross directional relationship between both perceptual and productive musical aptitude and pronunciation proficiency will be examined.

The musicality of the participants will be assessed without deliberate previous musical training, meaning that no musical instruction is included in the experiment. Nevertheless, we will survey the participants on their musical skills resulting from demonstrable previous music training in their youth or childhood, and we will take these data into account in the analysis. As for the pronunciation proficiency tests, these were integrated in the Spanish-for-beginners classes, thus with an identical starting position for all participants.

In sum, it is the ultimate goal of this study to look for useful positive correlations between aspects of musical aptitude and pronunciation proficiency in a foreign language. The corroboration of this hypothesis would create interesting perspectives for the development of pronunciation proficiency by reinforcing the musical aptitude of the learners through instruction. However, this is not the scope of the present study, since it is limited to the assessment of the 'natural talent for music' or 'musical aptitude' of the participants as such.

2. METHODOLOGY

2.1. Participants

In a cross-sectional design a population of 29 university students took a perceptual/receptive and productive test on Spanish pronunciation proficiency and musical aptitude. Given the duration of the test parts, they took place during two different course moments. All 29 students are native speakers of Dutch, and absolute beginners in Spanish. Each participant completed a questionnaire to assess their personal, linguistic and musical background.

2.2. Contents of the pronunciation test

In this paper the concept of 'pronunciation' includes both the lexical and supralexical unit, thus including prosodic elements such as second and third degree word and phrase stress, as well as intonation (Hualde, 2005). 'Pronunciation proficiency' is defined by the following factors: i) Spanish being a stress-language, pronunciation includes the pronunciation of sounds, accentuation of syllables and prosody of sentences (including synalepha or elision); ii) since the research is about foreign language acquisition, pronunciation proficiency is only studied in the context of acquisition by a foreign language learner; iii) nevertheless, the standard for evaluation is that of a native speaker, and the pronunciation of the subjects is not only evaluated on its effectiveness and intelligibility, but also on its level of naturalness, given the importance of both criteria according to recent research (Munro, 2008).

The Spanish test was composed of a receptive/perceptual auditory discrimination part (see Appendix 1) and a productive pronunciation part (see Appendix 2). The input received by the subjects was exclusively oral. There was no visual input of text, in order to avoid possible biases of the spelling of the mother tongue of the participants.

The receptive part of the test contained both phonemic and stress contrasts. The subjects were asked to indicate the odd one out in 20 sequences of 3 words each (2 identical and one slightly different): 10 sequences with phonemic differences (exclusively consonant contrasts, because as described in Macpherson (1975:41) standard Spanish has only five basic vowels which are very clearly defined and not easily confused one with the other) and 10 with stress differences (see Appendix 1). The total possible score was thus 20. The recordings of the sequences were made by a native speaker of peninsular Spanish, an experienced teacher of Spanish as a foreign language with a master's degree in Spanish philology.

The productive part of the test consisted of the repetition by ear of 10 words and 5 sentences without any visual input. These 15 elements were selected for their phonetic as well as stress and intonation difficulties (see Appendix 2). The 29 students were all individually recorded and rated by a native speaker of peninsular Spanish who is also a university teacher of Spanish as a foreign language. The rating was made on a scale of 10; 1 being very bad or hardly understandable, and 10 perfect. The maximum score is 160, given the fact that the 15 elements were rated together on a maximum of 150 points, and that a global appreciation of the prosodic proficiency in general was granted for a maximum score of 10 points.

2.3. Contents of the musicality test

As for the perceptual part of the musicality test, we chose to use the test developed for this purpose by Seashore (Seashore, 1967). It consists of six subtests: Pitch, Loudness, Rhythm, Time, Timbre and Tonal Memory. We completed this test with a seventh subtest on stress patterns, given the afore-mentioned importance of contrastive word stress in Spanish, as well as the fact that stress is considered as one of the fundamental perceptual dimensions of music (Levitin & Tirovolas, 2009). In what follows, we describe each of these dimensions in more detail. Pitch or 'intonation' in music is the ability to internalize a sound and recognize it from another sound while monitoring the product with one's inner ear. This is frequently described as possessing 'a good ear'. The Seashore test presents 5 different sound intervals to test this dimension. Loudness, or 'dynamics' in music, is the part of musical expression concerned with the varying degrees of intensity of the sound produced. Again, the Seashore test presents 5 sets of sounds varying in intensity to the listener. Rhythm is the hierarchic organization of beat and accents into measures, and measures into phrases. The Seashore test presents 3 sets of two rhythmic sequences that have to be judged as equal or different. Time, or 'tempo' in music, is about the duration of the sounds, so it determines the speed of a performance. The Seashore test presents 5 sets of sound sequences that differ in length. Tone quality, or 'timbre' in music, are terms that are used to define the differences in tone quality of the same pitch and at varying dynamic levels. This quality is often referred to as 'tone-colours'. Expressive elements in music which influence this timbral perception include dynamics, articulation, breathing, bowing and vibrato. The ability to recognize timbre is important in music because in all performance, players and singers need to identify, differentiate and manipulate the timbral qualities of their instruments and voices to accommodate and vary the style and mood of the music. Timbre does not exist on its own however; it interacts with pitch and duration. The Seashore test includes 5 sequences on timbre. Regarding tonal memory, Seashore states that memory recall is central to the musical mind and performing musician. Both working and long-term memory are crucial to effective music perception or performance. In the Seashore test only working memory with respect to tones is tested with 3 items. Finally, we added a seventh subpart to the test on stress. Stress is a dimension of music that does not exist in isolation, but depends both on rhythm and pulse or meter. Stress is mostly an expressive feature that conveys expression, in the way that it aims to move or touch the listener. Technically it consists in giving more weight or intensity to one sound in a sequence of sounds. We included this dimension because of its importance in a stress language such as Spanish. Therefore, in all, our perceptual test included Seven aspects of receptive musicality were tested through 29 items: pitch (5), loudness (5 items), rhythm (3), length (5), timbre (5), tonal memory (3), stress (3). Each item corresponds to 1, the maximum score being 29.

The productive part of the test was developed by a professional musician, co-author of the paper. It consisted of 5 parts: repetition by hearing of tones to test the tonal memory with respect to both pitch and length, repetition by hearing of tone intervals to measure the pitch or intonation dimension in tonal sequences, repetition by hearing of stress patterns to measure the capacity to reproduce expressive accents or beats, repetition by hearing of rhythm patterns to test the rhythmic dimension, and repetition by hearing of the beginning of a very well-known lullaby in Flanders, namely "Brother John", to test the whole of the forenamed dimensions in a larger sequence. According to their gender, and in order to avoid possible confusion due to octavation problems, the subjects listened to a recording made by a professional male or female singer, both singing teachers at the Artesis Plantijn University College of Antwerp. The productive test was composed of 5 groups of items: the first eight bars of the lullaby "Brother John", pitch (10 items), intervals (5), stress (10), rhythm (10). The rating was made per group of items on a scale of 5, going from very bad intonation and rhythmic expression to excellent. This means that the maximum score was 25. The 29 students were all individually recorded and rated by the co-authoring professional musician.

2.4. Equipment and procedure

All tests were performed in an electronic learning environment language lab. Each student disposed of its own personal computer, and the instructions were given on screen. The input for both the receptive and productive tests was given individually by headphone.

2.5. Statistical analysis

Descriptive statistics were performed using SPSS for Windows (version 20.0, Armonk, NY: IBM Corp). We report the mean scores of the separate productive and receptive items, as well as a global score for both the musicality and language test, all with their standard deviation and minimum/maximum score. Furthermore, we calculated the Pearson correlation coefficient for all items. A result is considered as statistically significant if the p-value <0.05. The results are graphically represented in scatter plots.

3. RESULTS

In total, 29 participants took the musicality and language tests. They also completed a questionnaire with some questions regarding their personal, linguistic and musical background. There were 14 male and 15 female

students, aged between 18 and 24. With respect to their cognitive background, they all followed a secondary education course with immediate access to university education. None of them reported hearing problems or other neurological illnesses. They were all native speakers of Dutch, mastering at least two other foreign languages (French and English), apart from starting with Spanish. They were all asked about their own appreciation as singers. Only 2 of them indicated that they considered themselves to have a talent for singing. One explicitly mentioned that this was thanks to singing lessons. This person (female) followed 5 years of music education (age of onset: 8), and took guitar and piano lessons, as well as singing lessons. The other person (male) that considered himself a good signer, took 3 years of music lessons (guitar) and started at the age of 10. In all, only 8 participants (5 female, 3 male) indicated that they had musical education as a child: for 3 of them this was piano lessons, for 4 of them guitar lessons, and one of them combined piano, guitar and singing lessons. The age of onset coincided with the age at which you can start with subsidised music education in Belgium, that is 8 years, except for 3 students who started later, respectively at 10, 12 and 15 years old. One student only took music education during 3 years (guitar), 1 during 4 years (piano), 2 during 5 years (guitar; guitar, piano and singing), 1 during 7 years (guitar), 2 during 10 years (piano and guitar), and 1 during 11 years (piano). Since the group of students who took music lessons as a child is very small (only 8), the results of this group cannot be considered conclusive.

Below we first report on the mean scores for all tests.

3.1. Descriptives Receptive language test

The test was composed of a group of 10 phonemic items and 10 stress items (see Appendix 1). Each item was scored as 1 point, so in whole the minimum was 0 and the maximum was 20. Both groups were normally distributed. Table 1 shows that the participants showed a similar score on both parts of the test, as the mean scores are identical. With a minimum of 15 out of 20 and a mean score of **17.72**, the scores are to be interpreted as (very) good.

Table 1. Descriptives of the receptive language test.

	N (number of participants)	Mean score out of 10	Std. Deviation	Minimum	Maximum
Phonemic items	29	8.86	1.06	7.00	10.00
Stress items	29	8.86	0.52	8.00	10.00
Receptive test total	29	17.72	1.28	15.00	20.00

3.2. Descriptives Productive language test

This test consisted of 15 items. Each item was scored on a scale of 10 (1: unacceptable, 10: native like), and the whole was also scored on a scale of 10 as a general appreciation of the total performance. This means that the total score was on 160. We calculated the sum score which was normally distributed. The results on this test are rather poor, with a mean score of 83.83, a minimum of 64 and a maximum of only 99.

Table 2. Descriptives of the productive language test.

	N	Mean	Std. Deviation	Minimum out of 160	Maximum out of 160
Productive test total	29	83.83	8.49	64.00	99.00

3.3. Descriptives Receptive musicality test

Seven aspects of receptive musicality were tested through 29 items: loudness (5 items), pitch (5), rhythm (3), timbre (5), length (5), tonal memory (3), stress (3). Each item was scored as 1 point. Again, all scores were normally distributed. The results on this test are rather good, with a total mean score of 22.73 and a minimum of 17.10.

Table 3. Descriptives of the receptive musicality test.

	N	Mean	Std. Deviation	Minimum Out of 29	Maximum Out of 29
Loudness	29	4.14	0.63	2.30	4.80
Pitch	29	3.70	0.54	2.40	4.70
Rhythm	29	2.58	0.29	1.90	3.00
Timbre	29	4.05	0.55	2.60	5.00
Length	29	4.18	0.46	3.20	4.70
Memory	29	2.23	0.65	0.60	3.00
Stress	29	1.85	0.27	1.30	2.30
Total	29	22.73	1.92	17.10	25.70

3.4. Descriptives Productive musicality test

The productive musicality test was composed of 5 parts: the first eight bars of the lullaby “Brother John”, a pitch exercise, an interval, a stress exercise, and a rhythm exercise. Each part was scored on a scale of 5 (1: unacceptable, 5: excellent), bringing the total possible score to 25. All scores were normally distributed. The mean score of 15.90 is rather good, although the minimum is only 6.50 out of 25.

Table 4. Descriptives of the productive musicality test.

	N	Mean	Std. Deviation	Minimum out of 25	Maximum Out of 25
Brother John	29	2.78	1.13	0.00	5.00
Pitch	29	3.19	1.11	1.00	5.00
Intervals	29	3.40	1.04	1.00	5.00
Stress	29	3.21	0.97	1.00	5.00
Rhythm	29	3.33	0.88	1.00	5.00
Total	29	15.90	4.03	6.50	24

3.5. Correlations between scores of productive and receptive language and musicality tests

There is no significant correlation between the productive and receptive language test. Nor is there a significant correlation between the productive and the receptive musicality test. However, the items of the productive musicality test do correlate moderately to strongly with each other (correlation coefficients between 0.41 and 0.89 and $p < 0.05$). The items of the receptive musicality test do not correlate well, except for length that correlates well with tonal memory as well as with timbre. More importantly, there is a moderate, significant correlation between the receptive musicality test and the receptive language test (the correlation coefficient is 0.50 and $p = 0.01$, see scatter plot Figure 1). The results for the stress items in the receptive language test also correlate with the stress items in the receptive musicality test (correlation coefficient 0.42 and $p = 0.02$). When calculating the results for the original Seashore test, we did not take the stress items that we added into account. The results of this test show a similar correlation (correlation coefficient 0.46, $p = 0.02$). The productive tests do not show any correlation. Table 5 below shows the main results.

Table 5. Correlations between scores of productive and receptive language and musicality tests.

		Productive musicality	Productive language	Receptive musicality	Receptive language
Productive musicality	Pearson Corr.	1	0.23	0.21	0.17
	(Sig. 2-tailed)	N.A.	(0.25)	(0.28)	(0.39)
Productive language	Pearson Corr.	0.23	1	0.09	0.12
	(Sig. 2-tailed)	(0.25)	N.A.	(0.64)	(0.55)
Receptive musicality	Pearson Corr.	0.21	0.09	1	0.51**
	(Sig. 2-tailed)	(0.28)	(0.64)	N.A.	(0.007)
Receptive language	Pearson Corr.	0.17	0.12	0.51**	1
	(Sig. 2-tailed)	(0.39)	(0.55)	(0.007)	N.A.

** statistically significant at the 0.05 level.
N.A. not applicable.

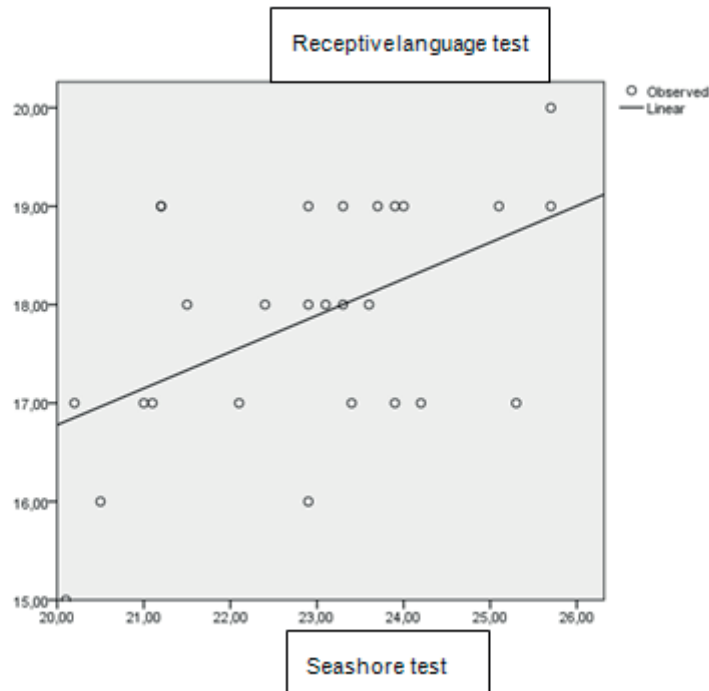


Figure 1. Scatter plot Correlation receptive language and receptive musicality (Seashore) tests.

3.6. Effects of musical education

The participants with previous musical education, only 8 out of 29, obtain for all tests a score that is slightly higher than that of the other participants (mean score for the productive musicality test 16.43 vs. 15.35; mean score for the productive language test 81.43 vs. 77.55; mean score for the receptive musicality test 23.84 vs. 22.56); mean score for the receptive language test 17.86 vs. 17.85). This result seems to be in line with recent research that musical education enhances the auditory processing of linguistic sounds (e.g. Kraus & Chandrasekaran, 2010; Skoe & Kraus, 2012). However, the effect in our research is only significant for the receptive musicality test ($p=0.05$) in this small group. Furthermore, the correlation between the receptive items from both the language and the musicality test is stronger in the group without musical education (correlation coefficient for the group without musical education 0.63 indicating a strong correlation and $p=0.003$).

3.7. Effects of gender

14 male and 15 female participants took the tests. Neither for the language test nor for the musicality test a significant difference regarding gender was found.

4. DISCUSSION

The results confirm that a good receptive auditory capacity in music coincides with the same capacity to make distinctions between phonemes (consonants) and between stress patterns in languages. This means that having a good ear for music is correlated with having a good ear for language, and vice versa, which confirms the findings of previous recent research on perceptual bidirectional transfer between language and music (Bidelman, Hutka & Moreno, 2013).

Nevertheless, no significant correlation could be found between the auditory perception skills for both music and language (receptive music and language tests), and their productive counterparts (productive music and language tests), which means that in this research experiment, listening proficiency is not directly related to productive performances. These results do not corroborate the findings of other studies that do claim a positive correlation between proficient linguistic auditory perception skills and productive pronunciation skills (e.g. Xiaoyu, 2009; Hazan & Kim, 2010;).

Third, the hypothesis that a good productive musical ability (e.g. singing) coincides with a proficient productive pronunciation cannot be corroborated on the basis of this study, which is not in line with several other recent studies either (for an overview see Nardo & Reiterer, 2009).

The fact that our findings are not in line with previous similar research, might be due to the designs of the tests as well as to the profile of the participants. We will first discuss the test designs. Regarding the musicality test, the receptive Seashore test is still considered a standard test in the scientific international world, in spite of its age. We altered the original Seashore test by adding three items focusing on stress, taking into consideration the importance of stress for Spanish. As shown in the results section, the marks on the altered Seashore test were comparable to those of the original test; moreover, the correlation with the receptive language test was even higher in the altered Seashore test. Furthermore, the effectiveness of the Seashore test is supported by the results of a previous study conducted with a group of musician and nonmusician students (Vangehuchten, Verhoeven & Thys, 2013). The results of the Seashore test in this study show very clearly a more developed musical aptitude in the group of the musician students. As for the productive part, this is a non-validated, in-house test, and the data were rated by only one musical expert. The data show excellent correlation between the various items of the productive part. Nevertheless, it is not certain to what extent the ability to reproduce vocally rhythm patterns and melodic sequences by hearing is an adequate means of measuring musicality. In the professional world of music there are ample examples of the contrary; for instance excellent musicians who nevertheless have very poor singing skills (Kleber, Veit, Birbaumer, Gruzelić & Lotze, 2010; Halwani, Loui, Rüber & Schlaug, 2011). Therefore, we think that further investigation on this topic is needed in order to develop a reliable productive test on musical aptitude. With respect to the language testing environment, several other observations that might explain the absence of positive correlations, can be made. First, the receptive test is not very complicated nor very long (Appendix 1). Although it is similar to tests used in other studies, our target public is composed of university students, which might require a cognitively more challenging test. It was, however, used in a previous study with 200 participants (Vangehuchten, Verhoeven & Thys, 2013) and the results allowed us to distinguish very clearly in this study between the 'best' and 'worst' students, corroborating its reliability at this respect. As for the productive test, the output was judged by only one rater and no computerized analysis of the results was made. Therefore, the conditions of the language test design should be improved in further research in order to corroborate the present findings.

With respect to the profile of the subjects, the Ability Differentiation Hypothesis (Spearman, 1927) argues that the correlations between skills in individuals with less intellectual and cognitive abilities are stronger than in individuals with above-average intelligence. In other words, given the fact that the subjects of this study are all university or higher education students, it can be supposed that their cognitive capacities are not only homogeneous but also superior. This might explain why the correlation between musicality and pronunciation proficiency is not confirmed in this study, whereas in other studies, performed with subjects that present heterogeneous cognitive abilities, e.g. a group of randomly selected school-aged children, this correlation does appear. Furthermore, with respect to the profile, there is the possible influence of age. In a review on the CPH (Critical Period hypothesis), Schouten (2009) shows that the most convincing empiric evidence for CPH is to be found in the realm of foreign language pronunciation. Of course, there is counter-evidence to these explanations, e.g. in a study by Milovanov, Pietilä, Tervaniemi & Esquef (2010) with Finnish higher education young adults. However, the study by Milovanov *et al.* (2010) performs the pronunciation tests for English, which really is not a foreign language for Finnish higher education students, but should be considered as a second language. In this respect, there is a great heterogeneity to be noticed in the international bibliography regarding the mother and target language of the test subjects. No doubt this heterogeneity regarding the phonetic and prosodic identity of the mother and target language in the test designs of the different studies, might also explain the divergent outcomes. Hence the need for more and more longitudinal empirical studies with a similar test design.

5. CONCLUSIONS AND TEACHING IMPLICATIONS

In this paper, the link between foreign language (Spanish) pronunciation skills and musicality was investigated in an experiment with 29 university students of Spanish as a foreign language. The results of the experiment confirm that a good receptive auditory capacity in music coincides with the same capacity to make distinctions between phonemes (consonants) and between stress patterns in languages. It is, however, not possible to claim any causality on the basis of this study.

Furthermore, the results show that there is no strong link between auditory perception skills for both music and language (receptive music and language tests), and their productive counterparts (productive music and language tests). This seems to indicate that listening proficiency is not directly related to productive performances.

Also, the hypothesis that a good productive musical ability (e.g. singing) coincides with a proficient productive pronunciation cannot be corroborated on the basis of this study. As stated in the discussion, these findings are not in line with several other recent studies, which might be due to the conditions of the test environments as well as

the profile of the participants, hence the necessity to corroborate the findings in a research setting that takes into account these observations.

Finally, the results of this study do not corroborate other findings that a positive correlation exists between proficient linguistic auditory perception skills and productive pronunciation skills. In other words, the participants with the best score for listening did not outperform on the productive language test the participants with a lower score for listening. This result implies that, although it is obvious to start the teaching of pronunciation skills with listening examples, the practicing of pronunciation difficulties in a foreign language calls for a more diversified approach, one that uses different kinds of strategies depending on the specific context and individual abilities of the learner (as stated, e.g., in Osburne, 2003; Jenkins, 2004; Levis, 2005; Lord, 2005; Trofimovich & Gatbonton, 2006). Therefore, at least when it comes to teaching pronunciation and prosody to students that show a similar profile to the subjects of this study, it seems profitable to combine the intuitive-imitative approach with the linguistic-analytical one, including phonetic transcriptions, articulatory descriptions, vocal tract schemes and images, contrast analysis of the L1 and L2, etc. (CelceMurcia, Brinton & Goodwin, 1996). In this respect, computer-assisted pronunciation training has a huge potential to administer individual exercises to the learner with significant and motivating feedback that does not require teacher mediation (Tanner & Landon, 2009; Peabody, 2011). However, research on how this potential can be used to improve the acquisition process of pronunciation and prosody skills has not been able to keep up, and an empirically founded pedagogical approach is very much needed (Levy, 2009; Olson, 2014). Currently, getting to know the student's response to the potential of technologically assisted learning activities seems to be one of the most important challenges in the training and teaching of pronunciation and prosody in a second/foreign language, as reported recently by e.g. Lear (2013).

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APPENDICES

APPENDIX 1: RECEPTIVE SPANISH TEST

Serrar – cerrar – serrar; Lama – lama – llama; Perro – pero – pero; Vista – pista – vista; Apearce – apearce – afearse;
Tasa – taza – taza; Cocino – cocino – cochino; Odio – ocio – ocio; Hiero – hierro – hiero; Despegar – despejar
– despegar; Crítico – crítico – criticó; Límite – limite – limite; Calculó – calculó – calculo; Secretaria – secretaria –
secretaría; Telefonee – telefoneé – telefoneé; Público – publicó – público; Catálogo – catalogo – catálogo; Vértebra
– vertebra – vertebra; Vacío – Vacío – vació; Hacia – hacía – hacia

APPENDIX 2: PRODUCTIVE SPANISH TEST

Paella; Descenso; Lluve; Euro; Significado; Aéreo; Compañía; Válido; Telefonee; Envidió

Buenos días, ¿qué tal? ¿Cómo estás? (greeting); ¿Cuánto cuesta este teléfono? (asking for information); Lo siento,
ahora no puedo, me necesitan en la oficina. (apologizing); ¡Qué bonito! ¡Me encanta este piso! (appreciation); Ven,
Ernesto, que te presento a mi novia. (presentation)