Music and Language Learning

Mohammad Saber Khaghaninejad, Ph.D.

Shiraz University

Rahim Fahandejsaadi, Ph.D.

Shiraz University

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Preface

Language development is the most complex and most remarkable achievement of our species. Understanding the specificity of perceptual skills in infancy and their contribution to subsequent cognitive, language, perceptual and motor development is the broad aim of this axis. At birth, infants exhibit a listening bias for affectively positive vocalizations, whether speech or music, which facilitates learning in these domains. Later in the developmental process, skill at discriminating, remembering, and producing sound patterns such as the intonation patterns of speech or the melodies of music are acquired.

The research focuses on understanding the developmental processes of all aspects of language (i.e., syntax, semantics, morphology, phonology, pragmatics and discourse) across multiple learner populations, especially in bilingual and second/foreign language learners throughout the life span. In the areas of music development and processing, it has been demonstrated that age of acquisition has an effect on brain structure and similar questions are being addressed related to bilingualism. A focus on brain signatures of 'nativeness' in second language acquisition have natural counterparts in the development of musical abilities focusing attention on issues related to presence, absence or differences in critical periods for language and music skill development.

To many people across the globe, music is an important part of everyday life. In addition to its cultural importance, many studies have found that music plays a key role in early language acquisition and can also help boost language learning. Neurologists have found that musical and language processing occurs in the same area of the brain, and there appear to be parallels in how musical and linguistic syntax are processed. Hence, music can be used as a promising instructional instrument in educational contexts.

Several theoretical accounts proposed that, particularly during early language acquisition, language is rather perceived as music. For example, Koelsch (2011, p. 16) hypothesized that “the human

brain, particularly at an early age, does not treat language and music as strictly separate domains, but rather treats language as a special case of music." Brandt et al. (2012, p. 5) denoted "that music has a privileged status that enables us to acquire not only the musical conventions of our native culture, but also enables us to learn our native language." In addition, music and language share a number of similarities. Both are based on acoustic information, involving a limited number of categorical elements or classes (phonemes and tones) that are organized in structured sequences according to specific regularities. These regularities are acquired using similar learning mechanisms (McMullen and Saffran, 2004). There are indicators for common evolutionary origins. Electrophysiological evidence suggests shared cognitive resources and similar underlying neural substrates for processing semantics, syntax, and prosody.

The benefits of using music as a tool for second language acquisition are extensive. First and foremost, songs teach linguistic elements, such as vocabulary, grammar and syntax. Through learning lyrics, students' vocabulary can quickly become more advanced, and singing phrases can lead to better vocabulary recall. Songs can also prove helpful in learning paralinguistic and extra linguistic elements, including accents and tones, helping to improve pronunciation and comprehension of the language.

Most importantly, music helps connect students with new cultures and opens up a whole new world, just one of the reasons why songs are an important element of teaching world languages. They are an infinite number of songs that discuss culturally relevant topics, such as human relations, ethics, customs, history and humor, as well as regional and cultural differences. These songs can help teach language and culture simultaneously.

This book has been an enquiry to shed light on the cognitive similarities between language acquisition and music learning, and the possible help that music presence can bring about regarding second/foreign language acquisition. First, the impact of music on brain's processing ability has been described, then, the role of music

at early mental development is focused on. Thirdly, music has been defined and portrayed in different cultures around the globe, then, the structural similarities of language and music have been tapped on and the possible positive impacts of employing music for language teaching and learning purposes have been elaborated.

However a sudden shift to use music for pedagogical purposes is not that easy and needs some cultural, pedagogical foundations which should be set in advance. Employing music is a cheap and theoretically promising technique for improving language teaching and learning that may soften the stressful context of classrooms and makes language learning a fun.

Mohammad Saber Khaghaninejad, Ph.D.
Shiraz University

Rahim Fahandejsaadi, Ph.D.
Shiraz University

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Introduction

Throughout the centuries, experts in different fields - philosophers, scientists, teachers and therapists have recognized the place of music for therapeutic and developmental functions. Over the last two decades, researches have made great advances in the theory of foreign language acquisition. Many find the didactic conjoining of language and music surprisingly convincing as there are numerous historical and developmental proofs of music's relationship with language learning. Language and music are the two ways that human beings use to communicate and express themselves through sound.

Studying profound and intense relations between language and music throughout history, one should take a glance at the Greeks. Plato wrote that "musical training is a more potent instrument than any other, because rhythm and harmony find their way into the inward places of the soul... making the soul of him who is rightly educated graceful". In the Ancient Greek culture, music implied language, Plato himself considering a tune without words a "sign of a want of true artistic taste." Language uniquely enabled the Greek listener to distinguish the exact character of the mood which the rhythm and tune is supposed to represent. Plato expected language in a musical context, but he did not write about the music inside language. For insight into this, one must look to the Greek myths. The word *mousikas* means "from the muses" and understanding the origins of the muses shows how they

understood music's role in the development of linguistic genres, the three classical elements of *mousikas* being: Melody (intonation), verse (words), and dance (body language). And in fact, today a meaningful communication is recognized as a multimodal construct, a large part of which is musical. In any oral interaction, only 15% of the information corresponds to verbal language, while 70% of the message is performed through body language and the final 15% belongs to intonation, the musical character of language. And because music and language share essential qualities of rhythm, pitch, timbre, and dynamics, methods for teaching each of them work surprisingly well together to teach them both.

Music is recognized as a universal feature of human cognition; every healthy human is born with the ability to appreciate it. However, music's role in human development is often viewed as ancillary and slower to mature. Wilson (2012) argues that "whereas language acquisition in children is fast and largely autonomous, music is acquired more slowly and depends on substantial teaching and practice." As a result, he surmises that music appears "to be derived from language" (p. 283). At its most extreme, Pinker (1997, p. 45) has described music as "auditory cheesecake, an exquisite confection" without any biological utility.

A child can imitate the rhythm and musical contours of the language long before he can say the words. They notice the sound qualities of direction, frequency, intensity, duration, tempo, intonation, pitch, and rhythm. Musical aspects of language, tone, pauses, stress, and timbre are sonorous units into which phonemes, the consonant and vowel sounds of language, are later placed. Researchers have made several meaningful points regarding the competitive positions of language and music, in terms of brain structure and functioning. These abilities seem to be somewhat localized in the two temporal lobes, the left one

being 90 percent better at recognizing words, and the right one about 20 percent better at recognizing melodic patterns. The terms right-brain and left-brain are regularly informally used to describe a continuum between tasks perceived as emotional and artistic and those understood as rational and scientific.

Howle (1989) said that lullabies are more than simple nursery songs, serving to set musical patterns to words the child hears but does not yet comprehend. This language-music structure provides an early formation of listening skills and language facility through cradle songs and nursery rhymes. The rhythm made the words memorable, as the child learned the prosody of his language. She believes this early memory bonding forms the basis of literary repertoire and future creativity. She admonishes both mothers and fathers to "seize every opportunity to sing and read to their children" (p. 22). Merkur, (2000) from the Institute of Bio-musicology, believed that the musical ability and musical behavior of humans originally evolved as an advantageous reproductive strategy in the ancestors of humans and chimpanzees. He suggested that music is an evolutionary spin-off from patterns of sexual selection. In particular, males who "made music" together may have attracted females, who chose music-makers as mates. Thus, music might be implemented due to the fact that males that were musical were more likely to reproduce than males that were not. In short, music is needed because to be human is to be musical.

It was previously thought that language and music involved two distinct brain mechanisms. Speech functions were localized in the left brain hemisphere and language in the right. But advances in brain imaging technology have challenged that idea. It is becoming clear that there's a whole lot of overlap between the two. Studies have shown, for example, that musical training can improve the brain's language learning abilities and vice versa. (Mozart himself spoke several tongues, including German, French and Italian.)

Several factors have clouded an understanding of the entanglement of music and language, especially in the very young. First, overly restrictive definitions of music often impose adult assumptions onto newborns. Second, music and language are often treated as largely independent systems whose convergence is dependent on factors such as musical training. Third, while language skill is typically measured against the adult population at large, musical skill is often measured against the expertise of professional musicians, leading to mismatched expectations that make music learning seem more arduous and time-consuming.

It is possible however to create a link between the right brain's processing of music and rhythm and the left brain's processing of verbal information. High musical ability is common among multilingual individuals. Likewise, musical people have increased aptitude in foreign language learning due to an advanced ability in perceiving, processing, and closely reproducing accent. With this appreciation for the assistive place of music in the mind, one must acknowledge that music can more effectively awaken students to language learning and this has been proven by specific examples of 'musical language teaching'. And here enters the musical-linguistic technique, which helps students develop intonation, rhythm, pitch and auditory memory and experience gains in comprehension of word stress, attention duration and anticipation of new text.

On the surface, music and language appear to be rather similar because they share a number of features on the structural level: Both consist of sounds and make use of rhythm, pitch, volume, stress and pauses (Mora, 2000; Lowe, 1995). In addition, experts argue that from an evolutionary point of view, music and language might have a partly common origin (Molino, 2000; Wallin et al., 2000). The two domains also seem develop in

analogous ways in early childhood; studies by Saffran (2003) indicate important parallels in the ways music and language are learned by infants. Such structural and evolutionary similarities between music and language might not seem surprising, but there are also fundamental differences. The most conspicuous is their different functions in terms of communication: Language commonly expresses propositional meaning, whereas music can only convey more subtle meanings such as emotions or affect (Jackendoff, 2006). Additionally, they also differ structurally beneath the surface level in terms of pitch, rhythm and syntax. In summary, the relation between music and language is highly complex indeed and can be analyzed on a variety of different levels with regard to structural, evolutionary and functional properties.

With respect to shared syntax and meaning processing in music and language, research suggests that the neuro-physiological mechanisms responsible for syntax are enhanced, and develop earlier, due to musical training (Slevc, Rosenberg & Patel, 2009). In addition, speech recognition and production depend on, and operate simultaneously with, conceptually-driven processes, such as awareness of the lexical, syntactic and semantic aspects of language (Rapp & Goldrick, 2000). Research suggests that two shared cognitive processes may underlie linguistic and musical syntax: Working memory or executive functioning, and implicit learning (Francois & Schön, 2011).

There are firm scientific grounds for a link between musical abilities and first (L1) and/or second language (L2) proficiency. Firstly, musical and speech sounds are segmented and processed similarly by the auditory system (François, Chobert, Besson, & Schön, 2012; Schön et al., 2010). Secondly, these components of language and music may be compounded into larger meaningful units in a structured hierarchical manner_ grammar and harmony or rhythm (Patel, 2010; Sloboda, 1985). This shared syntactic

integration resource hypothesis challenges the domain-specificity approach and argues that, although representations of music and language components may be stored in different brain regions, a common neural network is used to interpret and structure music and speech sounds (Schön et al., 2010). Therefore, musical practice and expertise fine-tune the auditory system for both music and speech processing and, in turn, strengthen related neural and cognitive mechanisms (Kraus, Strait & Parbery-Clark, 2012).

In particular, the behavioral and neurological effects of musical expertise on native language proficiency have been extensively researched (Parbery-Clark, Tierney, Strait & Kraus, 2012). However, less is known about how music training or expertise could impact upon L2 learning. To identify possible benefits of musicianship, Slevc and Miyake (2006) conducted a pioneering study which provided clear evidence for the transfer of musical skills to L2 receptive and productive phonology, as distinct from L2 syntax or lexicon. By concluding that musical expertise may assist only L2 sound structure acquisition, this influential study set the direction for subsequent research, which largely examined the phonological aspects in L2 learning.

The use of music as a tool by language teachers to teach foreign languages has been the center of attention to researchers for many years. That is why in the related literature one can see different, but mostly positive comments concerning the effectiveness of music in language learning and performance. Music like language is unique to the human species (Leith, 1979). Surprisingly not only has teacher benefited from the use of music in language teaching but also some scholars used music in their work “throughout time, healers, philosophers, and teachers have recognized the role of music for therapeutic and developmental functions” (Bancorft, 1985 cited in Stansell, 2005, p.16).

Stansell (2005) presented the idea that making music is seen historically to be as fundamental as the characteristically human activities like drawing and painting. For centuries it has been used to boost memory and learning. Also, according to Richards and Rodgers (2001, p.102):

> "The musical background helps to induce a relaxed attitude, which Lozanov refers to as concert pseudo - passiveness. This state is felt to be optimal for learning, in that anxieties and tension are relieved and power of concentration for new material is raised."

Hence, music can soften the harsh atmosphere of the classroom and make new information meaningful and integrate education and entertainment known as edutainment. Background music can also be encouraged at home and it is the job of educators to "let parents know that music offers a sense of comfort and security to young children in this confusing world and creates a bond among members of the entire family" (Scholastic, 2000, p. 2).

Until recently, research on the use of music and song as a pedagogical tool in the foreign language classroom has been rare. As Falioni (1993) stated, music's use in the foreign language classroom has long been valued, but "all too often, music in the classroom has been relegated to recreation and entertainment status" (p. 98). She went on to state that a survey of the last two decades of journals for foreign language teachers shows only a few articles on the subject compared to multitudinous articles on other methodological ideas. It is noteworthy that the major foreign language journals for the last 50 years were perused for articles on the subject. Except for anecdotal articles advocating the incorporation of songs to increase students' involvement, there was little published until the late 50s and 60s, when the

popularity of audio-lingual methodology became evident. Little has changed since 1972 when Coe stated that in the area of songs there have been no controlled experiments. That is to say, no one has actually tried to measure how effective songs and music actually are in foreign language teaching.

The problem is how the teacher can create a situation that promotes a low filter. According to Lazanov (1999), using emphatic vocal inflection with classical music such as Mozart has been developed in the late 1970s in foreign language teaching (Suggestopedia). Reading with music played in background was one of the main components of this method. Stress is the biggest obstacle students might encounter in language classes. Therefore, it can develop a kind of mental block, or affective filter (Chastain, 1988; Krashen, 1982) which in turn can adversely affect students' reading comprehension. Under such circumstances, music can lessen their tension and stress (Drowns, 2002; Merrell, 2004; Stansell, 2005), and result in better language learning and internalization of the language. The majority of the students are not motivated enough to learn a second or foreign language. To decode a written text and keep the information in the memory, one needs to have a powerful imagination and memory. Music can improve students' power of imagination and memory.

According to Claerr and Gargan (1984), incorporation of a musical methodology can be seamless "with some imagination, music can be used to teach all aspects of foreign languages" (p. 31). These sentiments were echoed by Falioni (1993), who stated that "practically all grammar points can be found in music texts, and the texts also offer a wide variety of vocabulary, all of which can be utilized to practice the four communication skills" (p. 98). Second language teachers (e.g., Jolly, 1975; Techmeier, 1969; Urbanic & Vizmuller, 1981), following observations in the classroom, concluded that songs and music help to develop better

second language skills. The pedagogical potential of music in foreign languages is enormous and has only begun to be realized. As more experimentation takes place and better materials become available, music in all its forms-from opera to popular ballad-would probably become an integral part of any sophisticated foreign language instruction program (Leith, 1979).

Music and Brain

Music is an integral part of every culture, constantly weaving in and out of daily life. It is documented that the human brain is "hard-wired" for music; thus providing a biological basis for the importance of music in the human experience. The impact of music in children's lives may be demonstrated via children's literature in different languages, through lullabies and traditional plays. Widespread research has studied the impact of music on the brain and its role in neural cell growth. The process of music interpretation in the human brain is very similar to that of language processing. Indeed, many language areas overlap with those of music. The basic concepts of music such as frequency, intensity, and tension levels are perceived via the primary auditory area, while the higher concepts such as musical phrases are processed in the secondary and association areas which closely overlap areas of language.

The use of music as a problem solver to enhance learning is justified by Gardner (1985) who stated that "all normal (non-brain-damaged) people possess some musical intelligence" (p. 285). The left hemisphere of the brain expresses thoughts in words, while the right hemisphere of the brain controls actions, problem resolution, memory, and emotions. As Guglielmino (1986) stated, "Music bridges the hemispheres, strengthening retention through a complementary function as the right hemisphere learns the melody, the left, the words" (p. 20). That

connecting bridge is also mentioned by Claerr and Gargan (1984), who proposed music's benefit as relaxing and motivating, a natural bridge between native and foreign languages, motivating students to increase language practice.

Anton (1990) found that "when a learning activity combines both left and right hemispheres simultaneously engaged in a particular activity, an ideal learning situation is established and the most productive learning occurs" (p. 1170). This ideal learning situation facilitates flexible thinking and helps to explore new ways of expressing ideas. Using nonverbal "right-brain" skills, such as actions, emotions, and music aids improvement of creativity, memory, and the ability to imitate, which is considered one of the most useful strategies in language learning. Creating an ideal situation for optimal learning and flexible thinking may be a key to making connections between subject matter. Bruner (1960), on discussing transfer of learning between the disciplines stated: "it is indeed a fact that massive general transfer can be achieved by appropriate learning, even to the degree that learning properly under optimum conditions leads one to learn how to learn" (p. 6).

A connection to this notion was accomplished when Borchgrevink's (1982) study concluded that the speech hemisphere portion of the brain controlled musical rhythm and the act of singing:

> "For the 'normal' right-hander the left hemisphere controls speech perception, speech production, prosody (local dialect/stress/intonation), musical rhythm and the act of singing; whereas the right hemisphere controls pitch and tonality in singing (but not in speech!)... As musical rhythm and pitch/tonality are seen to be controlled by different cerebral hemispheres, singing and almost any musical performance implies extensive integration and cooperation between the hemispheres." (pp. 154-156)

This indicated that music possesses an invaluable key to incorporate the whole brain in the learning process. This theory may provide principles to design more effective learning experiences. By using a variety of input methods, including music, there may be more opportunities for students to connect to their present knowledge base and add new knowledge. Music not only helps to store bits of information, but it is a means by which the brain releases that same information for use.

Music and memory aid

Music is an effective memory aid for the classroom. "Many people often remember rhyme, rhythm or melody better than ordinary speech" (Falioni, 1993, p. 98). Several researchers (e.g., Chazin & Neuschatz, 1990; Geschwind, 1970; Isern, 1961; Wallace, 1994; Le Feron, 2005) expound the benefit of music as a memory aid.

Wallace (1994), when comparing recall ability, found that spoken text was the least frequently recalled, followed by rhyming text, and then with melodic text as the easiest to remember. Wallace (ibid.) compared immediate and long-term recall of spoken texts to texts learned with music. Results of the study indicated that recall was significantly greater for the music condition than for the spoken condition, revealing that "music, when repeated, simple, and easily learned can make a text more easily learned and better recalled than when the same text is learned without any melody" (pp. 1473-1474). The study suggested that simple musical song transforms ordinary text into information that is effectively retained and recalled when needed. In addition, melody provides sequential information, line and syllable length information, chunk linking, and rhythmical information which have the potential for making accurate

reconstruction of the text. Even when there was missing unrecalled text that, the subjects for the music condition more clearly indicated what was missing, such as how many lines, words, and even syllables. As Wallace explained, "A repeating, simple melody can provide a recall aid above and beyond what is provided in the text alone or even in the poetic properties of a text such as rhyme" (p. 1481). He inferred that, "music facilitates recall in the initial learning phase as well as in the delayed-recall task; simply, recall of the text is greater when the text is sung than when it is spoken" (p. 1475). Wallace continued,

> "The presence of structural characteristics within the material to be remembered, the ease of observing and acquiring those characteristics, and the contributions of those characteristics in terms of organizing, constraining, or cueing recall will all affect the memo-ability of material. Music accomplishes all three of these conditions and therefore can facilitate learning and recall of text." (p. 1483)

On a cautionary note, the experiments revealed that when the music was too difficult or the melody remained unlearned, it had the opposite effect on recall. In other words, the pivotal relationship construct between the melody and the text relies on simplistic melody in order to combine and facilitate recall, rather than interfere with the text.

Wallace (1994) stated that music's power in aiding text recall is in the interconnections of the musical characteristics to the text. The music has an inherent capability to accentuate the abstracted characteristics of the text, strongly linking the abstractions to the text string. Some component of the melody will cue or echo the parallel component of the text. "Once encoded together, the richness of information provided in the

melody serves as an effective recall cue" (p. 1472). This same text integration effect was confirmed by Serafine, et al. (1984) and Serafine, et al., (1986), who found that "music was recognized better when it was paired with its original text than when paired with another text, even if that text was equally familiar" (p. 129).

This music-text integration is closely related to what researchers Tulving and Thomson (1973) called encoding specificity. They stated that when a word occurs in a particular learning context, that context can be a better aid to retrieval than the target word itself. For example, they presented the word "glue" as a potential learning aid, next to the target word "chair". Later, people were better able to recall "chair", given the cue "glue", than they were able to remember "chair" when it was presented alone for recognition. The context apparently had changed the representation of the target (encoding specificity), just as Serafine, et al. (1986) claimed the text and melody change each other when presented together in a song. While the text example above reflects mental changes, melody and text have physical effects on each other.

Morrongiello and Roes (1990) sought to examine whether preschool children remembered a song primarily by the tune, the words, or a combination of these two features. They evaluated whether components were integrated in memory, or stored independently. For this study, adults were used for a comparison involving 40 subjects, 20 children (Mean age = 5.6 years), and 20 adults (Mean age =23.4 years). The results revealed some integration of text and tune for both children's and adults' memory of a song, however, the degree of integration was greater for adults than for children. For adults, tune and text were highly integrated in memory, and the presence of one familiar component facilitated their memory for the other-but not as much for children. It was the words that were particularly salient in children's memory of a

song, and consequently, their judgment of song similarity varied directly with the words. Thus, both adult and child listeners are more likely to judge as old, those songs that comprise the exact word-tune pairing originally presented to them.

As previously stated, the "staying" power of a song may be due to the connection formed between the tune and the words as it is put in memory, or the chunking effect. As many researchers agree (e.g., Anton, 1990; Morrongiello & Rose, 1990; Serafine, et al., 1984; Serafine, et al., 1986; Tulving & Thomson, 1973; and Wallace, 1994), the tune and text of a song are to some extent integrated in memory rather than stored independently. According to McElhinney and Annett (1996), "The integration of the temporal aspect of a tune with the text might promote better organization of material and consequently enhance recall" (p. 399).

Evidence of this integrative effect may be a factor for the lack of anticipated results in the Dominguez (1991) study, where the subjects were 51 preschool Spanish-speaking migrant children. Two groups were tested for vocabulary and language use. Both groups were provided vocabulary and language through the use of the basal reader, but the experimental group had this vocabulary set to familiar children's songs. Treatment was twice daily during a six-week summer camp program after which the Houghton Mifflin Reading Test was administered as the posttest.

Dominguez (1991) found no significant difference in the mean scores of these groups. One reason for the lack of difference in the scores could be the short time of the study. In addition to the study length, another possible reason could be the fact that the vocabulary was set to songs that were familiar to the children. If the findings of Serafine, et al. (1984), and Serafine, et al. (1986) hold true, there was interference in memory from the words the children had already learned with these familiar tunes. The hypothesis is that the brain learns the music and the text together;

therefore, the tune of these familiar songs would have actually been an interference to the learning of new vocabulary. Put another way, learning of the new vocabulary during this experiment may have been impeded by interference from the vocabulary that had previously been learned with the tune. In that case, the time that would be needed to learn, or attach new vocabulary, to an already familiar tune would be prolonged.

A study done by Prickett and Moore (1991) tested ten patients with Alzheimer's disease who resided in an intermediate care facility. They were assessed for recall of material, both sung and spoken, with which there was lifelong familiarity. They were also assessed in the same fashion when presented new information. Songs and spoken pieces such as "What a Friend We Have in Jesus," "Amazing Grace," and Psalm 23 were selected because of their familiarity for lifelong residents of a region often known as "the Bible Belt." The Disney song "It's a Small World" was chosen as the unfamiliar song, as no patient appeared to recognize the song. In each session, the therapist sat with the patient at the keyboard. Another therapist videotaped the patient's faces, and their voices were augmented with a remote microphone. Patients were invited to sing along as soon as they recognized the song. Patients recalled the words to songs markedly better than they recalled spoken words, including rhymed speech or newly presented information. Across all trials for all participants, performance percentages were relatively similar for reciting long-familiar words (Mean = 47.43), recalling a newly presented song (Mean = 42.19), and reciting a simple new poem (Mean = 39.33), but decidedly more accurate for the words to long-familiar songs (Mean = 71.8). This suggests that the musical context noticeably facilitated recall. Even though the poem contained rhyme and rhythm (as did the song), was a great deal shorter, and dealt with supposedly familiar ideations, in actual practice it appeared to be as challenging to recall as a much longer song.

McElhinney and Annett (1996) attempted to replicate the main studies of Prickett and Moore (1991) but with non-Alzheimer participants. They examined the effect of music on recall of verbal material using non- familiar tunes and lyrics. They used non-familiar tunes to reduce any confounding effect in prior association of alternative lyrics since they believed it is "unlikely that the tune and the words of a song are stored independently" (p. 395). The lyrics to be remembered were either sung or read aloud by the teacher. Two conditions, prose and song, were the variables for three trials. Subjects were 20 volunteers. All were final year students in psychology with a mean age of 21, and an equal number of males and females. Each group listened to their respective tapes three times. After each presentation, they were asked to freely recall and to write as much as they could remember from the tape. Recall was assessed by counting the number of words correctly recalled by each participant without regard to order. For trial 1 there was no significant difference between groups in number of words recalled. Over subsequent trials, the total number of words recalled increased.

Results showed that using song to aid recall was effective. Subjects had better overall recall when song was employed to present information. Matched- pair tests showed that the number of words per unit recalled by the song group was significantly higher than that for the prose group on all three trials. There was evidence for greater chunking of material in the song condition. No unfamiliar words in this study could have contributed to the desired results.

A study by Chazin and Neuschatz (1990), however, indicated that information does not have to be familiar. They tested the effects of a musical mnemonic on the recall of unfamiliar scientific information among 8-year-olds and young adults. Results showed that for material that was presented either as a song or a lecture,

there was higher recall of information from the musical condition than from the traditional lecture. The scientific information may have been unfamiliar, but the actual words were understood if they were in the learner's native language. Isern (1961) had also found that material which was sung was retained longer than that which was spoken in a study with mentally retarded children on the influence of music on the retention of instructional content.

In the study to examine the effectiveness of melodic-rhythmic mnemonics as an aid to short-term memory, Gfeller (1983) used the variables of group membership (learning disabled or normal) and rehearsal mode (musical or verbal) with 30 normal and 30 learning disabled males, ages 9 to 12. She found in the first experiment that with the two variables alone-group membership and rehearsal mode-both the normal subject membership and verbal rehearsal resulted in significantly greater recall. In the second experiment, the variables for teaching method (repetition versus repetition with modeling and cuing) and time were added. Results of the second experiment showed that extended rehearsal of the musical mode in conjunction with modeling and cuing of the strategy resulted in significantly greater recall for both normal and learning disabled students. Gfeller (ibid.) stated:

> "This study indicates that musical mnemonics may be a useful aid to retention for both learning disabled and normal students. However, the manner in which the strategy is presented and encouraged appears to be a crucial factor in that strategy's effectiveness: without modeling of appropriate use and encouragement of application, even the best strategy may be rendered ineffective." (p. 188)

Involuntary mental rehearsal

Involuntary mental rehearsal is the general term used in psychology, while din is the term for the same phenomenon after a period of contact with a foreign language. The SSIMHP refers to songs and tunes that perpetuate repeatedly in our heads. When these songs that playback in our heads occur from exposure to a foreign language; the phenomenon is termed as the "musical din". Psychologists such as De Guerrero (1987) believed that mental rehearsal may be viewed as a conscious strategy for remembering. It is defined by as the "overt or covert repetition of material that is to be learned" (p. 538).

The din phenomenon was first described in literature by Barber (1980), after a trip to Eastern Europe. She explained the din as "words, sounds, intonations, and phrases, all swimming about in the voices of people I talked with" (pp. 29-30). Krashen (1983), who also defined the din as "an involuntary rehearsal of words, sounds, and phrases" (p. 41), hypothesized that this mental playback is an indication that the natural language acquisition process is taking place. Therefore, din may be described as a natural process in the acquisition of new language.

The results of the studies by Bedford (1985), Parr and Krashen (1986), and de Guerrero (1987) showed the extent to which language learners experience the din. Of a combined total of 581 second language learners, 74% said they experience the din "sometimes" to "very frequently."

Numerous studies (e.g., Bedford, 1985; de Guerrero, 1987; Krashen, 1983; Parr & Krashen, 1986) confirmed that the din is widespread among second language learners, particularly after activities involving second language listening activities. McQuillan and Rodrigo (1995) confirmed the widespread presence of the din phenomenon when using reading activities, while Murphey (1990) believed the din is directly related to

music. Salcedo and Harrison (2002) confirmed the widespread occurrence of the din after exposure to music. Their findings indicated that music and singing, as well as reading, were strong primary sources of input that provide extended mental interaction with the material and have a profound effect on the second language acquisition process. Krashen (1983) believed the din is the result of the stimulation of the language acquisition device (LAD) and that this stimulation occurs only after comprehensible input. He believed it will not occur after output practice without input and it will also not occur after pattern drills or grammar exercises. While Krashen stated the input must be understood, Barber (1980) had to look up words in the dictionary that she did not understand from her din experience.

> "According to this scenario, the Language Acquisition Device (LAD), sparked by listening and sub-vocalizations, activates a din in order to chew on elements and schemas for acquisition which would lead eventually to comprehension, later contributing to reading and ultimately production" (Murphey, 1990, p. 58).

In Krashen's hypotheses, the *i* stands for input that the student understands, and the 1 stands for input the learner has not yet acquired but is ready to acquire in the natural order sequence. Krashen also hypothesizes that it takes one to two hours of good input to activate the din. Bedford (1985), who performed a study based on Krashen's findings, also noted that spontaneous playback was widespread, stating that many second language acquirers report that they often experience spontaneous playback of the language; "that they are hearing bits and pieces of it insistently in their minds" (p. 279). Subjects from the study mentioned over and over that playback happened as they went about doing mechanical chores (driving, shopping, mowing the lawn, etc.) and many people mentioned that "at times they have an insistent playback of music" (p. 283).

Bedford (1985) offered a refinement to corollary 1 in that students reported that spontaneous playback is set off by comprehensible aural input. While playback occurs more often after listening and conversation, Krashen (1983) alluded to the comparative effect of aural and written input on playback. Although McQuillan and Rodrigo (1995) confirmed that the listening din figure was higher than the reading din, they suggest that both input methods are important in triggering a second language din.

Krashen (1983) also stated that at least 1-2 hours of input are required for the din to begin. This time may be excessive, as De Guerrero (1987) and Salcedo and Harrison (2002) reported that subjects reported the din beginning almost immediately. McQuillan and Rodrigo's (1995) research stated the beginning of the din ranged from immediate to two hours. Murphey (1990) believed that this language din is more effectively triggered by music and when this din occurs with music, he calls it the Song Stuck in My Head Phenomenon or SSIMHP. He believed that both the din and the SSIMHP could be manifestations of the LAD. Involuntary rehearsal of language from music may be triggered with much smaller amounts of input time (or be triggered by output) and the speaker frequently does not understand the input.

While Krashen (1983) indicated that the din seems to wear off after a few days (p. 44), many language learners insist the SSIMHP stays with them for years. Machesney (1985) pointed to the fact that adults were still able to sing the singing games learned in early childhood. Lafayette (2002) commented that he can still sing many musical parts (bass, tenor, etc.) of a song he learned over 40 years ago. He remembered the lyrics associated with the music, even though at the time, he did not understand the meaning of the words in Latin. Listeners may have an advantage in hearing music rather than reading. In the case of music and

aural input, as opposed to reading, listeners can often use other clues such as context, pitch, their personal experiences, etc., to comprehend without linguistic meaning.

Postovsky's (1974) and Kadota's (1987) studies suggested that a listening period preceding reading and production is most efficient. Kadota contended that if silent readings or vocabulary work were involved as input for the din, they were probably in the form of sub-vocalization in the reader's own voice. Kadota felt that such input would help later when actual production was the goal, because the reader would have already said to himself silently whatever was read.

However, there may be a problem with the premature use of reading materials. The problem with this scenario, as stated by Murphey (1990), is this:

> "Reading done too soon as the main source of input, and hearing one's own voice sub-vocally, may partially account for the fact that many adults keep a strong non-native accent in a foreign language, while children who are principally listeners not readers, seem to have little problem becoming native-like. Extensive reading by adults too soon would provide great reinforcement for their non- native subvocalized production." (p. 58)

This concept may help explain why many adults maintain a strong non- native accent after years of language learning. Scovel (1969) offered little hope for achieving native-like accent by saying that it is practically impossible for adults to lose their strong accent. If more instruction is presented in the form of aural input from an authentic source such as songs, there may be hope for adults to more closely achieve the native accent they hear aurally rather than their own non- native accent heard sub-vocally during reading.

If involuntary rehearsal is the humming of the efficient Language Acquisition Device, Murphey (1990) reminded that,

> "Music may initially play an associative facilitating role in engaging and stimulating it [LAD]. The song lyrics in written form can be used to reinforce what is heard auditorially and promote a deeper activation of the SSIMHP. Finally, it would seem that some things, like songs, have more staying power and that studying the how and why of the din and the SSIMHP phenomena may allow us to use them more advantageously for things we want to stick in our minds." (p. 61)

Music provides a residual effect in the learning process. According to Wilcox (1996, p. 10) "As the song or melody persists in one's head long after the audible singing has stopped, the music continues to enhance the learner's mental stimulus" (Her explanation of the SSIMHP was that this cyclical process of involuntary mental rehearsal is a form of residual repetition. The brain activates a continued learning process to extend the physical output practice as an internal mental exercise that the person seems unable to stop.

Music and Early Developments

The successful acquisition of reading and writing in early childhood depends on a solid background in oral language skills. What better way to gain knowledge and confidence in oral language than through music? Oral language is an interactive and social process, and music is a natural way for children to experience rich language in a pleasurable way. Young children seem to be naturally "wired" for sound and rhythm. Besides providing enjoyment, music can play an important role in language and literacy development. Strong social bonds are encouraged through music and songs beginning in preschool. Toddlers can begin to experiment with grammatical rules and various rhyming patterns in songs and other written text.

Establishing a sense of rhythm can be used to increase a student's awareness of rhyming patterns and alliteration in other areas of reading and writing. Through music, memory skills can be improved, and aural discrimination increased (Chong & Gan 1997). Music can focus the mind on the sounds being perceived and promote learning through an interactive process. It is important in teaching early childhood students to be conscious of auditory and discrimination skills. Music and songs help increase these listening skills in a fun, relaxed manner. Listening skills are vital in singing, language and expressive movement, and later reading and writing (Wolf, 1992).

Music has always been a way for children to remember stories and learn about the world around them. Using music as a stimulus can effect one's emotions and make information easier to remember. Music also creates an environment that is conducive to learning. It can reduce stress, increase interest, and set the stage for listening and learning. The similarities between literacy acquisition and musical development are many. Therefore, teaching that combines music with language arts instruction can be the most effective (Davies, 2000). Furthermore, it is important for emergent readers to experience many connections between literacy in language, music, and in print.

Language in music and language in print have many similarities, such as the use of abstract symbols. Both oral language and written language can be obtained in the same manner. That is, by using them in a variety of holistic literacy experiences, and building on what the students already know about oral and written language (Clay, 1993). For example, emergent readers will attempt to "read" along in a shared reading of a familiar text, just as they will join in a sing along to a familiar song. Just as emergent reading and writing are acquired to drawing and pretending to write, musical learning is connected to song and movement. Children instinctively listen to music and try to identify familiar melodies and rhythms, just as early readers will look for words that sound alike, have patterns, or rhyme (Jalongo & Ribblett, 1997). They also illustrated how the use of familiar text, predictability, and repetition can encourage children to read. Using songs put to print can expand vocabulary and knowledge of story structure, as well as build on concepts about print. The use of music for reading instruction allows children to easily recall new vocabularies, facts, numbers, and conventions of linguistic expression.

A child's initial introduction to patterned text often first occurs in songs, chants, and rhymes that are repeated over and over again throughout childhood. Once children become familiar with this patterning, they are excited and able to participate in shared reading, writing and other oral language experiences. Concepts about print become more meaningful, and conventions of print are learned in context. Additionally, substitutions in songs, chants or poems can provide for real language experience opportunities. When emergent readers see printed words in the text again and again, they come to identify those words and phrases by their similarities and configurations.

The effects of music on the emotions are commonly known. However the effects of music on the brain and thinking are demonstrable. Research has shown that during an electroencephalogram (EEG), music can change brain waves and make the brain more receptive to learning. Music connects the functions of the right and left hemispheres of the brain so that they work together and make learning quick and easy. Brain function is increased when listening to music and studies have shown that music promotes more complex thinking. It can make connections between emotions, thinking and learning (Davies, 2000). Advertisers and filmmakers realize and utilize the power of music to evoke emotions and get our attention. Educators need to learn from this multi-million dollar industry and use music to our advantage to help children to learn (Davies, 2000). Good first teaching is based on using what children already know, and the influence of music on learning is clear. Therefore it seems that teachers should be motivated to incorporate music, rhymes, chants, rhythm, and songs in the classroom.

Infant and pre-infant developments

In recent years, the listening capabilities of infants have been explored to determine at what stage of human development musical capabilities appear. Infants as young as five months old were found to be able to discriminate differences in frequency that were much less than the differences between two adjacent notes in the musical scale. Trehub, Bull, and Thorpe (1984) at the University of Toronto, Missisauga in Ontario, Canada, studied the musical capabilities of infants in relation to known capabilities of adults. For example, adults perceive melody not by remembering the exact pitches but rather by remembering the relationships between notes. Melodies are recognize as the same while paying attention to the increases and decreases of pitch and the "contour" of a melody, regardless of whether these musical aspects are played by instruments that differ in pitch or by the same instrument in a different key. Researchers found that importantly infants 8-11 months of age did perceive and remember melodic contour, revealing that infants use the adult-like strategy of listening to global pitch relationships, rather than the detailed notes themselves.

Adults organize sound sequences by grouping them into discrete phrases. Trehub's laboratory testing discovered that infants also mentally segment sequences of sound into "chunks." In addition, adults recognize the same melody, independent of how rapidly or slowly the melody is played. When presented the same melodies at different rates, infants did not respond to a change in tempo of the same melody, rather they displayed the same listening strategy as adults. Changes in rhythm from the background music were instantly detected by infants, as it is also easily detected by adults. In addition, infants have surprising adult-like capabilities in perceptions and attendance to musical stimuli. According to Trehub, Bull, and Thorpe (1984), "The Musical Infant" not only exists but in fact represents the normal human infant.

These musical abilities may actually appear before infancy, perhaps at birth or even as soon as the functional development of the auditory system in uterus. Hepper (1991) studied neonates 2-4 days of age who had been exposed to a popular TV theme tune while their mothers were pregnant. When the same tune (watched 360 times during the pregnancy) was presented after birth, the neonates exhibited a significant decrease in heart rate and change in movements as compared to a control group. Remarkably, fetuses of 29 to 37 weeks gestational age also showed specific behavioral responses to tunes played earlier in pregnancy. A follow-up experiment used a different piece of music to which the mothers and fetuses had never been exposed. In both experiments, behavioral responses were specific to the tune to which they had been exposed. These results seem to indicate that the learning and remembering of a melody can occur not only before birth but actually before or at the beginning of the third trimester.

A study by Kaminski and Hall (1996) started with the premise that noxious noise levels in the nursery can interfere with neonatal efforts to achieve physiological and behavioral homeostasis. To determine if music could facilitate homeostasis, twenty normal term neonates were monitored for the number of high arousal behavioral states and state changes during a control and an experimental period during which soothing, lyrical music was played. There was a significant decrease in arousal states during music. The results suggested that soothing music may be a feasible intervention to help newborns demonstrate fewer high arousal states.

Other impressive studies reporting postnatal development being superior for babies in a prenatal music group, as compared to a control group, are assessed through the mothers' judgments; therefore, unconscious bias cannot be absolutely ruled out. Nevertheless, these pre-speech studies seem to indicate that musical features have great importance in language acquisition.

Pre and primary school developments

Bryant, MacLean, and Bradley (1990) studied 65 preschool children in a longitudinal study. Children were ages 3 and 4 at the beginning of the study and ages 6 and 7 at the conclusion. They were tested on their rhyming abilities as a phonological skill. This repetition of sound patterns with minimal pairs is a vocabulary building technique which incorporates one component of songs in the memory pattern. Alliteration, the repetition of initial sounds, was also investigated. The authors stated there was a strong predictive link between sensitivity to rhyme and alliteration and success in learning to read.

A study of instruction by singing, which involved the accompaniment of music with rhythmic movements, as well as the verbal or physical representation of songs, was completed by Kalmar (1982). She measured the effect of the instruction by several methods. One group of 3 year olds was assigned to the experimental group, which received twice-weekly special singing lessons over a three year period; the second group, the control group, attended only regular nursery school programs. After a long term study, she reported several positive effects of singing in normal children. There were no differences in drawing ability or overall IQ between the two groups, yet the experimental group showed greater improvement than the control group on measures of motor development (particularly coordination), abstract conceptual thinking, play improvisation, originality, and verbal abilities. The findings both document the potential benefits of singing education on cognitive and motor development and also show that measurable developmental benefits need not involve IQ scores. The motor development was likely due to the movement aspects of the program.

Rauscher et al. (1994) researched musical training and the abstract cognitive ability to mentally rotate objects, a means of assessing spatial abilities. One group of preschool children received daily group singing lessons and weekly keyboard instruction, while the matched control group received no special experiences. After four months, the music group was superior to the control group on the test of spatial abilities but not on other tests of intelligence. Improvement was even greater after eight months. These studies indicated that music studied for its own sake has beneficial "side effects" on cognition.

A study done with third-grade students was reported by Madsen (1979). A randomly selected class from the public school system was divided; half were shown listening discriminations being taught via televised tapes that could be done by a classroom teacher with no musical training, the other half was the control group. Data were analyzed on the basis of correct academic responses and pre-posttest music gain scores. Results showed that although both groups were receiving regular music instruction from their music teacher, the control group evidenced almost no gain in music listening skills, while the group that received special music lessons on tape evidenced significant improvement in music listening skills.

The report of a study in which children that were provided a curriculum which increased music instruction at the expense of language and mathematics was summarized by Overy (1998). Results showed that students in the music instruction group became better at language and reading, yet no worse at mathematics than students who had spent more time on these subjects, without the additional music instruction. The transfer effects between music and other subjects were probably specific, as are many other known transfer effects, because they are based on similarities between the two activities. Learning to listen for changes in pitch in music may promote the ability to sound out new words.

There seems to be a correlation between language and music reading abilities. Some very early studies (e.g., Cooley, 1961; Maze, 1967) showed varying degrees of correlation, all positive, between language reading ability and music reading ability. Dalton (1952) compared the language reading ability scores with the music reading scores of 278 children in grades three through six. Her results, supported in further research, indicated that better music readers were superior to poorer music readers in reading language. Correlations between the language reading test and the musicality test reached high levels of significance in the Maze's study.

Children identified as having learning difficulties participated in a study done by Bygrave (1995) on the development of receptive vocabulary skills through a program of music activities. Four groups of children with reading difficulties, 6 to 9 years of age, participated in two programs for the development of listening skills. The programs, presenting either music or story-telling, were implemented daily by class teachers over a 30-week intervention period. Tests were administered before the program, after two school terms (23 weeks), and again 7 weeks later (post-posttests) to investigate the possibility of retention effects. Independent testers used the Peabody Picture Vocabulary Test-Revised (PPVT-R) and did not know from which class the student came. The music class consisted of singing, musical instrument playing, movement, creativity and listening activities. The story-telling program was aimed at developing language skills for early reading such as listening, organization, comprehension, and memory skills. Data may have been influenced by the different teaching styles and attributes of the class teachers.

Results showed an improvement in the receptive vocabulary skills of the students participating in the music program. This music effect on the PPVT-R was not apparent until the post-

posttest. This suggested that a longer period of time may be needed for a significant music effect to show. The finding appeared consistent with studies by Hurwitz, Wolff, Bortnick, and Kokas (1975), who found that the development of reading skills in young children involved in a music program tended to accelerate over a prolonged period of time.

In a 1972 study, Nicholson wanted to know if music study could improve reading readiness skills. She tested 50 slow learners who were 6 to 8 years old using a 16-week intervention program. Both the experimental group and the control group were given musical activities. The experimental group, however, added body movements to music, reading music, singing tones, and longer listening times. By the end of week one, there was a dramatic difference between the groups on post-test increases, which continued in all subsequent weeks. At the end of the year, the experimental group showed considerable improvement in certain reading readiness skills, such as increased attention span and discrimination for paired groups of letters. She concluded that music had a statistically significant effect on language reading readiness.

Douglas and Willatts (1994) reported on correlations between musical abilities and reading achievement. Seventy-eight boys and girls (Mean age = eight years) were tested on vocabulary, reading, and spelling as well as on some of their musical skills, e.g., ability to detect slight differences among rhythms. The authors found a significant correlation between rhythm performance and both reading and spelling. Because correlations alone did not show a causal relationship, they also ran a small study on the effects of a six month program of music instruction designed to develop discussion skills (e.g., descriptive, imaginative and comparative). At the end of six months, the music students showed a significant improvement in reading compared to the controls, who did not change. These findings suggested that music instruction can cause an improvement in reading.

According to Turnipseed (1976), "auditory discrimination has been found to be the 'leading factor' in reading readiness" (p. 1). She tested auditory acuity in relation to reading readiness by introducing music in the classroom. Children in the experimental group participated in a music listening program, whereas the control group did not. The experimental group scored significantly higher than the control group in reading, mathematics, and language arts tests. They also made greater improvements in auditory discrimination, originality, and flexibility; the students even missed fewer days of school than the control group ($p < .01$). She concluded that listening to music involved psychophysical processes similar to those used in discrimination of speech sounds.

In Albuquerque, New Mexico public schools, a study of children examined whether students in music programs performed better on CTBS (California Test of Basic Skills) tests than those who did not participate in the programs. Results demonstrated that in all areas of comparison involving CTBS scores, fifth graders who participated in instrumental music classes scored higher than their peers who had no music instruction. The longer pupils were enrolled, the better they achieved. Those students who were involved in music programs for two or more years scored consistently higher than those who participated for one year. In 1979, students with two or more years in band scored 10% higher in reading than the total group of fifth graders. They scored 12% higher in language than the others (Robitaille & O'Neal, 1981).

The effect of reading accuracy on three methods of shared reading, when paired with music, was examined by Colwell (1994). The study considered 27 kindergartners, participants in a music program that supplemented their entire language curriculum. One class employed a song rehearsal of their

textbook which was set to music, while the second class practiced both spoken and song rehearsal. The third class only participated with spoken text rehearsal. Subsequent text readings of the subjects were analyzed for word substitutions and omissions. The first two classes, exposed to music treatment, demonstrated greater reading accuracy than the third, strongly suggesting that song rehearsal facilitated reading accuracy by serving as a structural prompt.

Hurwitz, Wolff, Bortnick, and Kokas (1975) studied whether music training improved reading achievement in primary grade children. The experimental group received music training, which incorporates folk songs to emphasize melodic and rhythmic elements. The control groups consisted of children who tested for corresponding characteristics of age, IQ, and socioeconomic status at the inception of the study. The music instruction was intensive, extending for five days a week for 40 minutes a lesson, through seven months. Students were tested on reading ability twice-at the start of the school year and then again at the end. The music group achieved significantly higher reading scores than did the control group, scoring in the 88th percentile versus the 72nd percentile. After an additional year of the music training, the experimental group again scored significantly higher than the control group.

Teaching reading to exceptional children through the use of musical television commercials was initiated after noting the tendency of children (8 to 10 years old) to hum or sing the television commercials. While working with a group of disadvantaged learners in Appalachia for 20 to 30 minutes per day per group, teachers noticed that, even though the children demonstrated a deficiency of language, followed by a reluctance to communicate orally, they could freely and joyfully sing many of the musical television jingles. Moreover, verbal fluency and

pronunciation were excellent. Hirst and O'Such (1978) reported that students enthusiastically agreed to learn the words of the "television songs." Teachers worked with one or two of the commercials each day, listening, reading, and singing along to these songs. Students were given a pretest and posttest for the school year that showed an average gain of 12.3 months during the year in reading for the 39 pupils taking part in the program, even though the experiment was conducted only during the last 3 months of the school year. Teachers reported that the children had more confidence in themselves, and exhibited more fluency and ease in reading; as a result, pointing and word by word reading decreased.

Movsesian (1967) attempted to evaluate the transfer of music reading skills to reading vocabulary and reading comprehension of children in grades one through three. He found that the experimental groups who learned how to read music made more gains than the control group that did not receive music reading lessons. In fact, the students became significantly more efficient in basic reading skills when they were concurrently taught skills in music reading. The majority of the research indicates a positive correlation between language reading and music reading abilities.

According to Frith (1985), there are three stages in how children usually learn to read; (1) visually recognizing words, (2) learning the correspondences between visual parts of words ("graphemes") and their spoken sounds ("phonemes"), and then (3) achieving visual recognition of words without going through the earlier stages. Children "sound-out" syllables and words while they are learning to read (stage 2) which they discard when they reach stage 3. According to him music facilitates reading by improving the second, phonemic stage. If students have similar 1, 2, 3 stages in learning to read a foreign language as stated by

music the second phase (phonemic) being imperative, music might help not only with increased pitch discrimination, but also with the sound-symbol phonemic correspondence for the language being taught.

A study by Lamb and Gregory (1993) determined the relationship between musical sound discrimination and reading ability in first grade. In addition to some standard reading tests, children were tested on their ability to "sound out" nonsense syllables they viewed on cards (phonic reading) and pitch awareness, in which they heard pairs of musical notes or chords in sequence and reported whether the notes sounded the same or different. They were also tested with notes that had the same or different timbres. Finally, phonemic awareness was assessed by listening to spoken words and telling whether the words began or ended with the same sound.

The experimenters then determined the relationships between performance scores on the various tests. They found a high degree of correlation between how well children could read in both standard and phonemic materials, and how well they could discriminate musical pitch. Timbre awareness seemed unrelated to reading. These findings support the conclusion that good pitch discrimination benefits learning to read by enhancing the second, phonemic stage of learning. Therefore, the findings that music training facilitates learning to read may be understood as being mediated by enhanced pitch discrimination.

Other studies were performed by Mohanty and Hejmadi (1992) who tested for ability to learn the names of body parts and creativity. Three treatments were used; a non-training control group, a verbal instruction group, and a verbal instruction plus acting out-movements groups, and a music and dance group. The music/dance group was given instructions by

song, as well as acting-out movements. After twenty days of training, all experimental groups exhibited higher test scores than the control group, but the music/dance group showed the greatest improvement in learning about body parts and creativity. Thus, improvement in cognitive abilities can result from a variety of training experiences, but music is the most effective of these treatments.

Hove-Harding (1989) reported on the relationship between music and language achievements in early childhood. She chose a random sampling of third graders from public schools. Parents were given a questionnaire and asked to report on the musical experience of their children. The group was designated as either high and low in relation to previous musical experience. Students were then given standardized tests in mechanical language, expressive language, reading, and spelling. In three of the four language skill areas tested, the group with high musical experience scored significantly higher than did the group with low musical experience. Mechanical language was the only area where a significant relationship was not found between language skill and musical experience, although the high group did score better. She speculated that this difference exists due to the fact that the skills tested in mechanical language were not expressed orally, but rather were written and visual. Music, on the other hand, utilizes an oral type of learning based on sound discrimination. The major conclusion reached was that a strong relationship existed between early musical experience and three areas of language development in early childhood.

Wolff (1979) compared the effects of general music education on (1) academic achievement in math and reading; (2) perceptual-motor development, (3) creative thinking, and; (4) school attendance with two classes of first graders. The experimental group received 30 classes in general music, once a day for five months. The addition of the general music class to the

first graders' schedule did not affect reading scores, and there was no significant difference in math scores among the high-achieving male group. However, all students from the experimental group, ranked significantly higher in creative thinking. The greatest impact was on perceptual-motor skills. Wolff addressed the lack of difference in reading skills knowledge level by saying "a very basic perception of music is unlikely to influence what is already a comparatively sophisticated perception of language" (p. 146).

According to McDonald (1975), "one of the curricular areas where music seems particularly useful is in the development of language and reading readiness skills" (p. 872). McDonald reported "a reading program which introduced new vocabulary through the medium of music was credited with significant improvement in the reading skills of disadvantaged children" (p. 873).

According to Tucker (1981),

> "Using music as a tool for the teaching of reading not only secures music in the curriculum but may enhance the outcomes of reading instruction. The use of music with older students, even college students, as a tool for enhancing reading ability, is not as well documented, mainly because of the scarcity of research fusing music and reading beyond the primary grade." (p. 16)

Many schools have used the Shurley Method to teach language skills in English class through repetition and the use of all learning styles. Shurley (2002) asserted that:

> "Students are able to learn using not only visual but also auditory and kinesthetic learning styles. When students see, hear, and say their answers, retention increases. The first element of this method is the use of jingles. Students begin learning the parts of speech by using definitions in jingle form. These rhythmic definitions are chanted or sung by the class to help them initially remember the role of each part of speech." (p. 2)

Children are drawn to nursery rhymes, rhythmic activities, and songs as key texts in building concepts of reality. However, it seems that only enterprising teachers follow the methods suggested here in an institutional context. Certainly, the improvement of language teaching practice can be seen as the goal, in itself a substantive reason to explore and innovate. Songs also promote the use of hand gestures, puppets, and rhythmic movement, and the format enables public performance. All of these encourage abilities that are not addressed in more traditional language teaching methods. In fact, this differs considerably from the current teaching practices used in most contexts, which insists that language is best taught through instruction in vocabulary and the rules to combine them. The efficacy of such instruction, though well thought of by most teachers because it is textbook driven and relatively easy to administer, is not very high. The musical method focuses on having fun with the language and letting words come in a more natural way, and as such has more in common with communicative language learning methodology, which utilizes social interaction, small groups, and peer discussion.

Music can be integrated into a more true-to-life way of learning language. It assists learners not only with acquisition of vocabulary, but also mastery of language-relevant information. Benefits of using music in the early childhood language classroom are the result of the natural affinity of music to language. General classroom music activities that include singing and rhythm help enhance the development of auditory discrimination skills, including integration of letter sounds, syllabification, and pronunciation of words. Children pay close attention to subtle variations in tone and timing, which enables them to learn their language accent flawlessly.

Songs amplify important stress and duration elements, and intensify normal vocal contours in speech. In this way, music reproduces the way caregivers speak to their children which has

been shown to increase their understanding and acquisition of language. For this to work correctly, the phrase structure and musical structure must coincide, which does not always happen. It is thus important to choose well to songs to be used in the classroom. I have used some of the traditional children songs in English language, accompanied by illustrations and/or musical cartoon videos; others I've written and composed myself, in accordance with learning unit's exigencies. As a basis for the compatibility of music and language - the 4-beat division of most songs coincides well with the linguistic foundation of binary alteration, or stressed and unstressed syllables. This matching of foundation units helps to increase memory for words and phrases when sung. Naturally, I always use very simple musical forms, which are easily learned by young children. Pairing words and rhythm properly helps to hold songs together, and to improve the ability of the mind to recall it. A small change in the alignment of words and music can make the difference between a memorable and a forgettable song, and determine the success or failure of learning and memorizing new linguistic information.

Following the mnemonic principles, it is always good to use a song that rhymes. Using rhythm, rhyme, and categories to organize the information may simplify the learning of any new linguistic unit. Story-songs are also valuable because they use different words and phrase structures than standard speech, thus facilitating the memorization and illustrations or cartoons help to make these words comprehensible. Reilly (2000) conducted an experiment, dividing the class into two groups, one group heard a story sung; another had it told to them. All of the participants reported enjoying song stories more than regular stories and only the ones in the "singing" group were able to reconstruct the story and remembered the words used. A lesson in which two groups of children learned a grammatical concept in English, one group using traditional methods and the other using songs, reported the

same results. After 2 months, only the children who learned through song could remember the grammar rule. The singing children clearly continued to sing the song after the initial class, which repetition deep-rooted the concept along with the lyrics and melody.

Songs also give children knowledge of culture, improve their sensory awareness, encourage turn taking, and increase improvisation skills and the sociality of the group rises. Singing, chanting, or clapping in groups help children reduce their anxiety and increase their self-confidence. With these results, the musical enrichment of language teaching content becomes not an option, but a compelling next step in effectiveness. Music and language should be used together in the EFL (English as a Foreign Language) classroom. Verbal practice associated to musical information seems to be more memorable, foreign sounds paired with music are stored in long-term musical memory and accessible for mental rehearsal and memorization. Repetition is one of the basic ways the brain remembers material. This is why using a melodic approach works. Music and the musicality of language teaching provide a rich environment of sound and remove other auditory distractions. The musical-linguistic method enhances the learner's awareness of sounds, rhythms, pauses, and intonations and develops linguistic fluency through imitation and repetition.

Physiological response to music

Music has been shown to have physiological as well as pedagogical benefits. Physiological benefits include lowered anxiety, heart rate, pain, and blood pressure, as well as improved respiratory rate, recovery, and tension relief. Listening to music has been shown to “cause changes in blood pressure, blood flow, posture, respiratory rate, pulse rate and general activity” (Bancroft, 1985, p. 7). The human heartbeat ranges from 70-100 beats per minute; therefore, music that has a tempo of 60 to 80

MM/min tends to aid relaxation as it corresponds to the students' physiological rhythm. Music from the Baroque and classical eras are suggested by Botha and Puhl (1988) and Lozanov (1978) and for best results in relaxation and concentration, due to meter, tempo, and instrumentation. Botha and Puhl stated," Using classical music to relax students has defocused brain activity from one small area in order to be receptive to a much wider range of input. They can now absorb more easily and in greater quantities because they are using abilities of the whole brain, not only cognition" (p. 2).

As early as 1950, Pickrell, Metzger, Wilde, Broadbent, and Edwards found that music helped alleviate tension in operating room personnel. In later studies, two reports cited significant stress reduction during music therapy-assisted childbirth. In the Hanser, Larson, and O'Connel's (1983) study, seven mothers participated in an experiment to test the effectiveness of music in decreasing responses to pain during labor. The purpose of the music was to cue rhythmic breathing, to assist the women in relaxing by prompting positive associations with the music, and as a diversion from discomfort and extraneous hospital sounds which might signal anxiety.

Results indicated that the presence of background music significantly affected behavioral manifestations of tension in specific areas of the body. Background music also significantly affected verbalizations associated with pain in all subjects, as compared to the same setting with no background music. The behavioral measure supported patients' verbal reports of music's effectiveness in assisting relaxation.

In a more recent report, Reilly (2000) compared the physiological recovery of patients after a medical procedure. She found that patients who volunteered to listen to music during surgery used post-operative medication 47% less often than patients who had not listened to music during surgery.

Other studies have found music to be effective in the easing of anxiety such as McGrew (1953), who reported the effects of music on customers waiting in a bank line, and Devereux (1969), who found music effective in reducing the tension and boredom associated with routine work. To add to these studies Stanton (1973) studied the use of background music with subjects who listened to classical music during test taking and those who did not. The tendency for the music condition to produce better results overall was apparent, though it did not attain significance. However, analysis of variance indicated that highly anxious students achieved superior results when they were exposed to background music. The tertiary-level students who scored high on the Test Anxiety Scale (TAS) were apparently assisted by the music.

Förser and Strack's (1998) experiment investigated whether beliefs about music's influence on learning could actually affect learning and memory. College students were divided into groups which were either told that music facilitates learning or that it inhibits learning. Then they memorized a word list in the presence of music. Their later memory for these words was worse if they believed that music inhibits learning. Thus, the efficacy of music in learning can be affected by negative beliefs. By the same token, relaxation and physiological response also may be affected by the subjects' beliefs in a positive way, through relaxing music.

Stratton and Zalanowski (1984) also found significant correlations between the degree of relaxation and the liking for the music. Music preference may therefore be an influential factor that should be taken into consideration when providing music to students for relaxation purposes. The human heartbeat's change in response to music may be due to the listener's enjoyment of the music rather than the type of music.

Music and Language

By adulthood, we all have well-developed ideas about music informed by our culture and individual taste. However, though we all feel we know what music is, it has proven remarkably hard to define. Cross and Morley (2008) cited two dictionary definitions of music: "The art of combining sounds of voices or instruments so as to achieve beauty of form and expression of emotion" and "the art or science of arranging sounds in notes and rhythms to give a desired pattern or effect." They went on to state: "For contemporary musicologists and ethnomusicologists, these definitions are seriously unsatisfactory." After reviewing other definitions, they concluded: "All these notions of music reveal themselves to be ideological constructs rooted in the workings of broader socio-economic and political forces, which change." (Cross and Morley, 2008, pp. 6-7).

Defining Music

Operating without a clear, generalized definition of music has made scientific conclusions difficult to evaluate, as results cannot be standardized and conflicting data is harder to resolve. Creating such a definition is therefore our starting point for investigating the connection between music and early language acquisition. A comprehensive scientific definition of music must take into account the following:

Music varies across cultures_ The world's indigenous musical traditions are remarkably diverse and often contradict each other in both overt and subtle ways. The discrimination of consonance and dissonance has been cited as a human universal, with dissonance treated as displeasing (Fritz et al., 2009). However, Markoff (1975, p. 135) points out: "The parallel seconds, so widespread in Bulgarian polyphonic folk-singing, may on first hearing impress the listener as being extremely dissonant. Bulgarian folksingers, however, consider such interval combinations as representing a beauty which is likened to the 'sound of ringing bells." Playing in tune is something Westerners frequently take for granted: The beating created by out of tune notes is considered unpleasant. However, Javanese gamelan ensembles are deliberately de-tuned by small intervals to create beating; notes in perfect accord would be considered "wan and lifeless" (Tenzer, 1991, p. 33).

Western musicians often emphasize purity of tone; noise characteristics are considered clumsy. In contrast, Japanese shakuhachi players highlight the noise qualities of their instrument: the sounds of breath and attack transients are considered deeply expressive (Tokita and Hughes, 2008). Cultural diversity is true even of basic musical attributes such as how frequencies are classified. In Western music, frequency is mapped onto space: pitches are "high" and "low" and go "up" and "down." However, in Bali, pitches are "small" and "large"; to the Sayá people of the Amazon "young" and "old"; and to the Shona people of Zimbabwe "crocodile" (for low frequencies) and "those who follow crocodiles" (for high ones; Zbikowski, 2008; Eitan and Timmers, 2010). Harwood (1976, p. 528) concluded: "Contemporary ethno-musicological research yields an unequivocal response to the question of whether musical structure is similar across cultures. The answer is… that similarities are rare and unsystematic."

Music is often very ambiguous on an emotional level_ Music is often described as a "language of emotions" (Juslin and Sloboda, 2010). To many, music's expressivity – unconstrained by literal meaning – is what makes it a "universal language" (Cross, 2005). In order for this to be true, emotional readings should translate broadly across cultures. In Western music, one of the strongest examples of well established emotional attribution is the contrast between the major and minor modes: The major mode is associated with positive effects such as joy, triumph, and tranquility; the minor mode is associated with negative effects such as grief and anger. However, these emotional associations are culturally determined.

Listening to music is very subjective; as a result, emotional responses are inconsistent and subject to revision. In 1868, a New England critic wrote about an orchestral performance: "It opened with eight bars of a commonplace theme, very much like Yankee Doodle…I regret to say that [what followed] appeared to be made up of the strange, the ludicrous, the abrupt, the ferocious, and the screechy, with the slightest possible admixture, here and there, of an intelligible melody" (Slonimsky, 1965, p. 52).

The Soviet composer Shostakovich was able to fool the authorities with musical tributes deemed to be sincere that Shostakovich privately declared to be bitterly ironic. Commentators still debate whether certain of his works are patriotic or subversive (Fay, 1980). Music's ambiguity can actually be an advantage in group interactions, enabling it "to be efficacious for individuals and for groups in contexts where language would be unproductive or impotent, precisely because of the need for language to be interpreted unambiguously" (Cross and Morley, 2008, p. 10). While we often *invest* music with emotion and connect deeply to it for that reason, there is too much inconsistency and uncertainty in both personal and cultural views to describe music as a "language of emotions."

Any sound can be treated musically_ We often think of music as being performed by voices and melodic instruments. However, the palette of instrumental sounds extends all the way from the sine wave purity of a Western flute to the white noise of a maraca or cymbal crash. While melody is certainly a central feature of music in cultures throughout the world, it is not a prominent feature of many African and Asian drumming traditions, jazz drum solos, or in the extensive body of Western unpitched percussion works. Aboriginal didgeridoos produce different pitches when played by different players; performances rely on rhythm and timbre rather than melody to create musical interest (Tarnopolsky et al., 2005).

In order to satisfy all of the above requirements, we propose the following definition: Music is creative play with sound; it arises when sound meets human imagination. The term "music" also implies a value placed on the acoustic parameters of envelope, frequency, and spectrum irrespective of any referential function. Musical content is created by the behavior and patterns of these parameters; it can apply to any activity involved with the production and human perception of sound. Any experience_ from the strumming of a harp to the blowing of the wind_ that involves the cognition of these basic attributes of sound is potentially *musical*. All of the historical features of music – whether they are steady pulse, recognizable melodies, familiar instruments, or even its treatment as an art-form – are higher order phenomena that are flexible, mutable, and culturally mediated.

Our definition puts no limitations on how sound is organized. In many indigenous cultures, musical behavior is woven into everyday life and not treated as a concert experience (Cross, 2012). Defining music as "creative play with sound" is both rigorous and inclusive, embracing the full range of musical expression across time and cultures. Icelandic folk song, whose

vocal lines follow contours but not precise pitches, Balinese gamelan music, with its often speeding and slowing of pulse, and the open form pieces of Earle Brown, in which no two performances are alike, would all be recognized as music. Any more restrictive a definition risks being contradicted. McAllester wrote, "any student of man must know that somewhere, someone is doing something that he calls music but nobody else would give it that name. That one exception would be enough to eliminate the possibility of a real universal." (McAllester, 1971, p. 379).

It is a central human impulse to develop every one of our biological capacities – often beyond its original function. We move – so we run, jump, and dance. We grasp – so we paint, hammer, and slice. We breathe – into flutes, molten glass, and balloons. Music is the natural outcome of a species that takes every facet of its behavior and explores, amplifies, and extends it; it is an on-going conversation between our biological infrastructure and the plasticity of our imaginations. An elemental definition of music that applies broadly across geography, cultures, and eras is vital because it highlights the dynamism of this creative process. Our abilities to engage in and appreciate creative play with sound and to consider sounds irrespective of referential function lie at the heart of early language acquisition.

Music is what penetrates most deeply into the recesses of the soul, according to Plato. Language has been held by thinkers from Locke to Leibniz and Mill to Chomsky as a mirror or a window to the mind. Language and music define human beings. The two are facets of a single cognitive system. Under the brain's hood there is a simple computational operation, taking basic elements like words or simple sounds, combining them in a step-by-step manner and producing a larger structured object such as a flowing sentence or a melodious musical phrase. This is all just in the mind, but needs to happen before language is "externalized" as speech or writing and music is expressed through performance or by the simple act of tapping your foot to a rhythm.

But there are further questions to ask about the relationship between music and language, such as whether musical education and expertise influence our way with language or if it makes us better learners of a second or third language. On the other side, it would be great to know if fluency in more than one language makes it easier for us to learn an instrument.

The music of speech

Language is commonly defined as a symbolic medium for communication, with a lexicon of meanings and syntax for organizing its propositions. We do not just speak to be heard, we speak to be *understood* – to make declarations of love, order a meal, and ask for directions. But while speech is symbolic, sound is the bearer of its message. Depending on how one listens, the same stimuli can be perceived as language or music. When one repeatedly listens to the same looped recording of speech, it can begin to sound like singing (Deutsch et al., 2011): As attention to meaning is satiated, the melodic features of prosodic inflection come to the fore. Conversely, sine wave speech, which tracks the formant frequencies of a spoken utterance without other acoustic attributes of natural speech, sounds like whistles to naïve listeners. However, when subjects are primed to listen for speech, the clips are clearly intelligible (Remez et al., 1981).

Within many cultures, there are gray areas between music and speech. The Ewe tribe in West Africa use talking drums to communicate between villages (Gleick, 2011) while "speakers" of Silbo Gomero use whistles to converse (Carreiras et al., 2005). In Cambodia, secular singing is typically accompanied by a fixed metrical pulse. Buddhist practice argues against music for spiritual practice, so the religious chants, which are highly melodic, are nevertheless treated as speech, to be performed without a rhythmic accompaniment (Sam, 1998). Poetry, with its attention to such sonic features such as rhyming, assonance, alliteration, and metric design, is widely regarded as hovering between music and speech.

As adults, we process "canonical" speech and music differently; for example, speech and music show opposite patterns of hemispheric dominance, with speech processing relying more on the left hemisphere and music relying more on the right. Nevertheless, the neural regions underlying speech and music perception show significant overlap even in adults, with both types of stimuli recruiting a bilateral frontal-temporal network (Merrill et al., 2012). Furthermore, some differences between regions responsive to speech and song in adults are to be expected: Over development, our brains become far more specialized in many domains (e.g., Durston et al., 2006). Although there is little work comparing neural responses to speech and music in infants, there is evidence that newborns show largely overlapping activation to infant directed speech and to instrumental music (Kotilahti et al., 2010) suggesting that processing differences in adult brains may have emerged gradually over the course of development.

It has been suggested that speech and music may have intrinsic differences in low-level auditory characteristics that require different types of aural processing: For instance, some have proposed that speech includes very rapidly changing temporal features whereas music is made up primarily of pitch features varying over a longer time window (e.g., Zatorre et al., 2002). However, speech and music turn out to be closely related in this regard. Perception of temporal changes on the order of 25–50 ms is crucial for the extraction of segmental and phonemic information from the speech signal (Telkemeyer et al., 2009). Perception within this small time window is also crucial for instrument recognition. No musical instrument begins with a stable frequency: there is always an onset of noise, caused by the initial impulse that sets the sound in motion. This burst of noise is crucial for timbre perception (Hall, 1991). As a result, the same temporal acuity is required to process both speech and

musical timbre. This is true whether many instruments are playing or just one: Stepanek and Otcenasek (2005) demonstrate remarkable variety in the sounds of a violin, based on register, articulation, and fingering. Thus, both the perception of musical timbres and phonemes rely on rapid temporal processing.

In addition, languages vary in the extent to which they rely on these rapid phonemic cures: Some African dialects incorporate as many as 150 separate phonemes, while others, such as Hawaiian, use fewer than 20 (Maddieson, 1984). Similar to speakers of Silbo Gomera, the Pirahã people of the Amazon can converse without phonemes with a humming language; using "intonation, timing, syllable patterns, and stress" and whistling with "no apparent limits as to the quantity, complexity, or kind of information transmitted." Although whistling and humming languages are rare, they are an important reminder that language performance is not confined to timbral control (Everett, 1985, 413–414). Even in languages with rich phonemic inventories that would presumably rely heavily on timbral processing, only a small set of speech sounds actually require resolution on very rapid timescales. Instead, the primitives of speech perception might be on a longer timescale corresponding roughly to syllables (e.g., Morillon et al., 2010). Of course, music also relies on analysis over longer time windows: in an instrument such as a flute or piano, the noisy onset resolves into a sustained pitch – the basis of musical melody. This pitched sustain, which takes longer for the ear to measure, is an important part of speech perception as well. This is most clear in tone languages (the most widely spoken being Mandarin Chinese), where pitch is lexically contrastive. In the African language of Kele, the phrase "*alamhaka boili*" has two very different meanings depending on its pitch inflection: it can either mean "He watched the river-bank" or "He boiled his mother-in-law" (Gleick, 2011, 23).

Even in non-tone languages, pitch is an important feature of speech performance. Accented syllables help to parse streams of speech into individual words (e.g., Cutler and Norris, 1988). Pitch inflection is also a primary feature of prosody, which conveys semantic structure and emotional affect. In English, declarative sentences generally end with a drop in pitch, whereas questions end with a rise. Prosody also influences meaning through variations in emphasis. Thus, both music and speech require aural resolution at similar time-scales. From a musical perspective, speech is a concert of phonemes and syllables, melodically inflected by prosody.

Just as composers have made music out of speech, so too does every human voice. As adults, we learn to tone down the features of speech that do not contribute to meaning. In contrast, infants rely on a complete battery of musical information to learn speech: Timbre, pitch, dynamic stress, and rhythm. There is no evidence that timbral information alone would be enough to acquire language; in fact, speech perception can be relatively successful even in the *absence* of timbral cues (Shannon et al., 1995). As the succeeding section will show, the comprehensive nature of the infant's aural attention is a great asset in acquiring language: The infant's attention to *all* of the musical features of speech provides a richer context for language induction.

Close connections

Research has mostly concentrated on the benefits of musical knowledge for pronunciation and the perception of linguistic sounds. In a series of studies, Milovanov (2010) found that in Finnish-speaking children and adults, musical aptitude correlates significantly with better pronunciation skills in English. This may be because neural resources and pathways are partly shared

between language and music and that people with higher musical ability and training use the right hemisphere of their brain (traditionally music's domain) more for processing of linguistic sounds. There is some evidence showing lateralization of speech and music – meaning that music and language are processed in different brain hemispheres, with the left one for language and the right one for music. But conversely, American psychologist Diana Deutsch (2011) has shown there is a significant connection between speaking Mandarin, Vietnamese or any other tone language and possessing perfect or absolute pitch. This points again to a close connection between music and speech.

But speech is only one way that language is expressed. In a more recent study, Gordon (2013) found that children's perception of rhythm also has a significant influence on their use of different morphological and syntactic features, such as the use of verbs in the past tense. Earlier studies have compared brain responses to sentences ending with "incongruous" words, such as a singular noun where a plural one would have been expected. Researchers found that the brain responses showed significant interactions, strongly suggesting that linguistic and musical syntax overlap in the brain.

There is mounting evidence that linguistic and musical processing engages similar cognitive resources (e.g., Gordon, 2013; Deutsch, 2011). Coupled with the formal similarities, there seems to be strong evidence that a significant part of what is called Universal Grammar (the initial state of the innate language faculty), also underlies the music faculty. The strongest and boldest hypothesis is that, apart from their basic building blocks, language and music are in fact identical. Given what is known about brain plasticity and changes in synaptic and neural pathways as a response to practicing something throughout a person's lifetime, it is not surprising that the greater use of language will show up in musical ability and vice versa.

Researchers for the first time have shown that mastering a musical instrument improves the way the human brain processes parts of spoken language. The findings could bolster efforts to make music as much a part of elementary school education as reading and mathematics. In two Stanford studies, researchers demonstrated that people with musical experience found it easier than non-musicians to detect small differences in word syllables. They also discovered that musical training helps the brain work more efficiently in distinguishing split-second differences between rapidly changing sounds that are essential to processing language.

It is well known that formal musical training affects how deeply people appreciate music, Gabrieli (2007, p. 301) said. "This is the first example showing how musical training alters how your brain processes language components" he said. He continued:

> "It shows how important split-second timing is for understanding language_ if you are bad at it; you are at risk of becoming a bad reader. But what is important is that people are not stuck with this_ the study showed that with training people improved their perception of sounds. It shows that our mental capacity is amenable to experience: The brain is plastic, adaptable and trainable."

Gabrieli (2007) have shown that acoustical training can assist struggling young readers by helping them pick out rapid sound changes within syllables. Other works have shown that musical training helps people perceive sound pitches more effectively and increases verbal memory. The findings reveal, for the first time, that musical experience improves the way people's brains process split-second changes in sounds and tones used in speech, and consequently, may affect the acoustic and phonetic skills needed for learning language and reading.

Gabrieli (2007) took 28 adults, divided into musicians and non-musicians, who were matched for age, gender, intelligence and general language ability. Musicians in the study were

required to have started playing an instrument before the age of 7, to have never stopped playing and to have continued to play several hours a week. When musicians play, they must actively distinguish between sounds and their order, and adjust as necessary. Non-musicians in the study had to be native English speakers with minimal experience studying non-tonal foreign languages such as Spanish. People who had studied a tonal language such as Mandarin were not included.

During the experiment, participants listened to pairs of syllables such as ba-da, ba-wa and ga-ka, and noted if each syllable in the pair sounded the same or different. Depending on how they performed, the scientists made the task increasingly difficult by using syllables that sounded more and more alike. Musicians outperformed their non-musician peers in how quickly and accurately they perceived these rapid changes.

In another experiment, researchers used functional magnetic resonance imaging (fMRI) to find out whether musical training changes the way the brain processes sound. The fMRI scanning machines, which look like beds that slide into tubes, normally are used to check for brain injuries or tumors. With slightly different software they can be used to measure which regions of the brain are active by looking for changes in blood oxygenation, a process that occurs in parts of the brain where the neurons are active. Forty people, evenly divided into musicians and non-musicians, listened to three-tone sequences made from different combinations of low and high pitches. Participants had to reproduce the order of the tones they heard by manually pressing buttons on a panel. Musicians once again beat the non-musicians with this task. Musicians got the fastest tone sequences right at least 85 percent of the time, compared to non-musicians who hit a 50-percent average. They also could replicate the sequences a lot faster. Non-musicians needed to make a lot more effort_ their brains were not as finely attuned.

According to Gaab (2004, p. 67), musical training appears to alter the ability of the brain's language areas to process pitch and timing changes that are common to perceiving both words and music. "The brain becomes more efficient and can process more subtle auditory cues that occur simultaneously," she said. For the researchers, a better understanding of how the brain learns and maintains language and how to put this knowledge into practice will be a key goal for future research into language development, dyslexia and age-related cognitive decline.

Music and Language Acquisition

The use of music and song in the English language-learning classroom is not new. As early as Bartle (1962), Richards (1969) or Jolly (1975), scholars have been arguing for use of music in a language acquisition context for both its linguistic benefits and for the motivational interest it generates in language learners. There are examples in the literature to argue the strong relationship between music and language that are substantiated by research in the fields of cognitive science, anthropology, sociolinguistics, psycholinguistics, First Language Acquisition (FLA) and Second Language Acquisition (SLA). Music had been used on occasion with the *Audiolingual Method* in language teaching classrooms to reduce the boredom that could occur from repetitive drills from the 1950s through to the 1970s and later, the use of classical instrumental music was used with the goal to produce a relaxed state of mind that makes the brain receptive to inputs and activates the subconscious in *Suggestopedia* methodology (Lozanov, 1978). However, it may not have been until *Communicative Language Teaching* (CLT) and *Task Based Learning* (TBL) approaches became more pervasive that there was a sudden demand for pedagogical material for the use of songs in the language-learning classroom (Griffee, 2010).

There were two important outcomes from the authors' recent researches into effective use of music in the English language classroom. One suggested that there was strong support for use of music in the language-learning classroom, but that there was actually very little occurring in most classrooms. Connected,

but a separate issue, implied that while many teachers intuitively felt music was beneficial in teaching English language, there was also the perception that there was a lack of understanding of the theoretical underpinnings that supported such a choice. Therefore, some educators felt unable to defend the decision to champion use of music in the classroom to administrators, business English students or those in a predominantly exam focused environment. Salcedo (2010, p. 32), after a survey of foreign language teaching journals, suggested there were "only a few articles on the subject compared to multitudinous articles on other methodological ideas". Other scholars have noted this as well: Coe (1972) stated there has been no controlled music use in the language classroom experiments and Griffee (1989), in an editorial introduction discussing why songs and music are not used more extensively in the language classroom, suggested there exists a lack of theoretical perspective and empirically based research in the field.

The connection of song to both the development of human languages and the linguistic development of the individual are anthropologically worth noting. Livingstone (1973), in a contentious article that made extrapolations from physical anthropological research of birdsong and mammal behavior, hypothesized that humans evolved song before speech. While this can never conclusively be proven (Count, Hewes, Livingstone & Mourant, 1974), it raises interesting connections to infant development and first language acquisition research. From a social anthropological perspective, Merriam (1964) has argued that the survival of literature, epic poetry and ballads in oral traditions must be credited to the use of song. The odes of praise and stories of the tribe were passed on through song so that the texts would not be forgotten before the written word developed. Rubin (1995) suggested this may be because of the multilayered patterns of rhythm, sound, linguistic meaning and emotional content functioning simultaneously.

It is argued that use of song in the language classroom enhances social harmony (Huy Le, 1999), creates a safe space to experience learning collectively and contributes to the building of a community (Lems, 1996; Lake, 2003); all of which are essential factors for effectively attaining teaching and learning goals. The literature appears to suggest that the specific feeling of belonging to a cohesive community, that many teachers explicitly strive to establish for their learners in the classroom, can be promoted by use of music and collective singing. Music consistently surrounds our lives and may potentially assist educators in removing boundaries between the various communities that students belong to (Nagy & Herman, 1987). Extending their work, Medina (1990) suggested that it may be beneficial to attempt methods that more closely resemble life outside of the institutional classroom, which is generally filled with music, songs, stories and visual images. Because students learn a great deal of language before school age and outside of the institution once school has begun, it is potentially justifiable to consider non-traditional teaching methods that are less structured and ritualized.

In a study of young learner's engagement in music beyond the institutional classroom, Campbell (1998) discussed how the function of music in learner's lives, the use of music in play and the manner of musical enculturation relate to the place of music in institutional educational settings, suggesting more music should occur in educational institutions – supporting Murphey's (1992) argument that the school environment is the only place in society not using music and song to its full potential.

Music, while universal, is culturally specific in that the musical content and style mirror a particular culture, acting as a cultural artifact that may both reflect and influence that culture (Griffee, 1989). The introduction of vocal music as the foundation on which to either build a coordinated language-culture course or,

more often, supplement an already established program, can be a powerful tool, especially when the music is a faithful reflection of the culture from which it derives. While a number of academics agree and appear to support the pedagogical use of music to increase cultural competency in the culture of the target language (e. g., Orlova, 2003), there are other linguists such as Huy Le (1999) who argued that music, particularly songs, is an encoding of cultural values and ideology which needs to be viewed critically if foreign music is used in teaching a second language.

Cognitive research investigates the anatomic structure of the brain and its neural functions, suggesting that language and music have important points of convergence and/or overlap. There are multiple recent studies in this field, likely somewhat due to the increase in sophistication of neuroscience technology as well as increased interest from within the field in the neural and functional structure of both language and music domains (e.g., McMullen & Saffran, 2004). Additionally, the popularization of some studies such as the "Mozart Effect" (e.g., Hetland, 2000; Khaghaninejad, Saadabadi & Chamacham, 2016) has brought increased attention from the general public to the field of cognitive science.

Cognitive science research agrees that there are important connections between music and language: Like language, music is a human universal involving perceptually discrete elements organized into hierarchically structured sequences. Music and language can thus serve as foils for each other in the study of brain mechanisms underlying complex sound processing, and comparative research can provide novel insights into the functional and neural architecture of both domains (Patel, 2003). There is, however, an interesting contradiction noted in the literature debating how that occurs. The evidence from neuropsychology argues that musical and linguistic elements can be dissociated, and

therefore may work together as discrete domains. Borchgrevink (1982) postulated that linguistic and musical elements are processed in different hemispheres of the brain and therefore language and music used concurrently provides effective pedagogical methodology to increase learning, while Jackendoff (2006) describes how music parallels the perception of language and suggests a 'parallel architecture' approach.

The field First Language Acquisition (FLA) offers a number of insights that corroborate the arguments of cognitive neuroscience for the innate connection of language and music in human beings. Loewy (1995) postulated that music acts as the pre-linguistic carrier for communicative intent, essentially that a foundation for peer social interaction is built through the infant's preverbal communication of crying. Other scholars, such as Chen-Hafteck (1997), suggested that the pre-linguistic phase discussed in FLA literature is similar to the pre-musical phase discussed by musicologists, which echoes arguments that song-like vocalization will commonly precede language in regular ontogenetic development. Music and language are the two ways that humans communicate and express themselves through sound. Since birth, babies start to listen and produce sound without distinguishing between music and language, singing and speech.

It appears that melodic musicality of speech is not only significant to FLA, but to the entire language acquisition process and connections can be drawn between first language and second language acquisition. The "affective filter hypothesis" (Krashen, 1982) argued that the most favorable learning occurs in a setting of low anxiety, self-confidence and high motivation. Built on SLA research, the hypothesis states "acquirers with a low affective filter seek and receive more input, interact with confidence, and are more receptive to the input they receive" (Richards & Rodgers, 2001, p. 183). An exploration of the literature regarding how affective filters may relate to the use of

music and song in the language classroom (e.g., Merriam, 1964; Coe, 1972) suggests that music lowers affective barriers and assists in making students more relaxed, thereby more receptive to language learning.

Mishan (2005) contended that because music is an authentic activity that occurs among first language users both in terms of discussion of popular music as well as in the group singing that occurs at many public events ranging from karaoke to football, it also proves motivating to use for language-learners in a classroom setting. It has been suggested that motivation may have connections to other individual learner differences in second language acquisition such as learner strategies, learner autonomy and preferred learning styles (Cohen, 1998; Benson, 2006). Separating potential interconnectivity of the variables between motivations, individual learning preferences due to multiple intelligences and learner strategies, therefore becomes an issue. Mora (2000, p.146) applies Gardner's multiple intelligences hypothesis specifically to language teaching and asserted "one of the main implications for teaching of this theory was that students should not only be taught to increase their verbal, spatial, and numerical intelligences, but also to nurture their musical, bodily-kinesthetic, interpersonal, and intrapersonal intelligences."Although there are, admittedly, some challenges with the learner strategy literature in general, there are a number of researchers who remain enthusiastic about the value of language learner strategies (e.g., Chamot, 2005), suggesting that when music is situated as an aid to learning strategies in the language classroom, both cognitive and meta-cognitive strategies are enhanced, affective exploration is increased and the student is more receptive to language inputs (Lozanov, 1978).

Music and early language acquisition

In order to function in a community, basic speech has to be mastered by everyone. It needs to be understood even when delivered quickly and it needs to be capable of being performed even in moments of stress. All of these factors contribute to the design of this unique form of vocal performance. But there is another critical feature of language: It needs to be learned by children. Many linguists and anthropologists emphasized that language as a symbolic system of expression is constrained by children's ability to learn. Language is a compromise between what adults need to say and children's ability to process and perform what they hear. And, crucially, what infants hear is, by the broad definition above, a form of music.

Newborn infants' extensive abilities in different aspects of speech perception have often been cited as evidence that language is innate (e.g., Vouloumanos and Werker, 2007). However, these abilities are dependent on their discrimination of the *sounds* of language, the most musical aspects of speech. We argue not that language has a privileged status in the newborn brain, but rather that *music* has a privileged status that enables us to acquire not only the musical conventions of our native culture, but also enables us to learn our native language. *Without the ability to hear musically, we would be unable to learn language.* Infants are famously able to discriminate the phonemes of all languages (Dehaene-Lambertz and Dehaene, 1994), an ability that is evidence of sensitivity to timbre, as discussed above. Although newborns' ability to discriminate different instrumental timbres has not yet been tested, infants are able to use timbre to segregate sound sequences into separate perceptual streams. If phonemic contrasts and instrumental timbral contrasts rely on the overlapping perceptual mechanisms in infants, one would expect similarly precocious abilities in instrumental timbre discrimination among newborns.

In addition to timbre, newborns are sensitive to the rhythmic components of language and have a preference for their native language as well (Moon et al.,1993), however this has only been explored using languages from two different rhythmic classes. Because the ability to discriminate between two languages of the *same* rhythmic class (e.g., English and German) does not appear until 4 months of age (Nazzi et al., 1998; Gervain and Mehler, 2010), newborns may show a preference for *any* language belonging to the same rhythmic class as their native language. If so, then newborns may not prefer their native language *per se*, but rather the rhythmic characteristics of that language. Indeed, infants' early attention to rhythm (e.g., Gervain and Mehler, 2010) suggests that they are absorbing the sonic structure of their native language_ its rhythms of stresses, its phonemic character_ much in the same way that we listen to music.

Newborns can also discriminate a variety of other linguistic characteristics based on the musical aspects of language. For example, infants can distinguish the characteristic prosody (or melody) of their native language from others (Friederici, 2006). In fact, infants show electrophysiological evidence for discrimination of affective prosody even in the first few days of life (Cheng et al., 2012). Another piece of evidence that melodic abilities are important for language development comes from infant cries: the melodic complexity of crying increases over the first few months of life (Wermke and Mende, 2009), and infants who do not show such increasing melodic complexity also show poorer language performance 2 years later (Wermke and Mende, 2009).

Gradually, infants' abilities become more refined and culture-specific. At 6 months of age, infants can still discriminate all the phonemic contrasts of the world's languages although they show evidence of being attuned to the vowel sounds of their

native language over other languages (Kuhl et al., 1992). Similarly, infants at this age do not show a perceptual bias for the music of their native culture: while Western adults more readily detect changes in melodies made up of pitches from the Western major/minor scale system than in melodies using Javanese scales, infants detect changes equally well in both scale systems (Lynch et al., 1990). This is also seen in the perception of musical meter: Western music overwhelmingly uses simple meters where the underlying beat pattern (regardless of the specific rhythm) is symmetrical and regular.

Between 6 and 12 months of age, infants' linguistic and musical perception begins to become more specific to their native culture. This occurs earlier for vowel sounds than for consonants: 4–6 month old infants discriminate between non-native vowel contrasts, but 6–8 month old infants do not (Polka and Werker, 1994). In contrast, 6–8 month old infants still readily discriminate between non-native consonants and it is not until 10–12 months of age that most infants lose sensitivity to non-native contrasts (Werker and Tees, 1984). In addition to these changes in phonemic perception, by 9 months, infants have become especially sensitive to the stress pattern of their native language.

As infants gradually become more sensitive to both the musical and linguistic sounds of their culture (and less sensitive to the characteristic sounds from other cultures), they also begin to lay the foundation for processing meaning and syntax. For instance, English speaking infants at 7.5 months show a preference for stress-initial words, which is the predominant stress pattern in English (Jusczyk et al., 1999). Eight-month old infants have become sensitive to the word order conventions of their native language, largely through their use of word frequency, and prosodic information. Again, infants are first attuned to the musical aspects of language (stress patterns and prosody).

All of the aspects of language that an infant can perceive at birth and all of those aspects that are learned during the first year of life are musical by the definition of music that we are advocating. The aspects of language that differ the most from music come later: The further removed a feature of language is from music, the later it is learned. At around 9 months, infants show evidence of understanding their first words (Friederici, 2006). Once infants discover that words have referential meaning, semantic, and syntactic development takes over. Infants typically begin to talk between 11 and 13 months, experience a vocabulary growth spurt between 18 and 24 months, and reach the high point of their syntactic learning between 18 and 36 months (Friederici, 2006; Kuhl, 2010). From this point on, music and language likely proceed on relatively separate, but parallel, tracks as the musical aspects of language become secondary to its referential and discursive functions.

Infants learn the musical information of speech both by being spoken and sung to directly and by "overhearing" other language and music. Although all speech has musical aspects (see above), speech that is directed to infants is typically characterized by an even greater degree of musicality. This infant directed speech, or *motherese*, is relatively high pitched, slow, and rhythmic, with a larger pitch range and more exaggerated melodic contours than typical adult directed speech (Fernald, 1989). Parents not only speak to their children in musical ways; singing also takes on a specific set of characteristics when directed to children.

Additional support for the idea that musical hearing is critical to language acquisition and ability comes from studies of children with language disorders and language delays. These children not only show difficulties with the musical aspects of language, but_ very tellingly_ they show impairments in music

processing, too. Although the initial entanglement of music and language gradually unravels over the course of development, the fact that underlying deficits in musical hearing are associated with a variety of language impairments argues for the idea that although music and language grow apart, they are never truly separate in the brain.

Dyslexia, in particular, has been associated with more general auditory processing deficits. One proposal is that dyslexia results from an underlying problem with rapid temporal processing, specifically of the quickly changing formant transitions that distinguish one consonant from another. Treatment programs that use exaggerated versions of these contrasts as well as musical stimuli (e.g., pitch glides) appear to improve reading ability by way of improvements in rapid temporal acuity (Gaab, 2004), although many studies of these treatments have not been well controlled. Nevertheless, it is clear that dyslexia is associated with rapid temporal processing deficits, and given that phonemic distinctions are akin to the perception and discrimination of instrumental timbres, one would also expect dyslexics to have trouble distinguishing different instruments.

Although little attention has been paid to timbre perception in dyslexics (or to timbre perception in general), there is some evidence that dyslexic children do show significantly impaired perception of timbre (Overy, 2000; Overy et al., 2003). Indeed, dyslexic children's perception of rise times and perceptual centers (the moment when a sound is perceived to occur) is impaired compared to typically developing children across a variety of language backgrounds.

Additional support for the idea that musical hearing is necessary for linguistic competency comes from longitudinal studies of newborns showing that cortical responses to speech and

non-speech stimuli at birth are significant predictors of later dyslexia and reading problems (Molfese, 2000) and from a variety of other findings that pitch processing and other abnormal patterns of sound processing predict later reading ability. There is thus considerable evidence for auditory processing deficits in dyslexia, suggesting that developing competence in reading requires competence in musical hearing. Without an accurate perception of the musical elements of language, learning to read is very difficult, if not impossible.

The relationship between music and language continues past the first year of life. However, one challenge with comparing language and music development in later childhood is that, while speech ability is measured against the general population, musical ability is often implicitly measured against the virtuosity and expertise of professional musicians. This has contributed to the perception that, whereas language is an innate skill, music is a "gift" and much slower to mature. Becoming a pianist or violist does depend on a great deal of teaching and practice, but this is the acquisition of a very specialized physical skill. Meanwhile, acquiring the musical conventions of your culture is no more demanding than mastering your native language (Bigand and Poulin-Charronnat, 2006).

When considering general musical ability (rather than formal musical training), it seems that musical and linguistic development continues on parallel tracks after the first year of life. Between 2–3 years of age, toddlers gain competence with the syntax of their native language (e.g., Höhle et al., 2001) and with the syntax of their culture's music (in Western music, knowledge of key membership and harmony; this is not complete syntactic competence, however: at age 5, semantics and syntax are still interdependent for children, although by age 6, children appear to have mastered the basic syntax of their native language (Scott, 2004).

In sum, infants' learning of sound structure is based strongly on the musical aspects of sound. This is true in infant directed auditory input, where musical features are exaggerated in both speech and song, and in incidental statistical learning, which relies strongly on musical features like rhythm (especially early in development). These types of exposure are not independent – in fact, statistical learning can be enhanced in the context of infant directed speech (Thiessen et al., 2005) – but the development of both music and speech rely heavily on the musical aspects of children's environments.

If, as we propose, music cognition plays a strong role in early language acquisition, we would expect that musical training would correlate with improvements in language learning later in life. In fact, musical training and expertise confer many linguistically relevant advantages. Musical training also leads to advantages in the processing of prosody: musicians show greater sensitivity than non-musicians to emotional prosodic cues (Lima and Castro, 2011) and better detection of subtle prosodic variations at the end of utterances in both their native and in a foreign language. Musical training is also associated with better discrimination of subtle timing contrasts in both native and foreign speech. These advantages, too, have practical advantages, for example, in the ability to perceive and learn second language sound structures.

Linguistic benefits of musical training are not confined to adult musicians: children taking music lessons also show linguistic enhancements relative to their non-musician peers. Like adults, they are better at detecting subtle prosodic variations at the end of utterances (Magne et al., 2006). They also showed that enhanced passive and active syllable processing, especially voice onset time, a critical ability in distinguishing consonants (Chobert et al., 2011), and show advantages in reading development and phonological awareness (e.g., Forgeard et al., 2008).

Patel's (2011) *OPERA hypothesis* proposed that these benefits of musical training result from overlapping language/music networks, the fact that music involves precise auditory processing, emotional engagement, repetition (i.e., practice), and high attention demands. Evidence that attending to the musical features of speech is an effective language learning strategy may have implications for adult learning and recovery as well. For example, a focus on musical aspects of speech may improve second language acquisition (Slevc and Miyake, 2006; Jedrzejak, 2012) and musically-based therapy may effectively treat developmental and acquired language deficits. Although these findings cannot establish a direct link between music and language learning in infants, they are an anticipated outcome of our hypothesis. In addition, the extensive volume of work enhances the view that music and language share many similar properties_ something we might expect infants to observe, especially before they are attuned to speech's referential meaning.

Music and aspects of language acquisition

Humans first started creating music 500,000 years ago, yet speech and language was only developed 200,000 years ago. Evolutionary evidence indicates that speech as a form of communication has evolved from our original development and use of music. This explains why our music and language neural networks have significant overlap, and why children who learn music become better at learning the grammar, vocabulary and pronunciation of any language.

When children start studying music before the age of seven, they develop bigger vocabularies, a better sense of grammar and a higher verbal IQ. These advantages benefit both the development of their mother tongue and the learning of foreign languages.

During these crucial years, the brain is at its sensitive development phase, with 95% of the brain's growth occurring now. Music training started during this period also boosts the brain's ability to process subtle differences between sounds and assist in the pronunciation of languages_ and this gift lasts for life, as it has been found that adults who had musical training in childhood still retain this ability to learn foreign languages quicker and more efficiently than adults who did not have early childhood music training.

Music training plays a key role in the development of a foreign language in its grammar, colloquialisms and vocabulary. One recent study found that when children aged nine and under were taught music for just one hour a week, research concluded that they exhibited a higher ability to learn both the grammar and the pronunciation of foreign languages, compared to their classmates who had learned a different extracurricular activity.

Language researchers agree (Fiske, 1993) that there seems to be some sort of symbiotic relationship between the underlying principles and the mental processing of language and music at the meta- level. It has been asserted that infants learn their native language by principles that make sense of aural information; therefore, it seems reasonable to approach second language acquisition in a similar way (Jackendoff, 2006). Since music is also acquired through the aural sense, musical activities are suggested to aid in first or second language acquisition.

Hungarian studies reviewed by Marquart (1992) have concluded that remarkable differences exist between children who are sung to daily, versus those who are not, especially in the area of speech and language acquisition. Marquart explained the background of these studies:

> "Most of these studies are based on the philosophy of Kodàly, the Hungarian musicologist, composer, researcher and philosopher, who believed that music played a significant role in the development of mankind. He also believed that it was important to begin music education at the youngest possible age. His philosophy was that music's place in the curriculum was one of a core subject. His research indicated that classes receiving daily music instruction academically surpassed classes receiving less frequent instruction. Noted improvement in other academic areas, particularly math, was an unexpected result in Kodàly's first experiment. The results of his studies convinced the Hungarian Ministry of Education to expand the Singing Primary Schools." (p. 161)

Lowe (1995) wanted to know whether the incorporation of a music program would reinforce both the learning of music, as well as the learning of a second language. The subjects of her study were 53 second-grade students of the French Immersion program in Canada that were set up in interdisciplinary music and French classes. Students were given eight weekly units of five 15-minute music lessons that were incorporated into the regular French second- language classes. Daily lesson plans for both classes were prepared together by both teachers using the same educational materials and curriculum content.

The results showed that the group that received the additional music lessons performed significantly better than the control group in all music tests and in the oral grammar and reading comprehension French tests, even though the principal emphasis was on musical instruction. Her findings lead to the conclusion that the study of music and foreign languages are mutually beneficial.

Music has been used more extensively in the ESL classroom since teachers have more access to songs in English. In Switzerland, adolescents are in contact with between 8-12 hours a week of English language music, double or triple the number of hours of English classes in school (Murphey, 1987; Bolduc, 2007). Such contact may just be making learning English in school easier if, as Lyczak (1979) concluded, prior exposure to language does affect subsequent learning, even when this exposure is not linguistically meaningful.

The purpose of Cormier's (1985) study was to determine the extent of the relationship between selected music and French second language variables. Subjects encompassed 79 students in grades 4, 5, and 6, who were enrolled in French Immersion (including music) classes. Students were tested for six days with standardized tests for music and reading, with French tests created by the researcher. The French variables included: Retention of aural information, comprehension, vocabulary, diction, pronunciation, language reading and imitation. The music variables included: tonal imagery, rhythm imagery, phrasing, music reading and pitch discrimination. Results of this study found the music variables to be significant predictors of the speech variables, implying that music and speech, both aural expressions, may involve similar learning processes. The final conclusion was that a relationship exists between French second language and music variables for grades four, five and six subjects when mental ability is taken into consideration. This is supported by the theories of Bruner (1960), Gagné (1977), and Thorndike (1913) who suggested that learning transfer occurs through similar elements, shared between subject areas.

Medina (1990) reported on the effectiveness of music and story illustrations in the English vocabulary acquisition of second-grade limited English proficient students. The dependent variable of vocabulary acquisition was crossed with instructional medium (Music/No Music) and extra-linguistic support

Illustrations/No Illustrations). After a four day treatment, mean vocabulary gain scores were consistently higher for music treatment groups and illustration groups. The gain scores for vocabulary acquisition were highest for the group that used both music and illustrations. Data obtained one and a half weeks after treatment showed mean gain scores were still consistently higher for the combined effects of both music and illustrations. The investigation provided empirical support that music is a useful tool for second language acquisition.

Most adults who learn a foreign language speak with an accent which derives in part from phonological and phonetic differences between their native language (L1) and the target foreign language (L2). Music can be effective in improving phonetic skills in a variety of ways. Leith (1979) stated, "There is probably not a better nor quicker way to teach phonetics than with songs" (p. 540). Gatti-Taylor (1980) believed that phonetic instruction was one good use to which songs could be put, even in beginning classes, stating, "It is relatively easy to find song lyrics that stress a particular phoneme" (p. 466). García-Sáez (1984) agreed stating, "the use of song is an excellent way to practice Spanish phonetics and it is not at all difficult to find examples of songs that contain sounds the majority of students have trouble producing" (p. 4). The melody, combined with the lyrics, provides an excellent opportunity to review pronunciation and enjoy music at the same time.

Traditional pronunciation texts have emphasized or implied that students should strive for perfect pronunciation or near-native pronunciation. Morely (1996) contended that this would be an unrealistic goal, an important shift in language instruction now tends to emphasize a communicative focus: "One that views the proper place of pronunciation in the L2 curriculum as an integral part of communication, not a separate drill-based component set aside from the mainstream of spoken discourse" (p. 151).

Techmeier (1969) stated that the most difficult skill in learning a foreign language is proper pronunciation. He felt that if the child does not pronounce a word well, the problem may be that the child does not hear the word correctly. According to Techmeier, singing helped to develop better hearing skills and, as a result, promoted and reinforced good articulation of words. Poliquin (1988) suggested that the particular value and effectiveness of using songs in language instruction, was specifically to improve pronunciation skills. He explained that semantic comprehension is controlled by the left brain and that musical tones and rhythm are controlled by the right. He therefore encouraged the pedagogical use of songs to develop cognitive skills, to demonstrate the relationship of language rhythm and song rhythm, and to teach a second or third language.

Karimer (1994) formulated a study using ESL students to find out if acquiring a native-like fluency would be faster using nursery rhymes, chants and songs. Students were Southeastern Asian adults, who were divided into ethnic groups. This division was made since the Lao Hmong group's culture practiced a courtship ritual requiring the man to look for two qualities in a wife, sewing and singing. The man sang an original love song to his intended, who then responded by matching his intonation patterns exactly. No difference was noted with this nationality since only three subjects from this group remained in the final results.

The subjects' task was to distinguish between minimal pairs defined as two words that differ in one phoneme only-for example "fill/pill, buzz/bus." Both groups were given a pre-test that distinguished between phoneme sounds, then they were given a treatment consisting of 20 minutes of instruction, twice a week, and over a two week period. The control group was asked to listen to a word list of 10 minimal pairs, while the experimental

group was asked to listen to various songs and rhythmic chants which presented the same sounds contextually. The students were given a post-test similar to the pre-test after the two week period. An advantage in test scores was seen in the experimental group. Since the control group had tested higher on the pre-test, the improvement scores were used to compare between the groups. The improvement score for the control group was 3.9 while the experimental, songs and chant group gained 10 points. These results indicated a definite advantage for the experimental group, after only two weeks of treatment. In addition to the rhythm of the language, what might have been an important factor in this case was contextual learning, or learning the use of a language as it naturally occurs.

Eterno (1961) found a direct relationship between musical aptitude and/or musical training and foreign language pronunciation. This might suggest that although teachers present the material to a group of students, those who (perhaps unknowingly) have a musical aptitude may be more affected by language when that language is presented in song form.

Arellano and Draper (1975) considered 79 students in fifth grade, who had experienced previous exposure to Spanish. Subjects were tested on 15 variables. Researchers viewed the relationship between discriminatory abilities- pitch, intensity, rhythm, timbre, and tonal memory-and the capacity to achieve in the area of Spanish accent and Spanish language comprehension. Overall results indicated musical ability and Spanish accent were strongly correlated, even when the possible common relationship with IQ was taken into consideration. Researchers concluded that the close relationship found to exist between musical ability and second language learning may suggest that the learning of music and second language can be mutually reinforcing.

Scovel (1969) discussed the relationship between cerebral dominance and a speaker's accent. He states that the onset of cerebral dominance, which seems to occur around the age of twelve, inhibits the ability of a person to master the sound patterns of a second language without an impinging foreign accent. He believed that adults cannot master the sound patterns of a second language with the fluency of a native speaker. The basis for this opinion is the fact that children learn language in a different way- with actual objects in the environment and their names, the largest being visual-auditory and tactile-auditory association. When adults learn a second language, it is primarily done by translating from the first language, i.e., by auditory-auditory associations, not by dealing directly with the environment. Different anatomical regions are used in the two cases.

Speakers in Scovel's study (1969) were asked to say a simple sentence twice. The listeners, junior high school students, were able to judge whether the speakers were native born Americans with 85% accuracy. His point was that speakers must achieve a native accent before the age of twelve or they will never be able to sound native. He presented the possibility that it is the nature of the brain, specifically the phenomenon called cerebral dominance or lateralization that accounts for the ability of children to learn languages fluently. He stated that there is strong circumstantial evidence that the maturational development of cerebral dominance is closely linked to the ability to acquire language. He believed it is nature, not nurture, which determines our ability to speak without a foreign accent. What he pointed out as the different ways that children learn a language, and different anatomical regions used in learning, may well be attributed to nurture in the way that adults are taught. The traditional method has been to teach adults using the first language as the foundation.

Evidence for pronunciation factors was given by Elliot (1995), who tested 12 variables believed to be related to pronunciation accuracy, but found only three that related significantly to pronunciation accuracy. These were; (a) attitude or individual concern for pronunciation, (b) subjects' degree of Field Independence (FI), and (c) subject's degree of right hemisphere specialization. Field Independent (FI) individuals were analytical, reflective, highly detailed, ambiguity-tolerant, and left-cerebrally-dominant. They often maintain social distance. Field Dependent (FD) individuals were more globally oriented, impulsive, holistic, and right-cerebrally-dominant. They tend to be outgoing, empathetic, and perceptive.

As for language acquisition, FI individuals did better at written tasks, learning grammar rules and manipulation of linguistic forms, while FD individuals would prefer speaking. He suspected FD individuals would have better pronunciation since they were more social and interested in communication. However, FI individuals tended to have better pronunciation. No reason was suggested for this, but it may be due to FI individuals' tendency to high detail and a preference to analyze the sounds.

What Scovel (1969) termed cerebral dominance, Elliot (1995) called hemispheric specialization, but both referred to which side of the brain was more likely to be used for individual cognitive learning styles and preferences. Elliot's results suggested that "although Field Independence and Right hemisphere specialization related to accurate target language pronunciation in certain tasks, attentiveness or concern for pronunciation accuracy proved to be the most significant factor" (p. 356).

The total number of years of formal instruction in Spanish also had a small effect on pronunciation, but the most significant predictor of pronunciation accuracy was attitude (speaker's desire to pronounce correctly). It seems that using music to bridge the

hemispheres may be the necessary connection between language comprehension controlled by the left side and pitch, intonation, and rhythm controlled by the right side. If instruction is focused on language form only, then students may lack the fine tuning skills of pronunciation including pitch discrimination. Improving students' pronunciation through the sounds heard in song may be an answer to Scovel's (1969) statement that adults can never acquire a native-like accent.

Pimsleur, Stockwell, and Comrey (1962) reported over forty research studies pertaining to the factors within students which bear upon their abilities to learn a foreign language. One of the important sub-headings of that review was devoted to studies dealing specifically with the relationship of the ability for discriminating pitch to the ability for learning a foreign language. Early work from Dexter (1934) had shown a viable connection between pitch discrimination and accent rating; interestingly "the correlation of pitch with accent increases as age of subject decreases" (p. 717). Both studies (Dexter, 1934 and Pimsleur, Stockwell, and Comrey, 1962) confirmed the trend of significant correlations between pitch discrimination and various criterion measures of achievement in several foreign languages on the high school and college, as well as intensive course (Army Language School) levels. Correlations between pitch discrimination and foreign language achievement are largest in high school, the lowest level in these studies; the correlations became progressively smaller as the individual proceeded through college and intensive course levels. These correlation changes may be due to the change in teaching methods used for the older learner.

To examine the relationship between pitch discrimination and accent, Arellano and Draper (1975) gave 79 children a six-week period of audio-lingual instruction. There was no exposure to written Spanish. Each child, 10 years of age, received 30 minutes of instruction per day in Spanish. In keeping with the age

and relatively limited attention span of the subjects, a teaching approach built around games, songs, rhymes, and "The Three Bears" folktale was pursued in all class-work. Results indicated that musical ability and Spanish accent achievement are strongly related, even when their common relationship with IQ. is taken into consideration. "The rather close relationship found to exist between certain musical acuities and Spanish learning in young subjects suggests the possibility that music and second-language learning may, during early childhood and over a protracted time period, be mutually reinforcing" (p. 114).

Learning language in song is also a much more engaging way to practice pronunciation than simple listen-and-repeat drills. This means that you are more likely to put in more pronunciation practice time without realizing it, simply by playing foreign language music in the car or at home. When it comes to remembering groups of words, such as colors, numbers, body parts or directions, language learners should look to song for help. The University of Edinburgh's study shows an effective way of memorizing phrases, but this tool of singing new vocabulary can be great for recalling clusters of similar words.

Song lyrics give learners the opportunity to practice language in context and become familiar with basic forms. They are an accessible and fairly unintimidating way to practice the structural concepts of language like word order or conjugation. Though it may seem juvenile, children's songs are a great tool for vocabulary practice. They typically use simple structures, everyday vocabulary, and lots of repetition, making them a great tool for beginner language learners. Pop or contemporary lyrics are useful for more advanced learners who can study colloquialisms and slang. Linguists have long been researching the correlation between music ability and language aptitude. The findings are consistent: a connection between pitch awareness and phonological awareness.

This means that language learners who play a musical instrument are conditioned to better identify and process different sounds in language. A musical ear is a great asset when it comes to learning tonal languages like Thai or Cantonese. Furthermore, a study in the Journal of Neuroscience found that people who have rhythmic abilities have more consistent brain responses to speech. This means that with musical training the brain becomes more attune to processing spoken language.

Students in two Japanese conversation courses were asked to rate songs usefulness by Jolly (1975). He showed that 80 and 91% of students rated songs as being "very useful" (p. 13). Students commented that songs created a relaxed and enjoyable atmosphere and that they felt more receptive to the lessons.

According to Falioni (1993, p.104), "the addition of music to the foreign language classroom as a teaching method may be a way to focus students' attention, and produce a more committed learner." In a study of English-speaking students in a Montreal high school who were studying French, Gardner and Lambert (1959) reported that students who had positive attitudes toward the French Canadian community and were interested in interacting with or becoming part of it (i.e., were interactively motivated) tended to be more successful language learners than those students who were learning French merely as a requirement for school and had no interest in the French Canadian community (i.e., were instrumentally motivated). In this case, the community of French speakers may have provided a motivator for some students. When students do not live in the community where the target language is spoken, using music may be a way to introduce the culture and motivate students to learn the target language.

Nambiar (1993) recommends recent pop songs to enhance motivation in the younger generation: "Songs deal with the whole realm of human emotions and students are often willing to sing a

song in a foreign language even if they do not fully understand the meaning of the words" (p. 336). Songs also allow timid students to hide behind the music and take the pressure off.

Murphey (1987) discussed the use of musical activities using two learning experiences in teaching English as a second language. Murphey stated that an interest in music and related movement was a strong motivator for language learning. He proposed that language courses should be taught for a specific purpose (with specific subject matter) to stimulate normal communicative activity. He suggested a course about songs to be taught in the target language, rather than a music-based language course. In this way, students implement the language in a natural way while teachers structure true learning through the students' environments and interests. When music was the subject matter, the class was not studying language; rather, they were studying music which allowed for a host of language learning opportunities and the improvement of their language skills. "They [students] were concentrating on the messages and ideas as they would in their native language" (p. 7). Murphey stated that in the case of song activities, "students are doing something with language: they are participating actively in the game called communication" (p. 8).

Effective natural communication cannot exist without the exchange of relevant information. Music used as teaching aids in the foreign language classroom, facilitate the development of a natural rhythmic response that is needed in the acquisition of a foreign language (Jolly, 1975).

Unlike spoken conversation, music contains pitches, melodies, rhymes, beats, and measured phrases that may help students remember vocabulary or grammatical structures and aid in comprehending the general meaning. Practically all grammar

points and a wide variety of vocabulary can be found in musical texts. As Falioni (1993) stated, "The new structures that may seem isolated or out of context in pattern drills, are seen in a different perspective when they are part of a song" (p. 101). Fluency in the use of the language was one of the most valuable contributions of songs, according to Bartle (1962), who believed that "some songs lend themselves to the incidental revision of grammatical points or of verb tenses. Songs are a definite advantage in memorization of phrase constructions. They are more easily learned and tend to 'stick' longer than straight-out grammatical examples" (p. 11).

Salcedo (1996) suggested another way to use music for grammatical reinforcement of tenses by using multimedia computer software with incorporated music video clips. As the video clip is viewed, users could choose to show the written lyrics on the screen, which has some general discussion of vocabulary and phrases as well as specific words and phrases in hypertext form. Students could click on these linked words in the song lyrics and get an explanation of the grammatical structure as it is used in that particular song.

The grammatical structures taught during the basic language courses are listed with some corresponding songs that contain these structures in the song lyrics. After covering a particular language structure in class, students listen to a song stressing that particular structure. Better than traditional pattern drills, songs demonstrate authentic language use while reinforcing syntax.

In addition to the grammar content, music could be chosen that relate to cultural aspects being presented in class, such as social situations, historical events, geographical descriptions, and others. The use of music, according to Jolly (1975), gives students the opportunity to acquire a greater understanding of the culture

underlying the target language. When Edwards (1997) asked teachers to rank their reasons for utilizing music in educational training, the highest value was placed on vocabulary, then cultural awareness and appreciation (only slightly lower on the scale).

Many researchers (e.g., Gatti-Taylor, 1980; Salcedo, 1996; Malgorzata, 2008) gave suggestions for adopting the chanson (song) as a primary source for teaching language and elements of culture. Folk songs for classroom use were also advocated by Sheehy (1973) who stated that,

"Folk songs grow out of the needs and aspirations of people. Their very essence is change and adaptability both in melody and words. The rhythm and melody are simple and basic but provide a flexible frame within which stories and emotions are easily expressed" (p. 43).

Some words of caution were provided for cultural sensitivity by Falioni (1993). She asserted that one must incorporate a variety of famous music because: "By using certain songs (e.g., some traditional folk music) we may confirm a student's stereotype or imply an outdated presentation of a culture's music" (p. 104). Another way to use music incorrectly, according to Griffen (1979), is to use borrowed songs (e.g., translated American pop) "implying that other cultures have nothing to offer and that they only imitate" (p. 943).

In order to define the possible benefits of musical ability on L2 learning, it is necessary to explain how diverse linguistic sub-domains can be affected by this cross-domain relationship. As auditory qualities of language and music are more tangible than semantic ones, a considerable amount of research has been done on the effect of musical training on pitch and duration perception in speech.

- **Enhancing processing of tonal variations.** Firstly, it has been found that musically able adults detect and identify foreign language lexical tone variation better than adults without musical background. Analysis of research literature indicates that tonal fluctuation processing has been studied most extensively. For example, Marques, Moreno, Castro, and Besson (2007) demonstrated that musicians more easily detect diminutive prosodic pitch deviations; whereas, Delogu, Lampis, and Belardinelli (2010) indicated that both musically able children and adults are better at discriminating lexical tones, but not phoneme duration variation. Lee and Hung (2008) extended findings regarding enhanced discrimination abilities and showed that musicians are also more accurate at identifying pitch height and pitch contour in speech. Musicians are also faster to categorize prosodic variation and more sensitive to foreign syllabic tone change (Martínez-Montes et al., 2013).
- **Enhancing processing of utterance duration.** Secondly, musical experience has a beneficial impact on the processing of phoneme duration and overall language segmentation. Marie et al. (2011) showed that musical training enhanced discrimination and categorization of both segmental and tonal contrasts. In a cross-linguistic study, Sadakata and Sekiyama (2011) compared musicians and non-musicians and found that musical expertise benefited discrimination of speech materials more than identification in both L1 and L2, and the greatest effect of musicality on identification processes was seen in the temporal aspects of speech (duration of consonants and vowels). Therefore, musicianship enhanced automatic neural encoding to a greater extent than the application of categories to an incoming sound. Importantly, the enhancement effect interacted with the previous experience of the linguistic

background_ for example; Dutch musicians did not outperform Japanese musicians and non-musicians on sensitivity to certain specific Japanese language material. The distinctiveness of perceptual cues depended on the type of first language_ implying that some languages themselves enhance phonological perception more than other languages.

- **Enhancing pronunciation.** Thirdly, musical training has a positive impact on L2 phonological production abilities and this is most likely mediated by the effects of musical training length on pitch perception ability as suggested by Posedel, Emery, Souza, and Fountain (2011). In their study, pitch perception was the only significant predictor of Spanish pronunciation quality. Perhaps due to the smaller sample, the length of musical education was not significantly correlated with pitch perception; L2 pronunciation or working memory within the group of musically trained individuals.
- **Enhancing L2 comprehension.** Fourthly, the perception of a written text, that is, reading, can also be enhanced by musical training, although there have been fewer research articles published on this topic. Herrera et al. (2011) demonstrated that 2 years of phonological and music training improve reading readiness in native speakers and L2 learners. Strait, Hornickel, and Kraus (2011) examined older children and showed that musical aptitude (and particularly rhythmic abilities) is related to reading skills. Furthermore, Swaminathan and Gopinath (2013) studied primary-school children speaking various Indian languages, and found that those who were trained in Western or Indian music performed better in English L2 comprehension and vocabulary, and this advantage was not due to familiarity with English music tradition.

Musical activities seem to give an advantage to the aforementioned linguistic sub-domains of one's first and second languages. Herrera et al. (2011) found that phonological training with music especially benefited Tamazight-speaking (L1) children, who, after training, were similar to Spanish control children in the naming speed task. Thus, although native language speakers were generally better at reading readiness measurements, the effect was stronger for those children who learned Spanish as their second language. Similar advantages of musicianship on L1 and L2 were found in Sadakata and Sekiyama's (2011) study_ for example, Dutch and Japanese musicians outperformed non-musicians in the identification of Japanese stop contrasts. With regard to discrimination performance, musicians demonstrated shorter reaction time and greater accuracy in L1 and L2. Furthermore, Japanese musicians did not show an overall advantage on L1 materials, but did exceed Japanese non-musicians on several L2 speech contrasts.

Working memory (WM) is associated with L2 reading, speaking, vocabulary and listening abilities. Herrera et al. (2011) indicated that verbal WM and naming speed are strong mutual predictors of reading and are crucial at the initial stages of reading acquisition. Phonological recoding strategy is said to develop concurrently; this aims at decomposing the written word into sound components and keeping it in the WM while the meaning and sounding is retrieved from long-term memory. Musical training especially accelerated children's L2 naming speed, that is, the recall of labels from long-term memory.

Music in Teaching Methods

Brief review of music-based Educational methods

Dalcroze method

The Dalcroze method was developed in the early 20th century by Swiss musician and educator Émile Jaques-Dalcroze. The method is divided into three fundamental concepts - the use of solfège, improvisation, and eurhythmics. Sometimes referred to as "rhythmic gymnastics," eurhythmics teaches concepts of rhythm, structure, and musical expression using movement, and is the concept for which Dalcroze is best known. It focuses on allowing the student to gain physical awareness and experience of music through training that engages all of the senses, particularly kinesthetic. According to the Dalcroze method, music is the fundamental language of the human brain and therefore deeply connected to who we are.

Kodály method

Zoltán Kodály (1882–1967) was a prominent Hungarian music educator and composer who stressed the benefits of physical instruction and response to music. Although not really an educational method, his teachings reside within a fun, educational framework built on a solid grasp of basic music theory and music notation in various verbal and written forms. Kodály's primary goal was to instill a lifelong love of music in his students and felt that it was the duty of the child's school to provide this vital

element of education. Some of Kodály's trademark teaching methods include the use of solfège hand signs, musical shorthand notation (stick notation), and rhythm verbalization. Most countries have used their own folk music traditions to construct their own instruction sequence, but the United States primarily uses the Hungarian sequence.

Orff Schulwerk

Carl Orff was a prominent German composer. Orff Schulwerk is considered an "approach" to music education. It begins with a student's innate abilities to engage in rudimentary forms of music, using basic rhythms and melodies. Orff considers the whole body a percussive instrument and students are led to develop their music abilities in a way that parallels the development of western music. The approach fosters student self-discovery, encourages improvisation, and discourages adult pressures and mechanical drill. Carl Orff developed a special group of instruments, including modifications of the glockenspiel, xylophone, metallophone, drum, and other percussion instruments to accommodate the requirements of the Schulwerk courses. Experts in shaping an American-style Orff approach include Jane Frazee, Arvida Steen, Judith Thomas, and many more.

Suzuki method

The Suzuki method was developed by Shinichi Suzuki in Japan shortly after World War II, and uses music education to enrich the lives and moral character of its students. The movement rests on the double premise that "all children can be well educated" in music, and that learning to play music at a high level also involves learning certain character traits or virtues which make a person's soul more beautiful. The primary method for achieving this is centered around creating the same environment for learning

music that a person has for learning their native language. This "ideal" environment includes love, high-quality examples, praise, rote training and repetition, and a time-table set by the student's developmental readiness for learning a particular technique.

In addition to the four major international methods described above, other approaches have been influential. Lesser-known methods are described below:

Gordon's Music Learning Theory

Edwin Gordon's Music Learning Theory is based on an extensive body of research and field testing by Edwin Gordon and others in the larger field of Music Learning Theory. It provides music teachers with a comprehensive framework for teaching musicianship through audiation, Gordon's term for hearing music in the mind with understanding and comprehension when the sound is not physically present. The skills and content sequences within the Audiation theory help music teachers establish sequential curricular objectives in accord with their own teaching styles and beliefs. There also is a Learning Theory for Newborns and Young Children in which the Types and Stages of Preparatory Audiation are outlined.

World Music Pedagogy

The growth of cultural diversity within school-age populations prompted music educators from the 1960s onward to diversify the music curriculum, and to work with ethnomusicologists and artist-musicians to establish instructional practices rooted in musical traditions. "World music pedagogy" was coined by Patricia Shehan Campbell to describe world music content and practice in elementary and secondary school music programs. Pioneers of the movement, especially Barbara Reeder Lundquist, William M. Anderson, and Will Schmid, influenced a second generation of music educators (including Bryan Burton, Mary

Goetze, Ellen McCullough-Brabson, and Mary Shamrock) to design and deliver curricular models to music teachers of various levels and specializations. The pedagogy advocates the use of human resources, i.e., "culture-bearers," as well as deep and continued listening to archived resources such as those of Smithsonian Folkways Recordings.

Conversational Solfège

Influenced by both the Kodály method and Gordon's Music Learning Theory, Conversational Solfège was developed by John Feierabend, former chair of music education at the Hartt School, University of Hartford. The program begins by immersing students in the musical literature of their own culture, in this case American. Music is seen as separate and more fundamental than notation. In twelve learning stages, students move from hearing and singing music to decoding and then creating music using spoken syllables and then standard written notation. Rather than implementing the Kodály method directly, this method follows Kodály's original instructions and builds on America's own folk songs instead of on Hungarian folk songs.

Simply Music

Australian music educator Neil Moore founded “Simply Music” on the core belief that all humans are naturally musical. Simply Music offers programs for students from birth through old age, with the stated goal that "students acquire and retain music as a lifelong companion." To meet this goal, the repertoire includes a wide variety of musical genres, such as classical, blues, jazz, and popular. “Simply Music” patterns its approach after primary language acquisition, where speaking comes first. In this it shares some philosophical ground with other developmental approaches like Kodály, Orff-Schulwerk, and the Suzuki Method. Simply Music currently licenses teachers at over 700 locations worldwide.

Carabo-Cone Method

This early-childhood approach, sometimes referred to as the Sensory-Motor Approach to Music was developed by the violinist Madeleine Carabo-Cone. This approach involves using props, costumes, and toys for children to learn basic musical concepts of staff, note duration, and the piano keyboard. The concrete environment of the specially planned classroom allows the child to learn the fundamentals of music by exploring through touch.

Popular Music Pedagogy

"Popular music pedagogy"_ alternatively called rock music pedagogy, modern band, popular music education, or rock music education — is a recent development in music education consisting of the systematic teaching and learning of rock music and other forms of popular music both inside and outside formal classroom settings. Popular music pedagogy tends to emphasize group improvisation, and is more commonly associated with community music activities than fully institutionalized school music ensembles.

MMCP

The "Manhattanville Music Curriculum Project" was developed in 1965 as a response to declining student interest in school music. This creative approach aims to shape attitudes, helping students see music not as static content to be mastered, but as personal, current, and evolving. Rather than imparting factual knowledge, this method centers around the student, who learns through investigation, experimentation, and discovery. The teacher gives a group of students a specific problem to solve together and allows freedom to create, perform, improvise, conduct, research, and investigate different facets of music in a spiral curriculum. MMCP is viewed as the forerunner to projects in creative music composition and improvisation activities in schools.

O'Connor Method

American bluegrass music fiddler Mark O'Connor developed a method of violin education that is designed to guide students in developing musical techniques necessary to become a proficient violinist. The method consists of a series of pieces covering a wide range of genres. Teacher training sessions based on the method take place around the US.

Boss-School Method

During its tenure, the Mumbai-based Boss School of Music developed a proprietary method of education using audio-visual technology, simplified concepts, and specially designed musical equipment. They trained novice students for standardized electronic keyboard graded examinations conducted by Trinity College London, requiring only 3–6 months of training using their methods. Traditional methods required up to 8 years to prepare students for testing. Vidyadhar Vyas, Head of the Music Department at the University of Mumbai, claimed that they "revolutionized" music learning by teaching complex musical concepts in short periods of time. They also trained a few young children ages 6–10 for the Trinity College Grade 8 examination; after passing the examination, the students were reportedly considered child prodigies. Although the Boss School Method is not formally documented, various notable musicians in Mumbai such as Louis Banks agreed that the school had developed a "revolutionary technique". Some controversy has surrounded the school and its methods.

Music-based language teaching methods

Music as a language learning tool is only recently being recognized as a methodology to be used in the foreign language classroom on all levels. As research continues to justify the use of music to teach language skills, textbook developers will continue to increase publication of materials that focus on teaching with music. The degree to which it may be emphasized depends on the method. Some methods introduced an additional song with suggestions for lesson planning; others created programs which used music for specific purposes, such as grammar or vocabulary instruction; while others employed music as the basis for the course.

To understand why some teachers choose not to use musical instruction, Edwards (1997) conducted a survey to find out whether English as a Second Language (ESL) classroom teachers incorporated music into the classroom, how they applied it, and what discouraged greater use. Not surprisingly, the lack of money to buy the materials was listed as the greatest reason for why teachers (88%) were not using music to a greater degree in ESL instruction. Lack of training was also listed as a significant problem, although "72% of teachers were very interested in getting training on ways to implement new strategies utilizing music in ESL instruction" (pp. 55-56).

There are numerous indications that people believe in music as seen by the increase in methodologies that now use music to teach a foreign language. This first segment is devoted to an overview of methods that incorporate music as a pedagogical tool for language learning. These methods are often not based on any particular research; however, they are presented here to inform the reader that many believe in the pedagogical benefits of music without citing research. Many of these programs were typically designed to teach children through song, but more recently

programs have been geared with the older learner in mind. The following lines describe these specialized methods of language teaching based on the magic of music.

Suggestopedia

An unusual foreign language learning/teaching method for the classroom was introduced in 1978 by the Bulgarian psychotherapist and physician Lozanov. His method, called *Suggestopedie* (Suggestopedia), has been the subject of numerous research articles written on the use of music in the foreign language classroom. Although the basis is psychological, this method uses classical music (believed to be an essential element for learning to take place) to relax the student. Lozanov (1978) emphasized the importance of whole-brain stimulation for optimal acquisition to take place and suggests that the relaxation techniques help learners tap into subconscious resources to aid in acquisition and greater retention of vocabulary and language structures. According to Botha and Puhl (1988), "Lozanov stumbled upon using the power of suggestion in a waking state as a way of teaching that fits well with the processes of the human brain" (p. 3).

This optimal condition for acquisition was in harmony with later second language acquisition theories by Krashen (1985), who believed that Lozanov's method generated a type of super-learning identical to subconscious acquisition that was the result of providing comprehensible input in a low-anxiety situation. Krashen agreed with these relaxation efforts, since one of his basic principles for language acquisition stated that the language student must have a low level of anxiety in order for the message to be acquired naturally.

Suggestopedia is described as a holistic method that directed learning to both the left and right hemispheres of the brain. Soft lighting, baroque music, cheerful room decorations, comfortable seating, and dramatic techniques aim at totally relaxing students, a state which heightens mental activity and concentration. Evidence of this mental activity was seen in the technology used by Morrissey (1996) in brainwave biotic which furnishes graphic data for all four of the brainwave frequency ranges (delta, theta, alpha, and beta), and the corresponding amplitudes for each.

"Employing brainwave biotic in the classroom has identified a low, suppressed beta state as optimal for learning which can in fact accompany prolonged concentration. If accelerated learning results are demonstrated to coincide with the regular and consistent inducement of this prolonged state of concentration, then Lozanov's research would be confirmed, and a beta suppressed brainwave state would be identified as optimal or ultimate for learning during input of new material." (p. 489)

Music was an important means used to achieve the relaxation and harmony needed to increase learning effectiveness. The music was carefully chosen and prescribed to induce a mental state in which material was more easily absorbed and retained. It was said to produce an alpha state in which the mind was relaxed and meditative but remained receptive (Williams, 1983). Nevertheless, all of the results could not be attributed to the use of music, since music was only one aspect of the method; however, experiments indicated that suggestology was extremely effective. The method's application in the United States was reported to reduce language learning time by one-third or more. In remedial reading experiments in Atlanta, 75 to 80% of the students gained a year or more on the oral and silent reading subtests after only 14 weeks in the program (Bancroft, 1983; Lecoq and Suchaut, 2012).

Classes are small and intensive, with a low-stress focus. Material is presented in an especially melodic and artistic way. By activating the right "creative side" of the brain, a much larger portion of the intellectual potential can be tapped, thus drawing out long-term memory. This innovative approach to language pedagogy maximizes the learners' natural holistic talents. Background classical or baroque chamber music, oftentimes accompanied with soft lights, pillows or cushions on the floor for relaxation, accentuate active and passive meditations, séances, yoga, breathing exercises leading into the "alpha state", songs for memorization purposes, therapy sessions and stream-of-consciousness catharsis in the target language with little reliance on English. Little emphasis on grammar is given. Such non-verbal communication as kinesics, paralanguage, environmental proxemics, and oculesics can be incorporated into the method.

This method shows that interconnections between the musical and linguistic areas enable music to assist in learning vocabulary and phrases, which tasks are governed by the linguistic intelligence. Music positively affects language accent, memory, and grammar as well as mood, enjoyment, and motivation. Language teachers and music therapists alike should encourage the conjoined study of these natural partners, because communicating through a musical medium benefits everyone. Thus, the musical-linguistic method opened new pathways in the brain, which provided a wider perception of incoming information, and even created more of a desire to communicate with and learn from others, specifically to improve communication. Using music in a language acquisition context generates interested students, but there are other effects, including higher vocabulary acquisition, a natural context for words, extra-linguistic clues to meaning and exaggerated prosody, all of which aid second language acquisition.

Audio-Singual Method

The method which is introduced by Kind (1980) used familiar songs to teach the English language. He contended that because the tunes are familiar, a satisfying feeling of recognition helps the learner overcome any fear and resistance to the unknown or fear that a student learning a second language may experience. Kind's (ibid.) Audio-Singual Method has been developed and tested at Harvard University and other American and European schools. According to Kind, "It has been found that foreign languages can be taught more rapidly, more effectively and with greater recall through the use of music and song, rather than the mechanical classroom drills" (p. 49). The supporters of Audio-Singual method have also begun to supply teachers with alternate methods for introducing content, which include materials for using songs in the classroom. Songs are incorporated into the methods with varying degrees of commitment, from a minimal supplemental entry to the complete basis of the instruction.

Singing Grammar

A program using songs specifically to teach grammatical points is Singing Grammar (Hancock, 1998). Although based on music, this second language course for learning English dissects each song according to its syntactic structures. Each unit has a song as the basis for the lesson; however, all the songs were unfamiliar to this researcher. Since the songs are not commonly heard in the culture, they do not serve as examples of authentic language use and may not provide catchy popular tunes. There are exercises to practice the grammar in the song, for pronunciation and vocabulary usage, as well as comprehension of the song's meaning by checking the appropriate drawing. This text did have one unique feature, in that there is a variety of related games provided one for each unit, which the entire class may play. The method consisted of a three-step approach for children. First, students learned new words through comprehension exercises, not

translation. Once students understood the song's content and main vocabulary items, they are taught to sing the song. Actions are used with the song whenever possible. The final step, the written song, is introduced along with some writing exercises or grammatical explanations-but only if the child is already proficient in reading in the first language.

Total Immersion Program

This generalized technique in foreign language pedagogy "immerses" or "submerges" the student directly and immediately into the target language from the first opening day or hour of class. There are basically two (2) types of total immersion approaches: (a) *effective* and (b) *ineffective*. An *effective total immersion* environment begins wherein the teacher speaks the foreign language slowly, clearly, and uses easily understandable and comprehensible cognates, at least to the best of his or her ability as a foreign language professional educator. These closely and oftentimes immediately recognizable related words may differ only slightly in pronunciation or spelling from the student's native language. Hand gesticulation, appropriate modeling, various *realia* (such as picture files or photos), and sometimes TPR can facilitate such effectiveness. An *ineffective total immersion* approach occurs when the teacher opens class by speaking rapidly at native speed as if the students were residing within the target culture, as if they were inputting the attempted language on an hourly, daily basis.

In essence, in Total *Immersion Program* the student is being treated as if they were living in the country where the foreign language is predominant. Thus, the intended language "goes over the heads" of the students from the very first day of class, thus creating a distancing and ultimate loss of the student's attention and cognitive awareness of just what is being communicated in class. Either type of immersion oftentimes overlaps other methods in second/foreign language acquisition.

The Final Word

In our time, it is hard to escape music and song as it occupies ever more of the world around us: in operating theatres, restaurants and cafés, shopping malls, at sports events, in our cars, and literally everywhere. It would seem that the only place music and song is slow to catch on is in schools. And it is exactly schools, that could use the best and the most the immense potential a song disposes. "Songs have a place in the classroom for helping create that friendly and co-operative atmosphere so important for language learning, but they can offer much more", claims Griffee (2010, p. 6). The world is evolving a common culture and pop songs are its backbone. By using pop songs in your classroom, you and your students are participating in the emerging world culture."

The benefits of music in the classroom are numerous; however some of the principle advantages were discussed in depth. The Mozart Effect provides adequate findings to support the idea that music affects how the brain operates and carries out processes. Music can be used to nurture students and lead them to their highest potential as a learner. Music can lower the number of disturbances created by students because the inclusion of music keeps them engaged more of the time. Also, research has shown that students learn better and cooperate with each other more when there is music playing in the background while they are completing a task. Students have higher test scores when music is included in instruction because they are more involved and engaged in the lesson; therefore, they are retaining more

knowledge. The power of music in foreign language classrooms is invaluable; chants and songs are used to serve as chunks of comprehensible input so that students can understand, create relevancy and retain the second/foreign language content.

Music can be used and introduced into any classroom because it serves as a resource for the teacher to gain a sense of effective classroom management, it is a tool to raise scores and it can be used to learn a second/foreign language. The capabilities of music are important in the realm of education and learning. It is important not to overlook the benefits of regularly using music in the classroom.

Khaghaninejad, Saadabadi and Chamacham (2016) indicated that Mozart music would improve language learning; young students can concentrate and read better in this environment. Maybe one of the reasons of the positive effect of Mozart music on silent reading refers to Chastain's belief. Chastain (1988) indicated that music processing units are stimulated in the right hemisphere of the brain, while the left one controls language processing. On the face of it, these two seemingly isolated tasks are performed independently, and they may not interfere with each other. Correspondingly, as the results of this study demonstrate, exposing students to music, especially Mozart music can improve their reading comprehension and facilitate their arriving at the meaning in their silent reading. They implied that with the help of music, each instructor can not only cover up the noise but also foster his/her students' learning; the results suggested that background music in the classroom has a positive effect not just for the individual, but for the class as a whole.

Music facilitation of L2 phonological perception and production has been the most predominantly studied area. More recent studies elaborated and confirmed Slevc and Miyake's (2006) findings of superior L2 receptive and productive phonology

among musicians, and this collection of results is consistent with the Speech Learning model which states that phonological production and perception of L2 segments are related (Flege, 1995). Furthermore, the L2 facilitation was linked to musical expertise; higher acoustic encoding precision in musicians should benefit various aspects of phonological awareness.

The reviewed findings of literature had practical implications for music teaching and language learning. Collectively, they suggest that music training may play a significant role in human language development by aiding a number of perceptual and cognitive processes required for language acquisition. Thus, integrating music training into L2 programs or encouraging concurrent music and language training can potentially improve foreign language pronunciation, receptive phonology and reading skills. Since music training can facilitate both the tonal and timing aspects of L2 phonology, the implicated facilitation may apply to different language groups, including tonal languages. Tonal contrasts being especially hard to distinguish without prior experience, music could provide a tool for familiarization with musical and lexical tones. In an increasingly globalizing world, it becomes useful to have "perceptual fundamentals": The sensitivity to the key acoustic parameters such as pitch or duration, which would help in learning languages from other language families more easily.

Music is often described as a universal language but it is neither: musical universals across eras and cultures have been stubbornly difficult to find; you cannot order a soda or use the future tense without vocabulary and syntax. However, it may *feel* like a universal language because, for normally developing humans, it underlies the way that we acquire language: as "creative play with sound," it directs our attention to and amplifies the features of speech that we were paying attention

to *before* we were listening for referential meaning. Human creativity, aural abilities, and a desire to communicate underlie both music and language. Listening to music may give us insights into how language sounds to us before we understand it_ and how we experience our world before we have words.

It is well known that music can be a very effective tool for learning a foreign language. As with films in original version, the lyrics of the music are a good source of words and phrases to memorize while having fun. Also, listen or hum foreign songs to improve your pronunciation. Through music, huge waves of words and phrases around us, with extraordinary potential for learning are provided through music's lyrics. But often we do not pay enough attention (passive listening), so it does not improve our language level. Learning a language with music, is trying to deal with linguistic information while doing an activity that we like. The passion for music can be the key to improving language acquisition. The following lines present some techniques which may be helpful to language learning through music.

- **Choose the song you like:** There is no need to go further to choose what music to listen to. The advice is to start with the songs you already listen. Then find the lyrics you love. We hear a dozen times a day our favorite songs, but maybe we do not pay enough attention to their content and meaning of their words. I think you now know that repetition is one of the most important factors in learning a foreign language.
- **Try to sing or hum without looking:** If you want to improve your pronunciation, it is important to try to sing in trying to have the best possible pronunciation without reading the lyrics. Indeed, when one tries to sing reading the lyrics, our bad pronunciation habits will resume. It does not matter if you do not understand the meaning of what you sing, most in this step is to properly pronounce. An additional step would be to try to write the lyrics by listening. This is a very good exercise.

- **Listen to the song while reading the text:** Find the lyrics by surfing the net and googling the name of the song. It seems that the sites that have both the original text and the translation would be more beneficial for the language to improve. In this way, you can, if you wish, listen to your favorite music while reading its words. It is time to listen to music with lyrics, one may be surprised to find words and phrases you already know without being aware of it. In fact, it is not always easy to understand the words of a song in a foreign language. Focus on phrases of interest or maybe just the chorus. If you already know the chorus of your favorite songs, this is sufficient for you to learn hundreds of words and phrases in foreign languages.
- **Listen again and start singing:** Now that you know the lyrics and understood the general sense, then you can continue to listen to it while singing it. Once you have chosen your favorite song, you will definitely want to sing it while doing other activities like, for example, driving a car, in the shower… After a while, you will eventually memorize the song! Repetition is one of the fundamentals of memorization.

Challenges and caveats

It is somewhat controversial to claim that speech is processed as a special form of music. Many have claimed that speech and music are separable modular systems (e.g., Peretz and Coltheart, 2003). Such a separation has even been claimed to be innate, given evidence that infants show left hemispheric lateralization for speech perception and right hemispheric lateralization for frequency perception (Dehaene-Lambertz et al., 2002). However, these hemispheric asymmetries may reflect cortical specialization for more general auditory properties rather than specificity for

speech or music *per se* (e.g., a left hemisphere specialization for rapid temporal processing). Although the hemispheric division of labor is likely not straightforward (Telkemeyer et al., 2009), the insight remains that hemispheric differences likely reflect processing asymmetries in aspects of auditory processing rather than specializations for speech or music.

Furthermore, other work does not support this early specialization for language, showing either no lateralization for speech stimuli (e.g., Dehaene-Lambertz, 2002; Kotilahti et al., 2010), or even *right* hemispheric lateralization for speech (Perani et al., 2011) that closely parallels activation to music in an earlier study (Perani et al., 2010). These findings suggest that hemispheric specialization emerges over the course of development. In further support for this idea, early damage to the right hemisphere tends to lead to more severe later language problems than early damage to the left hemisphere.

A second powerful argument for the neural separation of music and language comes from the dissociation of musical and linguistic abilities sometimes seen in brain damaged patients. Musical deficits can occur without linguistic deficits. Linguistic deficits can accompany preserved musical processing as well; for example, the Russian composer Vissarion Shebalin continued to compose after a series of strokes left him with profound language deficits. Such cases provide strong evidence for some degree of music/language separation, however, they may reflect damage to abilities that have become specialized and neurally separated over development. Supporting this claim, all reported cases of preserved musical processing accompanying linguistic deficits involve professional musicians, who one might expect to show a relatively higher degree of specialization (Tzortzis et al., 2000).

One might also object to the thesis that language acquisition is inherently musical based on a wide range of evidence that language acquisition is inherently a *social* process. For example, the effectiveness of the sorts of infant directed communication may be in part musical, but clearly one of the main reasons for the capture of attention is that infant directed communication is highly socially and emotionally expressive (Trehub, 2003; Zedda, 2005). Music is well suited for this sort of communication, however, it is not *only* music that can have these effects; sign language speakers also use infant directed *sign language*, and both deaf and hearing infants prefer this "sign motherese" to adult directed sign language (Masataka, 1996).

The fact that deaf children are able to learn sign languages (at least when receiving appropriate input) may seem especially problematic for the view that musical perception underlies language learning. However it may be that the very aspects of music that are advocated here_ especially its nature as a flexible and constantly evolving form of expression_ make it well-suited to adapt even to different modalities. In particular, the rhythmic and expressive nature of gesture and sign babbling might be a sort of visual parallel to the music of speech.

Some conceptual and methodological issues of these studies and the research area need careful consideration. Posedel et al. (2011) examined the phonological production, and made attempts in finding mediating factors between music and L2 and implied that it is reasonable to expect musical pitch discrimination skills to link with pitch in speech comprehension, which would then relate to L2 phonological production.

In addition Sadakata and Sekiyama (2011) looked at 'late' L2 learners, some of whom were experts in the music domain, whereas Herrera et al. (2011), François et al (2012), and Gopinath (2013) considered young children whose brains were still at the

developmental phase, and music was introduced while L1 and L2 skills were still emerging. The latter studies have an advantage in the participants' age, since there might be a sensitive period, namely around seven years, beyond which music-induced structural alterations in the brain are less salient (Habib & Besson, 2009). Accordingly, because the adult musicians' brains would have already been impacted by structural and functional changes, it is problematic to distinguish whether it could have been early musical training or gained expertise over long practice that positively affected L2 learning.

While the studies examined the potential benefits of musical training or expertise on L2 proficiency separately, the relation between short-term musical lessons, musical expertise, and the effects of both on L2 remain unclear. To date there have been few attempts made to link the effects of the amount and the continuity of musical training (Delogu, lampis & Belardinelli, 2010), and, therefore, more longitudinal studies looking at various age groups of musicians and non-musicians learning a L2 would be useful to study and elucidate the potential causal link. Since most of the articles used quasi-experimental design, it is possible that other factors underlie music-L2 transfer. For example, individual differences such as motivation to excel in learning or predisposition to music or language, openness to experience and conscientiousness may explain why musicians are better at certain L2 skills. Therefore, only studies using longitudinal designs could reliably demonstrate that the positive transfer is a result of music training.

There are many other questions that need to be addressed before the nature of music and language and its entanglement in the brain (infant or adult) can be satisfactorily resolved. There are very few studies of infant timbre processing, nor has much work investigated timbre processing in dyslexia, SLI, or other language

disorders. Testing timbre discrimination, especially of instrumental attacks using both native and non-native instrumental timbres, would be informative. If it were shown that phonemic processing was innately separate from the processing of musical timbre, it would raise substantial questions about our claims. Research on musical development between 12–24 months of age is scarce, perhaps simply because infants of that age are difficult to test; closing this gap would contribute to our understanding of the co-development of music and language. Finally, more research into music and linguistic processing in non-western cultures is needed. Until research addresses language and music from a broad cross-cultural context, any claims must be circumscribed within a specific cultural context.

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