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Departamento de Filología Inglesa



## **A study of the relationship between musical- phonological stimulation and early reading skills in foreign language learning**

**Memoria para optar al grado de doctora  
presentada por:**

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**A STUDY OF THE RELATIONSHIP BETWEEN MUSICAL-  
PHONOLOGICAL STIMULATION AND EARLY READING  
SKILLS IN FOREIGN LANGUAGE LEARNING**

**ESTUDIO DE LA RELACIÓN ENTRE LA ESTIMULACIÓN SONORO-MUSICAL Y  
LAS DESTREZAS LECTORAS INICIALES EN EL APRENDIZAJE DE UNA  
LENGUA EXTRANJERA**

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Vº B

La directora de la tesis

Vº B

El director de la tesis

Vº B

La doctoranda

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A mi familia

“Music expresses that which cannot be put into words and that which cannot remain silent”

Victor Hugo



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## **INTRODUCTION: MUSIC AND LANGUAGE LEARNING**

The relationship between music and language learning is becoming increasingly popular as an object of study for scientific research in many different disciplines. This is a transdisciplinary research topic which brings many different perspectives and fields of study into the picture, such as neuroscience and neuropsychology, psychology, musicology and applied linguistics.

This study reviews the literature on music and language learning, providing special emphasis on the relationship between musical aptitude, musical training and early reading abilities in young learners' foreign language acquisition. It explores the effects that melodic and rhythmical patterns might have on literacy acquisition in both a first (L1) and a foreign language (FL), along with the possible cognitive benefits that musical training may have on linguistic skills. This study also considers that the pre-existing genetic and individual differences in musical perception abilities may affect the development of early reading skills in English as FL.

Musical training does not only have a beneficial effect on the skills of reading and auditory processing but it can also enhance many other cognitive functions ranging from neuroplasticity, verbal intelligence, working memory and attention to executive functions and creativity. Moreover, music has the power to engage all emotions, from excitement to relaxation, from tears to laughter, and it can also increase self-efficacy beliefs, willingness, effort and motivation towards learning a foreign language. Therefore, musical practice and expertise is linked to enhancements in different research domains unrelated to musical abilities.

From a linguistic perspective, numerous studies have shown the existence of a relationship between the learning-to-read process and auditory skills in a L1. Furthermore, well-established research has evidenced that L1 reading abilities are predictors of second language (L2) reading skills, suggesting that L1 proficiency impacts L2 and FL development. More concretely, research in the process of acquisition of linguistic skills in alphabetic languages suggests that phonological awareness is related with the acquisition of reading skill, supporting the crucial role of phonemic and phonological awareness as strong predictors of literacy skills in either an L1 or L2. Furthermore, as Jongejan, Verhoeven, & Siegel (2007) pointed out, the pivotal contribution of some basic foundational skills in reading development such as the

alphabetic principle, mapping letters into their corresponding sounds, phonological skills, lexical access, naming speed, and word-decoding and recognition are of equal importance for L1 and L2 acquisition. One of the concerns of this study is based on the fact that poor Spanish learners of English as FL lack phonological awareness skills, letter-sound knowledge, naming speed and word-decoding skills. Ascribing our study to the exploration of the reading skills transference from Spanish, a syllable-timed language, to English, a stress-timed language, these problems in the acquisition of English as FL is not only due to differences in terms of the consistency of grapheme-phonemes mappings but also due to the many different pronunciation rules and different isochronic features or distinct rhythmic properties between both languages.

Although the teaching of decoding skills is highly relevant for FL learners and students' reading problems should be solved at the first educational levels where decoding skills are taught, unfortunately the phonological-decoding component of reading has traditionally been forgotten or at least underestimated. However, in recent years there is an increasing interest in English as foreign language (EFL) reading instruction through the use of innovative teaching approaches such as phonics instruction to develop learners' decoding skills. In this regard, and based on the assumption that melodies and rhythm can facilitate languages learning as music and language share auditory cognitive mechanisms, the use of musical input and speech-sound stimulation have been proved effective to learn to read and promote reading success in a foreign language.

Nonetheless, despite the growing body of literature that demonstrates the potential effect of music training and musical perception ability on literacy development in a L1, much less is known about its influence on L2 and FL reading skills. Although the effect is not yet fully explored in this area and, thus, it is difficult to generalize the results to overall L2 learning, associations between music and L2 reading skills learning have also been established since there is a connection at the prosodic level. Both in reading aloud and silent reading, the graphemes that the eye deciphers are supported by sound elements such as phonemes, accent, rhythm, and intonation, that is to say, the prosody of language (Fonseca-Mora, 2013). Working with the prosodic, melodic and rhythmical properties of language and, therefore, with musical processing skills such as pitch and rhythm in the FL classroom provides a springboard to enhance the development of FL learning acquisition. These elements constitute a first step of great relevance in order to have lexical access and develop fluency and reading comprehension in a FL. Additionally, as

a cross-linguistic transfer has been observed, and Sadakata and Sekiyama (2011) stated that L2 proficiency should not be explained in terms of musical expertise alone but that L2 proficiency is significantly influenced by L1 proficiency, it is reasonable that music and language training effects on FL reading acquisition depend on a third variable, such as L1 skills.

In conclusion, this review sheds light on the potential benefits of musical abilities and training for optimizing linguistic cognitive processes and helping language learning acquisition. Of particular interest is the fact that musical training based on melodies, rhythm, phoneme discrimination and chord duration may be a valuable approach to promote early reading skills in a L1, L2 or FL acquisition. Therefore, the relationship between musical training, musical abilities and the development of reading skills, more precisely the influence of musical-phonological instruction on foreign language-reading skills and on students' cognitive factors are some of the main issues explored in this thesis.



## READING GUIDE: CHAPTERS

**Chapter 1** begins by laying out the theoretical dimensions of the relationship between musical-phonological stimulation and the development of early reading skills in first and foreign languages.

**Chapter 2** determines the general objectives of this doctoral dissertation as a compendium of articles, together with the premises and main research questions addressed in this study.

**Chapter 3** refers to the methodology carried out in this study. This chapter describes the main aims and contributions of the meta-analysis on the effects of music training and musical aptitude on the development of reading skills that was conducted in the first published study of this dissertation. The purpose of this meta-analysis is to investigate the current state of the issue and select the most-frequent multidisciplinary research instruments needed for the study of musical influence on language reading skills in order to replicate this study in a foreign language. Furthermore, in light of the results obtained in the meta-analysis, this chapter also describes the procedure and the problems found for the study of musical-phonological stimulation and reading skills. Among these procedure is to select the appropriate diagnostic test batteries for early reading in L1 and L2, so in this chapter a review on the following early reading assessment tests in Spanish and English is also presented: DIBELS, DRA, Woodcock-Johnson and EGRA. More precisely, this section explains how two well-known early reading assessment tools (DIBELS-6 and EGRA) have been used in different pilot studies and analyses the EGRA instrument in detail.

Based on the previous review on early reading assessment tests in L1 and L2 described in chapter 3, **chapter 4** describes the study in which the *Oral Reading Fluency* task from the literacy assessment tool DIBELS was administered to Spanish-speaking learners of English as foreign language. This study examines whether a training programme based on reading aloud texts in English on a daily basis and a minute and working on the understanding of these passages can improve oral reading fluency and reading comprehension in 14-15-year-old EFL learners.

**Chapter 5** describes the experimental study carried out in this doctoral dissertation. It focuses on the effect of a phonological training programme, with a without musical support, on the development of young learners' early reading skills in English as a foreign

language. This musical-phonological training programme is characterized by the use of musical activities such as song melodies in video-clips and rhymes paired with phonics for auditory and phonological stimulation and to aid learning to read in English as a FL.

Finally, **chapter 6** summarizes the main findings from each study included in this doctoral dissertation. It also contains the discussion and some conclusions with regard to the study of the relationship between musical-phonological stimulation and early reading skills development in English as a foreign language. Furthermore, some methodological issues that arose from results will be provided as well as suggestions for future lines of research.

## **CHAPTER 1: THEORETICAL FRAMEWORK**

### **1.1. The concepts of musical aptitude and linguistic aptitude**

Musical aptitude or ability has been defined by Gordon (1995) as one's ability to hear and internalize music that is no longer present in the physical environment. Among the 20 dimensions approximately of musical aptitude, the two dimensions having the greatest influence on Western music learning are rhythm and tonality, the latter including melodic and harmonic pitch (Gordon, 1987, in Pei, Wu, Xiang, & Qian, 2016). In this vein, it can be said that musical aptitude or ability is described as the perceptual ability of discriminating tonal and rhythmic patterns and the productive ability of imitating these patterns retained from instant short-term memory. The processing of musical stimuli such as pitch and rhythm can be defined as the reception or perception of sounds emitted with varying auditory frequency that are grouped in accordance with a prescribed system (Gardner, 1993). According to Patel and Peretz (1997: 202), rhythm may be defined as "the temporal and accentual patterning of sound". Rhythm refers to stressing the notes according to the musical sense of the phrase, that is, a rhythmic structure consists of durations of notes in a musical composition and their underlying hierarchical beat structure (Anvari et al., 2002). Tonality refers to notes with particular pitches and durations which are linked according to rules specific to a musical system to form melodies and harmonies (Anvari et al., 2002). Tempo is a subordinate concept of rhythm as it is related to speed, the same as timbre is for tonality or pitch.

Most of the studies that investigate aspects of musical perception and production abilities compare the performance of musicians or musically-trained individuals versus non-musicians or non-musically trained individuals on musical aptitude, linguistic skills and cognitive factors. However, the concept of musical aptitude or ability can be considered under different perspectives depending on whether development of music is by nature or nurture. Many studies indicate that receiving formal musical training can enhance performance on musical aptitude tests. That is, those individuals who receive extensive musical training and active exposure to music have higher levels of performance to specific type of musical stimuli than untrained individuals (Tsang and Conrad, 2011). Nevertheless, musical ability should not only be measured taking into account the extent of musical training since musically untrained individuals may possess strong musical skill and proficiency the same as individuals who receive extensive

musical training do not always reach higher levels of musical competence than those without musical training (Law and Zentner, 2012). According to these authors, the earlier are called “musical sleepers” as they are individuals whose musical skills are present but inactive either because they are undiscovered or because different conditions may have prevented their development. The latter are called “sleeping musicians” and are those individuals who have accomplished musical qualifications and extended musical practice but their musical expertise and skillfulness has, however, decreased.

Therefore, having a high musical aptitude and musicality can be an acquired skill, the result of periods of training and practice or an instinct that encompass the definition of a mainstream individual’s innate giftedness and potential for learning music before formal training and achievement (Law and Zentner, 2012; Gordon, 1997). This understanding of musical aptitude or ability as an inherited talent development in music compared to musical training is also based on notions of musical intelligence and individual differences in musical capacities, as for instance, one’s ease or speed to perceive and reproduce melodic and rhythmic patterns, learn to play a musical instrument, read musical notes or sing and intone tunes, for instance, in a chorus. In fact, according to Gardner (1993), the majority of the population display musical instincts and these can be developed with practice, through schooling and learning.

Similarly, Carroll (1981) described foreign language aptitude as “the individual’s initial state of readiness and capacity for learning a foreign language, and probable degree of facility in doing so” (p. 86). Therefore, both musical and linguistic aptitudes are related to the capacity or level of competence the learner can achieve and the facility by which the individual learns and progresses. Additionally, the concept of musical aptitude is incomplete if we do not consider the performance of music, as it has been previously described, that despite not being present or recognizable in our physical environment, it has been reproduced as it was retained from our immediate memory. In the same way, the phonetic coding ability refers to the capacity to decode unfamiliar letter-sound mappings and verbal information that after being retained in the short-term phonological memory, it is later recognized and automatized from long-term memory.

Research has shown that there are shared basic learning processes and sound processing skills required for language and music abilities. That is, some auditory analysis skills critical for language and reading development such as blending, combining and segmenting sounds (Wagner and Torgesen, 1987) are similar to those skills necessary for

music perception, such as rhythmic, melodic and harmonic discrimination (Lamb and Gregory, 1993; Anvari et al., 2002). The cognitive mechanisms employed in music perception to discriminate sounds and pitches, segment them into relevant units associating them with their corresponding symbols, and to recognize compositions across variations in pitch, tempo, performer and context are similar to the processes of decodification required in language (Anvari et al., 2002: 112).

Thus, given that musical aptitude and language aptitude are centered on coding auditory input and shared common sound processing skills are required for linguistic and music abilities such as a reliance on auditory neural mechanisms, it is conceivable that high musical ability, musicality or musicianship and musical training may significantly improve the phonetic coding ability. This phonetic coding processing may influence linguistic skills such as receptive phonology, reading and pronunciation in either a L1, L2 or FL. In this vein, it has been evidenced in literature that students who have high musical aptitude or those who have an accurate ear to music seem to obtain better results on L1 phonological and reading tests than those who have less “musician advantage” (Kraus and White-Schwoch, 2016) for sound processing (Anvari et al., 2002; Lamb and Gregory, 1993). On the contrary, Patel et al., (2008), among many others, demonstrated that people with deficits in perceiving musical sounds very often face with similar learning difficulties in discriminating linguistic prosody. Regarding L2 studies, Slevc and Miyake (2006: 675) revealed that having musical ability means having a “good ear” for perceiving foreign speech sounds. In fact, they showed that ‘individuals who are good at analyzing, discriminating, and remembering musical stimuli are better than other people at accurately perceiving and producing L2 sounds’ (p.679). Moreover, they emphasized that the musical aspects of speech may be an effective learning strategy to improve L2 acquisition. Likewise, Pei et al. (2016) concluded that musical aptitude could predict and affect FL phonological production.

## **1.2. Commonalities between music and language**

Music and language share some parallel skills, being of crucial importance rhythm and melody. Fonseca-Mora (2000) points out that music and language share some intrinsic features such as pitch, volume, prominence, stress, tone, rhythm, and pauses and that both capacities are learnt through exposure. Similarly, Anvari et al. (2002) stated that

“as with language, acquisition of musical structure occurs without formal musical training, simply through every-day experience with music” (p.113).

As we have previously stated, research has shown that similar cognitive processes are involved in discriminating phonemes and musical notes, letter-sounds patterns and musical symbols, that is to say, similar decoding processes are used in learning how to read verbal or musical texts. Hansen and Bernstorf (2002: 17) compare the skills used in text reading, music-symbol reading and music-text, and reported that learning music and learning language and reading processing skills share the following abilities: phonological awareness, phonemic awareness, sight word identification, orthographic awareness, cueing systems awareness and fluency.

Consistent with this, Tierney and Kraus’s review (2013a) explains that all the abilities and cognitive or neural functions underlying reading acquisition are processes which have been shown in neurophysiological studies to be enhanced by musical training and expertise. These authors stated that the following abilities are all called upon in the process of learning music and reading: precise temporal and frequency representation, rapid auditory processing, perceiving a signal in noise, auditory working memory and auditory or sound-pattern learning.

Sloboda (1989), Patel (2003b) and Gordon (2003, 2007) have established the similarities between music and language as can be seen in Table 1. Nonetheless, although music and language depend on the same auditory analysis skills there are distinct capacities, so the differences among them have been traced too by many authors, such as Mithen (2005). These similarities and differences between both capacities established by the previously mentioned authors are summarized in Table 1.

Table 1.

*Similarities and differences between language and music*

Similarities	Differences
Both are universal and specific to human beings.	While a language normally needs to be translated into another language, it doesn't make sense to translate music to another culture.
They have three modes of expression: vocal, gestural and written.	Although many people are only competent in one language, most people are familiar with different musical styles.
Speech and song are spontaneously developed at the same time.	Musical rules don't provide meaning whereas grammar provides meaning to language
The natural environment is auditory – vocal.	The range of musical styles evolve and progress quite quickly in comparison to the grammar of a language
There is a human ability to create an unlimited number of new sequences using musical contours or words.	While language asks about the real world, objects and relations, music doesn't have this manipulative function.
Rhythm and melody are essential elements	Music poses less cognitive demands than language
Both follow a fixed order in structure through use of words or musical notes creating a sentence or a melody	Emotional expression is essential in music but not in language.
The first capacity that emerges is that of receptivity and then, consequently that of productive ability	Despite the fact that temporal structure and rhythmic organization play an important role in both language and music, the metric is specific to a piece of music, and the suprasegmental structure of language prosody is less specific and more variable
Both are culture-bond.	The numbers and variety of tones are similar in all cultures, whereas the numbers of phonemes connected to language vary.

Source: Fonseca-Mora, Toscano-Fuentes, & Wermke (2011: 2)

### 1.2.1. Melodies in language learning

As many studies conducted with neuro-imaging techniques and with musicians and non-musicians have shown, the brain is activated on a bilateral level when music and language are studied together. While prevailing language functions such as grammar, vocabulary, the prosody of language (such as intonation and stress), pronunciation of words and understanding are often lateralized to the left hemisphere, melodic expressions, rhythm and tonality in singing, emotions and artistic expression are mainly processed by the right hemisphere. Music is a potential and beneficial instrument for language learning

since musical activities and songs help develop auditory perception, metacognitive knowledge, and aid phonological memory, increase sensibility and motivation and improve concentration (Fonseca-Mora, Toscano-Fuentes, & Wermke, 2011). Therefore, these authors suggested that using music training and songs for language learning can produce an ideal situation since melodies activate and involve the cooperation and integration of both brain's hemispheres in the learning process as well as they help to develop the four skills: listening, speaking, reading and writing. Thus, generally, the left temporal lobe processes speech perception, speech production and prosody, so it interprets the sound patterns that form words and associate these patterns with meaning, whereas the right temporal lobe interprets musical patterns such as pitch and rhythm, musical sounds or the changes in the vocal quality when singing that help to express emotions. Additionally, verbal memory predominantly corresponds to the left hemisphere. Therefore, when we are learning words and studying language we are using the brain's left hemisphere, the analytic one, but melodies and repetitions stimulate the right hemisphere, the creative and artistic lobe, that interprets musical capacities (Pei et al., 2016).

### **1.3. Music and early language acquisition**

Neurophysiological, psychological and linguistic evidence has shown that music cognition plays a robust role in early language acquisition. Both music and language are unique, innate, human capacities that require attention to acoustic features. Moreover, musical and linguistic skills develop along parallel and similar lines after the first year of life (Brandt, Gebrian, and Slevc, 2012). This commonality suggest that music and language acquisition is activated at a very early stage; indeed, some medical studies have confirmed that foetus can hear acoustic signals and external musical stimuli in their mothers' womb about two months before they are born (Crade, & Lovett, 1988; Hepper, 1988). This evidence indicates that sound perception and its auditory memory are some of the earliest processes to be developed since they have started before birth (Fonseca-Mora, 2000). In fact, Brandt et al., (2012:12) claimed that for the first year of life, babies listen to language not only for emotional content but also for its rhythmic and phonemic patterns and consistencies. Thus, newborns are sensitive to a variety of linguistic aspects which are based on the musical aspects of language. Actually, speech directed to infants or "motherese" are characterized by musical features such as abundant repetitions, extreme intonation, slow tempo and exaggerated melodic expression such as high pitch

and slow pitch contours with up and down patterns (Anvari et al., 2002; Fonseca-Mora, Toscano-Fuentes, Wermke, 2011).

Howard Gardner's (1999) *Theory of Multiple Intelligences* includes music as one of the nine types of intelligences, being the others the verbal-linguistic, logical-mathematical, interpersonal, intrapersonal, bodily-kinesthetic, spatial, existential and naturalistic intelligences. According to him, musical intelligence is the first intelligence to be developed in human beings as it is impossible for children to avoid the many external sounds that surround them. This intelligence is defined as the capacity to perceive, value and create musical forms (melodies and rhythms) and includes sensitivity to rhythm, melody, timbre or tone of a musical piece. It is our innate musical intelligence that makes us capable of producing speech efficiently; in fact, when babies are developing the first steps for the acquisition of speech, such as "cooing" and "babbling", and they are not still familiar with the sounds of language before producing words, they are already able to imitate rhythm and prosodic contours and to distinguish phrases, words, vocal sounds or phonemes "according to an intuitive, and innate sense of pitch, melody and rhythm in a fashion directly akin to the composition of music" (Newham, 1995-1996: 67, in Brandt et al., 2012). These coos, babbles and even the mitigated cries that are the first sounds babies emit, are produced in variety of melodic forms at the very early phases of L1 acquisition (Wermke & Mende, 2006; 2009; Wermke, 2002). These musical aspects of language, which are developed before babies are able to pronounce a single word, will be later replaced by phonemes.

Moreover, young infants are particularly attentive to the sounds they hear around them as early childhood is the optimal period to develop and nurture musical ability (Gordon, 1993, 2003) which will enable them to learn their own native language, being sensitive to its intonation, melodic contours, and tonal and rhythmic properties. In this vein, evidence has shown that young infants prefer their mother's voice to that of a stranger and show preferences for their native languages (Moon, Cooper, & Fifer, 1993) and their rhythmic characteristics (Friederici, Friedrich, and Christophe, 2007). In the same line, they also show an early attention to the prosodic and melodic aspects of their first language (Friederici, 2006). Furthermore, as with speech perception, infants show early sensitivity to some musical features, such as rhythm (Baruch and Drake, 1997) or melodic pitch structures and tonal sequences (Schellenberg and Trainor, 1996), whereas other features are specific to a musical system and thus need to be learned (Anvari et al.,

2002:113). Habib and Besson (2009) stated that there is a sensitive period from birth until around seven years onwards when structural alterations in music are less salient in children's brains.

Therefore, melody, of both speech and music, is especially significant during the early phases of L1 acquisition since it is seen as a forerunner of a codified abstract meaning in the linguistic sense acting as a scaffolding during early L1 acquisition, from the simple melodies during the first week of life to the first spoken words (Fonseca-Mora, Toscano-Fuentes, Wermke, 2011: 4). Interestingly, Wermke et al., (2007) showed that a disturbed melody development during the early phases of L1 acquisition correlates to language disorders in later years. The framework function of melodies in the early stages of L1 acquisition also means strong similarities for an effective L2 acquisition. The use of nursery rhymes, for instance, work so well with children to foster phonological skills (Bolduc and Lefebvre, 2012) because they reinforce the musical features of language providing a richer context for language learning during either the L1 or L2 acquisition process. They combine the effects of simplifying our vocal behavior while singing, that is, words are shorter, sounds are clearer and repeated more often, they usually rhyme and the musical features such as rhythm and pitch are exaggerated in both speech and song. Related to FL learning and acquisition, it is also interesting to note that the same as the starting age to play a musical instrument seems to play an important role in music practicing success (Bidelman and Alain, 2015; Schlaug, Jäncke, Huang, Staiger, & Steinmetz, 1995) since as it has been previously stated early childhood is the optimal period to develop and nurture musical ability, it is also known that foreign language learning is more fluent when it has been started before adolescence (Johnson & Newport, 1989).

Taking all these references into account, we could argue that language can be considered as simply a type of music for a child since the process of learning the sound structure during early language acquisition is strongly based on the musical aspects of sounds, such as rhythm, timbre and melodic contours. The use of these musical aspects of speech and simple melodies acts as a scaffold system for children during early acquisition to later develop literacy skills. Thus, once children's ability to recognize the prosodic and musical patterns of sounds at a very early age develops, they begin to attach meaning to the musical and language units and at approximately six months they are able

to produce their first vocalizations and musical sounds in an indistinguishable way, such as the vocal and music babbles (Runfola, Etopio, Hamlen & Rozendal, 2012).

#### **1.4. The importance of early reading skills in L1 and L2 learning**

One major issue that has dominated the field of language learning for many years concerns literacy skills. They have been defined as basic, essential instruments for an individual's personal, intellectual and social development (Fernández-Corbacho, 2016), as well as for other cognitive and affective factors, such as imagination, maturity, willingness, motivation, self-efficacy and autonomy.

Reading, as crucial language ability for success in formal education, is at the heart of our understanding of FL contexts as written texts are a very significant form of input. Some undeniable effects of reading on FL learners' acquisition are the improvement of their reading fluency, comprehension and expression, the enhancement of their vocabulary in particular and a higher competence of language in general.

There are five essential components of reading, namely phonemic and phonological awareness, phonics, fluency, vocabulary and comprehension. The development of the reading components is a continuous and overlapping process in any language; in this vein, Biggs, Homan, Dedrick, Minick, & Rasinski (2008: 201) affirmed that that reading comprehension depends on good decoding skills:

*“...the reader moves from familiarity with the sound-symbol relationship to automaticity with words, thus allowing the opportunity to direct his limited attention and cognitive capacity to comprehending the text. The number of students who struggle with fluency is not trivial (...). This struggle greatly affects their reading and causes them to focus inordinately on decoding, leaving insufficient resources to be applied to text comprehension.”*

That is, reading problems occur at the basic foundational levels of the reading acquisition process due to failure to quickly decode visual and orthographical information. Then, attention, memory and comprehension skills will derive from the preceding emergent skills.

Early skills in reading development such as the alphabetic principle, phonological processing skills, letter-sound knowledge or mapping letters into their corresponding sounds, lexical access, naming speed, and word-decoding skills (Hulme & Snowling, 2013; Melby-Lervag et al., 2012; Seymour, Aro, and Erskine, 2003) have been defined as highly important abilities for an efficient development of literacy acquisition and success either in a L1 or in the learning of any other language (Sparks, Patton, Ganscho, & Humbach, 2009). In fact, Jongejan, Verhoeven, & Siegel (2007) stated that phonological skills, lexical access and word recognition are of equal importance for L1 and L2 acquisition since they are considered to be basic foundational skills developed at the first phase of the reading skill acquisition (Seymour et al., 2003). Decoding and oral reading fluency skills are strongly related to better reading comprehension in both a L1 and a L2.

As regards some theoretical underpinning related to decoding skills in a FL learning, it is important to note that impairment of phonological assembly at the sub-lexical or pre-word stage leads to an inability to construct a correct pronunciation at the word level, and thus to access meaning in a FL. Another relevant element in FL learning is the phonological loop, considered a language learning device (Baddeley, Gathercole & Papagno, 1998) which stores unfamiliar sound patterns while more permanent memory records are being constructed. Furthermore, Erler and Macaro's study (2011) showed that deficiencies in phonological decoding ability and word segmentation are related to lack of self-efficacy and have a negative influence on learners' willingness to continue studying the foreign language. Similarly, Fonseca-Mora, Ávila and Segador (2015) concluded that good phonological decoding ability and word segmentation are related to stronger self-efficacy beliefs and have a positive influence on learners' willingness to continue studying the foreign language. Taking into consideration that there are plenty of variables that could explain FL learners' low performance on reading, it is also worth-mentioning the three variables considered relevant for L2 and FL reading ability developed by Koda (2005:25): (1) L1 reading ability, (2) L2 proficiency level, and (3) L2 decoding ability.

Assigning our study to the examination of the reading skills transference from Spanish to English, it is important to highlight Cummins' *Interdependence Hypothesis* (1981) which stated that reading skills are learnt in L1 and then transferred to L2, suggesting that literacy development in L1 is likely to influence L2 or FL reading ability. In fact, Chuang,

Joshi, & Dixon (2012) and Sparks, Patton, Ganschow, Humbach, & Javorsky (2008), among others, have shown L1 reading skills to be predictors of L2 reading skills. Researchers have therefore concluded that the development of early reading abilities in L1 is highly relevant for the subsequent acquisition of full literacy in any other languages to be learnt. Additionally, studies from last three decades have studied the transfer between L1 and L2 reading, showing high correlations between the alphabetic principle, phonological awareness skills and word decoding skills across languages (Bruck & Genesee, 1995; Cárdenas-Hagan et al., 2007; Dickinson, McCabe, Clark-Chiarelli, & Wolf, 2004; Durgunoğlu, Nagy, & Hancin-Bhatt, 1993; Leafstedt & Gerber, 2005; Lindsey, Manis, & Bailey, 2003)

Regarding FL learning and teaching, much of the emphasis in the language classroom is on training learners' reading comprehension skills while assuming a direct transference from what students already know as regards their phonological decoding skills in the L1. While reading, EFL learners tend to rely on their L1 decoding abilities and may transfer this knowledge to the L2; however, variation in the consistency of letter-sound mappings and the grain size of lexical representations develop differently across languages (Ziegler & Goswami, 2006) and, thus, certain problems may arise for learners whose mother tongue depends on very different pronunciation rules from those in the L2. In the case of Spanish learners of EFL, for instance, the L1 may play a disruptive role in the process of mapping letters into sounds as Spanish is a transparent language, with a consistent phonemically-based orthography, in which the phonological information is visually accessible and easily codified through grapheme representation (Vokic, 2011: 396) and, on the other hand, English is an opaque language and very inconsistent in small reading units since one letter corresponds to a single phoneme. Nevertheless, English is more regular in syllabic and intrasyllabic reading than Spanish, which implies that while reading, EFL learners need to develop not only phonemic but also intrasyllabic awareness and even strategies for whole-word recognition (Ziegler & Goswami, 2006).

Therefore, the teaching of decoding skills is especially relevant for EFL learners as learning difficulties are closely linked to the opacity of the target language with respect to the correspondence between pronunciation and written texts. English has an alphabet of 26 letters, 44 sounds or phonemes, and these may be written in approximately 70 different ways. This means that EFL learners may have troubles when, for example, they try to identify which graphemes are pronounced with the sound /i/ in the following words:

*enough, women, ship*. Adding to this complexity in learning pronunciation is the existence of phonograms, combinations of more than one grapheme or more than one phoneme. Furthermore, the problems in the acquisition of English as FL is not only due to differences in terms of the consistency of grapheme-phonemes mappings and pronunciation rules but also due to different isochronic features or rhythmic properties between Spanish and English. English is a stress-timed language, strongly relying on rhythmic cues, and, as such, the duration between two stressed syllables is the same whereas Spanish is a syllable-timed language, that is to say, the duration of each syllable is the same. These isochronic and prosodic elements cause different developmental rhythms when reading in both languages that must be also learnt.

### **1.5. The relationship between musical aptitude, musical training and early reading skills**

If music cognition and high musical ability is a powerful aid to learn and code the sounds of a language as both music and language abilities are based on coding auditory input, we would expect that musical training would improve language learning skills.

The interest in the influence of musical training on linguistic abilities is constantly growing. In the past few decades, a great variety of studies have investigated the benefits that having received musical training or having greater musical expertise many have on young children. There is increasing evidence that musical training is associated with enhancing effects on various cognitive processes related to L1 skills. Particularly, research shows that musical abilities enhance the development of auditory perception skills, phonemic and phonological awareness (Anvari, Trainor, Woodside, & Levy, 2002; Degé and Schwarzer, 2011; Gromko, 2005), reading comprehension (Corrigall & Trainor, 2011), vocabulary (Moreno, Friesen, & Bialystok, 2011; Piro & Ortiz, 2009), speech abilities (Moreno et al., 2009), speech perception and segmentation (François, Chobert, Besson, and Schön, 2013) and general intelligence (Schellenberg, 2004). Moreover, musical training has been found to be related to enhancements in working memory or memory for sound (Franklin, Moore, Yip, & Jonides, 2008; Ho, Cheung, & Chan, 2003), visual attention (Rodrigues, Loureiro, & Caramelli, 2013, 2014) and in the development of executive functions (Moreno et al., 2011; Zuk et al., 2014). In addition, Tierney and Kraus' longitudinal study (2013b) linked reading acquisition subskills to music experience and concluded that music can provide an effective developmental educational

strategy for all children, with and without language learning impairments. Finally, some recently conducted meta-analyses point to a relationship between music training and reading skills, mainly reading in a L1 (Butzlaff, 2000; Bolduc, 2008; Standley, 2008; Lessard and Bolduc, 2011; Gordon, Fehd, & McCandliss, 2015), despite some non-significant effects on certain components of reading as well as very different measures, methods, approaches and results from one study to another.

Regarding the effects of musical training on L2 and FL reading skills, we should recognize that research offer more limited data. Zeromskaite's study (2014) reviewed articles suggesting the transfer effect of music on L2 phonological and reading skills as well as the role of working memory in this transfer effect and evidenced that musical training and aptitude positively impact aspects of L2 proficiency, especially L2 phonological perception and production. This finding is shared by Slevc and Miyake's study (2006) which showed that L2 receptive and productive phonology is superior among musicians. From a neuropsychological perspective, Chobert and Besson's literature review adds that 'musical training palliates some phonological deficits and facilitates second language acquisition' (2013: 940) while Ott, Langer, Oechslin, Meyer, & Jäncke (2011) points to the fact that early phonetic processing of verbal or nonverbal stimuli is differently organized depending on musical expertise.

As we have previously said, there is mounting evidence that musical abilities, musical training, auditory processing and linguistic reading skills are associated. As this research moves forward, there are two main areas of research which need to be answered in order to explain why one might expect musical training to enhance the ability to read. The first line has been analyzed from a linguistic perspective and it shows a positive relationship between the auditory aspects of speech and the learning-to-read process in a L1 (Brady, 1991; Melby-Lervåg, Lyster, & Hulme, 2012; Wagner & Torgesen, 1987). Concretely, research has shown that phonological processing skills are core contributors to numerous aspects of literacy including basic reading, fluency and comprehension. According to a meta-analysis conducted by the *National Early Reading Panel* (2008), there are three main phonological processing components which predict reading success in elementary grades when measured in preschool (Bolduc and Lefebvre, 2012): phonological access to lexical store or rapid automatized naming of phonemes from long-term memory; phonological memory, which is a component of working memory and refers to the short-term memory for phonetically coded verbal information (Baddeley, 1986; 2012; Kibby,

Lee and Dyer, 2014), and finally, phonological awareness, which involves phonemic awareness, also called phonological awareness at the phoneme level.

Among the phonological language skills, decades of research have established that literacy acquisition relies heavily on the development of phonological awareness, which plays a crucial role in reading acquisition (Adams, 1990; Castles & Coltheart, 2004; Goswami & Bryant, 1990) since reading requires the ability to segment words into individual speech sounds or phonemes in order to map these sounds onto visual symbols or graphemes. Both phonemic and phonological awareness have been proven to be good predictors of alphabetic decoding and literacy skills of children learning to read in either first or second languages. Phonological awareness has been defined as the “ability to recognise, identify, or manipulate any phonological unit within a word, be it phoneme, rime, or syllable” (Ziegler & Goswami, 2005: 4). Therefore, it refers to the oral manipulation of linguistic sounds on word- and phoneme-levels. Children first develop awareness for larger phonological units such as syllables, onsets and rimes; later, through instruction, they develop the phonological ability to manipulate phonemes, ability defined as “phonemic awareness”. Thus, phonological awareness is a global term that also includes the earlier stages of reading, such as rime and syllable awareness, which are essential in emergent literacy, while phonemic awareness only involves the ability to manipulate phonemes by identifying, isolating and blending them within words.

Nevertheless, reading is one of the most complex abilities to be mastered and the learning to read process involves many interrelated skills. Thus, phonological processing skills are not the only predictors of reading development but some other abilities such as the alphabetic principle (mapping letters into their corresponding sounds), decoding familiar words and nonwords or “translating printed words into a speech code” (Melby-Lervag et al., 2012), and the recognition and storage of words, are also highly important abilities in learning to read (Hulme & Snowling, 2013; Melby-Lervag et al., 2012) since they are also considered to be the main processes underlying basic reading. In fact, based on the phases of reading development for alphabet languages proposed by Seymour, Aro and Erskine (2003), learners acquire the knowledge of these basic foundational skills at the first phase of the reading acquisition process. Not only have these early reading abilities been found highly relevant for the subsequent literacy acquisition and success in L1, but also for the learning of other languages (Sparks, Patton, Ganschow, & Humbach, 2009). In fact, Jongejan, Verhoeven, & Siegel (2007) claimed that phonological language

skills, lexical access and word recognition are of equal importance for L1 and L2 acquisition. Moreover, reading fluency and verbal working memory also play a pivotal role in reading performance. Based on the model of working memory developed by Baddeley (1986, 2012), Kibby et al.'s study (2014) demonstrated that whereas the phonological loop or the phonological short-term memory contributes to speech sounds and basic reading ability, the central executive contributes to other aspects of reading such as decoding, fluency and reading comprehension.

On the other hand, the second area of research as regards the relationship between music and reading skills has demonstrated that musical training has a beneficial impact on the auditory aspects of speech (Moreno et al., 2009), which in turn influence phonological awareness and enhance linguistic skills such word knowledge (Register et al., 2007), reading and oral abilities (Degé and Schwarzer, 2011; Gromko, 2005; Moritz, Yampolsky, Papadelis, Thomson, & Wolf, 2012) and working memory (Ho et al., 2003; Franklin et al., 2008) in the L1. Furthermore, Christener and Reiterer (2013: 9) added that singing is “a good indicator of the ability to remember new and unintelligible utterances“ and concluded that the ability to sing also improved the memory span of auditory working memory in Austrian adult singers performing Hindi. Therefore, that auditory perception and processing is a leading factor on both early literacy development and music practicing is not in question. Nonetheless, the effects of musical training on reading skills can be analyzed from different perspectives, as it will be described in the coming paragraphs.

From an educational and pedagogical perspective, some studies emphasize the beneficial use of music as a viable motivational methodology for teaching and learning language and reading skills (Darrow et al., 2009; Standley, 2008). They developed a music curriculum designed to enhance pre-reading and reading skills, that is, a music-for-language-learning intervention programme (Runfola et al., 2012) in which phonological awareness and other literacy skills such as letters names and sounds, rhyming and alliteration, alphabetic principle, word-decoding and recognition, and spelling skills are taught in a musical context accompanied by songs, chants, rhymes or musical instruments, to children with and without reading disabilities (Bolduc and Lefebvre, 2012; Darrow et al., 2009; Fisher, 2001; Fonseca-Mora, Jara-Jiménez, & Gómez-Domínguez, 2015; Register, 2002; 2004; Register et al., 2007). Multisensory phonological-musical training programmes based on general music instruction or on singing musical activities supported by phonological input that incorporate specific

reading skills (Standley, 2008: 29) have proved to be helpful teaching tools for promoting EFL young learners' literacy skills and the idiosyncrasies of the English language. Moreover, these activities will help children foster their phonological memory and metaphonological abilities without exclusively relying on language activities (Bolduc and Lefebvre, 2012) at the same time they are generating enthusiasm to learn the subject. However, given that these studies included musical and linguistic training programmes, they present some limitations because it is difficult to evidence whether the increased reading skill was driven by the musical activities exclusively.

From a neuropsychological perspective, music training enhances phonological awareness, speech processing and reading abilities since music and speech rely on similar auditory or acoustic neural mechanisms such as timing, frequency, pitch or duration, intensity, timber, auditory processing and phonological awareness (Besson, Chobert, & Marie, 2011; Kraus and Chandrasekaran, 2010; Patel, 2011; Tierney and Kraus, 2013a). These neuroscientific studies questioned which brain mechanisms are involved in music and language, and the functional changes and activation of the brain regions related to the learning process of auditory information in both capacities. That is, this literature investigates the beneficial role of music training to enhance perceptual and neural systems essential for reading, such as the encoding of speech (Kraus et al., 2014). Thus, the transfer of learning from musical perception and training to linguistic reading skills is based on shared abilities, auditory neural plasticity and an overlap of brain functions involved in music, speech processing and reading acquisition (Tierney and Kraus, 2013a). Evidence favouring neural plasticity was provided by Patel (2003a; 2011) whose OPERA hypothesis has postulated shared processing structure in language and music. This hypothesis proposes conditions for instrumental musical training to affect brain plasticity and benefit speech processing networks; these benefits depend on the demands that music places on the precision of auditory processing and the degree of emotional reward, repetition and attention associated with musical activities (Patel, 2011: 12).

In this line, studies in the neuroscience of music conducted with electrophysiological brain imaging methods have provided that musical training and greater musical expertise lead to increased neuroplastic auditory areas on the brain and, thus, have a positive influence on language-related processing abilities (Chobert et al., 2014, 2011; François, et al., 2013; Magne et al., 2006; Moreno et al., 2009) and on cognitive functions such as memory (Ho et al., 2003), attention (Strait, Slater, O'Connell, & Kraus, 2015), executive

functions (Moreno et al., 2011; Zuk et al., 2014) and general intelligence (Schellenberg, 2004). These studies generally show that musicians outperform non-musicians in language processing and reading abilities since they are more sensitive to speech sounds and have faster brain plasticity than non-musically-trained individuals. Moreover, neuropsychological evidence also points out that the younger participants begin playing an instrument, the greater are the neuroplastic effects on the brain ( Schlaug et al., 1995). However, this association between musical experience and neuroplasticity is not only enhanced during early childhood but also across the life span (Benz, Sellaro, Hommel, & Colzato, 2016) despite the fact that older individuals' plasticity is less sensitive to changes (Bidelman and Alain, 2015). Finally, being language skills and musical abilities correlated, and in light of findings showing that children with reading problems or disorders have also auditory and musical deficits (Forgeard et al., 2008; Goswami, 2011; Gordon et al., 2015), some research has speculated whether music-based intervention programmes and musical practice might be beneficial for children with reading problems to improve their literacy skills and prosodic aspects of speech (Goswami, Gerson, & Astruc, 2010; Huss, Verney, Fosker, Mead, & Goswami, 2011; Overy, 2003).

Given the large literature showing overlaps between cognitive and neural resources involved in music and language, there is ample reason to believe that music training may well strengthen the ability of learning to read. Furthermore, given the evidence for a positive relationship between phonological processing and reading in an L1, and taken into account that L1 reading skills are predictors of L2 reading skills, it could be reasonable to assume that musical abilities and musical training would also likely facilitate the learning-to-read process in an L2 or FL. A growing body of cross-sectional studies has shown associations between musical abilities and reading skills in L1 as well as there is ample evidence from longitudinal studies that musical training has a positive effect on L1 reading skills. However, the limits of the influence are still being established and thus, important questions arise: Are the benefits of musical training limited to L1 reading skills or do they extend to FL reading skills as well? In the following, we will review current behavioral, linguistic and neuroscientific studies on the effects of musical aptitude and training on early reading skills in L1 and L2 or FL languages.

As regards L1, correlational studies demonstrated that pitch and rhythm discrimination and production skills in children between the ages of four and eight correlate with phonological awareness and early reading skills (Anvari et al., 2002;

Bolduc & Montésinos-Gelet, 2005; David et al., 2007; Degé, Kubicek, & Schwarzer, 2015; Forgeard et al., 2008; Huss et al., 2011; Lamb and Gregory, 1993; Peynircioglu, Durgunoglu, & Öney-Küsseföglu, 2002, Zuk et al., 2013). These studies show that those students who get higher scores in pitch and rhythm processing tests because they have high musical aptitude or accurate ear to music also obtained better results on word decoding, phonological awareness and reading tests in their L1. Anvari et al. (2002) showed that pitch (melody and chord) and rhythm perception skills correlated with phonological awareness and early reading skills in 4- and 5-year-olds, converging with previous findings which demonstrated that pitch discrimination was also significantly related to phonemic awareness and early reading skills in 5-year-old children (Lamb and Gregory, 1993). These findings suggest that musical perception shares auditory mechanisms related to reading skill that partially overlap those processes related to phonological awareness (Anvari et al., 2002). Additionally, Forgeard et al. (2008) found that dyslexic children also face difficulties with musical perception abilities such as melody discrimination.

Correlational and cross-sectional studies, however, only established an association between musical aptitude or abilities and reading-related skills but they did not examine the effect. On the other hand, quasi-experimental and experimental studies support a causal relation between music training and reading skills and demonstrate that music interventions can enhance language reading abilities and development in a L1, such as phonological awareness on phonemes and word levels (Bolduc, 2009; Degé and Schwarzer, 2011; Forgeard et al., 2008; Moreno et al., 2009; Moritz et al., 2012; Register et al., 2007). In a quasi-experiment, Gromko (2005) compared a 4-months musical treatment kindergarten group designed by the experimenter to a control kindergarten group in which children were given no special training to investigate the effect of musical training on phonological awareness; results indicated that children at the musical group showed gains in phoneme segmentation fluency. However, the pseudo-random assignment of the Kindergartens to the treatment and the control groups and the fact that the control group did not receive an alternative training limit the generalization of results. Another important factor in these influences is related to the intensity of the musical lessons. Moritz et al. quasi-experimental study's (2012) compared two groups of kindergartens, one of them was provided with daily music lessons and the other with one music lessons per week. Results indicated that the hours of training was a leading variable

since children with more frequent music lessons excelled those in the less intensive music group in phonological awareness.

This is not the case of experimental studies where solid effects of music training on L1 reading skills are provided. Moreno et al. 's experimental study (2009) gave third graders computer-based training to improve either painting skills or musical skills over a period of 24 weeks. Results found that children who underwent the musical training were superior in the discrimination of small pitch variations in both melodies and spoken sentences than the control group receiving the painting training. However, not so much has been said about the benefits of musical perception abilities or musical training on L2 and FL reading skill acquisition and some effects reported are contradictory to warrant generalizations. With regard to the influence of musical training, there seems to be some controversy related to the exclusive potential effects of music training to improve phonological processing skills in both a L1 and FL. As regards L1 experimental studies, whereas Degé and Schwarzer (2011) found that preschoolers benefited to a similar degree from a 20-weeks musical training and a phonological training programme, both created by the authors, on phonological awareness on the word level in comparison with a control group receiving sports training, Kempert et al. (2016) demonstrated that adding musical training to a conventional phonological training programme was not enough to contribute significantly to the development of phonological awareness. As far as FL studies are concerned, Herrera, Lorenzo, Defior, Fernandez-Smith, & Costa-Giomi (2011) pointed out that native and FL Spanish-speaking preschoolers who received a phonological training programme without musical support outperformed those who received a musical plus phonological training programme in the phonological awareness and naming speed tests, except for the ability to identify word endings. Similarly, Moreno, Lee, Janus, & Bialystok (2015) found that either a 4-weeks language or music training programme improved the processing of trained sounds of 4-to -6-year-old children.



## CHAPTER 2: GENERAL OBJECTIVES

To investigate the relationship between speech-sound stimulation and early reading skills in a foreign language learning, three different research studies have been published in three separate JCR journal articles that are going to be reported and presented in Annexes I, II and III, respectively. Although they are connected research studies, the aims, participants, the number of instruments administered as well as the statistical data analysis vary across them and thus, it is possible to read these studies independently to each other. The first article, *Instrumentos de investigación para el estudio del efecto de la música en el desarrollo de las destrezas lectoras*, was published in the *Porta Linguarum* journal in June, 2015 (see Annex I). The second article, *Fluidez lectora oral en inglés como lengua extranjera* was published in the *Tonos Digital* journal in July, 2016 (see Annex II). Finally, the third article, *Musical plus phonological input for young foreign language readers* was published in the *Frontiers in Psychology* journal in March, 2015 (see Annex III).

The influence of musical perception capacity on FL reading skills is the focus of this work. More specifically, as this doctoral dissertation is a compendium of articles, the objectives of the study are going to be divided into three parts. As regards the first published article of this thesis, *Instrumentos de investigación para el estudio del efecto de la música en el desarrollo de las destrezas lectoras*, its main aims are the following:

1. To review studies of the last decades to outline the effect of music on the development of reading skills in L1, L2 and FL.
2. To determine the instruments of data collection that experts have used, the effects found and the current state of the issue regarding the relationship between musical aptitude and reading competence in order to recreate these methods in future FL studies.

The second part of this study deals with the second published article of this thesis, *Fluidez lectora oral en inglés como lengua extranjera*. The main objectives of this study are the following:

1. To identify FL reading difficulties in the early phases of the reading process (decodification) and in the reading fluency and reading comprehension skills.
2. To test the efficacy of a training programme aimed at improving oral reading fluency and reading comprehension in 14-15-year-old EFL learners.

3. To provide some didactic guidelines to implement a future reading training programme which may remedy FL reading problems.

Finally, the third part of this study deals with the third published research article of this thesis, *Musical plus phonological input for young foreign language readers*. The principal objectives of this paper are the following:

1. To analyze the relation between FL reading skills and students' sociocultural context.
2. To examine the influence of a phonological training programme with and without musical support on young learners' FL early reading skills considering interactions with working memory.

## **2.1. Premises and research questions**

### **2.1.1. Premises:**

The incorporation of the development of musical perception in FL reading-learning programmes is underpinned by the following premises:

- a. The learning of a foreign language is a highly complex cognitive, affective and social activity that can be facilitated by the use of musical elements (as there is a connection at the acoustic and prosodic level) that influence the development of phonological and working memory, recall, metaphonological abilities, auditory ability, pronunciation and motivation.
- b. Reading is a key skill in the acquisition and learning of a second language, especially in the context of foreign languages where it becomes the main and most accessible source of contact with the language.
- c. Although the learning of reading involves the visual processing of written language, the acquisition of the reading skill correlates with the development of phonological awareness, decoding and auditory analysis skills. These abilities are needed to access lexical content while reading in a FL.
- d. Phonological and decoding skills in a FL are transferred from L1 knowledge; however, reading problems in the FL may occur specifically when L1 and FL rely on different phonological systems.
- e. Poor foreign language readers, in this case Spanish learners of English as FL, lack phoneme and phonological awareness skills, letter-sound knowledge and

rapid automatized naming from long-term memory (Hulme & Snowling, 2013) since they are not able to map letters into sounds nor learning the rhythmic and isochronic elements when reading in an opaque and stress-time language as English.

- f. Music training leads to enhancements in phonological awareness skills and literacy development as music and language cognition share the same auditory mechanisms and neural processing.
- g. As the transfer hypothesis between L1 and L2 defines that learning to read in a L2 is based on the cognitive processes acquired in the L1 and musical abilities have been associated with reading skills in a L1, administering an early reading assessment test in Spanish and English versions will help to examine the effect of students' musical perception capacity on Spanish and English.

### **2.1.2. Research questions**

The following research questions are examined in this doctoral dissertation through the three different studies:

- a. What is the current state of the issue regarding the study of musical influence on language reading skills and what are the main effects found?
- b. What assessment tools are needed in order to study the relationship between musical aptitude and reading skills in a FL?
- c. What is the most adequate reading assessment tool to be applied to both L1 and FL reading learning contexts?
- d. Does a musical-phonological training programme improve the learning of FL early reading skills in 7-8-year-old students?
- e. Are certain components of the reading process particularly affected by musical and phonological training?
- f. Does musical and phonological training improve the cognitive abilities of working memory, verbal comprehension and speed processing?
- g. To what extent can musical perception abilities affect participants' early reading skills in a FL? And what is more, has musical perception an effect on FL early reading skills through its influence on L1?



## CHAPTER 3: METHODOLOGY

### **3.1. Procedure followed to examine the effect of musical-phonological stimulation on the development of FL early reading skills**

Music and language learning is a research topic that is transdisciplinary and has been dealt with in applied linguistics, education, music, psychology and neuroscience studies. An increasing amount of studies has put forward associations between musical training, musical input and reading, resulting in music to be likely an effective way to enhance reading skills, especially for children at pre-school and at the beginning of the elementary level. However, the nature of this link is not clearly defined given the varying results of the studies and the disparity in the types of assignments to either experimental and control conditions employed in them. It leads to a research area with so much theoretical and instructional diversity showing a broad variety of music interventions to influence reading skills. Therefore, in order to assess the efficacy of music training for reading outcomes, this doctoral dissertation seeks to address the following procedures:

The first step to examine the relationship between the musical-phonological stimulation and reading skills was to carry out a complete literature review documenting the association between musical training and the learning-to-read process. Thus, a meta-analytic approach was conducted to study this link and to examine the effect of music on the development of reading skills in first, second and foreign languages. This meta-analysis is explained in detail in the first study of this thesis (see Annex I where the original version of the published manuscript is presented). Moreover, the most-frequent multidisciplinary research instruments needed for the study of musical influence on language reading skills were also analyzed in this article.

To find the articles that met the selection criteria for this meta-analysis, we first set out to delineate peer-reviewed studies that dealt with the use of melodies and tone, rhythm, chord duration and phoneme discrimination to improve the learning-to-read process. Some studies also used intensive and instrumental musical training. That is, these articles could not be conference proceedings or unpublished theses, dissertations, manuscripts or reports and had to be indexed in Scopus and Web of Science databases or

others such as ERIC, JSTOR and Academic Search Premier. These inclusion criteria helped to ensure an appropriate level of academic quality and rigor.

Twenty-seven international articles, published between 2001 and 2013, met these criteria, out of them 11 were correlational studies, 8 quasi-experimental and 8 experimental studies. Articles that were of a descriptive nature were not included in this corpus.

### **3.2. Research instruments for the study of musical influence on language reading skills**

If music has a role in enhancing phonological awareness, decoding and reading skills, the first aim of the first published study of this compendium, *Instrumentos de investigación para el estudio del efecto de la música en el desarrollo de las destrezas lectoras* (Fonseca-Mora and Gómez-Domínguez, 2015; see Annex I) was to review the multidisciplinary research instruments that had been used in literature to study the effect of music on the development of reading skills. Twenty-seven international studies from the last two decades (studies published between 2001 and 2013) affirm that musical training and musical aptitude can enhance the reading acquisition of young learners with and without reading problems in either a first, second or foreign language (see Annex I). This meta-analysis allowed us to detail the main positive effects found in the field but also the great difficulties due to the wide variety research instruments for data collection that were necessary to carry out this kind of study. Determining the effects of musical training on reading abilities is not a straightforward issue since a broad variety of variables affect the reading process. Apart from this, multidisciplinary studies use different behavioural and neural instruments and varied intervention programmes had to be analyzed and coded as well.

#### **3.2.1. Inclusion and analysis criteria for the study of musical influence on language reading skills**

The study of musical-phonological stimulation and reading skills is a complex research topic which poses some problems that need to be described in order to determine the current state of the issue. Prior to the description of these problems and limitations, we defined specific criteria for inclusion and analysis in this meta-analysis presented in the first published study of this thesis (see Annex I). Thus, the 27 studies that make up

this meta-analysis were coded by the following inclusion and analyses criteria bearing in mind the coming design features, qualities and variables of studies:

1. Studies assessing the effects of musical abilities and training on phonological awareness and early reading skills.
2. Date of publication: studies published in the last two decades.
3. Publication type, source and status: studies must be peer-reviewed works so that unpublished dissertations, theses, conference presentations or pilot works that have not been reviewed for publication were not accepted as they did not meet the requirements. Features and data information of studies such as the year, journal and authors of publication were also gathered.
4. Studies with random and without random assignment to experimental and control groups, classes and schools: studies on correlational, quasi-experimental and experimental research.
5. Studies designed to teach reading with subjects enrolled in reading instruction programmes and with reading-related assessments included.
6. Studies which describe characteristics of participants such as their age, grade, and educational status, and their size of sample.
7. Studies which describe the language spoken by participants: native or first language (L1), second language (L2), foreign language (FL).
8. Studies which include standardized data-collection research instruments or assessment tools (reading, music, intelligence, sociocultural status tests) for the study of musical influence on language reading skills.
9. Studies which describe experimental music interventions contrasted with a no-music experimental group receiving another training programme (active control) or with a non-treatment control group (passive control) receiving traditional reading instruction.

### **3.2.2. Problems for the study of musical influence on language reading skills**

In the meta-analytic approach presented in the first study of this dissertation, some problems in the field and limitations related to the heterogeneity of approaches and study designs used have been evident. These problems give rise to a panorama of results with diversity that can often be statistically considered as somewhat inconclusive.

1. Studies vary in their typology and design: experimental, quasi-experimental and correlational studies are analyzed.
2. Although the present meta-analysis contributes to the literature by examining the effect of music on reading skills, not all studies received the same amount of reading instruction across the experimental and control groups.
3. Studies present a great variability of potentially influential variables. Thus, the age among subjects, their educational status and nationality, and the sample size used vary considerably across the studies.
  - The analyzed studies included instruction across a wide age range or grade level, so the mean age varies across studies. However, the majority of studies considered young children studying preschool or elementary education (only two studies considered secondary students). The analyzed studies also included instruction across varying educational status. Levels of ability included: a) normally developing subjects, b) atypically developing subjects such as students with specific learning disabilities, students designated at-risk or struggling learners, students receiving special education, c) bilingual students, and d) students learning a second or foreign language.
  - The number of subjects varies a lot from one study to another and a small sample size is often present in many studies.
4. Studies present a broad variety of research instruments to be administered individually for data collection and their frequency of use varied considerably from a study to another. Thus, given the complexity of variables that affect the reading process, more than half of the studies that form this meta-analysis (51,9%) presented in the first study of this thesis administered 4 or 5 tests. Some of these instruments were standardized tests and some others were designed by the investigators. The time required to administer all these tests ranges approximately from 15 to 40 minutes, so that teachers' organization and their teaching routines can be affected. Moreover, a great variability of different types of instruments and tasks has been found to measure the same skills across studies. Additionally, socio-economic and sociocultural status (22,2%), IQ or working memory and musical aptitude measures were not reported and controlled in all studies.
5. As regards musical aptitude tests, it is still unclear what type of musical ability or dimension plays a more important role in the relationship between musical ability

and reading ability (e.g. pitch, rhythm, duration, intensity, tempo, timbre, melody perception, tonal memory). This data might be relevant to design treatment interventions to enhance the development of the reading process in any language to be learnt.

6. A multidisciplinary group of administrators and researchers should be of great benefit in order to carry out this type of study because, for example, general intelligence and working memory tests are required to be administered by professionals from the field of Psychology.
7. A limitation of this meta-analysis and one of its main conclusions is that so many of the studies are related to the influence of musical abilities and training on the learning of reading in a L1. Only 2 studies of 27 (7,4%) are related to the learning of reading in a L2 (Herrera et al., 2011; Fisher,2001), indicating a gap in the L2 and FL fields as regards the relationship between music and reading skills in a foreign language.
8. Regarding the L1-L2 transfer hypothesis that defines that learning to read in a L2 is based on the cognitive processes acquired in the L1, it would be interesting to administer a literacy test that contrasted students' early reading skills in both languages with the aim of remediating the detected reading problems. However, none of the studies in this meta-analysis included literacy tests administered in both a L1 and a L2 or FL. Therefore, this study considers necessary to adapt the use of reading tests to the context of foreign languages. This will be fully discussed in the section on early reading assessment tools, in the coming chapter, and in the second published article of this doctoral dissertation (Annex II).
9. A broad variety of music interventions with different methodological approaches and components of music training to influence reading skills has been presented in this meta-analysis. These interventions are different from one study to another, their descriptions are often incomplete and they include a wide range of variables that differ considerably across studies, such as the following ones:
  - Faced with the dilemma of the considerable variability as regards the type of training intervention and theoretical models across studies, musical training programmes use different component categories of musical abilities. On the one hand, some musical interventions make use of phonological training in musical contexts especially designed to improve auditory discrimination and reading acquisition based on alliteration,

chanting rhyming lyrics, letter-names and -sounds identification, phoneme discrimination, segmentation and blending, word decoding, and song-melodies recognition. On the other hand, some others are strict musical training programmes based on extensive practice in musical notation, choral and orchestral ensembles, and intensive instrumental musical training or conventional musical interventions carried out in schools. Moreover, some studies report interventions focused on kinesthetic activities, clapping and marching, singing, and visual representations of musical dimensions (Gordon, Fedh, & McCandliss, 2015). Finally, others musical interventions are inspired by the multisensory approaches developed by music educators such as Kodaly, Orff, Wuytack and Dalcroze that included activities on singing, instrument playing, or movement to music focused on rhythm, melody, timbre and harmony skills.

- Types of control interventions are also very diverse as they can include phonological training, visual training based on watching a television show, non-auditory training such as sports or painting, less intensive musical lessons, regular music education or no-treatment condition.
- Many studies do not provide complete descriptions of the experimental and active control training programmes.
- As regards duration of the studies, this has been a problematic element in this meta-analysis. While the majority of correlational studies describe the duration of their test administration sessions carried out in days or weeks (except for David et al.,2007) study), the total hours, extent or duration of training as well as their amount of continuity vary considerably across experimental studies: they ranged from 4 weeks to longitudinal studies lasting 3 years. However, according to Standley (2008: 27) these variables did not differentiate results, that is, “music instruction was equally effective for durations ranging from less than 4 weeks to those that occurred across an entire school year”.
- Sometimes, the amount of intervention and intensiveness varies across the experimental and active control groups (Moritz et al., 2012; Register et al., 2007).

- In the case of Spanish students learning English as FL, Spanish and English contrast in terms of their isochrony, that is, English has distinct rhythmical properties which lead to different rhythms when reading, so these isochronic elements must be also learnt in English. However, studies included in this meta-analysis do not describe whether these elements have been worked on in their intervention programmes.

### **3.3. Most frequent standardized and multidisciplinary research instruments**

The most-frequently used standardized research instruments in the studies that make up this meta-analysis are the following:

#### **3.3.1. Literacy skills**

Literacy skills were assessed using a wide variety of standardized tests such as Woodcock Language Proficiency; Woodcock Reading Mastery Tests-Revised (WRMT-R); Woodcock-Johnson Tests of Achievement-III; the British Ability Scales (BAS); the Test of Word Reading Efficiency (TOWRE); Wide Range Achievement Test-3 (WRAT-3); Developmental Reading Assessment (DRA); Test of Early Reading Ability-3<sup>rd</sup> Edition (TERA-3); the Dynamic Indicators of Basic Early Literacy Skills (DIBELS); Neale Analysis of Reading Ability-Revised, Gates-MacGinitie Reading Test, 4<sup>th</sup> Edition (GMRT-4); Concepts About Print; Informal Reading Inventory (IRI); Test of Language Development: Primary, 3<sup>rd</sup> Edition (TOLD: P3), and the Test de Análisis Lectoescritores (TALE).

#### **3.3.2. Phonological and phonemic awareness**

The most frequent phonological and phonemic awareness measures found in this meta-analysis are The Rosner Test of Auditory Analytic and The Test of Analysis Skills; the Phonological Awareness Test (PAT); the Comprehensive Test of Phonological Processing (CTOPP), and the Test of Cognitive Abilities Sound Awareness from Woodcock-Johnson III. The literacy test Dynamic Indicators of Basic Early Literacy Skills (DIBELS) also includes phonological awareness tasks.

#### **3.3.3. Vocabulary**

The Peabody Picture Vocabulary Test, 3rd Edition (PPVT-III), 4<sup>th</sup> Edition (PPVT-IV) and Revised (PPVT-R), and The British Picture Vocabulary Scales (BPVS) were administered as measures of receptive vocabulary in this meta-analysis.

#### **3.3.4. Cognitive abilities**

The most frequently used tests for measuring general and cognitive intelligence are Raven Progressive Matrices and The Coloured Progressive Matrices; The Kaufman Brief Intelligence Test (K-BIT), and Wechsler Intelligence Scale for Children -3rd Edition (WISC-III) and Revised (WISC-R). The working memory subtest Digit Span from WISC has been shown to be casually related to reading skill and, as Ho, Cheung and Chan (2003) stated, musical training has an effect on children's working memory ability. Thus, Digit Span, used to provide an accurate assessment of the participants' working memory, is widely used in the studies from the meta-analysis. Finally, Zuk et al. (2013) also used tasks to assess visual memory taken from the test Cognitive Linguistic Protocol.

#### **3.3.5. Naming speed**

Along with working memory, naming speed has been also shown to be a strong predictor of reading since both are crucial skills at the initial stages of reading acquisition. In order to assess rapid retrieval from long-term memory or rapid automatized naming, measures used to recall terms such as colours and images (David et al., 2007), objects and numbers (Zuk et al., 2013) and familiar words (Herrera et al., 2011) from long-term memory have been used. These measures were also used to examine whether musical training especially accelerated subjects' naming speed, either in a L1 or L2. Bhide, Power, and Goswami (2013) used to the *Rapid Automatized Naming* task (RAN) to assess learners' naming speed.

#### **3.3.6. Musical aptitude tests**

Among the musical aptitude tests, Gordon's *Primary Measures of Music Audition* (PMMA, 1986a) and *Intermediate Measures of Music Audition* (IMMA, 1986b), were used to assess preschool and primary education students' melodic and rhythmic discrimination abilities. In both measures subjects are required to listen to 40 pairs of tonal and rhythmic sequences and they had to identify whether they are the same or different using happy or sad faces in their answer sheet. Gordon's *Advanced Measures of Music Audition* (AMMA, 1990) and *Musical Aptitude Profile* (MAP, 1995) were also

used to measure musical aptitude but in college students, high school students and junior high students. The AMMA is comprised by 30 items measuring perception of tonality and rhythm. Each item was also composed of two short musical phrases, similar or dissimilar to each other. Bentley's (1966) *Music Ability Test* or *Measures of Musical Abilities* and *Wing Measures of Musical Talents* are also well-known musical aptitude tests based on same-different comparison tasks. Bentley's *Music Ability test* yields tonal memory, rhythmic memory, pitch discrimination and chord analysis. *Wing Measures of Musical Talents* measures musical pitch and includes three receptive tasks: chord analysis, pitch change and tonal memory subtests, and a production test called tonal-memory production task. Finally, Seashore, Lewis and Saetveit's *Seashore Test* (1960; 1992) has been also frequently used and administered in the studies of this meta-analysis. It is comprised by 260 items with dichotomous character, except for the tonal memory scale in which informants are required to choose one answer out of three, four or five options. It measures six scales: pitch, loudness, rhythm, time, timbre and tonal memory.

### **3.3.7. Prosodic sensitivity**

Whalley and Hansan (2006) analyzed the relation between prosodic sensitivity and the development of the reading process. This study includes tests of prosodic sensitivity, such as *The DEEdee Task* and some tasks from the *Profiling Elements of Prosodic Systems* children test. They defined prosody as the phonological subsystem that encompasses the tempo, rhythm and stress of language and concluded that the prosodic, melodic and rhythmical properties of language are essential for the development of reading acquisition since they constitute a first step of great relevance in order to have lexical access and develop phonological awareness, fluency, reading comprehension and musical-rhythm perception.

### **3.3.8. Socio-economic and socio-cultural backgrounds**

Children's reading skill is also influenced by the level of studies of their parents, especially mothers' educational level, the family's reading habits as well as the different languages spoken at home (Fernández-Corbacho, 2016; Phillips, Norris, y Anderson, 2008; Ramón y Sánchez, 2009). It has been evidenced in literature that the familiar habit

of reading aloud to children on a regular basis since early childhood influences the child's reading ability development in later years (Foy y Mann, 2003; Karrass y Braungart-Rieker, 2005; Lane y Wright, 2007; Phillips et al., 2008; Ramón y Sánchez, 2009; Sénéchal, y LeFevre, 2002). That is the reason why socio-economic and socio-cultural questionnaires designed and developed by the experimenters were used in some studies of this meta-analysis. They identified the main family characteristics such as the financial situation and household resources, demographic information, parents' education and occupation, languages spoken at home and the reading habits of children and their families. Tsang and Conrad's (2011) study asked students' parents to complete a socio-economic questionnaire which also included questions about the nature of the child's musical experiences and habits, such as whether they were enrolled in formal musical lessons, their duration, and whether they played a musical instrument.

### **3.4. Future battery of instruments for studying the effect of music on foreign language reading skills**

After having described the current state of the issue as regards the main effects found in the study of musical influence on language reading skills and having determined the multidisciplinary data-collection instruments that have been most frequently-used in this study, Fonseca-Mora and Gómez-Domínguez (2015) meta-analysis recommended that the following battery of research instruments should be used for future studies on the effect of music on foreign language reading skills:

- 1) A reading assessment tool adapted to both L1 and FL, including measures of phonemic awareness, phonological awareness and vocabulary adapted to the level and context of the participants.
- 2) A general intelligence and working memory test.
- 3) A musical aptitude test battery.
- 4) A sociocultural survey mainly related to parent educational status, learners' and family's reading and musical habits and languages spoken at home.

### **3.5. Review of early reading assessment instruments in Spanish and English**

Taking into account the literature review of multidisciplinary research instruments for the study of musical influence on language reading skills developed in the first published

article that make up this doctoral thesis, this meta-analysis concludes that any study which investigates the relationship between musical training and reading skills in a FL should administer a reading assessment tool both in the L1 and the FL. Nevertheless, the final decision as regards the instruments to use depends on the central objective of the study. Therefore, one of the aims of this chapter is to present a further detailed study of some commonly-used standardized literacy instruments to measure early reading abilities of young learners, with particular relevance for Spanish EFL learners. This review analyzes the following classroom-based early reading assessments in their English and Spanish versions:

- a) *The Dynamic Indicators of Basic Early Literacy Skills*, 6<sup>th</sup> Edition (DIBELS-6; Good & Kaminski, 2007) and the Spanish version, *Indicadores Dinámicos del Éxito de la Lectura*, 7<sup>a</sup> Edición (IDEL; Good, Knutson, & Watson, 2006).
- b) *The Developmental Reading Assessment, K-3*, 2<sup>nd</sup> Edition (DRA-2, K-3; Beaver, 2006) and the Spanish version, *Evaluación del Desarrollo de la Lectura*, Segunda Edición (EDL2) (Ruiz and Cuesta, 2006)
- c) *The Woodcock- Muñoz Language Survey-Revised Normative Update* (WMLS-R NU; Schrank, Wendling, Alvarado & Woodcock, 2010)
- d) The English and Spanish versions of *The Early Grade Reading Assessment* (EGRA; Research Triangle Institute [RTI], 2009a, 2009b, respectively)

This review provides information about what is measured in each assessment and reports its method. The information included was derived from diverse sources such as test reviews, databases and catalogs. These reading assessment tools have been selected taking into account the following criteria:

- All these classroom-based assessments allow teachers to measure students' reading skills from the very beginning of reading acquisition. They assess individuals from 2 years old through adults. Grade norms, thus, are available for Pre-Kindergarten to graduate school (Grades PK-16).
- These tools are for dual language or bilingual settings and thus, they can be administered in English and Spanish.
- They have similar purposes such as the following: all of them pinpoint reading problems, help teachers identify those students at-risk for reading difficulties, plan early reading intervention programmes and guide educational policies. These

tools also identify students' strengths in reading skills and provide helpful information about students' progresses in school. Furthermore, they are useful for monitoring progress so teachers can track learning over time, evaluating the impact of instructional reading programmes and identifying students who are ready for more advanced instruction.

- All these assessments are individually administered and paper-and-pencil tests.
- These assessments show testing times that span from 10 to 25 minutes.
- Examiners should have some formal training in assessment based on a basic understanding of testing statistics and on general procedures for test administration, scoring and interpretation.

However, these assessments differ slightly in some aspects of their methodologies since all of them do not assess the same reading skills. For instance, all these assessments focus on the beginning of reading instruction but few fully measure the basic skills for literacy acquisition reported in the current scientific literature on early reading abilities. Moreover, although these reading assessment instruments are aimed at identifying reading difficulties of young native Spanish learners and Spanish learners of English as L2 or FL, some instruments' research items contribute to better reliability than others.

### **3.6. Description of the tests**

#### **3.6.1. Dynamic Indicators of Basic Early Literacy Skills, 6<sup>th</sup> Edition (DIBELS-6) / Indicadores Dinámicos del Éxito de la Lectura, 7<sup>a</sup> Edición (IDEL)**

DIBELS are a set of measures elaborated by researchers from the University of Oregon (Good & Kaminski, 2002; 2007) to assess the five essential components of the reading skill: phonemic awareness, alphabetic principle, oral reading accuracy and fluency, vocabulary and comprehension. All its measures have been designed to be individually administered in a minute.

DIBELS offers different versions of its subtests according to the level and grade of the learner, from kindergarten to the sixth grade of primary education, so that the development of learners' reading abilities according to their grade can be controlled and teachers can identify struggling readers as well as those who excel in particular reading skills. DIBELS subtests may be also used to design a pedagogical intervention in the classroom aimed at improving reading instruction or as an evaluation test which facilitates teachers to control for their students' progress several times throughout the year. DIBELS can be also administered just once every school year but its creators do not recommend that, but a trimestral evaluation. The complete test is formed by seven subtests organized according to grades and it lasts approximately about 10 or 15 minutes.

DIBELS has its own data analysis system and it provides standardized scales and scores for each measure and grade. Nevertheless, it is a test designed to be used with L1 native-American speakers or with populations where the target language is a L2; therefore, the level of its subtests is very high for (low-proficiency) English as FL learners.

The Spanish version of DIBELS is called *Indicadores Dinámicos del Éxito de la Lectura, 7<sup>a</sup> Edición* (IDEL). The measures included in IDEL are not a translation of the DIBELS measures but they consider the linguistic structure of the Spanish language including the phonology, orthography and syntax. However, this version requires some adaptation since it was designed to be administered to Spanish-speaking students living in the USA immersed in bilingual programmes where they learnt English as a L2.

The DIBELS test will be fully dealt with and discussed in chapter 3 and in the second published article that form this doctoral dissertation (see Annex II). In this paper, a pilot study using the *Oral Reading Fluency* and the *Retell Fluency* tests of DIBELS-6 will be explained and presented.

### **3.6.2. Developmental Reading Assessment, K-3, 2nd Edition (DRA-2, K-3) / Evaluación del desarrollo de la lectura (EDL2)**

The DRA-2, K-3 purpose is to identify primary students' reading level rather than ranking students in terms of their age or grade peers. This assessment uses a set of leveled tests which increase in difficulty, and as such, it is designed to be used several times throughout the year. DRA evaluates the basic aspects of reading such as the following elements: phoneme awareness, letter knowledge, phonological awareness, decoding, cipher knowledge, semantics (vocabulary and morphology), and reading comprehension. The DRA *Word Analysis* (Pearson Group, 2004) is designed to evaluate the phonological awareness, print awareness and phonics skills of students in kindergarten and early first grade and the word analysis skills of below-grade-level readers in Grades 1 through 3. A Spanish version of the DRA-2 is available called *Evaluación del Desarrollo de la Lectura*, Segunda Edición (EDL2), translated by Ruiz and Cuesta (2006). However, the EDL2 just assesses oral reading accuracy, oral reading fluency and comprehension; thus, it does not measure phonological awareness, phonics and alphabetic principle in recognizing letters and words. Another drawback of the EDL2 tool is that it is used for bilingual settings rather than foreign language learning contexts. Moreover, no normative scales based on tests results and alternate-form reliability evidence are provided, so it is not possible to compare whether students get higher or lower scores as well as establishing the reliability and validity of the results.

### **3.6.3. Woodcock- Muñoz Language Survey-Revised Normative Update (WMLS-R NU)**

WMLS-R NU is a norm-referenced measure of reading, writing, oral language and language comprehension. This test aims to determine language proficiency level in English and Spanish as well as monitoring progress in the abilities developed in both languages. This test includes seven individually-administered tests that are combined to yield eleven different cluster scores. We are solely interested in three of these interpretative clusters in both languages: a) Reading-Writing: designed to measure letter-

word identification and spelling, capitalization, punctuation and word usage skills; b) Reading: a measure of letters and word identification skills and the ability to comprehend written short texts; and finally, c) Language Comprehension, that is a measure of oral and reading comprehension abilities. The Reading-Writing cluster score includes the Letter-Word Identification and Passage Comprehension tests; the Reading cluster score includes the Letter-Word Identification and Dictation tests, and the Language Comprehension cluster score includes the Story Recall and Passage Comprehension tests. Each measure or test takes 25 minutes to be administered in the Spanish and English forms.

Although WMLS-R NU is also used to measure early reading abilities, this is mainly a tool that aims to assess the level of language proficiency in bilingual English and Spanish settings. This test also provides a cognitive-academic language proficiency (CALP) score that can be used to determine if the student is fluent enough in the assessment of language comprehension.

#### **3.6.4. Early Grade Reading Assessment (EGRA)**

*EGRA* was developed by the *Research Triangle Institute* (RTI, USA) in collaboration with education experts from the United States Agency for International Development (USAID) after reviewing several assessment tests such as DIBELS (*Dynamic Indicators of Basic Early Literacy Skills*), CTOPP (*Comprehensive Test of Phonological Processing*), the *Woodcock-Johnson Tests of Achievement*, and the *Peabody Picture Vocabulary Test* (Fernández-Corbacho, 2016).

EGRA has been classified as a “hybrid” assessment that looks for local validity more than for national standards (Wagner, 2010), and thus, it can be adapted in several ways: to local contexts and local linguistic and orthographic variation. Quoting Fernández-Corbacho’s study (2016), EGRA has been adapted and contextualized in order to be implemented in more than 50 countries and 70 languages. It is culturally adaptable, in fact, some subtasks vary according to language and country ‘to correspond with local curricula, and assess students on locally and culturally appropriate words, texts, and concepts (Gove & Wetterberg, 2011: 26).

Although EGRA was initially designed to assess early reading skills at the end of Grades 1-3 or the beginning of Grades 2-4, subtasks can also be selected according to learners’ level, so that decisions about the use of *EGRA* should depend on learners’ skills rather than age (RTI, 2009a, Fernández-Corbacho, 2016). It is generally used in low-

income countries as well as in countries where the language of instruction is not the same as that spoken in students' homes and within students' community. It was originally conceived as a national reading diagnostic system, where assessment results are contrasted against international standards although each country policy makers may establish their own benchmarks based on national scores. However, the instrument can also be adapted according to the purpose of the assessment, such as classroom assessment or impact evaluation (Gove & Wetterberg, 2011). As a classroom assessment, EGRA provides teachers with a flexible set of tasks that can be used in the classroom. As teachers can modify the tasks to meet their students' needs and context of learning, the skills assessment tasks may become into worksheets and activities for the classroom in both Spanish and English languages (Fernández-Corbacho, 2016).

Given that EGRA is a flexible and adaptable tool, each country decides which subtasks to use, so it is common not to find the same subtasks or tests in versions of EGRA in the same language.

Table 2 reviews the tasks included in each of these four early reading assessments instruments in their Spanish and English versions: DIBELS-6/ IDEL; DRA-2, K-3/ EDL2, EGRA and WMLS-R NU.

Table 2. (Cont.)

*Review of early reading assessment instruments in Spanish and English*

ASSESSMENTS/ TIME	TASKS
<b>DIBELS-6/ IDEL</b>  10-15 minutes	<b>Alphabetic principle:</b> (1) <b>Letter Naming Fluency:</b> name as many upper and lower- case letters as possible arranged in random order in one minute period.  <b>Phonological awareness:</b> (1) <b>Initial Sound Fluency:</b> recognize and produce the initial sound of a word presented orally by the assessor in one minute. (2) <b>Phonemic Segmentation Fluency:</b> segment three- and four- phoneme words read by the assessor into its individual phonemes fluently in one minute.  <b>Vocabulary and oral language:</b> (1) <b>Word Use Fluency:</b> use correctly a word presented by the teacher in a phrase, expression or utterance or provide a definition.  <b>Phonics and decoding:</b> (1) <b>Nonsense Word Fluency:</b> sound out as many nonsense words as possible in one minute period using the correct grapheme-phoneme correspondences.

Table 2. (Cont.)

*Review of early reading assessment instruments in Spanish and English*

ASSESSMENTS/ TIME	TASKS
<p><b>DRA-2, K-3/ EDL2</b></p> <p>15-20 minutes</p>	<p><b>Fluency:</b></p> <p>(1) <b>Oral reading fluency:</b> read aloud a passage or connected text for one minute with accuracy and fluency.</p> <p><b>Reading comprehension:</b></p> <p>(1) <b>Retell fluency:</b> Orally retell the understanding of the passage.</p> <p><b>DRA Word Analysis (only available in English):</b></p> <p><b>Alphabetic principle:</b></p> <p>(1) <b>Letter naming:</b> identify upper- and lower case letters.</p> <p><b>Phonological awareness:</b></p> <p>(1) <b>Rhyming and alliteration:</b> demonstrate awareness of rhyme, alliteration, segmentation and phonemic awareness.</p> <p>(2) <b>Structural analysis and syllabication:</b> segment words into syllables and make substitutions and analogies.</p> <p><b>Print awareness:</b></p> <p>(1) <b>Metalanguage:</b> demonstrate knowledge of printed language concepts.</p> <p><b>Phonics and decoding:</b></p> <p>(1) <b>High-Frequency Words:</b> read a list of high frequency words.</p> <p>(2) <b>Encoding and decoding:</b> spell correctly, identify and decode high frequency words.</p>
	<p><b>DRA-2, K-3/ EDL2:</b></p> <p><b>Fluency:</b></p> <p>(1) <b>Oral reading Accuracy/ Fluency:</b> read aloud each passage of text for one minute without making oral reading errors and with an adequate oral reading rate and expression.</p> <p><b>Reading comprehension and vocabulary:</b></p> <p>(1) <b>Story retelling/ scaffolded summary:</b> orally retell the story or write a story summary using comprehension items.</p> <p><b>Oral comprehension:</b></p> <p>(1) <b>Oral Reading Comprehension:</b> orally or written responses to open-ended comprehension questions asked by the teacher.</p>
	<p><b>Alphabetic principle and decoding:</b></p> <p>(1) <b>Letter- Word Identification:</b> identify letters of the alphabet and fluently read familiar words.</p> <p><b>Alphabetic principle and spelling:</b></p> <p>(1) <b>Dictation:</b> write questions related to letter forms, spelling, punctuation, capitalization, and word usage.</p>
	<p><b>Fluency:</b></p>
	<p><b>WMLS-R NU (English and Spanish)</b></p>
	<p>25 minutes for measure</p>

Table 2. (Cont.)

*Review of early reading assessment instruments in Spanish and English*

ASSESSMENTS/ TIME	TASKS
<p><b>EGRA</b> <b>(English and Spanish)</b></p> <p>15-20 minutes</p>	<p>(1) <b>Passage Comprehension:</b> measure of reading achievement.</p> <p><b>Reading comprehension:</b></p> <p>(1) <b>Passage Comprehension:</b> ability to understand written passages.</p> <p><b>Oral comprehension:</b></p> <p>(1) <b>Story Recall:</b> recall increasingly complex stories that presented by an audio recorder.</p> <p><b>Alphabetic principle:</b></p> <p>(1) <b>Letter Name Knowledge:</b> provide the name of upper- and lower-case letters arranged in random order in one minute.</p> <p>(2) <b>Letter Sound Knowledge:</b> provide the sound of upper- and lower-case letters presented in random order in one minute.</p> <p>(3) <b>Syllable naming:</b> name as many legal syllables as possible presented in random order in a minute.</p> <p><b>Alphabetic principle and spelling:</b></p> <p>(1) <b>Dictation:</b> write isolated words dictated by the assessor to assess alphabet principle on writing, spelling and appropriate use of grammar.</p> <p><b>Phonemic awareness:</b></p> <p>(1) <b>Phoneme segmentation:</b> segment words orally said by the assessor into phonemes.</p> <p>(2) <b>Initial sound identification:</b> identify the initial sound of ten different words read aloud by the assessor.</p> <p>(3) <b>Identification of words with the same initial sound:</b> identify which of three words orally said by the administrator begins with a different sound.</p> <p><b>Print awareness:</b></p> <p>(1) <b>Concepts about print:</b> indicate basic knowledge of print such as text direction and concept of word.</p> <p><b>Oral vocabulary:</b></p> <p>(1) <b>Oral vocabulary:</b> Show parts of the body and objects in the room, and check comprehension of spatial terms.</p> <p><b>Phonics and decoding:</b></p> <p>(1) <b>Familiar Word reading:</b> read simple and frequent one- and-two syllable words.</p> <p>(2) <b>Unfamiliar Word reading:</b> decode simple pseudo-words using the correct grapheme-phoneme correspondences in one minute period.</p> <p><b>Fluency:</b></p> <p>(1) <b>Oral Reading fluency:</b> read a short text or a short dialogue with accuracy, little effort and at a sufficient rate in a minute.</p> <p><b>Reading comprehension and vocabulary:</b></p>

Table 2. (Cont.)

*Review of early reading assessment instruments in Spanish and English*

ASSESSMENTS/ TIME	TASKS
	<p>(1) <b>Reading comprehension:</b> respond correctly to different types of questions about the text.</p> <p>(2) <b>Maze/ Cloze:</b> read a paragraph in silence and choose an appropriate missing word for the cloze test and several choices for the maze test.</p> <p><b>Oral comprehension:</b></p> <p>(1) <b>Oral comprehension:</b> respond correctly to different types of questions about a story told by a test administrator.</p>

Source: Prepared by the author

### 3.7. Pilot studies: DIBELS-6 and EGRA

Two pilot studies were carried out in order to determine whether DIBELS-6 or EGRA was the most adequate early reading assessment instrument for the third study presented in this doctoral dissertation. To fulfill this objective, problems related to the contents and administration of both tests were checked. The pilot study using DIBELS-6 will be described in the next chapter and it is presented in the second published article of this doctoral dissertation called “Fluidez lectora oral en inglés como lengua extranjera” (see Annex II).

#### 3.7.1. Pilot study using EGRA

After having administered DIBELS, a pilot study using EGRA in Spanish and English was conducted with six Spanish-speaking English language learners studying second grade of primary school. The sample and age of students in this study changed in comparison with the preceding pilot work using DIBELS (second published article of this thesis) because, as it has been previously indicated, early reading skills are essential abilities for an efficient development of literacy acquisition and they should be measured at the first stages or levels of the reading acquisition process. The fact that DIBELS subtests are organized according to grades implies that alphabetic principle and phonological awareness subtests for 2<sup>nd</sup> grade do not exist. The tasks administered in this study using EGRA in its English and Spanish versions were the following: letter-name knowledge, initial sound identification, phoneme segmentation, letter-sound knowledge, familiar word reading, unfamiliar word reading, oral reading fluency in a dialogue and in a paragraph, reading comprehension, listening (oral) comprehension, and dictation.

All these students were selected from a school located in a disadvantaged socio-economical and socio-cultural area in the province of Huelva and had Spanish nationality although the schools' district is multicultural. All had been attending school from kindergarten with Spanish as language of instruction and English as a foreign language since the age of four, receiving one hour of English lessons per week in pre-primary education and two hours per week in second grade of primary education.

After having achieved to adapt the English version of EGRA to the context of 7-8-year-old learners of English as foreign language, EGRA was finally decided to be the initial early reading assessment instrument to be used in the third study presented in this dissertation (see Annex III). Although most subtasks posed no important problems for administrators during the pilot study, some changes related to content, format and administration were introduced in both versions. For example, due to the floor effect in the "phoneme segmentation" task in English, the "identification of words with the same initial sound" task (oddity task) was chosen instead. Moreover, all instructions in the English version were translated into Spanish. For a context in which English is a FL, explaining tasks to students in English would have increased the difficulty of the administration as it requires good oral comprehension skills on the part of the students.

EGRA was selected for the study presented in the third article of this thesis (see Annex III) because it meets the following criteria (adapted from Fernández-Corbacho, 2016):

- 1) It is a test with Spanish and English versions.
- 2) It is a test that assesses early reading skills, not only comprehension. EGRA measures the basic abilities that should be mastered to become literate: decoding skills and alphabetic principle, phonemic awareness, word identification processes, accuracy and fluency, vocabulary, spelling and finally, written and listening comprehension. This battery of reading tests assesses emergent reading skills from phonemic awareness, letter-sound correspondence and word-decoding, to more complex and later acquired reading abilities called orthographic reading skills, such as automatic writing word identification and reading comprehension.
- 3) As EGRA focuses on the five fundamental components of the reading skill (phonological awareness, phonics, fluency, vocabulary and comprehension), it has the proper research items for helping teachers to develop and implement instructional reading programmes aimed at improving reading skills of Spanish-

speaking students and Spanish learners of English as foreign language. All the EGRA subtests are valid to translate into educational practices and they help teachers to track performance and learning over time.

- 4) It is individually tested.
- 5) It is suitable for 7-8-year old students since it focuses on the early grades of primary schooling. Furthermore, it is suitable for 7-8 year old EFL students since students at this age should have acquired the L1 basic reading skills.
- 6) It is easy and quick to administer (15-20 minutes) and flexible (it can be administered just once every school year). It is very important to note that very long tests may deviate students' attention and lead to negative outcomes in the final reading scores as well as tests that require trimestral administration and monitoring require a great effort for teachers.
- 7) EGRA is adaptable to local context and context of language use: it can be adapted to local linguistic and orthographic variation (Wagner, 2010).
- 8) It can be easily accessed online and it is inexpensive since it is free.
- 9) It is a paper-pencil test accessible for all type of communities avoiding the digital divide in some countries. However, online versions are also being developed (Fernández-Corbacho, 2016; Gove & Wetterberg, 2011).
- 10) Finally, we should highlight an issue of training. In order to administrate EGRA, test-administrators and teachers are required to have some formal training on assessments and methodologies, but they do not need to have formal training on teaching the reading process and the basic skills for developing reading acquisition.

### **3.7.2. Conclusions**

This meta-analysis helped to understand that to achieve the main aim of this doctoral dissertation, longitudinal experimental studies were required to establish a causal relationship between the effects of musical training on literacy skills. Cross-sectional and correlational studies suggest that musical ability or musical aptitude can improve reading skill since they indicate an existing link between musical abilities and reading but results cannot be taken as strong evidence for the causative effect of musical training on reading skills as no treatment condition is carried out to compare. Longitudinal experimental studies, on the other hand, provide evidence for a causative relationship between musical training, musical experience and reading ability.

Therefore, an experimental design should be performed, and it was done in this study in the second and third published articles that make up this doctoral dissertation (see Annexes II and III). Finally, the creation and implementation of a sonoro-musical training program in the English as a foreign language (EFL) classroom would be essential for the study of the relationship between musical training and reading skills.

## CHAPTER 4: ORAL READING FLUENCY IN ENGLISH AS A FOREIGN LANGUAGE

### 4.1. Selection of oral reading fluency tests

Despite the relevance of reading, international and national evaluations of primary and secondary learners' reading skills (*European Survey on Language Competences* [ESLC], 2012; *Programme for International Student Achievement* [PISA], 2014 (conducted by the OECD); *Progress in International Reading Literacy Study* [PIRLS], 2011 (conducted by the IEA); in the USA, *National Assessment of Educational Progress* [NAEP], 2013; or in Spain, *Prueba de Diagnóstico*, 2010, 2011) are continually confirming the reading deficit that exists at a global level both in the L1 and in the L2 or FL (Fernández-Corbacho, 2016; Fonseca-Mora, Fernández-Corbacho, & Gómez-Dominguez, 2012). Nonetheless, these reading assessments focus on measuring oral reading fluency and reading comprehension but there is a minor amount of assessments designed to assess decoding skills such as phonological awareness, phonics, alphabetic principle and automatic word identification processes. Moreover, these decoding skills have been traditionally less assessed in the foreign language classroom, giving all the importance to reading fluency and comprehension skills.

Given the increasing attention now being paid to the importance of developing literacy skills, it is not surprising that there is a growth in interest concerning assessments to evaluate the quality of reading education. However, addressing the appropriate criteria to choose among the big variety of learning assessments is a complex issue since no single reading assessment can be said to be 'the best' but they come into a variety of styles and contents and they are designed along a set of compromises to reach specific policy needs or goals (Wagner, 2010: 754). Therefore, while some international assessments are aimed at cross-national comparability such as PIRLS or PISA, some others put more emphasis on local validity and on classroom and context levels, as it is the case of hybrid assessments and classroom-based assessment tools. These hybrid assessments, such as *The Early Grade Reading Assessment* (EGRA), has been defined as "smaller, quicker and cheaper methods of literacy assessment" (Wagner, 2010: 747), they are adapted to the realities of low-income societies and can be used to make changes at the classroom or individual levels in order to improve reading instruction (Wagner, 2010).

In recent years, there has been a growing body of research stating the need for classroom-based assessment tools (Beaver, 2006; Good & Kaminski, 2007; Gove & Wetterberg, 2011). Some well-known classroom-based tools only include oral reading fluency and reading comprehension measures for learners whose phonological and decoding skills are supposed to be mastered according to their grade, such as *The Woodcock Reading Mastery Test (WRMT)*, *The Dynamic Indicators of Basic Early Literacy Skills (DIBELS)*, *Developmental Reading Assessment (DRA)*, *Gray Oral Reading Test (GORT)* or *The Early Reading Diagnostic Assessment (ERDA)*. Oral reading fluency has been traditionally measured by timed assessments of correct words per minute. Oral reading fluency is a measure of overall reading competence, that is, it is the ability to translate letters into sounds, unify sounds into words, process connections and correspondences, relate text to meaning and make inferences to fill in missing information (Hasbrouck & Tindal, 2006). Moreover, oral reading fluency tests have been shown to have a strong correlation with reading comprehension tests (Fuchs, Fuchs, Hosp, & Jenkins, 2001). Thus, when skilled readers translate a written text into spoken language, they combine these tasks in a seemingly effortless manner, achieving the comprehension of the text. Conversely, poor performance on a reading comprehension tool would suggest that the student has trouble with decoding, with vocabulary and lexical access or with reading fluently enough to comprehend the information.

Among teachers' competences is that of knowing how to assess their students in order to diagnose the problematic language areas, plan remediation for their individual needs and monitor their progress. Therefore, providing guidelines for teachers to implement and design a future training programme which may remedy EFL learners' reading problems is a helpful and valuable tool (Gómez-Domínguez, 2016). However, the majority of primary and secondary teachers have not received the appropriate training in order to teach the basic phases of the learning-to-read process, such as phonological awareness, phonics, decoding and fluency skills (Fonseca-Mora, Fernández-Corbacho, & Gómez-Domínguez, 2012). Based on this lack of training, we would say that teachers need appropriate classroom-based assessment tools based on the nature of language ability, the characteristics of the tasks and the context of language used (Stoyonoff, 2012: 525-527).

Moreover, considering the fact that early L1 reading skills have been defined as predictors of L2 reading skills (Sparks et al., 2008), for classroom-based assessments to be efficient early reading tests that could be used in both L1 and FL contexts, they should

measure the basic reading abilities in both languages so as to teachers could identify students' mastered and problematic skills in both of them. Administering the Spanish version before the English one could help teachers to detect the possible origins in the L1 of the problematic reading areas in the L2 or FL and, then, they can be handled in both languages. However, a gap in the existence of an assessment tool to measure reading skills in parallel in a L1 and FL has been detected in literature and those that exist have been designed for bilingual settings or populations where the target language is a L2 instead of a FL; that is to say, populations where the language of instruction is used within the speech community rather than limited to the FL classroom. Therefore, the main problem is that the standardized scales provided by these existing tests to assess early reading skills are not adapted to the linguistic context of (low-proficiency) Spanish learners studying English as a FL. This adaptation to foreign languages needs to be developed and provided, then, remediation in one or both languages could be planned through an adequate reading intervention programme and teachers could base their pedagogic interventions on the obtained results from the tests (Fernández-Cobacho, 2016; Gómez-Domínguez, 2016). In conclusion, the existent classroom-based assessment tools (Beaver, 2006; Good & Kaminski, 2007; Gove & Wetterberg, 2011) and the diverse tasks included in them still need analysis to be defined as appropriate and teacher-friendly classroom tools, mainly with regard to the FL learning context.

#### **4.2. The study: *Fluidez lectora oral en inglés como lengua extranjera***

The second study of this thesis “*Fluidez lectora oral en inglés como lengua extranjera*” (see Annex II) aimed at testing for the efficacy of a training programme designed to improve the oral reading fluency and reading comprehension development of thirty Spanish learners of English as a FL studying the third grade of Compulsory Secondary Education. To achieve this goal and identify students with reading difficulties in the FL, the *Oral Reading Fluency* and the *Retell Fluency* measures of the standardized literacy test *Dynamic Indicators of Basic Early Literacy Skills*, 6<sup>th</sup> Edition (DIBELS-6; Good and Kaminski, 2002; 2007) were individually administered to students, before and after the reading training programme.

All the participants of the study were native speakers of Spanish and they were studying at a high school located in a middle-high socio-economical and socio-cultural

neighborhood from a village located in the province of Huelva. All were immersed in the school bilingual programme and had been attending school from kindergarten with Spanish as language of instruction and English as a foreign language since the age of six, receiving three hours of English lessons per week. Lessons were completely instructed in the target language, using Spanish just to give more extensive explanations of some difficult points or to solve doubts.

Descriptive analyses were carried out on the oral reading fluency and retell fluency measures at both pre-test and post-test periods. In order to fulfill the first objective of this study, the pre-test was administered in order to determine the initial level of students and identify those with reading difficulties in the initial phases of reading development, such as decoding, and in the fluency and comprehension skills in the FL. The oral reading fluency test was measured by the correct words read by the student in a minute time and the retell fluency was measured by the total words said by the student in a minute that illustrate the comprehension of the previous read passage.

Descriptive analyses were followed by a pre-post comparison design, with the aim of examining the effects of the oral reading fluency intervention on students' reading performance. This longitudinal experimental study of repeated measures lasted one month and was divided into the following phases: (1) pre-test and post-test selection: the *Oral Reading Fluency Benchmark Assessment, Sixth Grade, 6<sup>th</sup> Edition* tests and its *Retell Fluency* test (Good and Kaminski, 2002) were used for the pre-test and the *Oral Reading Fluency Progress Monitoring, Sixth Grade, 6<sup>th</sup> Edition* and its *Retell Fluency*, (Good and Kaminski, 2007) were selected for the post-test; (2) administration of both tests before and after the intervention; (3) implementation of the reading intervention in the EFL class. The training programme was based on reading aloud English texts during a minute in pairs or in groups and on a daily basis during three weeks, together with working on the understanding of these written texts in class. The pre-test and post-test from DIBELS-6 were both selected after having been analysed using the *text analyzer* and *textalyser* tools so as to they both had the same lexical difficulty and readability level. Finally, statistical data analysis was performed using the 21.0 SPSS statistics package.

Despite the importance of oral reading fluency and comprehension to adolescent students and the advantage that DIBELS-6 is a standardized literacy measure that can be administered both in Spanish and English, the two measures of DIBELS-6 used in this paper posed some problems to the EFL learners (see Annex II). As regards the findings

and to fulfill the second objective of the present study, the reading intervention was found to improve students' fluency, speed and accuracy in oral reading; however, its effect on reading comprehension was not statistically significant. This finding may be due to the low foreign language proficiency level of the participants since the beginning of the study: at the pre-test, students were identified at risk of reading failure. However, in order to determine whether the level of development in oral reading fluency and reading comprehension skills was average in respect of age or grade, results should be compared with similar groups. One of the limitations and main conclusions of this study is that the average rates provided by DIBELS benchmark scores are based on research with native speakers of English or for English as L2 learners but they are not suitable for EFL learners.

In conclusion, this study shows that EFL learners who have deficiencies at the initial levels of the learning-to-read process, such as in the decoding and reading fluency skills, will face difficulties with mapping letters into sounds which is necessary for the automatic identification of words, with spelling and writing skills and with the development of vocabulary and the subsequent mental lexical access, impeding the effective development of fluency and, hence, reading comprehension in the target language. Moreover, in the case of Spanish learners of English as FL, learning difficulties are closely linked to the opacity of the target language with respect to the correspondence between pronunciation and written texts and also to the different developmental rhythms between the two languages.

In view of these reading difficulties in the FL and based on Koda's study (2005), our current state of knowledge allows us to state that in order to determine the essential concepts to develop an efficient development of reading fluency and comprehension, we should consider the following suggestions: (1) a fully developed L1 reading ability; (2) the ability to decode and recode effectively in the FL since reading comprehension is the result of understanding the spoken language plus the ability to decode the writing (Fernández-Corbacho, 2016) and the correct decodification of words is not enough for an effective development of reading fluency unless this process is automatized; (3) a high FL proficiency level.

Related to the FL difficulties stated above and to fulfill objective number 3 of this study, this paper provides some didactic guidelines to implement a future intervention which may remedy reading problems in the FL. For this reading training programme to

improve decoding and reading fluency skills, activities which work on these abilities should be selected taking into consideration two different levels. Firstly, teachers should work on the foundational phases of the reading skill such as phonemic and phonological awareness, phonics and word-decoding and recognition skills. Decoding depends on sensitivity to and manipulation of linguistic sounds on phoneme- and word-levels, and on recognizing that letters map into sounds to create new words and that words combine to build sentences. Therefore, some possible activities to enhance decoding in English are: (1) reading aloud a list of frequent or familiar English words to learners for about 10 minutes; (2) reading unfamiliar words to students or pseudowords (non-sense words) daily in class, this activity can be timed so that learners might be required to read as much words as possible, for instance, in a minute time; (3) segmenting multi-syllabic and low-frequent words in English into the syllables that form them, blending words using various combinations of vowels and consonants, and identifying initial and final sounds in words; (4) reading aloud texts or texts in silence where the words are not separated for about 1 or 3 minutes, segmenting them in the text with a slash. Secondly, once decoding abilities are mastered, teachers should move to teach more complex and later acquired reading abilities called orthographic reading skills, such as automatic word identification, reading fluency and accuracy and reading comprehension. Some resources that could provide learners with opportunities to improve their reading fluency plus oral and reading comprehension skills are the following: (1) graded or adapted and simplified books for those readers who are not able to read the texts according to their grade appropriately; (2) audio-books, through which learners can listen to the text at the same time they are reading in silence, and (3) repeated or modeling reading texts, through which students are read aloud texts with an appropriate rate and correctly articulating the rhythm, intonation and melody of speech, that is, the prosody of language.

Finally, as stated in the previous chapter, the socioeconomic and sociocultural backgrounds of the students and their families undoubtedly have also a significant influence on learners' reading performance (Fernández-Corbacho, 2016; Gove and Wetterberg, 2011; INEE, 2012; OECD, 2014). This key factor will be also dealt with and discussed in the third published article that makes up this doctoral dissertation (Annex III).

## CHAPTER 5: STUDY: MUSICAL PLUS PHONOLOGICAL INPUT FOR YOUNG FL READERS

### 5.1. Introduction

This chapter describes the study carried out in this doctoral thesis which is reported in the research study *Musical plus phonological input for young foreign language readers* presented in Annex III. This study aims at testing for the efficacy of two phonological training programmes, one with musical support and the other without it, on the phonetic aspects and early reading skills of 7-8-year old Spanish children learning English as FL. The musical-phonological programme used musical activities such as song with lyrics presented in video-clips and rhymes paired with phonics for auditory and phonological stimulation and to aid learning to read in English as FL. Of interest are also the effects of these training programmes on working memory, decoding skills and reading fluency.

In order to achieve these goals, students were randomly assigned to one of the following three groups: a passive control group (n=23), receiving the traditional teaching programme without any phonological stimulation training nor musical input, an experimental group with no musical intervention (n=22) but with phonological training (active control group) and an experimental group receiving phonological and musical support training (n=18). Both experimental groups focused on the same activities oriented to teach early reading skills such as the alphabetic principle, phonological awareness and phonics, and video-clips were used in both of them. The difference between them is that the musical experimental group was based on audio-visual videos with musical elements such as simple, repetitive and catchy songs with lyrics, whereas the non-musical experimental group centered on attractive visual videos, audio-books, and colourful posters and flashcards without musical elements. Besides this difference, teachers planned their lessons together in order to teach simultaneously the same curricular contents at the same time. The control group and the non-music experimental group were situated within the same school, whereas the music experimental group was located in a different one to avoid contamination of musical elements. However, these two schools were located in the same low socio-economical and socio-cultural district.

## 5.2. Method

### 5.2.1. Participants

Three second grade classes included 63 students ( $\bar{X}$ = 7.6 years old,  $SD=0.4$ ; 29 boys and 34 girls) who were selected from two primary schools located in the same disadvantaged socio-economical and socio-cultural school district. All the participants in these two studies were native speakers of Spanish although the schools' area is multicultural. All had been attending school from kindergarten with Spanish as language of instruction and English as a FL since the age of four, receiving one hour of English lessons per week in pre-primary education and two hours per week in second grade of primary education. All the participants were very low-proficiency English language learners with classrooms located in suburban schools. This disadvantaged sociocultural background is important as this implies that there was no initial selection of participants at the beginning of the studies.

### 5.2.2. Instruments

#### 5.2.2.1. *EGRA tests in Spanish and English*

*Early Grade Reading Assessment* (EGRA) assesses the basic and emerging skills for literacy acquisition by measuring letter recognition, phonemic awareness, decoding skills (accuracy and speed), familiar and unfamiliar word reading, and written and oral text comprehension. Apart from being designed to assess early reading (grades 1-3), EGRA serves other purposes: (1) it is focused on local context rather than international comparability; (2) it is adapted to the context of local language use; and, as such (3) it aims to highlight reading problems and helps teachers track performance.

Being EGRA a flexible and adaptable tool, each country decides which subtasks to use, so it is common not to find the same subtasks or tests in versions of EGRA in the same language<sup>1</sup> (see chapter 3 for EGRA description). The tasks used in this study were selected according to the recommendations suggested by RTI International (2009a, 2009b) for Spanish and English versions. As a result, the same tasks were included in both Spanish and English versions, as Table 3 shows:

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<sup>1</sup> Versions of the tool in different language are available in the official website: [www.eddataglobal.org/](http://www.eddataglobal.org/)

Table 3

*Tasks included in the Spanish and English versions of EGRA*

ENGLISH	SPANISH
Letter name knowledge	Conocimiento del nombre de las letras
Initial sound identification	Identificación del sonido inicial
Identification of words with the same initial sound	Identificación de palabras con el mismo sonido inicial
Letter sound knowledge	Conocimiento del sonido de las letras
Familiar word reading	Lectura de palabras familiares
Unfamiliar word reading	Lectura de pseudopalabras
Oral reading fluency of dialogue	Fluidez en la lectura oral de un diálogo
Oral Reading fluency of paragraph	Fluidez en la lectura oral de un párrafo
Reading comprehension	Comprensión lectora
Oral comprehension	Comprensión oral
Dictation	Dictado

Source: Adapted from Fernández-Corbacho (2016)

In the present study, EGRA was administered individually in its English version in about 15 to 20 minutes to assess learners' pre-reading and reading skills. This test was administered orally twice throughout the study, at the beginning of the training period and immediately after the 11-week training period.

In order to evaluate the alphabetic principle, the “letter-name knowledge” and “letter-sound knowledge” tasks were used in which students were required to name and sound out as many upper and lowercase letters as possible in 1 minute, presented in random order. Two were also the tasks used to assess phonemic awareness or ‘early’ phonological awareness: “initial sound identification”, a singleton-onset task in which students had to identify the initial sound of ten words read aloud by the test administrator and “identification of words with the same initial sound”, a singleton-onset oddity task in which subjects were required to identify which of three words orally said by the administrator begins with a different sound, that is, they had to detect which word was odd in terms of their word-onset. To assess phonics and word-decoding abilities, we administered the “familiar word reading” task, which consists of decoding common words and the “unfamiliar word reading” task that is the ability of decoding legal syllables and letter-sound correspondences to read pseudowords. In order to assess the decoding of visual and orthographical information such as automatic word decoding and oral reading fluency (speed, accuracy, expression and intonation), we administered two reading aloud tasks, one of reading a dialogue and one of reading a paragraph with accuracy, speed and fluency in a minute. The oral reading fluency of paragraph included some comprehension

questions about the text, which were asked to learners to assess their vocabulary and reading comprehension ability, skill derived from the preceding abilities. To assess oral comprehension, students were required to respond correctly to different types of questions about a story told by the test administrator. Finally, we administered a dictation task in which subjects were required to write words from a sentence dictated by the administrator to assess their alphabet principle on writing, spelling, appropriate use of grammar and oral comprehension.

#### 5.2.2.2. *The Receptive Musical Aptitude Test: The Musical Perception Test*

In this dissertation, the musical aptitude test by Hernández-Hernández and Santiago-González (2010) was adapted to 7-8-year-old students to evaluate musical perception abilities within normal developing children.

The purpose of this test was to examine children's musical abilities and determine if they had an effect on learning early reading skills in Spanish as L1 and English as a FL. This test does not measure listening to music or productive musical aptitude, such as singing ability, performance of tonal or rhythmic patterns or playing a musical instrument but it is devised taking into consideration the receptive sensitivity to basic sound patterns varying in pitch, rhythm and timbre (Law and Zentner, 2012). It comprises 6 items, measuring different aspects of perceptual musical skills across the following dimensions: pitch, intensity, duration, rhythm, musical timbre and musical tempo (see Table 2). Each correct answer scores one point and any incorrect scores zero, thus, the maximum score to be obtained was 35 points.

During administration, two practice trials preceded each item to ensure that children understood the task and facilitate the encoding of the musical stimulus. Musical stimuli were pre-recorded on a DVD (they were not live music) and played in the classroom while students were completing the activities on a sheet. These recorded stimuli were presented in percussive sounds and musical notes played by the author of this study with a keyboard. Moreover, melodic sequences of classical music and of the timbre of some musical instruments were selected by the author to be included in the DVD too. The test was administered to the whole class once through the study, at the beginning and prior to the intervention programme, and it lasted around 30 minutes.

Table 4

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*Dimensions evaluated in the Musical Perception Test*

	Items	Description
<i>Pitch discrimination</i>	6	Skills in discriminating higher or lower tones in pitch by identifying up (ascending scale) and down (descending scale) intervals.
<i>Intensity – loudness</i>	6	Skills in differing strong and weak tones (volume).
<i>Duration or time</i>	6	Skills in differing among long and short sounds.
<i>Rhythm recognition</i>	6	Skills in recognizing the duration of sounds in different rhythmic patterns composed by 4 beats in length. Students were required to draw the beats of each note pattern on their sheet using points for faster beats and lines for slower ones.
<i>Musical timbre</i>	3	Skills in identifying melodies presented in different commonly heard timbres of musical instruments (tone or sound quality).
<i>Musical tempo</i>	8	Skills in discriminating the musical tempo of different melodic sequences: slow, normal and fast. It assesses the ability to recognize the musical tempo embedded in a melody: ‘El Elefante’ by C. Saint-Saëns (slow tempo); Symphony No. 101 ‘El Reloj’ by J. Haydn (normal tempo); ‘The Comedians’ by D. Kabalevsky (fast tempo). Subjects were required to associate the different tempos presented in melodic sequences with the movements of the following animals: elephant (slow), ostrich (normal), monkey (fast).

Source: Prepared by the author

Before adapting the musical ability test for administration purposes of our study, some well-known musical aptitude tests were analyzed in detail: Gordon’s (1986a) *Primary Measures of Music Audition* (4-to-8-year-olds), Gordon’s (1986b) *Intermediate Measures of Music Audition* (5-to-11-year olds), Bentley’s (1966) *Measures of Musical Abilities* (9-to-11-year olds) and Seashore, Lewis and Saetveit’s (1960; 1992) *Seashore Test* (9-10-to-16-year-olds). These tests usually focus on auditory skills which are divided into pitch, rhythm, timbre and melody perception. More concretely, both Gordon’s tests and Bentley’s test are based on same-different comparison tasks, which requires participants to identify whether pairs of musical phrases are identical, different in pitch, or different in rhythm. Gordon’s tests measure the perception of tonality and rhythm in items made up of short pairs of musical phrases which are similar or dissimilar to each other. Bentley’s test assesses pitch discrimination, tonal memory, chord analysis and rhythmic memory. Similarly, Seashore, Lewis and Saetveit’s test measures six basic sensory discrimination skills or scales: pitch, loudness, rhythm, time, timbre and tonal memory. It is comprised by 260 items with dichotomous character, except for the tonal memory

scale in which informants are required to choose one answer out of three, four or five options.

However, these musical aptitude batteries present some limitations. Seashore's test was decided to be unsuitable for the population of our study because it is devised to be used from 9-10-year-old individuals to 16. Similarly, Bentley is thought to be administered to individuals ranging from 9 to 11 years old. Furthermore, they are not adapted to our context of study because their answer sheets (and musical stimuli) are often quite complicated to understand for second graders. Additionally, Law and Zentner (2012) argue that these previous musical aptitude batteries are generally of difficult access today and they have been featured as obsolete over more than ten years ago (they were developed in the last century). Furthermore, these authors report that these tests measure generic children's musical aptitude, even occasionally a combination of musical skills instead of diagnosing individual differences in musical ability. Taking these considerations into account, some investigators prefer to create their own tasks; however, "these tasks do not lend themselves easily to comparisons across studies" (Law and Zentner, 2012: 3).

More recent tests of musical abilities include Gordon's *Advanced Measures of Music Audiation* (AMMA, 1990) for ages 9 to 18, and Gordon's *Musical Aptitude Profile* (MAP, 1995) for ages 17 to 19, *The Musical Ear Test* (MET, Wallentin et al., 2010), which solely measures skills in rhythm and melody perception, *The Goldsmith Musical Sophistication Index*, which is a measure for musical skills, expertise, achievements and facets of musical behaviour, and *The Profile of Music Perception Skills* (PROMS). The PROMS measures perceptual musical skills across multiple domains such as the tonal (pitch, melody), temporal (rhythm, rhythm-to-melody, accent, tempo) and dynamic (loudness) ones (Law and Zentner, 2012). This is an objective, standardized and construct-validated test to measure musical abilities. Its purpose is to diagnose individual differences in musical perception skills within the normal range instead of individuals' generic musical aptitude (Law and Zentner, 2012). This test consists of 9 subtests: melody, standard rhythm, rhythm-to-melody, accent, tempo, pitch, timbre, tuning and loudness. The PROMS is also based on same-different comparison tasks, which require subjects to identify whether the standard stimulus is the same ("definitely same" or "probably same") or different ("definitely different" or "probably different") than the comparison stimulus. Because of the length of the test and the time it consumes, two brief versions of the full

PROMS (it takes about 1 hour to complete) have been created: one is 30 minutes long and the other is 15, and both assess melody, tuning, rhythm and tempo.

#### 5.2.2.3. *The cognitive abilities test WISC*

The standardized neuropsychological test *Wechsler Intelligence Scale for Children, 4<sup>th</sup> Edition* (WISC-IV, Spanish version) was used to measure cognitive abilities related to reading processes, such as verbal comprehension, working memory and processing speed. This test is devised to be administered individually to children aged between 6 to 16 years old. The objective of this study is not to measure students' general factor of intelligence or general mental ability. Therefore, the Full Scale IQ score was not computed and only the following Composite Index Scores were obtained, each of them comprised by the coming core subtests: (1) Verbal Comprehension Index, comprised by Similarities, Vocabulary, and Comprehension. (2) To assess auditory memory span, the Working Memory Index was obtained and the following subtests were selected: Digit Span and Letters and Numbers Sequencing. Finally, (3) Processing Speed Index is made up of Symbol Search and Animals, the latter being a supplementary subtest. Subtests that comprise the Perceptual Reasoning Index, which assesses nonverbal reasoning and problem solving, are not included in this study.

The Verbal Comprehension Index assesses the child's use and understanding of language using subtests that measure the formation of concepts, the capacity of verbal and abstract reasoning, vocabulary development and the knowledge acquired from the individual environment of the child or common sense reasoning (Wechsler, 2005).

Working Memory refers to the ability to recall auditory information temporally in the memory and to manipulate and sequence it to produce certain results. This test measures rote verbal learning, working memory, and the ability to sequence auditory information. Working Memory also implies attention, concentration, mental control and reasoning (Wechsler, 2005).

The Processing Speed Index measures the speed and accuracy of visual motor integration. It provides a measure of the child's capacity to explore, order and discriminate simple visual information in an effective and quick way. This composite index also assesses short-term visual memory, attention and visual motor coordination. The speed used to process information is related to mental capacity, the development and the ability of reading and the effective use of working memory (Wechsler, 2005).

#### 5.2.2.4. *The Sociocultural survey*

Given that the cultural status of the family of the participants can seriously influence children's reading performance (Gove and Wetterberg, 2011; OECD, 2014; Fernández-Corbacho, 2016), a sociocultural survey was administered to identify the main family characteristics such as parent education and occupation, the languages spoken at home as well as the reading and musical habits of children and their families. Given that family involvement and cross-age interaction is crucial for literacy development, family members were asked if they read to and with their children aloud on a regular basis. Questions related to music habits such as the frequency by which students listened to music were also included. This sociocultural survey was adapted from the socioeconomic survey provided by the EGRA test to the context and aims of our study.

#### 5.2.2.5. *The Motivation test*

Students were required to answer some questions related to their motivation about the English as a foreign language subject. The test was administered to the whole class at the beginning of the study and after the intervention programmes (pre- and post-test) in order to study whether students' motivation in the English class increased once both training programmes had finished. It took students about 30 minutes to complete the questionnaire.

### **5.3. Procedure**

Although there was no initial selection of the participants or pre-existing differences between them, reading skills, working memory and socio-cultural background were assessed before training to ensure that the different groups were homogenous. Learners' musical aptitude (musical perception abilities) was also tested as it has been described as an individual difference in language learning (Slevc and Miyake, 2006). Thus, after the school community was informed and formal consent from local administration was granted, participants were tested on their early reading skills, musical abilities, cognitive abilities, family's sociocultural background and motivation level during the two weeks prior to the onset of the training period, at the beginning of the second term. The reading skills, cognitive abilities and motivation level were tested again immediately after the training period.

EGRA test was administered in its Spanish and English versions prior to the phonological training programmes with and without musical support and immediately after three months when both interventions finished in order to determine the effect of the training programme on children's FL early reading skills development. Both versions of EGRA had an average duration of 20 minutes per child and day (version), and all students were individually recorded by their tests-administrators in a quiet room at their school in order for them not to be distracted. WISC-IV was also administered twice, before and immediately after the 11-weeks training period. As this test includes three index scores, its complete administration required about 40 minutes. With the aim of assessing students' musical perception ability and its influence on FL learning, the receptive musical perception test was administered collectively to the three classes prior to the training programme. Recording was played in the classroom while students were completing the activities on an answer sheet. This test required about 30 minutes to be administered. Finally, the sociocultural survey was also administered prior to the training programme and it was conducted in groups too.

Due to the large amount of participants and questionnaires, six language postgraduate assistants of English as FL were trained by language researchers for the administration and correction of the reading test EGRA during two four-hour sessions. In the same way, six last-year graduate assistants in Psychology were instructed and supervised by a neuropsychologist professor on how to conduct the neuropsychological test WISC-IV. Furthermore, teachers of both the musical experimental group and the non-musical experimental group (with phonological training) were trained for several weeks before the start of the study by language researchers.

#### **5.4. Training programmes (experimental groups)**

This research study shows a language-teacher friendly phonological intervention with and without music to promote second-grade learners' phonetic and reading skills in English as a FL. The standard experimental design consists of a random assignment of subjects to an experimental group with two control groups: an active control and a passive control, with a unified course of training or intervention (Tierney and Kraus, 2013a). Thus, in this dissertation a musical experimental training programme based on a video-

clip format including songs with lyrics and especially designed to teach and enhance early reading skills such as the alphabetic principle, phonological awareness, phonics, word decoding and fluency was created for and implemented in a group of 7-8-year-old Spanish children learning English as a foreign language. Moreover, the proper selection of the control groups has been a significant issue since there must be a passive control group without treatment based on traditional teaching methods and an active control group that focus “on another activity from arts” (Schellenberg, 2005), an alternative intervention such as a phonological awareness training programme based on audio-video format without musical support, as it will be case of the third article of this thesis. Noteworthy is the fact that the presence of an active control group is relevant to avoid that trained children can be considered to have excelled the control ones due to the extra attention, reinforcement and motivation they are receiving from the intervention (Tierney and Kraus, 2013a).

Activities carried out in both experimental training programmes engaged children in language exploration through the introduction to the world of print and phonics, rhymes, chants, songs and melodies. In both programmes students learned to recognize the names of the letters of the alphabet in upper case and lower case forms as well as their corresponding sounds. They noticed that letters make words and words combine to build sentences. These words were spelled and pronounced at the same time the songs and non-musical videos were played in the classroom. Children in both training programmes received 1-h session, twice a week, for an 11 week-period, receiving a total of 22 sessions.

#### **5.4.1. The musical-phonological training programme**

The musical-phonological training programme makes use of audiovisual elements provided in video format. It was based on musical activities such as perceiving and singing known melodies and chanting songs´ lyrics shown on multi-sensory video-clips along with playing rhythm games or rhymes supported by visual materials such as posters, flashcards and audio-books. All these musical activities were matched with phonological awareness and word-decoding skills tasks such as the learning of the alphabet (English letter-names and letter-sounds), the development of phonological awareness and phonics

(auditory exercises that emphasized alliteration, initial sound identification in frequent English words and word-onset awareness in oddity tasks), visual recognition and decoding of familiar words (automatic word identification), and spelling (combination of letter-cards to create and segment words). Furthermore, song lyrics also contain elements of reading and oral comprehension since students have to decode the meaning of spoken plus visualized written words, along with identify these words with their corresponding images, that is, a meaningful referent shown in the videos. Each song contained known monosyllabic and polysyllabic words students learned in class, words starting with the same initial phonemes as well as some pseudowords to work on rhythmic patterns and on the alphabetic principle.

#### *5.4.1.1. The use of audio-visual elements*

The brain learns through multisensory and idiosyncratic music instruction which integrates audio-visual elements. The use of the audio-visual elements in video-format presented in both experimental groups are based on the model of working memory developed by Baddeley (1986, 2003, 2012) where the phonological loop, defined as the short-term memory for phonetically coded verbal information (Baddeley, 1986; 2012; Kibby, Lee and Dyer, 2014), contributes to basic reading ability and the visuo-spatial sketchpad addresses visual and orthographical elements. The phonological loop can be considered as a language learning device which according to Baddeley, Gathercole & Papagno (1998) stores unfamiliar sound patterns while more permanent memory records are being constructed.

Among the benefits of songs for learning languages are the development of the four linguistic skills, memory and recall, motivation and cultural sensitivity, and the activation of the two hemispheres (Fonseca-Mora, Toscano-Fuentes and Wermke, 2011). Furthermore, singing is an effective and easy way of memorizing something and thus, melodies may also strengthen long-term memory. In fact, most children (and adults too) find it much easier to recall words and phrases and retrieve information that have been set to a tune, melody or rhythm (Fonseca-Mora, 2000). Thus, simple, rhythmic and repetitive melodies matched with phonics can be considered a powerful aid for EFL learners when learning to read since they may induce the song-stuck in my head phenomenon (Murphey, 1990), a rehearsal loop that may improve musical, verbal and subvocal rehearsal (Fonseca-Mora, Jara-Jiménez & Gómez-Domínguez, 2015: 3). That is, these catchy melodies foster the self-initiated rehearsal needed for improving some

phonological skills and speech sounds, and therefore, have an effect on the neural processing of rules, memorized information and even comprehension.

The audio-visual and multi-modal elements combined in a multi-faceted video-clip (Baddeley, 2012) can be also used to help EFL learners attach meaning to the minimal units of discursive articulation (Gértrudix and Gértrudix, 2010). Thus, they are considered as carriers of visual and orthographic perception which visualized written letters and lexical patterns. The visuo-spatial sketchpad makes it possible for students to relate the discourse intonation of the repetitive melodies with their subtitles, which represent the comprehension of words in a written sentence. In fact, Baddeley (2003: 193) affirms that “visually-presented material may be transferred from an orthographic to a phonological code and thereby registered within the phonological output buffer”.

#### **5.4.2. The phonological training programme**

The phonological training programme without musical support used the same video-format instruction with subtitles than the musical-phonological programme but without the melodic and rhythmical patterns. Students work on phonological processing tasks that emphasized on alliteration, grapheme-phoneme correspondences and how to master the alphabetic principle (letter-name and letter-sound knowledge, phonics and spelling skills) in order to decode familiar words and pseudowords and to create, blend and segment words using various combinations of vowel and consonant letter-cards, sound matching tasks and “the phonic wheel”.

The phonological training programme included the following tasks supported by laminated flashcards and posters as well as audio-story books and rhymes. Each activity reinforces and develops one of the following early reading skills:

1. Letter-name and letter-sound learning: Students practiced with the names of the letters of the English alphabet and with single-letter sounds. Activities for alphabet rhyme.
2. Phonological awareness, auditory discrimination and production, early phonic knowledge linked to words:
  - a) Alliteration, onset and rimes detection and manipulation tasks: Activities in which students had to change initial, middle-vowel and final sounds of words in order to create new ones. They were asked to write the initial letter of the words in relation to pictures, sound the initial phonemes and give a word

beginning with the sound. Learners practiced with single-letter sounds (specially focusing on those phonemes that are pronounced differently in Spanish, such as, /g/, /h/, /j/, /k/, /r/, /v/, /w/, /x/, /y/, /z/) and with graphemes of more than one letter, for example, the phoneme /f/ is written 'ph'. Sometimes students' names could illustrate familiar examples (Jessica, Jonathan, Philip, etc).

b) Rhyming words:

- “Draw a Rhyme”: students have to find two words that rhyme from a set of CVC word cards that are placed face up. For example, “sad” and “dad” or “fun” and “bun”. Next, they need to reproduce a drawing for the two words together (Glynne and Snowden, 2010).

c) Phonological oddity tasks: learners were asked to identify the odd word out when listening to three different words, two of them sharing the same initial phoneme.

3. Phonics and spelling:

a) Word choice tasks based on spelling:

- “The alphabet rainbow”: learners made words using various combinations of laminated letter-cards (vowels and consonants), placing them on a cardstock paper with removable adhesive such as masking tape or sticky for all students to see. This activity makes students learn an appreciation of how words are constructed and can be also done using timers, mini-whiteboards or magnetic boards, individually or in pairs (Glynne and Snowden, 2010).

b) Oral blending skills, manipulation of sounds in words, word formation tasks when reading new words and spelling:

- “Sliding sounds”: Teachers create a template of a cat and a separate sliding card strip (it slides up and down). The first letter of the word is on the strip and the last two letters on the cat's body. Children were required to write letters on the strip, slide the strip up and down to change the initial sounds of words and read the new created words (Coulson and Cousins, 2012). For example, to change the initial sound of the following words (*hen, hill, hat, hot*) to /p/ or to choose which words could be made with the following initial phonemes: c, h, p, m, f, and the rime “at”. This activity can be also done using sleeve patterns

on cardstock paper: cut the outside of the sleeve with the sleeve folded in half, write the initial letters on a slide strip and the rimes on the sleeve.

- “The phonic wheel”: This is a sound matching task based on blending onsets and rimes (initial and final phonemes) to create words. Teachers needed to card circles for each wheel, one smaller and one larger and brass fasteners. Children were required to write and match the sounds of the two circles (the initial grapheme in the smaller one and the ending of the word on the outer edge) and read the word (Coulson and Cousins, 2012)
4. Fluency: reading isolated familiar words, being aware of rhyming words using rhymes, reading aloud rhymes using familiar words, and reading short texts and dialogues in English.

## CHAPTER 6: DISCUSSION AND CONCLUSIONS

### 6.1. Results and discussion

This dissertation is a compendium of three published research articles that reflect on the relationship between musical-phonological stimulation and reading skills development in English as a FL. Taken into account the results of the three articles included in this doctoral dissertation, our findings support the notion that musical plus musical-phonological training benefits early reading skills in English as a foreign language. This finding corroborates and supports previous research into this multidisciplinary field which links musical aptitude, musical training and the development of reading skills in a FL, being they mainly inclined towards enhanced phonological processing (Delogu, Lampis, and Belardinelli, 2010; Fisher, 2001; Francois et al., 2012; Herrera et al., 2011; Marques et al., 2007; Pei et al., 2016; Sadakata and Sekiyama, 2011; Slevc & Miyake, 2006; Zermoskaite, 2014).

Nevertheless, determining the effects of musical-phonological stimulation on the reading skill development is not a straightforward research topic but a complex one which poses some problems due to the wide variety of individualized research instruments and intervention programmes that have to be used and analyzed, together with the many different variables that affect the reading process and the different types of studies that investigate this topic with different aims and samples involving sizes, grades and nationalities that varied considerably across studies.

One of the most important finding and contribution that emerged from this meta-analysis was that many studies are related to the influence of musical abilities and training on the learning of reading in a L1. Interestingly, only a 7,4% is related to the learning of reading in a L2. This finding suggested a lack of studies in the L2 and FL fields as regards the relationship between music and reading skills. As a conclusion, given the limitations described here of the studies included in this meta-analysis, further research of music effect on reading skills, especially in a FL, is definitely warranted.

Based on the most frequently-used multidisciplinary research instruments in the meta-analysis and in terms of the last research question of this paper, a battery made up of five assessment instruments was recommended for the study of musical influence on language reading skills in a FL: an adequate early reading skill assessment tool that can be applied

to both Spanish as L1 and English as a FL, including measures of phonemic awareness, phonological awareness and vocabulary adapted to the level and context of the participants; a musical aptitude test battery or a receptive musical abilities test; a general intelligence test involving cognitive abilities related to reading processes such as working memory, processing speed and verbal comprehension, and a sociocultural survey mainly related to parent educational status, learners' and family's reading and musical habits and languages spoken at home.

Consistent with these results, we did a literature review of early reading skills assessment tools that could be used in Spanish and English. A study using the DIBELS-6 test was firstly carried out with the aim of analyzing which early reading assessment tool would be the more appropriate to be used in the main study of this doctoral thesis. This study is presented in the second research article that makes up the present dissertation: *Fluidez lectora oral en inglés como lengua extranjera*. Its principal purpose was to examine the effect of a training programme aimed at improving oral reading fluency development and reading comprehension in 14-15-year-old EFL learners. Regarding the scores obtained by students in the oral reading fluency test and the retell test (comprehension) from DIBELS-6, the results underline the lack of both reading fluency and reading comprehension in the FL. Although the levels of oral reading fluency after the intervention programme were at some risk of reading failure compared with the standard scales provided by DIBELS, findings revealed that FL learners involved in this study benefitted from an oral reading fluency training programme based on reading aloud English texts on a daily basis during three weeks. Learners improved their oral reading fluency so that better decoding of words were achieved; however, their enhanced decoding and fluency skills did not facilitate their comprehension in English as FL since results indicated that the effect of the training programme on reading comprehension was not statistically significant, which we did not hypothesize. Reading comprehension involves an enormous cognitive effort since it is the result of being able to decode written language or words at the same time they have to identify a meaningful referent. It is clear from the results that the adolescent learners involved in this study lacked this competence and as a result they failed to understand what they read. This finding might be due to the low initial proficiency level of students, and points out that a learner with good decoding skills is better equipped to read fluently, that is, with accuracy, expression and at a good rate, and to comprehend the text they were asked to read.

However, this test posed some problems. Among the shortcomings of using DIBELS as a reading assessment tool in the foreign language classroom, it is important to note that the reference criteria derived from the DIBELS test do not correspond to the grade, level and target language of the Spanish teenagers learning English as a FL involved in this study. These average rates provided by DIBELS benchmark scores are based on studies conducted with English L1 and L2 learners; many of the latter studies deal with Hispanic learners living in the US who are instructed in both Spanish and English, or only in English. Hence, using these standards simply highpoints the problems of the group in the oral reading fluency and reading comprehension skills as they are not appropriate ones for their context. In the case of our students, English is neither their official nor communication language, but it is used mainly just in the classroom and thus, studied as a FL. Moreover, DIBELS comparison scales were not appropriate for this group because as it has been previously stated, FL learners exhibit a different development rhythm than L1 and L2 learners while reading. Gómez-Domínguez's study (2016) concludes that there is clearly a lack of national and international oral reading fluency and reading comprehension standardized scales adapted to the context of Spanish adolescents studying English as a FL. Thus, in order for teachers to use the *Oral Reading Fluency* measure (along with the *Retell fluency* test) of DIBELS-6 as a user-friendly tool in the classroom, these standards are definitely required and adapted to the teaching and learning of foreign languages.

After piloting DIBELS, a pilot study using the EGRA test was also carried out but with some differences with regard to the participants' age and grades. The main reason why the sample of students changed from one pilot study to the other was based on the fact that early reading skills are essential abilities for an efficient development of literacy acquisition and, therefore, they should be measured at the first stages or levels of the reading acquisition process. The fact that DIBELS subtests are organized according to grades implies that alphabetic principle and phonological awareness subtests for 2<sup>nd</sup> grade do not exist. Finally, EGRA was decided to be the early reading assessment tool in Spanish and English used in the third study of this doctoral dissertation. However, consistent with the problems previously mentioned as regards the DIBELS-6 assessment, although the EGRA test has been adapted to the context of foreign languages (Fernández-Corbacho, 2016), this battery and the diverse tasks included in it still need more adaptations to be defined as an appropriate classroom and diagnostic instrument for

teachers to identify learners' reading problems, mainly in the FL learning context. This problem may be explained by the fact that the existent standardized data for the evaluation of this early reading assessment test do not belong to the Spanish context.

Taking into consideration that music training can improve early reading skills in young learners, and reflecting upon the little research done on the effect of music instruction on reading abilities in a FL, a study was set up in which a battery made up of five research instruments for the study of the relationship between musical training and early reading skills in a FL was used: an early reading skill test in Spanish and English, a receptive musical abilities test, a cognitive abilities test involving working memory, verbal comprehension and processing speed, a sociocultural survey, and a motivation questionnaire. The study reported in this thesis is, then, multidisciplinary since different research perspectives should be borne in mind and a variety of research instruments are assessed to analyze the interplay between music and reading abilities.

To fulfill this objective, the study *Musical plus phonological input for young foreign language readers* was carried out with the aim of examining the effects of musical-phonological stimulation on reading abilities in 7-8-year-old Spanish children learning English as FL. Moreover, two training programmes with and without musical support were implemented to three groups (musical experimental, non-musical experimental and control) from two different schools during eleven weeks. Before the training period, we tried to replicate the recommended battery of instruments described in the first paper of this thesis, so that a battery of early reading skills in English, and a musical aptitude, working memory, and sociocultural status tests were administered during two weeks, following a pre-post experimental design. One-Way repeated measures Analyses of Variance (ANOVAs) were conducted to test for before training differences in sociocultural factors and musical aptitude between groups. This was followed by a pre-post comparison design and multiple regression analyses including knowledge of sounds and letters, reading fluency and their interaction with working memory so as to test for the effect of the pedagogical training programmes on teaching the experimental and control groups to read in a FL.

With regard to the main results before training, findings showed that the three groups were homogenous in terms of their age, gender and sociocultural background. With respect to learners' musical aptitude, results found that students within the three groups were broadly within the norm since their musical aptitudes were homogeneous before

training. However, findings revealed that the non-musical experimental group had significantly higher musical aptitudes than the control and the musical experimental groups. Noteworthy was also that the three groups were similar in terms of working memory but were not in the scores obtained in the three reading variables, resulting the musical experimental group to be the one with the highest scores in the “Initial sound identification” task prior to the intervention. Regarding results after training, findings clearly point to the beneficial effects of the phonological teaching approach on both experimental groups’ early reading skills performance. However, the further impact of the musical support or training was not demonstrated since the analysis based on multiple regressions with interactions and considering working memory indicates no significant differences between the musical and non-musical experimental groups as regards ‘correct letters read in English’, ‘initial sound identification’ and ‘correct words read in an English dialogue’, both attaining significantly better scores than the control group.

One aspect that also deserve comments is the influence of the phonological training programmes on learners’ working memory given the literature underlining the positive effect of instrumental musical training (Ho et al., 2008; Franklin et al., 2008) and singing (Christiner and Reiterer, 2013) on cognitive factors such as verbal working memory. By contrast, results of pre vs. post comparisons for working memory showed that these effects were not found in the present study neither with regard to session (pre-post) and group. Nevertheless, using the results from the working memory in the pre-test allowed us to say that the influence of working memory to enhance the ‘correct letters read’ variable was larger in the musical experimental group. The findings of this study are in accordance with Bolduc and Lefebvre’s (2012) study that showed that the combination of phonological and musical input will improve learners’ auditory processing and verbal working memory, which in turn will cause significant gains in phonological awareness skills. Moreover, according to these authors, using music perception abilities will help children acquire metaphonological abilities without relying exclusively on language activities (p.500). That is, melodies will allow students to move away from just hearing single words and experience language in context. Similarly, Christiner and Reiterer (2013) considered that singing repetitive and memorable melodies can enhance auditory working memory. Our results are also in line with Herrera et al.’s study (2011) which pointed out that L1 and FL Spanish-speaking preschoolers who received a phonological training programme without musical input outperformed those with musical training in

the phonological awareness and naming speed tests, except for the identification of word ending tasks. Likewise, Moreno et al. (2015) showed that either a language or a musical training programme improved the processing of trained sounds.

Another important contribution of this PhD for the teaching of foreign languages is that having a high level of musical aptitude may facilitate learning to read in English as FL. In the present study, it was the case of the children participating in the non-musical group, who were shown to have the highest musical aptitude before training and, interestingly, they likewise obtained the highest level of performance in both the 'correct letters read in English' and the 'correct words read in an English dialogue' reading tasks. In short, these musical students seem to be better equipped for language learning and, thus, they benefited more from the phonological training programmes than children with lower musical aptitudes. However, of interest in this study is also the fact that although children in the music group showed low musical aptitudes, they performed better than the control group at the post-tests. All these findings leads to the conclusion that the phonological training program with and without musical support seemed to have significant effects on young EFL learners' early reading skills.

## **6.2. Conclusions**

Any interest regarding FL reading research and teacher training has traditionally centered on reading comprehension strategies although less attention has been given to the phonological-decoding component of reading. In recent years, however, a growing number of studies have shown the positive effects of musical input on the development of phonological awareness and decoding skills and the debate about the use of phonics in reading instruction has also brought to the English language teaching scene the relevance of developing learners' decoding skills by using more teaching efficient and innovative methodologies. However, finding alternative research-based teaching approaches that could help to achieve literacy skills in a L2 or FL is still a constant concern. One option that has received increasing attention is the influence of musical input as an aid for learning to read in a FL, which may be provided with or without audio-visual elements or software-based training.

There is mounting evidence for a relationship between musical training and reading ability since the neural and cognitive resources necessary for literacy acquisition and those required to learn to perceive and play music overlap (Patel, 2003a; 2011).

Moreover, music instruction provides children active ways of interacting with sounds so that it can give children the auditory, motor and cognitive skills they need to learn to read and succeed both in school and later in their lives (Tierney and Kraus, 2013a).

From a linguistic point of view, we hypothesized that basic foundational literacy skills such as phonological processing skills, alphabetic principle, word-decoding abilities, oral reading fluency and even verbal working memory would have improved after having received the phonological training programme with musical elements. Although we found this to be the case, results partly confirm this hypothesis since it has been found that the musical training programme was not the only effective intervention to improve learners' reading performance but a phonological training programme without musical support has been proven to enhance learners' reading skills too. Thus, one of the most significant findings to emerge from this study is that the phonological training programmes with and without musical support seem to have more significant effects on young learners' early reading skills than the traditional teaching methods developed in the control group. The present findings seem to be generally consistent with these previous research that have similarly stated the controversy related to the exclusive potential effects of musical training to improve FL early reading skill processing (Herrera et al., 2011; Moreno et al., 2015).

On the other hand, it should be noted that the main aim of this study was not to investigate the effect of formal musical training and performance such as playing instruments or instrumental music lessons, reading music notation and singing on verbal reading ability, as it is evidenced in numerous studies (Anvari et al., 2002, Bolduc and Montésinos-Gelet, 2005; Gromko, 2005; Forgeard et al., 2008; Degé and Schwarzer, 2011; Moritz et al., 2012). The theories of the influence of music on reading achievement included in this doctoral dissertation are more related to adding rhythmic and melodic discrimination activities, chants or song with lyrics to literacy activities instead of musical production ones such as participation in choral, band and orchestral concerts which require extensive and intensive musical training and learning to read music. Approaches of music education adopted in this study are more connected to studies taught to music that have designed musical activities as an aid or positive reinforce for teaching and improving specific reading skills, and even also related to some training programmes used in music therapy studies especially designed for children with learning disabilities (Register, Darrow, Standley, & Swedberg, 2007; Register, 2001; 2004) which are based

on the theory that music provides a fun, multisensory approach to learning that can rehearse and improve a skill (Standley, 2008: 19). Therefore, this doctoral dissertation is in agreement with Standley (2008:29) which indicates that “music activities which incorporate specific reading skills matched to the needs of children at-risk for reading difficulties will enhance reading instruction” and also with Christiner and Reiterer’s study (2013) that pointed out that singing help detecting rhythmic cues in foreign languages since it is similar to music at the acoustic-perception level. Moreover, while instrumental musical training is often difficult to implement in primary schools when music classes are not included in the curricula, singing, by contrast, is often practiced in kindergarten and early primary education and it is easier to implement.

Therefore, one of the main contributions of this study is that using music and multi-sensory elements in a phonological training programme especially designed for teaching early reading skills in beginner EFL learners is a powerful educational tool to improve learning to read in a foreign language. In line with Christiner and Reiterer (2013), this finding may be explained by the fact that rhythmic and repetitive songs characterized by their slow pace, simplicity in their melodic contours and easiness for memorization, could favour phonological memory and relevant foreign speech sounds and when activated periodically, they can also improve automatized decoding. Thus, this study concludes that a musical plus phonological intervention would be an added value when learning to read since these melodies that work as carriers of visual and orthographical perception may stimulate and provoke the song-stuck-in-my-head phenomenon that may improve the subvocal and verbal rehearsal needed for improving specific phonological skills (Fonseca-Mora, Jara-Jiménez, & Gómez-Domínguez, 2015). Of interest is also that this alternative teaching approach could help learners to overcome their reading difficulties in primary education and reach a richer and more effective learning context. Moreover, adding audio-visual melodies and rhymes to a phonological training programme are engaging, enjoyable and meaningful activities which would better aid the reading development of beginner learners. That is, musical activities such as rhymes, chants and songs (with lyrics or subtitles presented in video-clips) matched to the development of basic reading skills encourage children to play with words and sentence patterns, increase their vocabularies and enjoy the idiosyncrasies of the English language. They helped students to improve and give a sense of the natural rhythm of the target language, which usually sets high demands to Spanish EFL learners since Spanish and English differ at

their prosodic level. Therefore, teachers of young EFL learners should give emphasis to singing abilities using melodic approaches, prosodic and rhythmic features in the classroom when teaching the different stages in the learning-to-read process.

Finally, the findings of this study have a number of important implications for future practice. One of the issues that emerge from these findings is that it is essential to reconsider the space allocated to music and the development of musical abilities within early primary school programmes and curricula. There is no doubt that the addition of musical plus phonological activities to a foreign language classroom can remain an important part of reading instruction since it can improve and complement its development. Therefore, the implication for schools is that musical training based on melodies and rhythm and paired with phonics instruction, while valuable for stimulating the musical potential and metacognitive abilities of every child, may significantly foster young FL learners' early reading skills as well. Another important practical implication of this study is that further adaptations of early reading assessment tools to the context of teaching and learning foreign languages is definitely needed. In fact, one of the main weaknesses of this study is the lack of standardized scales adapted to the context of Spanish learners of English as a foreign language.

To draw definite conclusions on the relationship between musical-phonological stimulation and early reading skills in a FL learning, this study shows that an 11-weeks phonological training programme based on repeatedly singing rhythmic melodies and aimed at improving early reading skills, is an alternative, research-based and an efficient method for teaching young learners to read in a FL. In short, although readers should interpret these findings bearing in mind a number of limitations, our study provides further evidence for the claim that musical aptitude, musical training and linguistic skills are interconnected.

### **6.3. Suggestions for future research and limitations of the study**

It would be of interest in future investigations to test for the influence of these phonological training programmes on FL reading abilities outcomes when these pedagogical interventions are conducted for a longer duration and when assessments are made not only before and just after training, but also long after training has finished.

Given the overlapping brain structures in speech and music processing, it is suggested that a possible relationship between musical aptitude and linguistic abilities in a L1 and

FL should be also investigated in future studies. As the prosody of speech depends on musical elements such as rhythm, frequency and intensity, it would be of great interest for future studies to examine whether students' musical perception competence can affect their ability to perceive and produce the sounds of English as a FL. Moreover, we consider that the relationship between musical perception abilities and early reading skills in a FL may vary with different levels of competence in a native language. However, little work to our knowledge have been done concerning the causal effect of musical perception capacity on the acquisition of FL early reading skills based on their transference from L1.

Related to it, a further study addressing the influence of musical perception on first and foreign early reading skills has been carried out called *First and foreign language early reading abilities: the influence of musical perception* (Gómez-Domínguez, Fonseca-Mora, Herrero-Machancoses). This manuscript has been submitted to the *Psychology of Music* journal (impact factor: 2.010; *Science Citation Index*), it has undergone peer review and has been accepted for publication although some changes are still required (see Annex IV). The most interesting finding of this submitted manuscript is that musical perception has a significant effect on FL early reading skills through its transference from L1, and not directly. These findings corroborate that the higher the learners' scores in musical perception, the larger the increase in their early reading skills in L1 are, and therefore, the better these skills develops in the FL. This latter point is important, given the abundance of literature underlining the relationship between musical ability and reading skills (Gordon et al., 2015, Lessard and Bolduc, 2011; Standley, 2008; Tierney and Kraus, 2013a), especially as regards the link between musical perception and phonemic and phonological awareness in a L1 (Anvari et al., 2002; Degé et al., 2015; Zuk et al., 2013). Of interest in this study is that it is one of the few research that provides new insights into how musical perception and L1 early reading competence can influence the learning of FL early reading skills. To our knowledge, this is significant because it is the first report showing the existence of a casual effect of musical perception abilities to L1 early reading abilities (alphabetic principle, phonemic awareness and word recognition skills), transfer that will enhance the learning of these same early reading skills in the FL. From this study we can conclude that in order to develop and enhance young learners' early reading skills in a FL, it is not only necessary an appropriate training in musical and phonological abilities or having a high musical perception ability, but also an adequate competence in their L1 that will empower and positively influence the learning-to-read

process in the FL. Based on the present results, it is proposed that language-reading skills, both in production and discrimination, are interconnected with perceptual musical skills.

Finally, future work is needed to make definitive conclusions regarding whether the musical-phonological stimulation can enhance more complex reading skills such as reading fluency and comprehension. Further experimental study is needed to investigate if certain reading skills are more susceptible to a positive transfer from musical-phonological training than others both on young and adult learners of English as FL. We believe that more intensive and gradual training may be needed for these improvements in reading fluency in young learners since teachers should start by emphasizing auditory discrimination and decoding skills and use them to increase further orthographical skills, such as reading fluency and comprehension. In this vein, it would be interesting to assess the effects of musical competence not only on oral but also on silent reading fluency in both the L1 and the FL. It is recommended that further research be undertaken with regard to the relationship between musical-phonological training and silent reading fluency and reading comprehension in adult learners, instead of children, taking also into account cultural and identity values, although it is left to future studies to explore these relationships in greater depth. Furthermore, establishing the most influential dimension of musical perception (pitch or rhythm) competence on FL reading skills also indicates an area of research worth-considering in future studies.

As far as the limitations of this study are concerned, one of the most important is the heterogeneity of approaches and study designs used to investigate the relationship between musical-phonological stimulation and language-reading skills in a foreign language, together with the great variability regarding musical interventions, research instruments for data collection, sample sizes and diverse languages spoken in the studies analysed. As we have previously said, establishing this relationship is not a simple issue since experimental designs are required, along with a proper selection of multidisciplinary test batteries and of three different groups: an experimental group, a passive control group and an active control group that should emphasize another activity from arts. It is also interesting to note that the effects of the musical plus musical-phonological training programmes on reading skills could not be solely attributed to the interventions but they may have also been affected by other factors such as teachers' different dynamics in the different groups or the fact that students engaged in the experimental groups may have exaggerated the gains in reading skills due to the training and extra attention they

received. This training and the role of the teacher could have led to learners' higher motivation and enthusiasm to excel in learning in comparison to students involved in the control group.

Given the limitations discussed here of this study, there is still a long way to go and there is abundant room for further progress in this transdisciplinary area. However, we consider we are on the right direction to continue investigating about new and efficient methods for teaching to read in a FL.

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**ANNEX 1: ORIGINAL PAPER: “INSTRUMENTOS DE INVESTIGACIÓN PARA EL ESTUDIO DEL EFECTO DE LA MÚSICA EN EL DESARROLLO DE LAS DESTREZAS LECTORAS”**

# Instrumentos de investigación para el estudio del efecto de la música en el desarrollo de las destrezas lectoras

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**RESUMEN:** El aumento de estudios del efecto de la música en el desarrollo de las destrezas lectoras ha sido notable. Sin embargo, el panorama de resultados está fragmentado por tratarse de investigaciones multidisciplinares principalmente de lengua materna y con resultados diversos. En este artículo se revisan estudios de la última década para detallar los principales efectos encontrados y determinar los instrumentos de recogida de datos. Esto permite describir el estado actual de la cuestión y recomendar herramientas para futuros estudios sobre la relación entre música y desarrollo de destreza lectoras en una lengua extranjera.

**Palabras clave:** Música, destrezas lectoras, aprendizaje de lenguas, instrumentos de investigación

## Research Instruments for the Study of Musical Influence on Language Reading Skills

**ABSTRACT:** The increase in studies about the effect of music on the development of reading skills has been noticeable. However, the overview of results is fragmented due to multidisciplinary research mainly as regards L1 and with diverse results. This article reviews studies of the last decade to outline the main effects found and to determine the data collection instruments that have been used. It allows describing the current state of the issue and recommending tools for future studies on the relationship of music and reading skills in a foreign language.

**Keywords:** Music, reading skills, language learning, research instruments

## 1. INTRODUCCIÓN

La lectura es una habilidad esencial sobre la cual se construye el éxito en la educación formal. Se ha publicado mucho sobre el desarrollo de la capacidad lectora tanto en L1 como en L2 y de la transferencia del aprendizaje de la lectura de L1 a L2, sin embargo, los indicadores a nivel nacional e internacional siguen confirmando un déficit lector existente a nivel global. El Estudio Europeo de Competencia Lingüística (EECL, 2012) muestra que más de un 50% de estudiantes europeos de 15-16 años de edad solo tiene nivel de principiante en LE. Al igual que en Europa, la evaluación nacional del progreso educativo de EEUU (NAEP, 2011) alerta de un porcentaje significativo de lectores con problemas y destaca la

importancia de la intervención temprana, es decir, el énfasis de la enseñanza de las destrezas de descodificación en los primeros niveles educativos. Aún se necesitan métodos efectivos que puedan solucionar gran parte de los problemas lectores del alumnado.

Una de las alternativas para la enseñanza de lenguas que está en auge es la estimulación sonora-musical ya que melodías y ritmo facilitan el aprendizaje de lenguas maternas y extranjeras (Chobert y Besson, 2013; Toscano-Fuentes y Fonseca-Mora, 2012; Slevc y Miyake, 2006) y numerosos estudios avalan la relación entre música y desarrollo de destrezas lectoras (Tierney y Kraus, 2013a; Lessard y Bolduc, 2011; Standley, 2008; Butzlaff, 2000). Sin embargo, el panorama de resultados está fragmentado con resultados diversos fundamentalmente en L1. La investigación de la música y del desarrollo de las destrezas lectoras es objeto de estudio de disciplinas como la psicología, la neuropsicología, la educación tanto la general como la musical y la lingüística aplicada, con distintas herramientas de recogida de datos dada la complejidad del fenómeno a estudiar. Este número de herramientas y la dificultad *per se* de la investigación de sujetos en un aula influye también en el número de la muestra, por lo que a veces, estadísticamente los resultados han sido considerados como no concluyentes.

El objetivo de este artículo es revisar estudios existentes en L1 y LE para concretar resultados obtenidos y consensuar herramientas de recogida de datos para futuros estudios sobre la influencia musical en el desarrollo de las destrezas lectoras en LE.

## 2. LA RELACIÓN ENTRE LA MÚSICA Y EL PROCESO LECTOR

Distintas investigaciones muestran que la aptitud musical se relaciona con la lectura (Toscano-Fuentes y Fonseca-Mora, 2012). Ambas comparten algunas destrezas auditivas como la discriminación melódica, rítmica y armónica y, en general, la combinación y segmentación de sonidos. Los procesos cognitivos para discriminar y asociar sonidos y tonos musicales con sus símbolos son similares a los procesos de descodificación grafema-fonema en la lectura. Hansen y Bernstorff (2002) relacionan la capacidad lectora de los niños con su capacidad para discriminar tonos o melodías y explican los componentes básicos de ambas: la conciencia fonológica, la conciencia fonémica, la identificación visual de palabras o de notas y los símbolos musicales, la conciencia ortográfica, la conciencia de los sistemas simbólicos, y la fluidez.

Los estudios sobre el efecto del programa musical en la conciencia fonológica (Herrera, Lorenzo, Defior, Fernández-Smith, y Costa-Giomi, 2011; Moreno, Marques, Santos, Santos, y Besson, 2009; Forgeard, Schlaug, Norton, Rosam, Iyengar, y Winner, 2008; Bolduc y Montésinos-Gelet, 2005; Gromko, 2005; Anvari, Trainor, Woodside, y Levy, 2002; Peynircioglu, Durgunoglu, Öney-Küseföglu, 2002; Douglas y Willatts, 1994; Lamb y Gregory, 1993) concluyeron que los niños con mayor sensibilidad auditiva para discriminar sonidos consiguen mejores resultados en los tests de lectura. Sin embargo, Herrera et al. (2011) aportan que es el entrenamiento fonológico sin necesidad de apoyo musical el que mejora la conciencia fonológica y la velocidad de nombrar de los preescolares de su estudio mientras que los resultados de Gromko (2005) señalan que es la música la que afecta directamente a la capacidad de segmentar palabras en fonemas.

No hay acuerdo respecto al grado de relación entre percepción tonal, percepción rítmica y destrezas lectoras. Unos afirman que la percepción del tono es el único factor influyente en

las conciencias fonológica y fonémica (Runfola, Etopio, Hamlen, y Rozendal, 2012; Tsang y Conrad, 2011; Bolduc y Montésinos-Gelet, 2005, y Lamb y Gregory, 1993), mientras que otros constatan que es la percepción rítmica (Tierney y Kraus, 2013b; Moritz, Yampolsky, Papadelis, Thomson, y Wolf, 2012; Forgeard et al., 2008; David, Wade-Woolley, Kirby, y Smithrim, 2007, y Douglas y Willatts, 1994).

Whalley y Hansen (2006) analizan la relación entre sensibilidad prosódica y desarrollo del proceso lector. Definen la prosodia como: “The phonological subsystem that encompasses the tempo, rhythm and stress of language” (p. 288). Los resultados muestran que la sensibilidad prosódica es fundamental para el desarrollo de la destreza lectora y que las destrezas prosódicas se relacionan con la comprensión lectora, la conciencia fonológica, la lectura de las palabras y la percepción del ritmo musical. Estos dos investigadores defienden que la comprensión lectora se puede interpretar como el producto de descodificación y comprensión auditiva, que da lugar al acceso léxico, y desde esta perspectiva, expresan que la prosodia es parte de la comprensión auditiva y, por lo tanto, se debe relacionar con la comprensión del texto.

Los estudios que abogan especialmente por el entrenamiento musical centrados en el desarrollo de destrezas lectoras tempranas (Register, Darrow, Standley, y Swedberg, 2007; Register, 2001; 2004) aseveran que estos programas tienen un efecto positivo en la adquisición de destrezas pre-lectoras y lectoras. Register et al. (2007) describen un programa musical multi-sensorial diseñado para mejorar las destrezas de descodificación de palabras, el aprendizaje de vocabulario y la comprensión de textos en niños sin y con problemas lectores. Los investigadores concluyeron que tanto los estudiantes sin problemas como los estudiantes con discapacidades en la lectura mejoraron los distintos componentes del proceso lector a excepción de la comprensión lectora.

Finalmente, es necesario mencionar las investigaciones con estudiantes diagnosticados con discapacidad en la lectura, tales como dislexia o deficiencias de habla y lenguaje, por lo que reciben una enseñanza especial (Huss, Verney, Fosker, Mead, y Goswami, 2011; Forgeard et al., 2008; Register et al., 2007; Register, 2001; Douglas y Willatts, 1994). De notable relevancia es que en todas ellas los programas musicales tienen un efecto positivo en el desarrollo de la destreza lectora de sus participantes. En el caso de niños disléxicos se comprueba que también tienen dificultades en las habilidades musicales de discriminación de tono y ritmo. Forgeard et al. (2008) demuestran que la enseñanza musical que se centra en la mejora del procesamiento tonal y rítmico puede ayudar a niños disléxicos en las destrezas auditivas necesarias para la lectura.

### 3. MÉTODO

#### 3.1. Objetivo y muestra

El objetivo de este estudio es analizar investigaciones relacionadas con la percepción musical y el desarrollo de las destrezas lectoras para determinar los instrumentos de recogida de datos más usados según la tipología de estudio y el nivel educativo de los participantes con la finalidad de poder replicarlos en estudios de aprendizaje de lengua extranjera.

Para ello se han analizado 27 artículos internacionales publicados entre los años 2001-2013. Dichos estudios proceden de áreas diversas como lingüística aplicada (enseñanza de

lenguas, fonética), educación, musicología (musicoterapia), y psicología (neuropsicología). Las publicaciones científicas de este corpus han sido escogidas teniendo en cuenta los siguientes criterios de selección:

- Por temática: estudios sobre uso de melodías y ritmo para mejorar el proceso lector.
- Por impacto: estudios publicados en revistas de impacto por lo que han pasado los filtros de evaluación de expertos.
- Por tipología: estudios de carácter experimental, cuasi-experimental y de correlación.

Este corpus contiene artículos indexados en ISI “Web Of Knowledge”, ERIC, JSTOR y “Academic Search Premier”. La admisión de estas revistas de impacto y ranking en las bases de datos antes citadas supone que han sido evaluadas positivamente por su calidad de los procesos editoriales, su buen funcionamiento de los indicadores de difusión y visibilidad, sus indicadores de impacto y uso y, finalmente, sus indicadores sobre la calidad del contenido.

### 3.2. Sistema de criterio de análisis

El análisis ha tenido en cuenta las siguientes variables:

- Tipología del estudio: correlacional, cuasi-experimental y experimental.
- Características de los participantes: número de participantes, nivel educativo, clasificación educacional (estudiantes sin y con discapacidad en el aprendizaje de la lectura) y nacionalidad.
- Lenguas en el estudio: lengua materna y/o segundas lenguas o lenguas extranjeras.
- Instrumentos de recogida de datos: tests estandarizados, pruebas diseñadas por los investigadores del estudio.

### 3.3. Análisis de los estudios

Las investigaciones contrastadas son once estudios de correlación, ocho cuasi-experimentales y ocho experimentales. Los estudios de correlación comparan componentes del proceso lector con aptitud musical pero no incluyen ningún tipo de programa de intervención por lo que no se establece una relación causa-efecto entre música y destrezas lectoras como en el caso de los experimentales. Los experimentales y los cuasi-experimentales contienen uno o varios pre-tests, un programa de intervención sonoro-musical especialmente diseñado para el aprendizaje de la lectura o un programa de intervención estrictamente musical o convencional, y uno o varios post-tests para así verificar el progreso del alumnado. La limitación de los cuasi-experimentales es que los participantes no son seleccionados aleatoriamente como en los experimentales, lo que es considerado como condición esencial para establecer una relación causal entre las diferentes variables (Lessard y Bolduc, 2011:116).

#### 3.3.1. Estudios de correlación

La tabla 1 muestra los estudios de correlación seleccionados y las distintas pruebas usadas. Se indica también el nivel educativo, el número de los participantes y la frecuencia de uso de cada prueba con relación a los demás estudios correlacionales.

Tabla 1. Instrumentos de recogida de datos, muestra y nivel educativo en estudios de correlación

		Instrumentos de recogida de datos							
		Lectura (90,9%)	Vocabulario (27,7%)	Conciencia fonológica/ fonémica (100%)	Velocidad de nombrar (18,2%)	CI/ memoria verbal (54,5%)	Aptitud musical y auditiva (90,9%)	Prosodia (9%)	Cuestionario socio- económico/ cultural (27,7%)
<b>Autores y muestra</b>	<b>Preescolar</b>								
Anvari et al. (2002) n=100		✓	✓	✓		✓	✓		
Bolduc, y Montésinos- Gelet (2005) n=13				✓			✓		
Peynircioglu et al. (2002) n=72 (2 estudios)		✓		✓			✓		
<b>Autores y muestra</b>	<b>Primaria</b>								
Banai y Ahissar (2013) n=156		✓		✓		✓	✓		
Corrigal y Trainor (2011) n=46		✓		✓		✓			✓
David et al. (2007) n=53		✓		✓	✓		✓		
Forgeard et al. (2008) n=100 (4 estudios)		✓		✓		✓	✓		✓
Tsang y Conrad (2011) n=69		✓	✓	✓			✓		✓
Whalley y Hansen (2006) n=81		✓		✓			✓	✓	
Zuk et al. (2013) n=43		✓		✓	✓	✓	✓		
<b>Autores y muestra</b>	<b>Primaria y secundaria</b>								
Huss et al. (2011) n=64		✓	✓	✓		✓	✓		

La población participante oscila entre los 13 del estudio piloto de Bolduc y Montésinos-Gelet (2005) y los 156 de Banai y Ahissar (2013), siendo la media de 72,4 estudiantes. Solo los participantes del estudio de Huss et al. (2011) y algunos de los participantes de Forgeard et al. (2008) son disléxicos. Un 63,6 % se refiere a estudiantes de primaria mientras que un 27,3% se refiere a preescolar y un 9% a estudiantes de primaria y secundaria (8-13 años). La mayoría de los participantes son de habla inglesa (anglo-canadienses, ingleses, estadounidenses y australianos) si bien también se encuentran estudios con niños franco-canadienses (Bolduc y Montésinos-Gelet, 2005), turcos (Peynircioglu et al. 2002), brasileños (Zuk, Andrade, Andrade, Gardiner, y Gaab, 2013) y hebreos-israelíes (Banai y Ahissar, 2013). Casi todos son estudios de lengua materna, a excepción del de David et al. (2007) donde el alumnado de origen caucásico es residente en Canadá.

El único estudio que no incluye prueba de lectura es el de Bolduc y Montésinos-Gelet (2005) que solo evaluó la conciencia fonológica de niños preescolares. La prueba *Phonological Awareness Test* (PAT) es la más usada para evaluar la conciencia fonológica, si bien para evaluar esta destreza Anvari et al. (2002) y Corrigan y Trainor (2011) utilizaron los tests *Auditory Analytic Skills* y *Standardized Auditory Perception Test*, mientras que Forgeard et al. (2008) y Tsang y Conrad (2013) utilizaron el *Test of Auditory Analysis Skills* (TAAT). Las pruebas de conciencia fonológica son mayoritariamente de identificación de sílabas y sonidos iniciales y finales, y tareas de combinación y omisión de fonemas.

Se observa también una gran variedad de pruebas estandarizadas de lectura, siendo las más comunes los tests *Wide Range Achievement Test-3* (WRAT-3), *Neale Analysis of Reading Ability-Revised*, la escala de habilidades lectoras *British Abilities Scale* (BAS), y la conocida prueba *Woodcock Reading Mastery Tests-Revised* (WRMTR). Además, los estudios de Anvari et al. (2002), Huss et al. (2011) y Tsang y Conrad (2011) han completado la habilidad lingüística con las pruebas de vocabulario *Peabody Picture Vocabulary Test-Revised* y *4th Edition* (PPVT-R; PPVT-4) y la escala *British Picture Vocabulary Scale* (BPVS), mientras que David et al. (2007) y Zuk et al. (2013) utilizaron pruebas de nombramiento de estímulos visuales como colores, números o imágenes.

La prueba neuropsicológica de inteligencia general utilizada en un 54,5% de los estudios es el test *Wechsler Intelligence Scale for Children* (WISC) en sus distintas versiones adaptadas a las edades de los participantes, con especial énfasis en la tarea de “dígitos” (*Digit Span*) de memoria de trabajo verbal. Además, Zuk et al., (2013) utilizaron también tareas de memoria visual extraídas del test *Cognitive Linguistic Protocol*. Mientras que Corrigan y Trainor (2011) es el único estudio que no incluye un test de aptitud musical que evalúe la percepción melódica, rítmica y armónica, Whalley y Hansen (2006) se diferencia de los demás por incluir pruebas de sensibilidad prosódica: *The DEEdee Task* y dos tareas del test *Profiling Elements of Prosodic Systems – Children test*. Por último, algunos estudios como Corrigan y Trainor (2011) y Tsang y Conrad (2011) recogen información demográfica sobre la familia, datos del nivel educativo de las madres y datos de formación musical de padres e hijos. Corrigan y Trainor (2011), además, recoge datos de los hábitos lectores y musicales de ambos.

### 3.3.2. Estudios cuasi-experimentales

La tabla 2 muestra los estudios cuasi-experimentales seleccionados y las distintas pruebas usadas. Se indica también el nivel educativo, el número de los participantes y la frecuencia de uso de cada prueba en relación a los demás estudios cuasi-experimentales.

Tabla 2. Instrumentos de recogida de datos, muestra y nivel educativo en estudios cuasi-experimentales.

		Instrumentos de recogida de datos					
		Lectura/ lecto-escritura/ lenguaje oral (100%)	Vocabulario (50%)	Conciencia fonológica/ fonémica/ velocidad de nombrar (75%)	Aptitud musical y auditiva (37,5%)	CI/ memoria de trabajo verbal (25%)	Cuestionario socio- económico (12,5%)
<b>Autores y muestra</b>	<b>Preescolar</b>						
Gromko, (2005) n=103		✓		✓			
Register, (2001) n=50		✓					
<b>Autores y muestra</b>	<b>Preescolar y primaria</b>						
Fisher, (2001) n=80		✓		✓			
Moritz et al. (2012) n=42 (2 estudios)		✓	✓	✓	✓	✓	
Register, (2004) n=86		✓		✓			✓
<b>Autores y muestra</b>	<b>Primaria</b>						
Bhide et al. (2013) n=19		✓	✓	✓	✓		
Moreno et al. (2009) n=32		✓		✓	✓	✓	
Register et al. (2007) n=41		✓	✓				

El número de participantes oscila entre los 19 del estudio de Bhide, Power, y Goswami (2013) y los 103 de Gromko (2005) siendo la media de 56,6 estudiantes. Estos estudios se centran en el desarrollo de las destrezas lectoras en lengua materna tanto en preescolar (25%) como en cursos entre preescolar y primaria (37,5%) y en los primeros cursos de primaria (37,5%) principalmente en estudiantes estadounidenses, aunque también se encuentran participantes portugueses (Moreno et al. 2009), hispanos (Fisher, 2001) y hebreos-israelíes (Bhide et al., 2013). De notable importancia es que el estudio de Fisher (2001) es el único que incluye estudiantes que reciben educación bilingüe, en este caso de español-inglés. Un reducido número de estudios afecta también a alumnado con alguna discapacidad en la lectura (Bhide et al., 2013; Register, 2001; Register et al., 2007).

La tabla 2 recoge una variedad de pruebas estandarizadas que van desde pruebas de lectura adaptadas a los distintos niveles y lenguas (en 100% de los estudios), a las de vo-

cabulario (en 50% de los estudios) y conciencia fonológica (en 75% de los estudios) que a veces ya están incluidas en las estandarizadas de lectura, y finalmente de aptitud musical (37,5%) e inteligencia general (25%).

Gromko (2005) y Register (2004) utilizaron la prueba de alfabetización y conciencia fonológica *Dynamic Indicators of Basic Early Literacy Skills* (DIBELS) mientras los demás estudios incluyen tests estandarizados de lectura: *Test of Word Reading Efficiency* (TOWRE), *Woodcock Reading Mastery Tests-Revised* (WRMT-R), *Developmental Reading Assessment* (DRA), *Test of Early Reading Ability-3rd Edition* (TERA-3) y *Gates-MacGinitie Reading Test*, 4th Edition (GMRT-4), así como otros de conciencia fonológica: *Phonological Awareness Test* (PAT) y *Comprehensive Test of Phonological Processing* (CTOPP). Los tests de vocabulario usados son el de *Peabody Picture Vocabulary Test III* (PPVT-III) y el test *British Picture Vocabulary Scale-II* (BPVS II). Moritz et al., (2012) es el único que incluye un test estandarizado de aptitud musical (*Musical Aptitude Test*, MAT), mientras que Bhide et al. (2013) y Moreno et al. (2009) usan tareas de discriminación tonal en melodías y tareas de percepción auditiva creadas por ellos. Solo dos estudios incluyen un test de inteligencia general. Moreno et al. (2009) utilizaron diez tareas de una versión portuguesa del test *Wechsler Intelligence Scale for Children*, 3rd Edition (WISC-III). Además, para medir la memoria verbal a corto plazo y la memoria de trabajo se administró la tarea de “dígitos” de este mismo test (*Digit Span*). Por otro lado, Moritz et al. (2012) utilizaron el test de inteligencia verbal y no verbal *Kaufman Brief Intelligence Test* (K-BIT). Finalmente, solo Register (2004) recoge datos socio-económicos sobre la familia a partir de un cuestionario.

### 3.3.3. Estudios experimentales

La tabla 3 indica los estudios experimentales seleccionados, las distintas pruebas usadas, el nivel educativo, el número de los participantes y la frecuencia de uso de cada prueba en relación a los demás estudios experimentales.

Tabla 3. Instrumentos de recogida de datos, muestra y nivel educativo en estudios experimentales.

		Instrumentos de recogida de datos						
		Lectura (50%)	Vocabulario (12,5%)	Conciencia fonológica/ fonémica (75%)	Velocidad de nombrar (12,5%)	Aptitud musical (37,5%)	CI/ memoria verbal, (62,5%)	Cuestionario socio-económico/ cultural (25%)
Autores y muestra	Preescolar							
Bolduc, (2009) n=105				✓		✓		
Carmon et al. (2008) n=150	✓			✓		✓	✓	

Degé y Schwarzer, (2011) n=41			✓			✓	✓
Herrera et al. (2011) n=97	✓	✓	✓	✓		✓	
Moreno et al. (2011) n=60			✓			✓	✓
Runfola et al. (2012) n=165	✓				✓		
<b>Autores y muestra</b>	<b>Primaria</b>						
Cogo-Moreira et al. (2013) n=235			✓			✓	
<b>Autores y muestra</b>	<b>Secundaria</b>						
Taub y Lazarus, (2013) n=280	✓						

El número de participantes oscila entre los 41 de Degé y Schwarzer (2011) y los 280 de Taub y Lazarus (2013), siendo la media una población de 142. La mayoría de los estudios son de preescolar (75%), a excepción de dos: el de Cogo-Moreira et al. (2013) en el que participaron estudiantes de 4º de primaria y el de Taub y Lazarus (2013) que es el único en todo el corpus con estudiantes de secundaria (edad media 15 años). Estos estudios se centran en el desarrollo de las destrezas lectoras en lengua materna y recogen datos de participantes de siete lenguas distintas, mostrando una población de franco-canadienses (Bolduc, 2009), canadienses (Moreno et al., 2011), israelíes (Carmon et al., 2008), brasileños (Cogo-Moreira et al., 2013), alemanes (Degé y Schwarzer, 2011), estadounidenses (Forgeard et al., 2008) y españoles (Herrera et al., 2011). Digno de mención es el estudio de Herrera et al. (2011) ya que es el único en el que parte de su población son alumnos (hablantes de Tamazight) que estudian una segunda lengua, en este caso, el español. Además, los participantes del estudio de Runfola et al. (2012) tienen orígenes étnicos muy variados: un 66% son de origen caucásico mientras que un 19% son afro-americanos y un 8% hispanos; el 7% restante corresponde a estudiantes de otros orígenes étnicos.

Las distintas pruebas han sido administradas antes y después del programa de intervención musical. En la tabla 3 se observa un aumento de pruebas estandarizadas en todas las destrezas. La prueba de conciencia fonológica *Phonological Awareness Test* (PAT) es la más frecuente, también se incluyen las pruebas de *Woodcock-Johnson III, Test of Cognitive Abilities Sound awareness*. En algunos casos las pruebas de conciencia fonológica ya están incluidas en los tests de lecto-escritura por estar adaptadas al nivel preescolar o los primeros cursos de primaria. Entre las pruebas de lectura estandarizadas se observan las siguientes:

Woodcock-Johnson *Tests of Achievement-III*, *Informal Reading Inventory* (IRI), *Test of Language Development: Primary, 3rd Edition* (TOLD: P3) y *Test de Análisis Lectoescritor* (TALE). El test de inteligencia general de Wechsler (WISC) en sus distintas versiones adaptadas a las distintas lenguas y edades es el más frecuente. Varios estudios incluyen la tarea de “dígitos” del test de Wechsler para conocer el efecto del entrenamiento musical en la memoria verbal de trabajo porque como Ho, Cheung y Chan (2003) establecieron, el entrenamiento musical afecta a la memoria verbal y no a la memoria visual de los niños. Solo tres estudios (Bolduc, 2009; Carmon et al. 2008; Runfola et al. 2012) utilizaron tests de aptitud musical: una versión adaptada del test *Primary Measures of Music Audiation* y del test *Music Ability Test*, y los tests *Singing Voice Development Measure* (SVDM) y *Test of Early Audiation Achievement* (T-EAA). Finalmente, un 25% de los estudios recaban datos también con un cuestionario socio-cultural sobre la familia.

#### 4. DISCUSIÓN

La mayoría de los estudios son con estudiantes de infantil o de primaria, reduciéndose a dos los que explican algunos resultados en secundaria. Se estudia principalmente el efecto de la música, melodías y/o ritmo en las destrezas auditivas y de descodificación, en las conciencias fonológica y fonémica, en la memoria verbal, su conexión con la discriminación tonal y con otros elementos suprasegmentales de la prosodia que afectan el acceso léxico y la comprensión lectora. En algunas ocasiones las publicaciones analizan terapias musicales para niños con algún tipo de discapacidad, especialmente disléxicos.

La temporalización de los estudios ha sido un elemento de dificultad para interpretar en este meta-análisis. Mientras la mayoría de los estudios de correlación detallan la duración de las sesiones de administración de las pruebas que se llevaron a cabo en días o en semanas -a excepción del estudio longitudinal de David et al. (2007) que tuvo una duración de 5 años-, los estudios experimentales y cuasi-experimentales que especifican la duración de sus intervenciones abarcan una amplia gama de períodos que van desde 4 semanas hasta 2 y 3 años.

En los estudios correlacionales se identifican cuatro baterías de instrumentos claves para estudiar la relación entre la música y las destrezas lectoras: tests de lecto-escritura y tests de aptitud musical (usados ambos en un 90,9% de los estudios), tests de conciencia fonológica (usados en todos los estudios) y tests de inteligencia y memoria verbal (usados en un 54,5%). Los estudios de naturaleza experimental o cuasi-experimental intentan confirmar la relación causal entre la música y las destrezas lectoras a partir de la puesta en práctica en el aula de programas de intervención fonológicos-musicales especialmente diseñados para el aprendizaje de la lectura o en ocasiones de programas estrictamente musicales llevados a cabo en centros escolares. Debido a que cada estudio ha utilizado su programa de intervención musical y la descripción que ofrecen no es completa, no se puede concluir qué tipo de intervención es la más efectiva. En los cuasi-experimentales se observan por frecuencia de uso en los estudios tres baterías de instrumentos claves para analizar la relación causal entre la música y las destrezas lectoras: tests de lecto-escritura (100%), tests de conciencia fonológica (75%) y tests de vocabulario (50%) mientras que en los experimentales se de-

tectan tres tipos de pruebas claves: una batería de pruebas de conciencia fonológica (75%); una batería de instrumentos de lecto-escritura (50%), y una serie de tests de inteligencia general y memoria verbal (62,5%).

La capacidad lectora de los niños está también influenciada por los niveles educativos parentales, especialmente de la madre, y los hábitos lectores familiares así como las distintas lenguas que se hablen en el hogar (Phillips, Norris, y Anderson, 2008; Ramón y Sánchez, 2009). Existe consenso con respecto a que el hábito familiar de leerles libros a los niños desde edades tempranas incide posteriormente en el buen desarrollo de la capacidad lectora del niño (Foy y Mann, 2003; Karrass y Braungart-Rieker, 2005; Lane y Wright, 2007; Phillips et al., 2008; Ramón y Sánchez, 2009). Por ello, el 22,2 % de los estudios de este meta-análisis aportan un elemento relevante de visión al recabar también datos mediante un cuestionario socio-cultural y económico.

Los estudios de este meta-análisis reflejan el efecto positivo de la instrucción musical en la enseñanza de habilidades pre-lectoras de niños preescolares y muestran una mejora en las habilidades lectoras de niños de primaria sin problemas en la lectura y de niños disléxicos. Sin embargo, solo un 7,4% refleja estudios relacionados con el aprendizaje de la lectura en una L2 (Herrera et al., 2011; Fisher, 2001). Las hipótesis de transferencia entre L1 y L2 definen que el aprendizaje de la lectura en L2 se basa en los procesos cognitivos adquiridos en L1, si bien el nivel de competencia comunicativa en cualquier lengua es una variable determinante. Sería interesante administrar una prueba de lecto-escritura que contrastara las destrezas básicas del alumnado en ambas lenguas con el objeto posterior de subsanar las deficiencias detectadas.

Por otro lado, en el caso de estudiantes españoles aprendiendo inglés como LE, las dificultades del aprendizaje van estrechamente unidas a la opacidad de la lengua meta con respecto a las correspondencias entre su pronunciación y escritura y a sus diferencias isocrónicas. El inglés tiene un alfabeto de 26 letras, 44 fonemas, y éstos aproximadamente 70 grafemas o formas distintas de escribirse, mientras que el español es una lengua transparente. Contrastan también con respecto a su ritmo o isocronía. El inglés es una lengua isoacentual, la duración entre dos sílabas acentuadas es igual, mientras que el español es isosilábica, es decir, la duración de cada sílaba es la misma, lo que provoca un ritmo distinto en la lectura que también se ha de aprender. Los pocos estudios sobre L2 encontrados para este meta-análisis apuntan a que un programa de intervención fonológico-musical incide también en el aprendizaje del proceso lector de estudiantes de una segunda lengua. Sin embargo, los estudios de este meta-análisis no incluyen pruebas de lecto-escritura administradas en ambas lenguas ni describen si en sus programas de intervención se trabajan estos elementos isocrónicos.

## 5. CONCLUSIONES

Tal como se ha comentado con anterioridad, de notable importancia es que la mayoría de los estudios que conforman este meta-análisis son estudios monolingües. Por lo tanto, serían necesarias futuras investigaciones sobre la relación entre música y destrezas lectoras en una LE ya que los datos indican una alternativa efectiva de enseñanza de las habilidades lectoras. Dada la complejidad de variables que afectan al proceso lector, más de 51,9% de

los estudios administra 4 o 5 pruebas. La mayoría de éstas requiere un tiempo de administración de entre 15-40 minutos aproximadamente lo que afecta a la organización y rutina docente en los centros escolares. Otro elemento de dificultad es que ciertas pruebas, como las de inteligencia general y memoria verbal, requieren ser administradas por profesionales del ámbito de la psicología por lo que podría ser beneficioso un equipo multidisciplinar.

A la luz de de los estudios revisados, la investigación de la naturaleza causal entre música y desarrollo de las destrezas lectoras en una LE puede contemplar la siguiente batería de instrumentos estandarizados con el objeto de lograr una visión completa: prueba de lecto-escritura adaptada a L1 y LE, con pruebas de conciencia fonológica, fonémica y vocabulario adaptadas al nivel de los participantes; prueba de inteligencia general y memoria verbal; prueba de aptitud musical, y cuestionario socio-cultural sobre el nivel educativo de los padres, los hábitos músico-lectores familiares y las lenguas que se hablan en el hogar. No obstante, la decisión final de los instrumentos a usar depende del objetivo central del estudio.

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**ANNEX 2: ORIGINAL PAPER: “FLUIDEZ LECTORA ORAL EN INGLÉS COMO LENGUA EXTRANJERA”**

Gómez-Domínguez, M. (2016). Fluidez lectora oral en inglés como lengua extranjera. Tonos Digital, Revista de Estudios Filológicos, 31. ISSN: 1577-6921

## **FLUIDEZ LECTORA ORAL EN INGLÉS COMO LENGUA EXTRANJERA**

### **ORAL READING FLUENCY IN ENGLISH AS A FOREIGN LANGUAGE**

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#### **RESUMEN:**

Basándonos en estudios previos que demuestran que las destrezas de decodificación, fluidez oral y comprensión lectora están íntimamente relacionadas tanto en una lengua materna como en una segunda lengua, este estudio investiga la competencia en las destrezas de fluidez y comprensión lectora de 30 estudiantes españoles de Educación Secundaria que aprenden inglés como lengua extranjera. El propósito de este estudio es comprobar la eficacia de un programa de intervención para mejorar el desarrollo de la fluidez lectora oral del alumnado. Para conseguir este objetivo e identificar a los estudiantes con dificultades lectoras, al alumnado se le administró las pruebas de fluidez en la lectura oral –velocidad y precisión- y fluidez en el recuento oral –comprensión- del test estandarizado DIBELS-6, al comienzo y al final del estudio. De interés también son las pautas proporcionadas para que el profesorado pueda diseñar e implementar un futuro programa de intervención que subsane los problemas lectores identificados en su alumnado. Los resultados indican que la intervención mejora la fluidez oral, velocidad y precisión lectora del alumnado; sin embargo, su efecto en la comprensión lectora no es estadísticamente significativo. Este resultado puede deberse al bajo nivel de

competencia en la lengua extranjera del alumnado comparado con las medias de la población general de DIBELS. No obstante, para que esta herramienta sea práctica para los docentes en el aula, se necesitan medidas estandarizadas de fluidez en la lectura oral y comprensión lectora adaptadas al contexto de adolescentes españoles que aprenden inglés como lengua extranjera.

**Palabras clave:**

Fluidez lectora oral, decodificación, comprensión lectora, DIBELS, lengua extranjera

**ABSTRACT:**

Based on previous studies showing that decoding and oral reading fluency skills are strongly related to better reading comprehension in both a first and a second language, this study investigates the reading fluency and comprehension proficiency of thirty Spanish-speaking Secondary students learning English as foreign language. The purpose of this study is to test for the efficacy of a training program aimed at improving students' oral reading fluency development. To achieve this objective and also to identify those students with reading difficulties, the oral reading fluency –speed and accuracy- and the retell fluency –comprehension- measures of the standardized test DIBELS-6 were administered, before and after training. Of interest are also the guidelines provided for teachers to implement and design a future training program which may remedy participants' reading problems encountered during the reading process. Results show that the training program improves learners' fluency, speed and accuracy in oral reading; however, its effect on reading comprehension is not statistically significant. This finding may be due to the low foreign language proficiency level of the participants since the beginning of the study. Compared with the average rates provided by DIBELS benchmark scores, even after the intervention students are at some risk of reading failure. However, for teachers to use DIBELS as a user-friendly tool in the classroom, oral reading fluency and reading comprehension standardized scales adapted to the context of Spanish teenagers learning English as a foreign language need to be developed and provided.

**Keywords:**

Oral reading fluency, decoding skills, reading comprehension, DIBELS, foreign language

**INTRODUCCIÓN*****La importancia de la fluidez lectora y sus componentes***

La importancia de la fluidez lectora, habilidad que se define como la destreza de leer con rapidez, precisión y con la expresión, entonación y pronunciación adecuada, reside principalmente en su fuerte correlación con la comprensión lectora. Cada componente básico que contribuye al desarrollo de la fluidez lectora tiene una clara conexión con la comprensión de un texto. Entre estos componentes destacamos, en primer lugar, la precisión y decodificación de palabras, en segundo lugar la automatización en el reconocimiento de las palabras, y en tercer lugar el apropiado uso de los elementos prosódicos o suprasegmentales que contribuyen a la lectura e incluso comprensión de un texto como el acento, la duración, el tono o entonación y la expresión.

Numerosos estudios indican que las destrezas de decodificación y fluidez lectora desempeñan un papel crucial en el buen desarrollo de la lectura tanto en una lengua materna (L1) como en una segunda lengua (L2) (Hulme, Snowing, Caravolas, y Carroll, 2005; Sprenger y Messaoud, 2009) y apuntan que la base y el éxito del proceso lector en cualquier lengua reside en la correspondencia grafema-fonema para decodificar palabras y textos con una adecuada precisión, fluidez y velocidad lectora (Anthony et al., 2011; Ziegler y Goswami, 2006; Ziegler y Goswami, 2005). De hecho, los estudiantes con mayor nivel de fluidez lectora en una L2 tienen un nivel más elevado de comprensión lectora en la lengua meta, pues la decodificación correcta de dichas palabras conlleva a la precisa identificación de los grafemas con sus referentes. La precisión en la lectura de las palabras permite al lector acceder al significado intencionado por autor del texto mientras que, por otro lado, la falta de precisión en la lectura le puede llevar a malinterpretar el texto.

Sin embargo, tan importante es desarrollar las destrezas fonológicas apropiadas en la lengua extranjera (LE) como ser capaz de almacenar esos nuevos sonidos en la memoria de trabajo verbal, lo que se relaciona con el "bucle fonológico". Basado en el modelo de memoria de trabajo de Baddeley (2012), este dispositivo cognitivo desempeña un papel esencial en el aprendizaje de lenguas ya que se usa para retener la información sonora y facilita el aprendizaje de novedosas formas fonológicas en nuevas palabras. Kibby, Marks, Morgan, y Long (2014) demostraron que la memoria de trabajo verbal predice a la fluidez, indicando que mientras que el bucle fonológico contribuye a las destrezas lectoras básicas, su ejecución central contribuye a la decodificación, fluidez y comprensión lectora. De este modo, teniendo en cuenta que la capacidad de atención y memoria de trabajo es limitada, si la identificación de palabras se realiza relativamente rápido y sin esfuerzo, los procesos cognitivos más complejos se pueden usar para la comprensión de un texto (NICHD, 2000; LaBerge y Samuels, 1974). Por lo tanto, las destrezas de decodificación, la fluidez y la comprensión lectora están íntimamente relacionadas ya que la comprensión lectora, y la diferencia entre un lector bueno y pobre reside en el buen desarrollo de las destrezas de decodificación.

La velocidad lectora es otro elemento esencial en el buen proceso lector y forma parte de la fluidez lectora. Este componente hace referencia a la rapidez de lectura y a la capacidad de comprensión del contenido de un texto que un aprendiz adquiere cuando lee. La velocidad lectora incluye tanto la decodificación automatizada de las palabras como la rapidez y fluidez con la cual un lector lee un texto contextualizado. Moats (2001) indica que los lectores fluidos identifican con facilidad todas las palabras atendiendo más al significado de ellas que a la forma. Por el contrario, la mayoría de los lectores problemáticos no pueden leer con facilidad una palabra completa sino que leen lentamente palabra a palabra, centrándose en decodificarlas en vez de en comprenderlas, como si fuera la primera vez que la ven. Estos lectores se suelen cansar muy rápidamente cuando leen (Jainta y Kapoula, 2011), suelen fracasar en terminar sus trabajos, pierden el interés en el colegio y rara vez leen por placer. Esta dificultad para

decodificar las palabras, además, les impide convertirse en lectores fluidos, limitándoles en la comprensión del texto.

Por último, resulta de notable relevancia destacar que la fluidez lectora suele ocasionar problemas a los aprendices de inglés en las primeras etapas del proceso lector debido a la complejidad del sistema ortográfico que el inglés presenta en su correspondencia grafema-fonema. Tal y como establecen Koda (2005, 2007) y Thomas y Healy (2012), el nivel de fluidez en la L1 y el entorno en el cual se aprende una L2 puede influenciar el proceso lector en la L2. De hecho, los lectores que tienen un bajo rendimiento o competencia lectora en la L2 no pueden acudir a las estrategias y destrezas lectoras que tienen en su L1 mientras leen en la lengua meta porque el conocimiento que tienen en esta lengua no es suficiente para comprender el texto. Los aprendices españoles de inglés como LE, por ejemplo, pueden leer el inglés con la pronunciación, entonación y expresión de su lengua materna, pero este proceso les puede llevar a problemas con la comprensión.

El propósito de este estudio es averiguar si una prueba estandarizada de fluidez en la lectura oral (DIBELS) puede ayudar al profesorado a identificar las dificultades que actualmente se encuentran en las etapas básicas del proceso lector, en la fluidez y en la comprensión lectora. Además, con este estudio también se pretende averiguar si una intervención educativa basada en la lectura en voz alta de textos en inglés, es una opción metodológica eficaz para mejorar la fluidez y velocidad lectora en inglés como lengua extranjera de estudiantes españoles de 3º curso de Educación Secundaria Obligatoria (ESO). Por último, este estudio describe unas breves pautas para que el profesorado pueda planear e implementar un futuro programa de intervención que pueda subsanar los problemas lectores identificados en su alumnado tras la administración individual de esta prueba.

### ***Evaluación de la fluidez lectora***

Tradicionalmente la fluidez lectora se ha medido con pruebas que evalúan la fluidez en la lectura oral de un texto y se centran en la rapidez, precisión y número de palabras correctas en un minuto, total que determina el coeficiente de fluidez en la lectura oral del aprendiz. Las pruebas de

lectura oral son medidas fiables y válidas para evaluar la competencia lectora, incluyendo la comprensión. Son pruebas principalmente usadas por profesores interesados en seguir el progreso individual del estudiante en la lectura e identificar a aquellos que pueden necesitar instrucción adicional. Ejemplos conocidos de pruebas estandarizadas para evaluar la fluidez lectora oral y que disponen de puntuaciones estándares o porcentajes de fluidez que varían dependiendo del grado del estudiante son, entre muchas otras, las siguientes: *Woodcock Reading Mastery Test (WRMT)*, *Early Grade Reading Assessment (EGRA)*, *The Dynamic Indicators of Basic Early Literacy Skills (DIBELS)*, *Developmental Reading Assessment (DRA)*, *Gray Oral Reading Test (GORT)* y *Early Reading Diagnostic Assessment (ERDA)*.

No obstante, para el objetivo de este estudio, se encuentran varias limitaciones en estas pruebas: a) La gran mayoría son diseñadas para ser administradas a estudiantes nativos de inglés o que aprenden inglés como segunda lengua (L2) pero no presentan un nivel apropiado para estudiantes de inglés como lengua extranjera (LE) con un bajo nivel de competencia en la lengua; b) Muchas de ellas, a excepción de EGRA y DRA, no son pruebas bilingües que dispongan de una versión en español y otra en inglés, ventaja que en este caso si presenta DIBELS y que es importante destacarla pues teniendo en cuenta que los lectores de LE tienden a transferir el conocimiento y las habilidades que desarrollaron en la L1 (Sparks, Patton, Ganschow, Humbach, Javorsky, 2008), el profesorado de inglés como LE puede beneficiarse de la versión en español para identificar las áreas problemáticas en inglés y sus orígenes en la L1.

Tanto en la lectura en voz alta como en la lectura silenciosa, los grafemas que el ojo descifra se apoyan en elementos sonoros: sonidos, acentos, ritmo, e entonación, es decir, la prosodia de la lengua extranjera (Fonseca-Mora, 2013). Las pruebas de lectura en voz alta ayudan a evaluar las destrezas lectoras a nivel de las palabras, como la precisión, rapidez y automatización, y a interpretar los resultados en fluidez lectora. Por otro lado, los textos silenciosos son herramientas útiles para evaluar la comprensión lectora y se pueden administrar colectivamente. Trabajar con estos elementos en la adquisición de una LE son de gran relevancia para el desarrollo del acceso léxico y la comprensión lectora.

Sin embargo, muchos estudiantes de ESO que aprenden inglés como LE siguen teniendo dificultades con los niveles básicos de decodificación, lo que causa problemas en la conversión letra-sonido necesaria para la identificación automática de las palabras, en la escritura, en el desarrollo del vocabulario y el consecuente acceso al léxico mental, impidiendo el desarrollo efectivo de la fluidez y, por consiguiente, comprensión lectora en dicha lengua meta. En el caso de estudiantes españoles aprendiendo inglés como LE, las dificultades del aprendizaje van estrechamente unidas a la opacidad de la lengua meta con respecto a las correspondencias entre su pronunciación y escritura. No obstante, aún se buscan métodos efectivos que puedan solucionar gran parte de los problemas lectores que presentan el alumnado de inglés como LE.

A pesar de este problema, en el aula de inglés de Educación Secundaria no se suele incidir en las destrezas de decodificación principalmente porque la conversión letra-sonido no se contempla como objetivo dentro de su currículo y porque la mayoría del profesorado de secundaria no ha recibido aún la formación adecuada para la enseñanza del desarrollo de las destrezas básicas de decodificación en LE (Fonseca, Fernández y Gómez, 2012). Dicho profesorado suele incidir más en la comprensión lectora, obviando con frecuencia que los problemas lectores tienen a menudo su base en las primeras etapas del proceso lector correspondientes al nivel de decodificación.

Además, entre las competencias del profesorado se encuentran el saber cómo evaluar a los estudiantes para diagnosticar sus áreas lingüísticas más problemáticas y el planear una intervención que intente subsanar las necesidades individuales de cada uno de ellos. Para ello, el profesorado necesita herramientas de aula apropiadas que se basen en la naturaleza de la habilidad lingüística, las características de las tareas y el contexto de la lengua en uso (Stoyonoff, 2012: 525-527).

## **OBJETIVOS**

Los objetivos principales que persigue este estudio son los siguientes:

- Medir la capacidad de fluidez y comprensión lectora del alumnado durante la lectura en inglés con una prueba

estandarizada de fluidez en la lectura oral (DIBELS-6) al comienzo y al final del estudio.

- Desarrollar un programa de intervención basado en la lectura diaria en voz alta de pasajes en inglés por parejas o grupos.
- Comprobar si la intervención es una opción metodológica eficaz para el desarrollo de la fluidez y velocidad lectora en inglés del alumnado, analizando si se ha producido una mejora estadísticamente significativa del pre-test al post-test.
- Planear las bases para el diseño e implementación de un futuro programa de intervención que subsane los problemas identificados en las destrezas básicas del proceso lector del alumnado: conciencia fonológica, decodificación y fluidez lectora.

## **METODOLOGÍA**

### ***Selección y descripción del grupo***

El grupo objeto de estudio está compuesto por 30 estudiantes españoles de 3º de la ESO de entre 14 y 15 años, de los cuales 24 son chicas y 6 son chicos. El centro está localizado en una zona con un status socio-económico y socio-cultural medio-alto. Todos los participantes están inmersos en el programa de bilingüismo del centro, tienen nacionalidad española y están escolarizados desde preescolar. Estudian inglés como LE, idioma que empezaron a aprender desde el primer curso de la educación primaria, y reciben tres horas a la semana de clases de inglés, la cual se imparte en su totalidad en LE, haciendo uso de la L1 solamente para resolver ciertas dudas y/o aclarar ciertos aspectos de organización del material de clases.

En cuanto a las diferencias individuales del alumnado, es un grupo muy variado y diverso en sus capacidades pero en términos generales el grupo presenta un buen nivel de aprendizaje y motivación.

## ***Selección y descripción de la herramienta***

Para poder evaluar el nivel de fluidez lectora en inglés como LE de los participantes se administró el test *The Dynamic Indicators of Basic Early Literacy Skills, 6th Edition* (DIBELS-6). DIBELS es un conjunto de pruebas estandarizadas elaboradas por investigadores de la Universidad de Oregón (Good y Kaminski, 2002; 2007) para evaluar los cinco componentes básicos de la destreza lectora: conciencia fonémica, principio alfabético, precisión y fluidez en la lectura oral, vocabulario, y comprensión. Todas las pruebas han sido diseñadas para ser administradas individualmente en un minuto de duración.

DIBELS ofrece diferentes versiones de las pruebas según el nivel del estudiante, desde preescolar hasta sexto de primaria, de manera que el desarrollo de las habilidades lectoras del grado específico del alumnado se puede ir controlando, y se pueden identificar a los estudiantes con dificultades así como a aquellos que sobresalen en determinadas destrezas. Las diferentes pruebas de DIBELS también se pueden utilizar para diseñar una intervención pedagógica en el aula que mejore la instrucción lectora además de utilizarse como test de evaluación que facilite al profesorado verificar el progreso trimestral de sus estudiantes. La prueba completa consta de siete pruebas graduadas al nivel y grado del alumnado, y su completa administración dura aproximadamente unos 10 ó 15 minutos.

DIBELS, además, tiene su propio sistema de datos y ofrece puntuaciones estandarizadas en cada prueba y por cada grado. No obstante, es una prueba diseñada para ser administrada a hablantes estadounidenses de inglés como L1 o para poblaciones en las que la lengua meta es una L2, por lo tanto el nivel que éstas presentan es muy elevado para estudiantes de inglés como LE con un nivel o rendimiento lector bajo. La prueba administrada en este estudio corresponde al sexto grado de primaria pero presenta un nivel que se adapta a las competencias y habilidades de la muestra seleccionada, un grupo de estudiantes españoles de 3º de ESO que estudian inglés como LE.

Ya que numerosas investigaciones han demostrado que existe una relación causal entre las destrezas lectoras en la L1 y el rendimiento lector en la L2, resulta interesante comentar que DIBELS también dispone de su

versión española, *Indicadores Dinámicos del Éxito de la Lectura, 7ª Edición* (IDEL), si bien esta versión puede requerir adaptación ya que fue creada para alumnado hispano residente en EEUU que están inmersos en programas bilingües donde estudian inglés como L2. Es aconsejable que los profesores de inglés como LE administren la versión española antes ya que ésta puede ayudar a detectar los posibles orígenes en la L1 de los problemas lectores en la LE y así puedan ser subsanados lo antes posible en ambas lenguas.

### ***Procedimiento***

Para llevar a cabo este estudio se ha realizado un estudio longitudinal de medidas repetidas el cual tuvo una duración de un mes. Este proceso de investigación-acción constó de las siguientes etapas:

#### Selección del pre y post-test

A comienzos del estudio se administró la prueba individual de fluidez en la lectura oral en inglés del test *Oral Reading Fluency Benchmark Assessment, Sixth Grade* (Good y Kaminski, 2002) y su correspondiente prueba de comprensión (*Retell Fluency*), ambas seleccionadas de la sexta edición del test de alfabetización *Dynamic Indicators of Basic Early Literacy Skills, 6th Edition* (DIBELS-6), (Anexo I). El objetivo del pre-test es conocer el nivel lector de partida del alumnado e identificar aquellos alumnos que presentan problemas de decodificación, fluidez y comprensión lectora en inglés.

Después de la intervención se administró otra prueba diferente del test de fluidez en la lectura oral de DIBELS-6 *Oral Reading Fluency Progress Monitoring, Sixth Grade, 6th Edition* (Good y Kaminski, 2007), (Anexo II). La finalidad de administrar el post-test es analizar el efecto que la intervención tuvo en la decodificación, fluidez y, por siguiente, comprensión lectora de los estudiantes.

Ambas pruebas se seleccionaron tras ser previamente analizadas con las herramientas de análisis de textos: *text analyzer* y *textalyser*, de modo que ambas presentaran la misma dificultad léxica. Estas herramientas

analizaron el número total de palabras, el número de palabras diferentes, la complejidad léxica del texto y su nivel de legibilidad.

#### Administración de la prueba

El proceso de administración de la prueba de *Oral Reading Fluency* de DIBELS constó de dos partes:

En la primera parte cada estudiante leyó individualmente en voz alta un pasaje en inglés y en la segunda parte cada uno explicó con sus palabras en inglés qué había comprendido del pasaje leído, sin disponer de él. La administración de esta prueba fue sencilla y rápida pues ambas partes están diseñadas para que los informantes las realicen en un minuto de duración.

#### Intervención educativa en el aula

Una vez que el pre-test identificó el número de alumnos con dificultades en la lectura en inglés, se llevó a cabo la intervención educativa, la cual duró tres semanas. El objetivo de la intervención formativa en el aula es que el alumnado mejorase las destrezas de decodificación y fluidez lectora oral y desarrollase un nivel adecuado a su grado y edad. Para ello los estudiantes realizaron lecturas diarias de textos en voz alta durante un minuto en ocasiones todos a la vez y en otras por parejas o grupos. Tras la lectura, los estudiantes explicaban qué habían comprendido. A continuación, los textos se trabajaron en profundidad en clases.

## **RESULTADOS**

La tabla 1 muestra el análisis descriptivo de las pruebas del pre-test: fluidez en la lectura oral (ORF: *Oral Reading Fluency*) y fluidez en el recuento oral (*Retell Fluency*). Se ha recogido el total de palabras correctas leídas por el estudiante en un minuto y el total de palabras dichas durante un minuto que ilustran la comprensión del pasaje leído.

	N	Mínimo	Máximo	Media	Desviación típica
ORF: Palabras correctas pm	30	52	114	80	17,376
R: Recuento en la lectura oral	30	3	43	18	8,884

Nota: ORF: Oral Reading Fluency; p.m: por minuto; R: Retell (recuento en la lectura oral)

Tabla 1. Estadísticos descriptivos pre-test

Este análisis descriptivo se ha realizado para poder comprobar las medias de la muestra seleccionada con las medias de referencia de la población general que proporciona DIBELS y sus baremos indicativos. En el sistema de datos de DIBELS están disponibles las puntuaciones estándares para la fluidez en la lectura oral las cuales están relacionadas con el grado del estudiante y varían también dependiendo de la etapa del curso en la que se administre la prueba: comienzo, mediado o final. La tabla 2 muestra las medias de referencia de DIBELS en la prueba de fluidez en la lectura oral para sexto curso (máximo curso que ofrece esta herramienta) a finales de curso.

<b>FINAL DE CURSO (meses 7-10)</b>	
<b>Puntuaciones medias</b>	<b>Estatus</b>
<b>0-103</b>	<b>En riesgo (at risk)</b>
<b>104-124</b>	<b>Algún riesgo (some risk)</b>
<b>125 en adelante</b>	<b>Bajo riesgo (low risk)</b>

**Tabla 2. Medias de referencia de DIBELS en fluidez en la lectura oral**

Además, el sistema de datos de DIBELS establece que la puntuación obtenida en la prueba de fluidez en el recuento oral debería de ser el 50% aproximadamente de la puntuación obtenida en la prueba de fluidez en la lectura oral. DIBELS describe que una puntuación menor al 25% de la puntuación obtenida en la de fluidez en la lectura oral puede indicar un problema con la comprensión.

Si comparamos la media proporcionada por DIBELS con la media obtenida por nuestra muestra en el pre-test de la prueba de fluidez en la lectura oral (80 palabras correctas por minuto), podemos apreciar que el nivel de los estudiantes antes de la intervención estaba "en riesgo". Por otro lado, si comparamos las medias de referencia para la prueba de fluidez en el recuento oral con la media de nuestra muestra en dicha prueba, podemos comprobar que el alumnado presenta problemas de comprensión pues la puntuación obtenida en esta prueba es menor al 25% de la puntuación obtenida en el test de fluidez en la lectura oral (23,7%).

En cuanto a las medias obtenidas en el post-test podemos observar los siguientes cambios en la tabla 3.

	N	mínimo	máximo	media	Desviación típica
ORF: Palabras correctas pm	30	62	134	106	18,418
R: Recuento en la lectura oral	30	6	47	19	9,426

**Nota:** ORF: Oral Reading Fluency; p.m: por minuto; R: Retell

**Tabla 3. Estadísticos descriptivos- post-test**

La tabla 3 muestra unos datos orientativos de mejora tras la intervención ya que atendiendo a la media de palabras correctas en el pre-test de fluidez en la lectura oral, hay una diferencia de 26 palabras más leídas correctamente en el post-test. En cuanto a la prueba de comprensión, después de la intervención también ha existido una mejora, aunque mínima, puesto que la media ha subido a 19 palabras contadas por los estudiantes.

Si comparamos la media proporcionada por DIBELS con la media obtenida por la muestra seleccionada en el post-test de la prueba de fluidez en la lectura oral se aprecia que el nivel de los estudiantes después de la intervención pasó de estar “en riesgo” a estar clasificado con “algún riesgo”. Por otro lado, si comparamos las medias de referencia para la prueba de fluidez en el recuento oral con la media de la muestra objeto de estudio, podemos comprobar que al igual que en el pre-test el alumnado también presenta serios problemas de comprensión tras la intervención ya que la puntuación obtenida en esta prueba es menor al 25% de la puntuación obtenida en el test de fluidez en la lectura oral (18%).

Ahora pues, para comprobar si esta mejora ha sido estadísticamente significativa se ha de acudir a los análisis estadísticos correspondientes. Al ser un estudio longitudinal de medidas repetidas, se ha realizado una *prueba T de medidas relacionadas*, para comprobar si los cambios existentes en las variables “total de palabras correctas pm” y “fluidez en el recuento oral” son significativos y, por lo tanto, afirmar que la intervención ha tenido efecto. Los resultados obtenidos pueden observarse en la tabla 4.

DIFERENCIAS RELACIONADAS						
	media	Desviación típica	Error típico	Intervalo de confianza (95%)		Significación bilateral
				superior	inferior	
<b>Par 1</b> Palabras correctas pm PRE Palabras correctas pm POST	-25,767	11,828	2,160	-30,183	-21,350	,000
<b>Par 2</b> Recuento oral PRE Recuento oral POST	-1,467	9,035	1,650	-4,841	1,907	,381

**Tabla 4. Prueba de muestras relacionadas**

El par 1, el cual compara las puntuaciones obtenidas por el alumnado en las "palabras correctas leídas pm" en el pre-test y post-test, muestra que la intervención ha realizado cambios significativos de mejora pues la significación es menor a 0,05. Sin embargo, los resultados para la prueba de fluidez en el recuento oral antes y después de la intervención indican que la significación bilateral es más alta (0,381). En este caso, al ser mayor a 0,05 no se puede afirmar que hayan existido cambios significativos debido a la intervención en la prueba de fluidez en el recuento oral.

En conclusión, podemos aseverar que la intervención ha causado una mejora significativa en la prueba de Fluidez en la Lectura Oral de DIBELS (ORF) pues se demuestra que el número de palabras leídas correctamente por minuto ha aumentado tras la intervención. Sin embargo, a pesar de que en los análisis descriptivos las medias obtenidas en el recuento oral indicaran una mejora, la estadística no puede afirmar que sea una mejora significativa, por lo tanto, el beneficio no se puede demostrar.

## **PAUTAS PARA UNA FUTURA INTERVENCIÓN LECTORA**

### ***Actividades para mejorar la decodificación y fluidez lectora***

Los estudiantes que presentan dificultades para decodificar palabras se suelen cansar muy rápidamente cuando leen (Jainta y Kapoula, 2011) y esta dificultad les impide convertirse en lectores fluidos, limitándoles además, en la comprensión del texto. Por ello, las intervenciones orientadas a mejorar las destrezas de decodificación y fluidez deberían incluir actividades que trabajen estas destrezas en dos niveles diferentes:

En primer lugar se debería de trabajar en clases las destrezas lectoras iniciales como la conciencia fonológica, la conciencia fonémica y las destrezas de decodificación de palabras ya que se consideran destrezas de procesamiento auditivas básicas. Se podrían incluir en clases actividades diarias de destrezas de procesamiento fonológico como la identificación de sílabas y sonidos iniciales y finales, tareas de combinación, fusión y omisión de fonemas, actividades de repeticiones fonémicas y tareas de segmentación de palabras en sílabas que requiera la unión de éstas de nuevo para volver formar la palabra. Además, en este primer nivel se debe trabajar con la destreza de decodificación a través de la lectura de palabras simples aisladas y palabras sin sentido. La identificación de palabras tiene que realizarse de manera automática y precisa para que contribuya al desarrollo de la fluidez y comprensión lectora. Los problemas ocasionados en el nivel de la decodificación de palabras deben solventarse en los primeros cursos de la escolarización primaria pues de lo contrario esta dificultad impedirá el desarrollo de la fluidez y, por consiguiente, de la comprensión lectora en cursos superiores e incluso a lo largo de toda la vida.

Por ello, para evitar el bajo rendimiento en la lectura y el fracaso lector, el profesorado debería proporcionar ayuda adicional a todos los estudiantes con dificultades en las destrezas lectoras iniciales a través de actividades que se realicen y repitan con frecuencia en clases. El profesorado, además, puede ayudar a estos estudiantes proporcionándoles actividades diarias antes de comenzar las clases o después de éstas, así como comentándoles a sus padres sobre la necesidad de apoyo lector en casa. En su capítulo "Supporting Students Who are Low Achieving", Laud, Patel, y Cohen-Goldberg (2013) destacan posibles actividades para trabajar la destreza de decodificación en inglés:

1. Todos los días, los estudiantes leen en voz alta una lista de palabras frecuentes en inglés a un/a compañero/a o a el/la profesor/a durante 10 minutos.
2. Leer a diario palabras que no sean familiares para los estudiantes. Los profesores pueden cronometrar este tipo de actividades de modo que los estudiantes lean de una lista de palabras todas las que puedan en un minuto de duración.

3. Segmentar palabras multi-silábicas y poco frecuentes en inglés en las sílabas que las componen. Después, unir las sílabas y los fonemas para formar de nuevo la palabra.
4. Leer textos en silencio o voz alta que no presentan separación entre las palabras durante 1 ó 3 minutos, separándolas con una barra diagonal.

Con este tipo de actividades también se trabaja el vocabulario. De hecho, las listas de palabras se pueden diseñar en relación a la materia o tema del curso del alumnado, y tras leerlas, repetirlas o segmentarlas, se pueden definir cada una de ellas en clase.

En segundo lugar se deberían trabajar las destrezas lectoras ortográficas de fluidez y comprensión a través de la identificación o lectura automática de palabras en textos contextualizados. Estas destrezas se adquieren posteriormente a las destrezas de decodificación y requieren procesos cognitivos más complejos. Laud et al., (2013) argumenta que materiales como libros graduados para aquellos lectores que no pueden leer lecturas adecuadas a su grado, libros "audio" con los que los estudiantes escuchan el texto mientras que lo van leyendo en silencio, y lecturas repetidas o lecturas "modelos" son recursos que pueden proporcionar a este tipo de alumnado oportunidades para leer con más fluidez. Estos tres últimos, además, desarrollan la comprensión oral y ayudan a los lectores con problemas para decodificar a comprender textos largos sin la necesidad de tener que leerlos. De hecho, Laud et al., (2013) consideran que escuchar un modelo de lectura de texto fluido ayuda a adquirir la prosodia, entonación y velocidad apropiada.

De este modo, tanto el profesorado como los padres de los estudiantes en casa deberían de leerles a los niños lecturas en voz alta a menudo, a una velocidad apropiada y modelando el ritmo, la entonación y la melodía del lenguaje correctamente pues este hábito de la lectura en voz alta a los niños desde edades tempranas incide posteriormente en el buen desarrollo de la capacidad lectora del estudiante.

## **DISCUSIÓN Y CONCLUSIÓN**

Nunca es tarde para aprender a leer en cualquier lengua, siempre que la instrucción sea la apropiada. De hecho, cualquier lector adulto que

presente dificultades en el proceso lector puede aprender a leer si se le enseña los componentes iniciales de la destreza lectora que no desarrolló adecuadamente en los primeros grados escolares. No obstante, un seguimiento en todas las etapas del proceso lector se hace imprescindible. Por lo tanto, la enseñanza de una lengua, sea ésta materna o extranjera, debe de realizarse teniendo en cuenta dos niveles diferentes: en primer lugar se debe trabajar con las destrezas iniciales básicas como la conciencia fonémica, la fonológica, y la decodificación de palabras, y en segundo lugar se debe trabajar las destrezas ortográficas de identificación automática y precisa de palabras y oraciones en textos contextualizados. Sin embargo, actualmente se suele incidir más en la comprensión lectora y la enseñanza de la lectura en inglés como LE se sigue centrando en el enfoque tradicional del análisis gramatical y el aprendizaje del vocabulario, obviándose con frecuencia que los problemas lectores tienen a menudo su base en los procesos sencillos del nivel de decodificación y en el desarrollo efectivo de la fluidez lectora.

A la luz de los resultados de este estudio podemos observar que la intervención educativa basada en la lectura en voz alta de textos en inglés ha resultado ser una opción metodológica eficaz para mejorar el rendimiento y el desarrollo de la fluidez lectora (precisión, velocidad y expresión) en inglés como LE de estudiantes de 3º de ESO. A pesar de que los análisis descriptivos estadísticos de este estudio muestran que los estudiantes participantes presentan dificultades serias en las destrezas de fluidez y comprensión lectora antes y después de la intervención en comparación con las medias de referencia de la población general de DIBELS, la estadística indica que la intervención ha causado una mejora significativa en la prueba de Fluidez en la Lectura Oral de DIBELS pues se demuestra que la velocidad y precisión lectora ha aumentado tras la intervención (número de palabras leídas correctamente por minuto). Sin embargo, los resultados también demuestran que no han existido cambios significativos debido a la intervención en la prueba de fluidez en el recuento oral que ilustra la comprensión del texto leído.

Los tres conceptos que Koda (2005) considera esenciales para el buen desarrollo de la habilidad lectora en una L2 podrían explicar gran parte

de estos resultados: (1) La habilidad lectora en la L1; (2) El nivel de competencia en la L2; y (3) La habilidad de decodificación en la L2. En primer lugar, la literatura resalta que el aprendizaje de la lectura en L2 o LE se beneficia de los procesos adquiridos en la L1 pues cuando los lectores de LE leen tienden a transferir los conocimientos y las habilidades que desarrollaron en la L1. Del mismo modo que los buenos lectores en L1 suelen ser buenos lectores en L2, los lectores con bajo rendimiento y competencia lectora en sus L1 no son capaces de transferir sus conocimientos a la L2 o LE. Por lo tanto, es aconsejable que los docentes de disciplinas lingüísticas refuercen las destrezas lectoras del alumnado en L1 pues esta mejora puede llevar a un desarrollo más efectivo de las destrezas lectoras en la LE.

En segundo lugar, la literatura muestra que el buen desarrollo de la habilidad lectora en una L2 también depende del nivel de competencia en dicha lengua meta. De este modo, el déficit de comprensión que muestran los estudiantes participantes en este estudio puede haberse debido al bajo rendimiento o competencia lectora en inglés como LE del alumnado.

En tercer lugar, la literatura revela que la habilidad de decodificación en la L2 es esencial para el buen desarrollo de la habilidad lectora en dicha lengua meta. Relacionado con esto, los participantes de este estudio también han podido tener dificultades a la hora de decodificar las palabras en inglés debido a la opacidad de la LE con respecto a la correspondencias entre su pronunciación y su escritura. De hecho, la correcta decodificación de palabras no es suficiente para el efectivo desarrollo de la fluidez lectora si este proceso no se automatiza.

En relación a la prueba utilizada en este estudio, una de las ventajas de DIBELS es que las diferentes pruebas que componen esta herramienta evalúan los cinco componentes básicos de la destreza lectora y por ello se pueden utilizar para diseñar una intervención pedagógica que mejore la enseñanza de la lectura. Además, este instrumento puede utilizarse como test de evaluación que facilite al profesorado verificar el progreso de sus estudiantes en las diferentes etapas del curso.

Sin embargo, para que DIBELS se convierta en una herramienta práctica y útil para que los docentes la usen como prueba de diagnóstico y

planeen su intervención en base a sus resultados, algunas adaptaciones son necesarias. En primer lugar, se hace imprescindible adaptar el uso de esta prueba al contexto de lenguas extranjeras, proporcionando medidas de fluidez en la lectura oral para estudiantes españoles que estudian inglés como LE y que no parten de un nivel o competencia inicial elevado en la lengua meta. Debido a que las pruebas de DIBELS se diseñaron para ser administradas a hablantes estadounidenses de inglés como L1 o para poblaciones en las que la lengua meta es una L2, las medias obtenidas por la muestra seleccionada no son comparables con las medias de referencia de la población general de DIBELS ya que dichos datos no corresponden con el grado, nivel y lengua de los participantes de este estudio. Para evaluar a aprendices de inglés como LE se necesita un enfoque y unas pruebas de evaluación que se basen en la edad, la habilidad lectora en lengua materna, y la compatibilidad retórica y lingüística entre la L1 y la LE. Por lo tanto estos datos se deben de interpretar con cautela pues la población de referencia no es comparable con la nuestra.

Por último, esta herramienta requiere una administración y seguimiento trimestral lo cual supone un esfuerzo adicional para el profesorado. Además, los períodos de administración de esta prueba no se corresponden, hasta ahora, con los trimestres de nuestro sistema educativo.

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## **ANEXO II: MATERIAL DEL ADMINISTRADOR**

### **POST-TEST (DIBELS Oral Reading Fluency Progress Monitoring, Sixth Grade, 6<sup>th</sup> Edition)**

#### **Progress Monitoring Probe 4**

##### **Zoo Food**

Our class paid a visit to the zoo, but it wasn't an ordinary trip. We went to learn about feeding zoo animals. Before the field trip, our class researched the needs of various animals and made a list of questions. For example, one student wanted to know how they fed crocodiles, my friend wondered if anteaters ate ants, and someone else had questions about feeding snakes.

When the class arrived at the zoo, a caretaker greeted us in a special building where meals are planned and prepared. She explained that zoos rarely feed the animals what they eat in the wild. "An animal's natural foods aren't easily available," she said. "We have to find substitute diets that are appealing and good for the animals."

The caretaker took the class into the spotless zoo kitchen where several giant refrigerators are available for storing meat, fish, chicken, fruits, and vegetables. She showed students the storage room, with its huge bins filled with grain pellets, cereal, biscuits, peanut butter, nuts, and seeds. Then she let them read the notebooks that listed types and amounts of foods for each animal.

One of my friends inquired about the anteater. "We can't supply the thousands of live ants and termites this animal eats," the caretaker said, "But we've discovered they will eat cat food soaked in water." As for snakes, she explained that keepers open the door to a snake exhibit very carefully before placing a mouse or rat inside. "If several snakes live together, we'll separate them for a meal so they don't fight over the food," she added.

"With crocodiles, keepers usually go in the exhibit area, following the same routine every day, so the crocodiles get used

##### **Zoo Food (Continued)**

to them," the caretaker said. "For extra safety, we carry long poles and never take our eyes off the animals."

Before they left the zoo, the students watched a caretaker feed a rare pink pigeon chick. As the students boarded the bus to go back to school, our teacher asked them to sum up their feelings about the visit in one or two words. I raised my hand first. "That's easy," I said. "My overall feeling is, I'M FAMISHED!"

Total words: \_\_\_\_\_ - errors: \_\_\_\_\_ = words correct: \_\_\_\_\_

Retell: \_\_\_\_\_ ORF Total: \_\_\_\_\_

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125
126	127	128	129																					

Retell Total: \_\_\_\_\_

Notes:

**ANNEX 3: ORIGINAL PAPER: “MUSICAL PLUS  
PHONOLOGICAL INPUT FOR YOUNG FOREIGN LANGUAGE  
READERS”**

# Musical plus phonological input for young foreign language readers

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Based on previous studies showing that phonological awareness is related to reading abilities and that music training improves phonological processing, the aim of the present study was to test for the efficiency of a new method for teaching to read in a foreign language. Specifically, we tested the efficacy of a phonological training program, with and without musical support that aimed at improving early reading skills in 7–8-year-old Spanish children ( $n = 63$ ) learning English as a foreign language. Of interest was also to explore the impact of this training program on working memory and decoding skills. To achieve these goals we tested three groups of children before and after training: a control group, an experimental group with phonological non-musical intervention (active control), and an experimental group with musical intervention. Results clearly point to the beneficial effects of the phonological teaching approach but the further impact of the music support was not demonstrated. Moreover, while children in the music group showed low musical aptitudes before training, they nevertheless performed better than the control group. Therefore, the phonological training program with and without music support seem to have significant effects on early reading skills.

**Keywords:** phonological awareness, literacy, foreign language, reading, working memory, music

## Introduction

A large amount of literature has been published on reading acquisition difficulties in native (L1) or in second language (L2) learning. Several factors, such as phonological and decoding skills have often been described as variables of crucial importance in the learning-to-read process (Brady, 1991; Melby-Lervåg et al., 2012). In their review, Hulme and Snowling's (2014) conclude that deficits in oral language skills as well as deficits in phonological language skills and problems in phoneme awareness, letter-sound knowledge and rapid automatized naming are of primary importance to account for learning to read difficulties. Jongejan et al. (2007) also considered that phonological language skills are important for L1 and L2 acquisition as they provide the necessary tools for lexical access and reading. The lack of oral language input in L2 acquisition is problematic when the pronunciation rules of L1 differ from L2. In this context, finding alternative research-based teaching approaches that could help learners to achieve foreign language literacy skills is very relevant.

Several results in the last two decades points to music as an aid in learning to read (Butzlaff, 2000; Bolduc, 2008; Standley, 2008; Lessard and Bolduc, 2011; Toscano-Fuentes and Fonseca-Mora, 2012) but the nature of this connection still needs to be clarified. Ott et al. (2011) suggest that early phonetic processing of verbal or non-verbal stimuli is differently organized depending on musical expertise. Patel (2011) proposes the OPERA hypothesis with 5 factors that may account for the influence of instrumental music training on brain plasticity and on shared

speech processing networks: Overlap in acoustic features in instrumental music and speech; Precision due to the higher demands of music; Emotion, Repetition and focused Attention. Christiner and Reiterer (2013) consider vocal music, singing, as a 'good indicator of the ability to remember new and unintelligible utterances' and conclude that the ability to sing improves auditory memory span. In their review of electrophysiological studies of speech segmentation, Schön and François (2011) conclude that musical expertise facilitates the learning of both linguistic and musical structures. Similarly, Schön et al. (2004) and Marques et al. (2007) demonstrate that musical training increased pitch discrimination in both music and language. Most importantly, children who are more sensitive in discriminating sounds due to music training are better on phonological awareness and reading tests (Lamb and Gregory, 1993; Douglas and Willats, 1994; Anvari et al., 2002; Peynircioglu et al., 2002; Bolduc and Montésinos-Gelet, 2005; Gromko, 2005; Forgeard et al., 2008; Moreno et al., 2009; Degé and Schwarzer, 2011; Herrera et al., 2011; Moritz et al., 2012).

Similarly, the four meta-analyses of Butzlaff (2000), Bolduc (2008), Standley (2008), and Lessard and Bolduc (2011) that reviewed more than 70 different multidisciplinary studies also point to a relationship between musical training and reading skills, mainly reading in L1. Butzlaff's meta-analysis reviewed 24 correlational and 6 experimental studies. The author concluded that results strongly and reliably associate music performance with standardized reading/verbal tests but that the causal nature of the relationship remained to be demonstrated. For instance, the influence of a factor such as teachers' expectancy could not be ruled out. Bolduc (2008) reviewed 13 studies and concluded that emergent literacy of preschoolers with or without learning difficulties is affected positively by musical instruction. Standley (2008) reviewed 30 studies related to music-related reading instruction and specific reading skills in order to make pedagogical recommendations about reading failure. The author differentiated two main music education styles underlying these studies: on the one hand, studies including multi-sensory programs based on Orff, Kodály, or Dalcroze methods that focus on singing, rhythm, instrument playing, or movement to music, and on the other hand, those that rely on extensive practice in choral, band, or orchestral ensembles. Although, the studies in general indicated benefits for reading, the great diversity of intervention programs and of variables such as age and motivation did not allow to draw firm conclusions, except that the younger the child, the stronger the gains from music interventions. According to this analysis, "Music activities that incorporate specific reading skills matched to the needs of children at-risk for reading difficulties (as well as special education, ESOL, early intervention) will enhance reading instruction" (Standley, 2008, p. 29). Finally, Lessard and Bolduc (2011) analyzed 17 studies that added evidence to the link between musical learning and reading among first to third graders. However, causality was not demonstrated due to differences between musical intervention programs, musical, and reading skills, sample sizes and also that many of these studies were unpublished works (doctoral dissertations, master thesis, pilot studies).

Turning to L2 acquisition, Fonseca-Mora and Gómez-Domínguez (in press) reviewed 27 experimental, correlational and quasi-experimental studies on music and language reading published between 2001 and 2013 and concluded that only 7.4% referred to L2 learning, thereby indicating a gap in this field. Marques et al. (2007) showed behavioral and electrophysiological evidence that musical expertise influenced the detection of pitch manipulations on sentence-final words in a foreign language. In this review, Chobert and Besson (2013) proposed that musical training may reduce phonological deficits in second language learning.

From an educational perspective, it remains unclear if the benefits for learning to read in L2 are based on general music instruction or on singing musically-supported phonological input matched to specific reading skills (Standley, 2008, p. 29). In a study with 11-year-old Spanish English Foreign Language (EFL) learners, Toscano-Fuentes and Fonseca-Mora (2012) showed that the use of musical-linguistic activities in the foreign language classroom improved reading skills as well as speaking and listening skills. Herrera et al. (2011) discussed the effects of a phonological and a musical plus phonological training program on the reading readiness of native and L2 Spanish-speaking children and stressed that the musical training approach helped native and foreign Spanish learners to outperform those without musical training in the ability to identify word endings, possibly because children's songs make rhyming words particularly salient (Herrera et al., 2011, p. 78). However, preschoolers who received the phonological training program without musical support obtained better results in phonological awareness and naming speed.

Our concern in this study is based on the fact that poor foreign language readers, in this case Spanish learners of English, lack phonological language skills, phoneme awareness, letter-sound knowledge and rapid automatized naming (Hulme and Snowling, 2014). In addition, the Spanish school curriculum does not include musical training. All second-grade Spanish children who participated in this study were very low-proficiency English language learners with classrooms located in suburban schools. This is important as this implies that there was no initial selection of participants. However, socio-cultural background, reading skills and working memory were assessed before training to ensure that the different groups were homogenous. Learners' musical aptitude was also tested as it has been described as an individual difference in language learning (Slevc and Miyake, 2006).

### Purpose of the Current Study

Based on previous studies showing that phonological awareness is related to reading abilities and that music training improves phonological processing, the aim of the present study was to test for the efficiency of a new method for teaching to read in a foreign language. Specifically, we aimed at testing the efficacy of phonological training programs, with and without musical support that aimed at improving early reading skills in 7–8-year-old Spanish children learning English as a foreign language (EFL). Of interest was also to explore the impacts of these training programs on working memory and decoding skills. To achieve these goals we tested three groups of children: a control group, an experimental

group with non-musical intervention (active control), and an experimental group with musical intervention.

A video was selected in both experimental groups to teach early reading skills such as the alphabetic principle, phonological awareness and phonics. The musical experimental group was taught through video-clips that included musical elements such as songs with lyrics. The non-musical experimental group (or active control group) received the same phonological training program as the musical group but the program did not include melodies. The control group was taught in the traditional way without specific phonological awareness training nor musical support.

We hypothesized that the level of performance would be higher for teaching approaches that included phonological training with or without musical support than for traditional teaching methods. Moreover, we also hypothesized that musical support in a phonological training program for beginner EFL students would be an added value when learning to read because simple, rhythmic and repetitive melodies may induce the song-stuck-in-my-head phenomenon, a rehearsal loop that may improve sub-vocal rehearsal. The songs, created especially for improving phonetic aspects, were characterized by their slow pace and by the simplicity of their melodic contours. They were easy to memorize and, if activated periodically, they could favor automatized decoding. Finally, to determine the effects of the pedagogical intervention, pre/post tests and regression analyses including knowledge of sounds and letters, reading fluency and their interaction with working memory were computed.

## Materials and Methods

### Participants

A pre-post comparison design was used to examine training effects. Three second grade classes including 63 students ( $\bar{X} = 7.6$  years old,  $SD = 0.4$ ; 29 boys and 34 girls) were selected from two primary schools located in the same school district. Mean age between the three groups was not significantly different ( $F < 1$ ) nor were the gender differences [ $\chi^2_{(2, 63)} = 1.97, p = 0.374$ ]. At the beginning of the study, the music experimental group ( $n = 18$ ) comprised 8 females and 10 males (mean age:  $\bar{X} = 7.71$ ,  $SD = 0.40$ ). The non-musical experimental group ( $n = 22$ ) comprised 11 females and 11 males (mean age:  $\bar{X} = 7.58$ ,  $SD = 0.35$ ) and the control group ( $n = 23$ ) comprised 15 females and 8 males (mean age:  $\bar{X} = 7.67$ ,  $SD = 0.51$ ).

### Procedure

Prior to the beginning of the study, the school community was informed, organizational aspects were discussed and formal consent was granted. The control group and the non-music experimental group (with phonological training) were located within the same school. The music experimental group was located in a different school to avoid contamination if learners would sing the learned melodies in the playground. Teachers of both experimental groups were trained for several weeks before the start of the experiment. During the 2 weeks prior to the beginning of the training period, trained language graduate assistants and

graduate assistants in psychology (supervised by a neuropsychologist and two language researchers) tested the musical abilities, early reading skills, working memory and socio-cultural level of the 63 learners individually in a quiet room at their school. Immediately after the 11-week training period, reading skills and working memory of the young learners were tested again.

### Questionnaires

A battery made up of four questionnaires was used:

- A socio-cultural survey, administered prior to the training program, to identify the main family characteristics and reading habits of the children.
- A musicality test to control for musical aptitudes. This test is an adaptation of Hernández-Hernández and Santiago-González (2010) and included items that measured pitch, intensity, duration, rhythm, musical timbre and musical tempo. Two practice trials preceded each item to ensure that children understood the task.
- The *Wechsler Intelligence Scale for Children, 4<sup>th</sup> Edition* (WISC-IV, Spanish version) standardized neuropsychological assessment pre and post training. Selected tests included Digit Span and Letters and Numbers Sequencing subtests to assess auditory memory span.
- The *Early Grade Reading Assessment* (EGRA) in its English version including:
  - Letter name knowledge: name as many upper and lowercase letters as possible in 1 min. Letter presentation was random.
  - Initial sound identification: identify the initial sound of ten words read aloud by the test administrator.
  - Oral reading fluency: read a dialog with accuracy, speed and fluency in 1 min.

### Training Program (Experimental Groups)

Children in both training programs received two 1-h sessions per week, for a period of 11 weeks and a total of 22 sessions. Video-clips were used in both training programs to help learners attach meaning to the minimal units of discursive articulation. Activities focused on the development of phonological awareness and phonics (e.g., auditory exercises that emphasized alliteration, word-onset awareness, and initial sound identification in frequent English words). Other activities focused on the learning of the alphabet (e.g., English letter-names and letter-sounds). The teacher in the music group used videos supported by songs with subtitles, characterized by simple and repetitive melodies and rhymes (Gértrudix Barrio and Gértrudix Barrio, 2010). Children in this group were trained in song perception and production and they were encouraged to sing the material learned in the hope that the catchy songs would foster self-initiated rehearsal. Children in the non-musical group worked on the same reading skills and contents but through attractive and colorful videos, posters, and audio-books without music. Both teachers planned together and simultaneously their lessons so that they were teaching the same thematic units at the same time.

## Phonological Training Program

The phonological training program included the following tasks that were supported by visual materials (e.g., posters and flashcards):

### Practicing with Single-Letter Sounds

Children learned the names and sounds of the letters of the English alphabet. Letter-names and letter-sounds were presented using videos, posters, and audio-books in the non-musical group, and using songs and subtitles the music group.

To establish a relationship between letters and sounds, frequent one-to-three syllable words were spelled and pronounced at the same time the songs and non-musical videos were played. Every word with a common spelling and phonetic pattern was classified into different word-bank lists written on a board. For example, words with the same middle sound as “book” (/u/ sound: *book, foot, look, food*) or those with the “ph” grapheme (/f/ sound: *elephant, phone, dolphin*) were included in the same list. This task was used for students to automatize graphemes-phonemes matching as well as English pronunciation, structures, and rules. Most of the tasks were designed to foster learners to use their auditory discrimination and production skills, such as:

(a) Onset and rime detection tasks: learners were asked to identify initial and final phonemes in words. For example, “What is the first sound in the word ‘fish’? or ‘What is the last sound in ‘fox’?”

Phonological oddity tasks were also included in which learners were asked to spot the odd word out when listening to three different words, two of them sharing the same initial phoneme (e.g., “which word begins with a different sound: jam, yoghurt, juice?”).

(b) Oral blending skills, manipulation of sounds in words and word formation tasks when learning and reading new words. Learners were required to change the initial sound of a word to create a new word. For example, to change the initial sound of the following words (*hen, hill, hat, hot, hump*) to /p/ or to choose which words could be made with the following initial phonemes: c, b, l, f, v, h, j. Tasks that required learners to change the middle vowel in a word to another that had the same sound to find out the correct spelling that matched a picture presented on a flashcard (“jamper or jumper?,” “mauth or mouth?,” “food or fud?”).

### Phonics and Spelling

Word choice tasks based on spelling were also instructed: learners made words using various combinations of vowel and consonant letter-cards, putting them on a board for all students to see. Sound matching tasks based on blending words onset graphemes and ending phonemes (rimes), using “the phonic wheel,” were to improve learner’s spelling skills.

### Traditional Program (Control Group)

The traditional teaching program was based on the idea that phonological decoding skills are learned from direct exposure to foreign language and transfer directly from L1. The teacher used the syllabic and global word approach as classically described in L1 textbooks. The curriculum for teaching English to second

graders mainly included vocabulary (numbers, colors, food, animals, parts of the house, verbs), some easy verbal routines (greeting, saying good-bye...) and simple sentences such as “I have/not..., I like/ I don’t like...” Flashcards and games were used to help students to increase motivation for the English lesson.

## Data Analysis

One-Way repeated measures Analyses of Variance (ANOVAs) were conducted to test for before training differences in socio-cultural factors and musical aptitude between groups. Moreover, ANOVAs were also computed to test for differences before and after training that included Group (Control, musical, and non-musical) as well as Session (pre vs. post training) as factors. Finally, multiple regression analyses with interactions (Aiken and West, 1991; Rosel et al., 2014) were also conducted to test for the effects of the training program in the experimental and control groups. Data analysis was performed using the 21.0 SPSS statistics package.

To determine whether the intervention produces different effects in the 3 groups (non-musical experimental, musical experimental, and control groups), an ANCOVA was conducted on the differences between groups after training, controlling for the level of performance before training (i.e., “prior knowledge”) for each one of the three tasks. In addition, we computed a regression analysis for each one of the three tasks. Reading variables<sub>pre</sub>, WM<sub>pre</sub> and the interactions with the Group factor (musical, non-musical, and control) were included.

## Results

### Before Training

The three groups were homogeneous regarding their socio-cultural background (see **Table 1**). Learners’ musical aptitude was also homogeneous within the three groups before training, with a normal distribution [Kolmogorov-Smirnov’s test:  $K-S = 0.622$ ,  $p = 0.834$  and  $Levene_{(2, 60)} = 0.495$ ,  $p = 0.612$ ]. However, results revealed significant differences between groups [ $F_{(2, 60)} = 14.175$ ,  $p < 0.001$ ]: mean scores in the non-musical experimental (NME) group ( $\bar{X} = 27.2$ ,  $Sd = 3.7$ ) were significantly higher than in the control group (Cont:  $\bar{X} = 22.6$ ,  $Sd = 3.2$ ;

**TABLE 1 | Test for between groups differences on socio-cultural variables.**

	<i>df</i>	$\chi^2$	<i>P</i>
Level of studies (father)	10	10.22	0.42
Level of studies (mother)	10	7.67	0.66
Same language spoken at home and at school	2	0.83	0.66
Home language other than Spanish	2	3.16	0.20
Reading at home besides schoolwork	2	0.79	0.67
Family member who reads more	2	3.99	0.13
Someone reading aloud to participants	2	3.10	0.21
Listening to music	2	0.20	0.90
Frequency of listening to music	6	3.73	0.71

Bonferroni =  $-4.62$ ,  $p < 0.01$ ) and in the musical experimental group (ME:  $\bar{X} = 21.3$ ,  $Sd = 4.4$ ; Bonferroni =  $-5.89$ ,  $p < 0.01$ ), with no significant differences between the control and musical group (Bonferroni =  $1.27$ ,  $p < 0.855$ ).

Working memory (WM) data showed a normal distribution (K-S =  $0.495$ ,  $p = 0.967$ ), but this was not the case for “Correct Letters read in English” (K-S =  $4.069$ ,  $p < 0.001$ ), “Initial Sound Identification” (K-S =  $1.021$ ,  $p = 0.021$ ) and “Correct Words Read in a Dialog in English” (K-S =  $3.659$ ,  $p < 0.001$ ). Non-significant differences were found between the three groups [ $F_{(2, 60)} = 0.55$ ,  $p = 0.58$ ]. The H non-parametric test of Kruskal-Wallis showed no between-groups differences in the “Correct letters read in English” ( $H_{K-W(2)} = 2.977$ ,  $p = 0.226$ ) and the “Correct words read in a dialog in English” ( $H_{K-W(2)} = 5.159$ ,  $p = 0.076$ ) tasks, but significant differences in the “Initial sound identification” task ( $H_{K-W(2)} = 6.562$ ,  $p = 0.038$ ), with higher scores in ME than in NME group ( $Md_M = 94$ ,  $Md_{N-M} = 100, 5$ ;  $U_{M-W} = 110$ ,  $p = 0.016$ ).

In sum, the three groups were similar in terms of socio-cultural background and working memory but the non-musical experimental group had significantly higher musical aptitudes than the other two groups and the musical experimental group showed higher scores in the “Initial sound identification” task than the NME group.

### Before vs. after Training Comparisons

Results of non-parametric Wilcoxon tests for the variables with non-normal distribution were all significant: the level of performance in “Correct letters read in English” ( $Z_W = 4.791$ ,  $p = 0.001$ ), “Correct words read in English dialogs” ( $Z_W = 3.429$ ,  $p = 0.001$ ) and “Initial sound identification” ( $Z_W = 3.679$ ,  $p = 0.001$ ) were higher after than before training. By contrast, results for WM (ANOVAs) were not significant [ $F_{(2, 61)} = 0.001$ ,  $p = 0.974$ ] and neither was the interaction between Session (WM<sub>pre</sub> vs. WM<sub>post</sub>) and Group [ME, NME and Cont;  $F_{(2, 62)} = 1.90$ ,  $p = 0.16$ ]. Thus, we decided to use the results obtained for WM<sub>pre</sub> to avoid the potential influence of the WISC test on WM<sub>post</sub>.

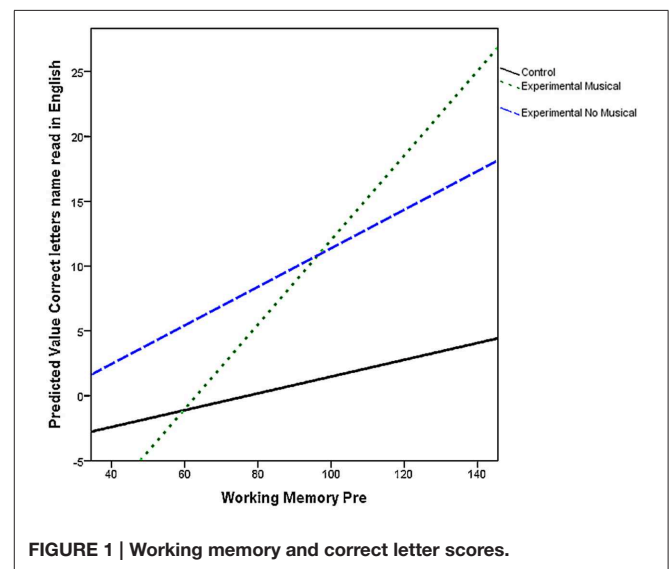
### “Correct Letter Names Read in English” Task

The main effect of Group was significant after training [ $F_{(2, 60)} = 9.81$ ,  $p < 0.01$ ,  $\eta_p^2 = 0.247$ ] with a larger effect when “prior knowledge” was controlled for [ $F_{(2, 59)} = 16.16$ ,  $p < 0.01$ ,  $\eta_p^2 = 0.354$ ,  $\beta = 0.979$ ], explaining 41.5% of the variance ( $R_c^2 = 0.415$ ). Planned Bonferroni contrasts revealed that the level of performance increased significantly in both experimental groups compared to the control group ( $p < 0.01$ ,  $IC_{EM-C} [5.11, 16.56]$ ,  $IC_{ENM-C} [5.67, 16.44]$ ), with no differences between the musical and non-musical experimental groups ( $p > 0.05$ ,  $IC_{EM-ENM} [-5.95, 5.50]$ ).

**Table 2** shows the interaction terms between working memory scores in the control group and in the non-musical group through dummy variables, with the musical experimental group as reference. Specifically, the model explained 52.2% variance in number of letters read per minute ( $R^2 = 0.52$ ). The number of correct letters read was predicted by the combined effect of Group and WM, with significantly lower scores in the control group than in the musical group.

**TABLE 2 | Regression coefficients for “correct letters read in English” task after training.**

	Unstdzied Coeff	Std. error	t	Sig.
(Constant)	-20,600	11,026	-1868	0.067
Combined punctuation in WM <sub>pre</sub>	0.326	0.115	2832	0.006
Correct letters read <sub>pre</sub>	0.563	0.126	4477	0.000
Dummy non-musical experimental	22,919	13,671	1676	0.099
Dummy control	22,364	13,436	1665	0.102
Interaction WM <sub>pre</sub> —Dummy non-musical group (Ref. G. M. Exp.)	-0.243	0.141	-1728	0.090
Interaction WM <sub>pre</sub> —Dummy control group (Ref. G. M. Exp.)	-0.351	0.141	-2484	0.016



**FIGURE 1 | Working memory and correct letter scores.**

As can be seen on **Figure 1**, learners with higher WM<sub>pre</sub> scores before training improved more in this task with larger improvements in the musical group. After training, the difference between the musical and control group was significant with no difference between the experimental (non-musical and musical) groups.

### Correct Words Read in a Dialog in English

The main effect of Group was significant after the intervention [ $F_{(2, 60)} = 5.216$ ,  $p = 0.008$ ,  $\eta_p^2 = 0.148$ ,  $\beta = 0.812$ ]. However, no pre-post differences were found when “prior knowledge” was controlled for [ $F_{(2, 59)} = 1.018$ ,  $p = 0.368$ ,  $\eta_p^2 = 0.034$ ]. The model explained 65.6% of the variance ( $R_c^2 = 0.656$ ) with confidence intervals at 95% (Bonferroni tests:  $IC_{CTR-EM} [-3.22, 5.18]$ ,  $IC_{CTR-ENM} [-5.31, 2.36]$ ,  $IC_{EM-ENM} [-6.82, 1.90]$ ).

As can be seen on **Table 3**, scores obtained in both groups, NME group (lower initial value) and Cont group (higher initial value), were based on significantly different initial values than in the ME group. Although, the interaction was not significant, there was a trend for the largest increase in this task to be found

**TABLE 3 | Regression Coefficients for “correct words read in English” post.**

	Unstandardized Coefficients	Std. error	T	Sig.
(Constant)	−8.57	5.69	−1.50	0.14
Combined punctuation in WM <sub>pre</sub>	0.18	0.06	3.23	0.00
Correct words read in a dialog in English <sub>Pre</sub>	−0.01	0.01	−0.87	0.39
Dummy non-musical experimental	7.48	2.53	2.96	0.00
Dummy control	5.29	2.49	2.12	0.04

in the NME group (steeper slope), then in the ME group and the slowest evolution to be found in the Cont group. In this case,  $R^2 = 0.505$  is reached.

It can be observed (**Figure 2**) that the non-musical group (lower initial score) and the control group (higher initial score) have significantly different initial values from the musical group. Differences were observed in the intercepts (the value of  $Y$  when  $X = 0$ ).

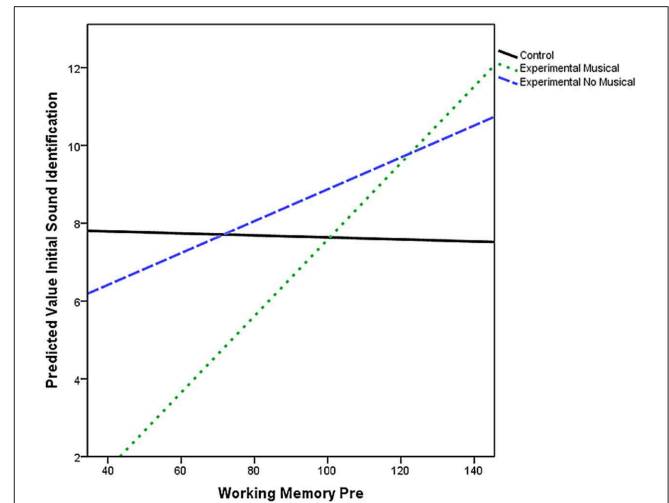
### Initial Sound Identification

After training, the main effect of Group was significant [ $F_{(2, 60)} = 3.352, p = 0.042, \eta_p^2 = 0.101, \beta = 0.612$ ]. However, no pre-post differences were found when “prior knowledge” was controlled for [ $F_{(2, 59)} = 1.47, p = 0.602, \eta_p^2 = 0.017$ ]. The model explained 45.3% of the variance ( $R_c^2 = 0.453$ ) with confidence intervals at 95% (Bonferroni tests:  $IC_{CTR-EM} [-1.30, 1.36]$ ,  $IC_{CTR-ENM} [-1.74, 0.81]$ ,  $IC_{EM-ENM} [-1.90, 0.91]$ ). Significance of the interaction terms between working memory and control group scores contrasted with the musical group on the total scores in this task is reported in **Table 4**. In this model  $R^2 = 0.525$  is reached.

As can be seen on **Figure 3**, no improvement was found in the control group. By contrast, the level of performance improved in both experimental groups with higher scores in the musical group. The difference between control and musical group was significant with no difference between the musical and non-musical experimental groups.

## Discussion

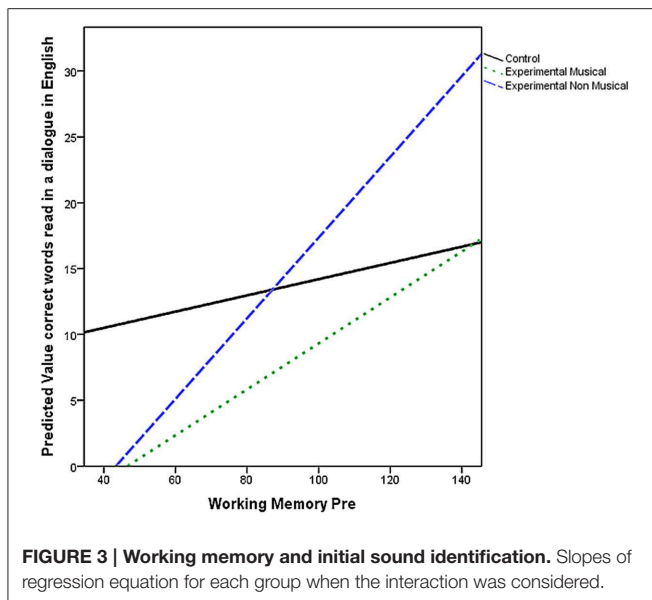
The main objective of this study was to examine the effects of phonological training programs with and without music support on reading abilities in 7–8 year-old Spanish children learning English as a foreign language. A positive outcome would allow us to propose an alternative, research-based, foreign language teaching method. Most studies point to instrumental musical training as an important factor contributing to reading skills (Anvari et al., 2002; Peynircioglu et al., 2002; Bolduc and Montésinos-Gelet, 2005; Gromko, 2005; Forgeard et al., 2008; Moreno et al., 2009; Degé and Schwarzer, 2011; Herrera et al., 2011; Moritz et al., 2012). However, instrumental musical training is often difficult to implement in primary schools when music classes are not included in the curricula. By contrast, singing is often

**FIGURE 2 | Working memory and correct words read in a dialog.** The number of correct words read in a dialog contains the significance of the working memory score.**TABLE 4 | Regression Coefficients for “initial sound identification in English” post.**

	Unstdized Coeffs.	Std. error	t	Sig.
(Constant)	−1.16	2.65	−0.44	0.66
Combined punctuation in WM <sub>pre</sub>	0.06	0.03	1.99	0.05
Initial sound identification <sub>Pre</sub>	0.50	0.09	5.71	0.00
Dummy non-musical experimental	5.21	3.28	1.59	0.12
Dummy control	7.36	3.24	2.274	0.03
Interaction WM <sub>Pre</sub> —Dummy non-musical group (Ref. G. M. Exp)	−0.05	0.03	−1.466	0.15
Interaction WM <sub>Pre</sub> —Dummy control group (Ref. G. M. Exp)	−0.08	0.03	−2.289	0.03

practiced in kindergarten and early primary schools. Christner and Reiterer (2013) pointed out that singing is similar to music at the acoustic-perception level and can also help detecting rhythmic cues in foreign languages. Consequently, singing can contribute to improve speech production and is easier to implement. Thus, rather receiving an instrumental music training, the young foreign language learners involved in this experiment benefitted from a phonological training program based on repeatedly singing rhythmic melodies during the 11-weeks training program.

Results of pre vs. post comparisons showed that children in the musical and non-musical (i.e., active control) training groups performed significantly better than children in the control group regarding the “Correct letters read in English” and the “Initial sound identification” tests. Moreover, a trend was found in the “Correct words read in an English dialog” with larger increase in the non-musical group compared to the musical group and



smallest increase in the control group. Finally, predictive analyses based on regressions with interactions, and taking working memory into account, indicated no significant differences between musical and non-musical groups, both doing better than the control group. These results clearly point to the beneficial effects of the phonological teaching approach but the further impact of the music support was not demonstrated.

Children in the non-musical group performed higher than children in the musical and control groups in the musicality test presented before training. This was possibly linked to these children being from Spanish gypsy families who typically show strong rhythmic abilities (Gil and Azcune, 2012). In this respect, using a longitudinal approach, David et al. (2007) showed that sensitivity to musical rhythm was related to the ability of decoding complex words requiring the use of linguistic stress and they argued that rhythm predicted reading ability from grade 1 to 5 in primary school. Similarly, Moritz et al. (2012) concluded that the rhythmic abilities students developed when they were preschoolers correlated with their phonological abilities in second grade. Thus, the higher level of performance of children in the non-musical group in both the “correct letters read in English” and the “correct words read in an English dialog” may be linked to English being a stress-timed language (while Spanish is syllable-timed) strongly relying on rhythmic cues. Moreover, early phonetic processing may be organized differently in children with high musical aptitudes, as shown in adults with stronger musical expertise (Ott et al., 2011). In other words, learners with higher musical aptitudes may tend to benefit more from the phonological training program than children with lower musical aptitudes. Importantly, however, while children in the music group showed low musical aptitudes before training, they nevertheless performed better than the control group in the tests described above. Therefore, the phonological training programs with and without music support seem to have significant effects on early reading skills.

Of interest in this study was to examine the influence of working memory and how it interacted with the effects of other factors. Previous reports in the literature have shown that instrumental musical training significantly improved working memory (Ho et al., 2003; Franklin et al., 2008). More recently, Christiner and Reiterer (2013) showed that singing also improved auditory working memory span in Austrian adult singers performing in Hindi. Surprisingly, no such differences between  $WM_{pre}$  and  $WM_{post}$  were found in the present study. However, as seen in **Figure 1**, the largest increase in WM scores is found in the music group. Moreover, the higher the scores in  $WM_{pre}$ , the larger the increase in “correct letters read” scores after training. This effect was larger in the experimental groups than in the control group with no differences between experimental groups. It may be that the speech sounds as well as the visual and orthographical elements, addressing the phonological loop and the visuo-spatial sketchpad, respectively (Baddeley, 2012), used in the two experimental groups, improved learners’ basic reading skills. In addition, and in line with Christiner and Reiterer (2013) results, it may be that the repetitive use of melodies with memorable lyrics allowed young learners to better retain verbal materials and relevant foreign speech sounds. Finally, the lowest level of performance in the control group clearly showed that direct transfer from learners’ L1 reading skills to another language should not be taken as granted in the foreign language classroom.

One final aspect that deserves comments is the positive impact of the phonological and musical-phonological programs after a relatively short training duration (11 weeks). This finding is in line with previous results showing significant effects of training after 16, 14, and 4 weeks, respectively in Gromko (2005), Moreno and Besson (2006), and Register et al. (2007). In addition, our results are in line with the conclusions from a meta-analysis conducted by Standley (2008) showing that using music activities that matched the specific reading needs of the children was more important than the duration of training (e.g., training of less than 4 weeks ( $d = 0.61$ ) were equally effective than training over an entire school year ( $0.33$ ,  $p = 0.37$ ). Nevertheless, and in line with previous longitudinal studies over a school year or longer (David et al., 2007; Moreno et al., 2009; Moritz et al., 2012; Chobert et al., 2014), it would be of interest in further experiments to test for the effects of the phonological and phonological plus music training programs on foreign learning abilities when these programs are applied for a longer duration.

## Conclusions

Acquiring good phonological and decoding skills is of uttermost importance for foreign language learners and these abilities are not necessarily directly transferred from L1 knowledge (specifically when L1 and L2 rely on different phonological systems). Nevertheless, these abilities are needed to access lexical content while reading. The phonological training program based on visual support that was used in this study, improved some of the early reading skills in 7–8-year-old Spanish EFL students. Moreover, learners in

the phonological plus musical support training program outperformed children in the control group. Thus, simple rhythmic melodies that work as carriers of visual and orthographic perception may stimulate the rehearsal needed for improving specific phonological skills, thereby providing valuable teaching approaches for learning to read in a foreign language.

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**Conflict of Interest Statement:** The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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**ANNEX 4: SUBMITTED AND ACCEPTED ORIGINAL PAPER  
WITH CHANGES: “FIRST AND FOREIGN LANGUAGE EARLY  
READING ABILITIES: THE INFLUENCE OF MUSICAL  
PERCEPTION”. CARTA DE ACEPTACIÓN ARTÍCULO CON  
CAMBIOS DE LA REVISTA PSYCHOLOGY OF MUSIC**

## **ANNEX 4:**

El artículo que forma parte del apartado “Annex 4” ha sido retirado de la tesis debido a restricciones relativas a derechos de autor. En sustitución del artículo ofrecemos la siguiente información: referencia bibliográfica, enlace a la revista, y resumen.

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Enlace al texto completo del artículo:

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### **RESUMEN:**

There is a growing body of literature that recognises how music perception affects first-language learning, but much less is known about its influence on foreign-language reading skills. The purpose of this paper is to examine the effect of music perception abilities on the acquisition of some foreign early reading skills based on their transference from first language. Data for this study were collected from 63 Spanish-speaking English-language learners studying second grade of primary school. We used a music perception test and the Early Grade Reading Assessment battery, which measures early reading skills in both languages. A mediation analysis using structural equation modelling was performed, integrating music perception and letter-sound knowledge, initial sound identification, and familiar word and pseudoword reading in Spanish and English. This research provides new insights into how music perception affects early reading skills in both languages. These findings indicate a transfer of music perception abilities to first-language alphabetic principle, phonemic awareness and word recognition skills that affect foreign language early reading abilities

