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MUSIC IN TEFL: FROM JOINT EVOLUTIONARY PATHWAYS TO CURRENT INTEGRATION ISSUES

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Abstract. *Language and music are two distinct cognitive domains, but seem to possess substantial similarities. This article investigates these similarities from different perspectives and looks at previous research on the topic. First, there is strong evidence on the evolutionary pathways of the two domains to support the claim that both language and music evolved from the same precursor. Language and music also share a number of features at the level of sound and hierarchical structure. Furthermore, they are interrelated in terms of cognition and neurology. Finally, the integration of these two areas has been successfully put forward in education. A number of scholars have reported positive results in their studies and research on the impact of music on the formation of cognitive and language skills in particular, with an emphasis on music as a mnemonic tool. Several didactic trends and theories on distinct learning styles, intelligence and aptitudes also favour a musical approach and discuss the musical learner among other types. Highly applicable benefits of music integration have been noted and extensively reported on in the development of English as a foreign language (EFL), with a focus on pronunciation. This paper also aims to test the influence of music on language acquisition and reports a positive transfer of musical instruction to particular phonetic aspects of English speech among a cohort of international EFL students. The subjects in this group improved their ability to distinguish between and produce rapidly changing target sounds, stresses and vowel reduction when they were treated with music.*

Keywords: *music, language, evolution, cognition, EFL, phonetic, reduction*

Introduction

It is usually assumed that individuals have separate faculties for language and music – and, indeed, they are two distinct cognitive domains. However, they also seem to possess a number of substantial similarities. Research into the relationship between language and music has been approached from a vast range of disciplines and varies from general typological theories describing feasible common origins to distinct experimental approaches looking into the parallels between the two. This article examines the evolutionary, structural, cognitive, neurological and educational commonalities in language and music, and aims to test the effects of exposure to music on the production of language production – namely, on particular phonetic aspects of speaking English as a foreign language (EFL) among international students.

The duality of language and music can be observed in the evolutionary pathways of the two domains testimony two uniquely interrelated human-specific manifestations (Brown, 2000; Mithen, 2005). Moreover, language and music share multiple features at the level of sound and hierarchical structure, with both systems using complementary rule-governed combinations of a restricted number of elements to originate meaningful signals (see, for example, Bernstein, 1976; Jackendoff, Lerdahl, 1982; Patel, 2008). Growing evidence also suggests that language and music are interrelated in terms of cognition and neurology (for example, Gfeller, 1986; Rauscher et al., 1993; Wallace, 1994; Moreno, Besson, 2006; Schellenberg, Peretz, 2008). Finally, the combination of language and music has been prosperously reflected in a number of pedagogical experiments revealing that musical expertise positively influences diverse aspects of education, including speech processing from auditory perception to speech production (Palmer, Kelly, 1992; Besson et al., 2007; Milovanov, 2009; Mora, Gant, 2016). Arguments for using music in an educational context and the plausible advantages that have been noted are supported by a number of didactic theories and trends with regard to distinct learning styles, intelligence and aptitudes (Krashen, 1987; Gardner, 1983, 1991). The influence of musical expertise seems to enhance learning capacity for auditory learners and facilitate the acquisition of information.

1. Evolutionary pathways

There is strong evidence with regard to the evolutionary pathways of the two systems to support the idea that both language and music have strong biological similarities and evolved from the same precursor. As Darwin (1871) famously noted, language emerged from ancient musical-type communication: "As we have every reason to suppose that articulate speech is one of the latest, as it certainly is the highest, of the arts acquired by man, and as the instinctive power of producing musical notes and rhythms is developed low down in the animal series, it would be altogether opposed to the principle of evolution, if we were to admit that man's musical capacity has been developed from the tones used in impassioned speech. We must suppose that the rhythms and cadences of oratory are derived from previously developed musical powers"[1].

1 Darwin, C. R. *The Descent of Man, and Selection in Relation to Sex*. London: John Murray, 1871, p. 12.

Brown (2000) developed and proposed the "musilanguage" model, in which he draws comparisons between language and music in the layers of combinatorial syntax and intonational phrasing[2]. The scholar claims that from an evolutionary standpoint, each of language and music derived from a common set of principles dealing with phrases and phrasing. To investigate the issue, he suggests adopting a double perspective and differentiates between shared ancestral and analogous features. Shared features, as Brown puts it, "have their roots in the common evolutionary origins of music and language", while analogous features "arise due to the parallel but independent emergences of similar processes during the evolution of music and language"[3].

Further on, Brown proposes five possible models for evolutionary convergence: first, he makes assumptions about genuinely parallel evolution; second, he says that "the similarities could have arisen from continuing interaction between discrete music and language modules"; third, he suggests that music could have evolved as an "outgrowth of language"; fourth, that language could, vice versa, have evolved as an "outgrowth of music"; and finally, Brown suggests that "these similarities could have arisen due to the occurrence of an ancestral stage"[4]. After considering these alternatives, the scholar favours the latter and calls it the musilanguage model. Even though this evolutionary perspective has often been debated, language and music are still seen in many studies as descendants of a parallel half-musical precursor.

Brown's model is also compatible with the views of Mithen (2005). Guided by the belief that both communication systems originated simultaneously and had a shared precursor, Mithen provides evidence from primate studies and research into child development, neuroscience and psychology, as well as from archaeological and fossil records. The scholar is in favour of a holistic approach and suggests that the premodern communication of our ancestors involved the "extensive use of variation in pitch, rhythm and melody to communicate information, express emotion and induce emotion in other individuals"[5]. From this viewpoint, this sophisticated vocal communication induced not only emotions, but also changes in behaviour, which possibly brings language and music to a common origin. Mithen's shared foundation for premodern musical and linguistic vocal behaviours incorporates several components under the onomatopoeic acronym "Hmmmmm", standing for holistic, manipulative, multi-modal, musical and mimetic[6].

2. Hierarchical structures

Language and music also both rely on vocal and auditory modalities – thus involving production and listening stages – and each contains acoustic information that can be written and notated. Moreover, they share a number of features at the level of sound and hierarchical structure (for example, see Jackendoff, Lerdahl, 1982; Brown, 2000; Patel, 2008).

2 Brown, S. The "Musilanguage" Model of Music Evolution. In: Wallin, N. L.; Merker, B.; Brown, S. (eds.). *The Origins of Music*. Cambridge, Massachusetts: MIT Press, 2000, p. 275.

3 *Ibid*., p. 274.

4 *Ibid.*, p. 275.

5 Mithen, S. *The Singing Neanderthals: The Origins of Music, Language, Mind and Body.* London: Weidenfeld and Nicolson, 2005, p. 98.

6 *Ibid.*

Brown (2000) suggests that "in both, a limited repertoire of discrete units is chosen out of an infinite number of possible acoustic elements, such that phrases are generated through combinatorial arrangements of these unitary elements"[7]. This implies that the similarity between language and music seems to also lie in the generation of higher-order structures. A key, undeniable point of connection between the two is that both rely on the analysis of sound. Analogies extend beyond the segmental level and can be found in more complex structures. The categorisation of sounds and their combination into larger units both in language and music seem to follow similar rule-governed sequences to originate hierarchically arranged signals[8]. Several theorists have established formal systems for the analysis of such hierarchical structures in language and music (see, for example, Schenker, 1969; Bernstein, 1976; Jackendoff, Lerdahl, 1982, 2006; Jackendoff, 2009; Patel, 2003, 2008).

Schenker (1969) laid the groundwork for describing musical structures hierarchically, characterising musical events as being elaborated (or prolonged) by other events in a recursive fashion[9]. Later, Bernstein (1973) presented an extensive study on the structurising of music and suggested links between several hierarchical categorisations in language and music. He suggested that language and music are two richly structured systems and proposed "musical grammar", primarily targeting tonal and metrical structure as compared to linguistic syntactic theory[10]. In fact, Bernstein's musical grammar was evidently akin to the transformational-generative grammar of Chomsky. Even though Bernstein argued extensively for clear structural parallels between language and music, as well as developed musical phonology, syntax and semantics, his attempts were more intuitive than scholastic.

More recent studies have also targeted the resemblance in the fine-scale organisation of language and music, recording significant structural parallels between the two. Jackendoff and Lerdahl (1982, 2006) investigated the hierarchical organisation of elements in music and developed the generative theory of tonal music (GTTM)[11]. They emphasised that both systems (linguistic and musical) are highly analogous rhythmically, as they have similar hierarchical metrical systems. The pair noticed that the syllable as the minimal phonological metrical unit corresponds in a way to a beat in the linguistic metrical grid, while a single note as an analogue in music can subtend multiple beats – meaning a beat can be subdivided by multiple notes. This theory includes four interacting hierarchical components: grouping, meter and two kinds of pitch hierarchy, time-span reduction and prolongational reduction. Moreover, the scholars said that the most discernible commonality in language and music was intonational phrasing (or breath groups)[12].

The hierarchical commonalities between the two modalities were also investigated by Patel (2003, 2008), who did not try to adapt specific linguistic concepts to music, but

7 Brown, S., p. 273.
8 Fitch, W. T. Production of Vocalizations in Mammals. In: Brown, K. (ed.). *Encyclopedia of Language and Linguistics*. Oxford: Elsevier, 2006, p. 115–121.
9 Schenker, H. *Five Graphic Analyses (Fünf Urlinie-Tafeln)*. New York: Dover, 1969.
10 Bernstein, L. *The Unanswered Question*. Cambridge, Massachusetts: Harvard University Press, 1976.
11 Jackendoff, R.; Lerdahl, F. *A Generative Theory of Tonal Music*. Cambridge, MA: MIT Press, 1982.
12 Jackendoff, R.; Lerdahl, F. The Capacity for Music: what is it, and what's special about it? *Cognition*. 2006, 100(1): 33–72.

instead suggested an abstract "syntactic architecture" of linguistic and musical sequences. He proposed a shared syntactic integration resource hypothesis (SSIRH), arguing that language and music contain separate representations (such as nouns and verbs in language, compared with tonal functions in music), but enrol a shared set of cognitive resources needed to assimilate these isolated representations into evolving sequences[13].

Thompson-Schill et al. (2013), meanwhile, hypothesised a relationship between linguistic and musical strings, describing the elements in the strings as hierarchies that capture relationships in meaning between the elements beyond their temporal order[14]. Bod (2002) investigated the possibility for a unified model of structural organisation in language and music. Using data-oriented parsing (DOP) models and combining them with the principles of simplicity and likelihood, he showed that exactly the same model with the same parameter settings achieves maximum accuracy for both language and music – thus concluding that a parallel definitely exists between linguistic and musical structuring[15].

3. Cognition and neurology

Some evidence for the parallels between language and music comes from the fields of cognition and neurology. A number of scholars (see, for example, Wallace, 1994; Hodges, Gruhn, 2012; Haut, Hoemberg, 2014; Moreno, Besson, 2006; Schellenberg, Peretz, 2008) have reported positive results in their research on the impact of music on the formation of cognitive and language skills in particular, putting a special emphasis on music as a mnemonic tool that facilitates representation and memory. The cognitive and mnemonic effect of music is definitely related to neurology. With regard to the brain, earlier ideas (for example, see Bever, Chiarello, 1974) acknowledged the different roles for each hemisphere in processing musical and language information, with speech functions localised in the left side and associated with propositional, analytical and serial processing, and music functions in the right hemisphere of the brain and related to appositional, holistic and synthetic reasoning[16]. This traditional view has recently been challenged, with innovative approaches revealing totally new perspectives on the neural and psychological foundations of music and speech, and proposing that hemispheric asymmetries for speech and music do not reflect cortical specialisation for the two domains. Recent research provides evidence that language and music function in common in the brain and that various neural modules are similarly involved in both (Tallal, Gaab, 2006; Slevc, 2012).

Given that both language and music involve similar processes in the brain, a vast number of studies have demonstrated that speech functions may benefit from music

13 Patel, A. D. *Rhythm in Language and Music. Parallels and Differences*. New York: New York Academy of Sciences, 2003.

14 Thompson-Schill, S., *et al*. Multiple Levels of Structure in Language and Music. In: Arbib, M. A. (ed.). *Music, Language and Brain*, 2013, p. 289–303.

15 Bod, R. A Unified Model of Structural Organization in Language and Music. *Journal of Artificial Intelligence Research.* 2002, 17: 289–308.

16 Bever, T. G.; Chiarello, R. J. Cerebral Dominance in Musicians and Non-musicians. *Science*. 1974, 185: 537–9.

functions and vice versa (Gfeller, 1986; Wallace, 1994; Hodges, Gruhn, 2012; Haut, Hoemberg, 2014). It appears that neural activities linked to music work deeper in the auditory cortex and influence the frontal, temporal, parietal and subcortical areas that are related to attention (Schellenberg et al., 2007), semantics and syntactic processing, and memory and motor functions (Koelsch et al., 2004).

Gfeller (1986) examined the potency of melodic-rhythmic mnemonics as an aid for short-term memory, concluding that musical expertise may be a useful aid for information retention among all students (including those with disabilities)[17]. In a study on musical exposure, Rauscher et al. (1993) reported that listening to a sonata by Mozart generated short-term increases in spatial-reasoning abilities – something that was later called "the Mozart effect"[18]. Moreno et al. (2006) discovered that musical expertise improved behavioural performance and modified brain substrates not only in the musical domain but also in other domains[19], and Wallace (1994) found that a melodic text was much easier to recall rather than a spoken text[20]. Meanwhile, research by Montgomery (2012) on song-based picture books and their connections to early development of literacy in children supported the idea of a positive effect of music on language[21]. In an ELT context, music might therefore be a potential device for improving language abilities. However, the most detectable elements noted in language acquisition from the language-music integration process relate to the activation and formation of phonetic skills (Palmer, Kelly, 1992; Mora, 2000; Besson et al., 2007; Milovanov, 2009; Mora, Gant, 2016). Music and rhythm have been defined as powerful aids for language learning, memory and recall, as well as mechanisms that improve sensibility and concentration, and that favour physical development and psychological well-being.

4. Educational trends

Cognitive and neurological studies are also in line with various didactic trends and theories on distinct learning styles, intelligence and aptitudes (Krashen, 1987; Gardner, 1983, 1991; Fleming, 2001; Milovanov, 2009), proposing that musical instruction aids the potential to nurture diverse learning styles and positively effects not only linguistic, but also overall cognitive and psychological skills, as well as reinforcing their stimulation and formation.

According to Krashen (1987), the so-called language acquisition device (LAD) is stimulated if learners are provided with comprehensible input in a low-anxiety context[22]. Exposure to music and songs in particular is an inexhaustible source of auditory and

17 Gfeller, K. E. Musical Mnemonics for Learning Disabled Children. *Teaching Exceptional Children*. 1986, Fall, 28–30.
18 Rauscher, F. H.; Shaw, G. L.; Ky, K. N. Music and Spatial Task Performance. *Nature*. 1993, 365: 611.
19 Moreno, S.; Besson, M. Musical Training and Language Related Brain Electrical Activity in Children. *Psychophysiology*. 2006, 43(3): 287–91.
20 Wallace, W. T. Memory for Music: effect of melody on recall of text. *Journal of Experimental Psychology: Learning, Memory, and Cognition*. 1994, 20(6): 1471–1485.
21 Montgomery, A. P. Bridging the Advocacy Gap with Song-based Picture Books. *Canadian Music Educator*. 2012, 54(2): 41–44.
22 Krashen, S. D. *Principles and Practice in Second Language Acquisition*. Englewood Cliffs, N.J.: Prentice-Hall International, 1987.

written stimuli. Moreover, the relaxation effect lowers the affective filter, which is a prerequisite for successful learning.

Gardner's (1983) theory of multiple intelligences (MI) radically changed the understanding of traditional intelligence. He suggested that intelligence is "the ability to solve problems or to create fashion products that are valued within one or more cultural settings and proposed to dwell on the learner as holding the capacity to comprehend, absorb as well as transmit the information in many modalities rather than a single general one"[23]. In other words, Gardner sees intelligence as an element of biopsychological potential that can be influenced by experience, culture and ways of knowing, understanding and learning about the world, as well as motivational factors. All in all, he formulated a list of seven intelligences (later adding two more), among which he defined a group of learners with musical intelligence or musical-rhythmical modality – in other words, individuals who absorb information easily through the auditory channel and are sensitive to sounds, rhythms and tones. He also asserted that "all normal (non-brain-damaged) people possess some musical intelligence"[24], so are auditory learners to a certain extent. The theory of Fleming (2001) on distinct learning styles also distinguishes auditory learners among visual and kinesthetic[25]. Musical instruction, in turn, serves as a perfect auditory channel for musical or auditory learners and helps them learn best by hearing information.

A number of studies have also examined the influence of musical aptitude – a measure of one's potential for music learning and the foundation of musical achievement[26] – on the acquisition of foreign languages. In many cases, a relationship has been reported between the musicianship of learners and positive EFL results. Milovanov (2009) suggests there is a connection between musical aptitude and linguistic abilities relating to a second language. His research found that the higher the musical aptitude, the better the pronunciation skills for a second language and the more prominent the sound-change-evoked brain activation in response to musical stimuli[27].

5. Research data, methods and results

In light of the evolutionary, cognitive, neurological and educational parallels between language and music, the current paper also aimed to test the effects of the transfer of musical instruction on particular phonetic aspects of English speech among a cohort of international students of English as a foreign language (EFL). Due to the specific stress-timed nature of English rhythm, EFL learners often struggle to produce natural sentence rhythm, differentiating between strong and weak syllables and employing vowel reduction.

23 Gardner, H. *Frames of Mind: The Theory of Multiple Intelligences*. New York, NY: Basic Books, 1983, p. 81.
24 Gardner, H. *The Unschooled Mind: How Children Think and How Schools Should Teach*. New York: Basic Books Incorporation, 1991, p. 285.
25 Fleming, N. D. *Teaching and Learning Styles: VARK strategies*. New Zealand: Christchurch, 2001.
26 Gordon, E. E. *Music Education: The Forgotten Past, Troubled Present, and Unknown Future.* PA: GIML, 1997, p. 25.
27 Milovanov, R. The Connectivity of Musical Aptitude and Foreign Language Learning Skills: Neural and Behavioural Evidence. *Anglicana Turkuensia. 2009,* 27: 1–56.

The cohort of internationally diverse students (n = 14) comprised EFL learners aged 16 to 18 from a number of countries around the world, including France, Italy, Russia, Spain, Lithuania, Kazakhstan, Iran, China and Japan, who had met in London for a course in English lasting a few weeks. A quasi-experimental classroom research design with pre-test, post-test and delayed post-test phases was used.

The pre-test involved the reading of 10 selected sentences that were expected to be read rather rhythmically and smoothly by the subjects, as well as with the natural employment of strong and weak syllables and vowel reduction where appropriate. Records were taken and transcribed by the author of this article, who was also the facilitator and instructor of the research. Next, the subjects underwent double musical instruction, which involved: a) rhythmically chanting the sentences along with a musical accompaniment specially designed by the instructor as background; b) singing the sentences along with specially designed tunes that were added to the rhythmical patterns. The post-test exercise involved the same task as the pre-test, with the subjects reading the 10 sentences rather rhythmically and smoothly, as well as using vowel reduction where appropriate. Finally, a delayed post-test was performed two weeks later to measure the amount of information retained in the memory compared with the post-test results.

All speech samples in the pre-test, post-test and delayed post-test phases were recorded and transcribed. Non-categorical statistical measurements were possible, given that forms of variation in stress patterns were acceptable if they sounded logical. A qualitative analysis was used to examine the results.

The variables targeted by the test were a number of target vowel (TV) phonemes in stressed positions, namely /ɑː/ /e/ /æ/ and /ɜː/, as it was noted that the subjects struggled with the production of these sounds, as well as the stress position (SP) on meaningful words in phrases and qualitative vowel reduction (VR). Vowel reduction was expected in the target positions that are prosodically or morphologically weak – in particular, on unstressed syllables or affixes. Roach (2002) refers to this process as “one of weakening, where vowels tend to become more schwa-like (i.e. they are centralised)”[28].

The results of the variables cited above were reported as manifested in the pre-test, post-test and delayed post-test. The data revealed that the subjects demonstrated considerably superior skills in the post-test after musical treatment compared to the pre-test in all the variables examined. The highest scores were observed in the production of TV phonemes, for which the emphasised nature (in quality, loudness, pitch and strength) of stressed positions meant the musical rhythms seemed to automatise the production of these phonemes. In the recall task, the particular variable also appeared to be best retained in memory, with the subjects 30 per cent more accurate in the pronunciation of TV phonemes than in the pre-test, and approximately the same percentage worse then in the post-test. Sentence stress positions were also identified more easily in both the post-test and delayed post-test, and exhibited more unified patterns compared with the first performance. Vowel reduction manifested much more often in the post-test than in the pre-test, although the relatively high scores were lost in the delayed post-test.

28 Roach, P. *Glossary – a Little Encyclopaedia of Phonetics*. 2002, [accessed 25-09-2018]. https://www.peterroach.net/uploads/3/6/5/8/3658625/english-phonetics-and-phonology4-glossary.pdf, p. 73.

Conclusions

This paper reviewed scholastic evidence for the interrelationship between language and music, particularly in terms of evolution, cognition, neurology, education and foreign language acquisition. Music was defined as a powerful aid for language acquisition, memory and recall, as well as a tool to improve sensibility, concentration and psychological well-being. The influence of music on language acquisition was tested in a classroom experiment, with a positive transfer reported of musical instruction on particular phonetic aspects of English speech among a cohort of international EFL students. After musical treatment, the subjects were more successful in distinguishing between and producing rapidly changing target sounds, stresses and vowel reductions.

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MUZIKA ANGLŲ KAIP SVETIMOS KALBOS MOKYME: NUO EVOLIUCINIŲ BENDRUMŲ LINK ŠIUOLAIKINIŲ INTEGRUOTO MOKYMO ASPEKTŲ

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Santrauka. *Kalba ir muzika – dvi skirtingos kongnityviojo pažinimo sritys, tačiau jos turi ir esminių panašumų. Šiame straipsnyje tiriami kalbos ir muzikos panašumai atsižvelgiant į įvairius požiūrius, ankstesnius šiose srityse atliktus tyrimus. Pirma, evoliucinėje eigoje besiformuojant dviem skirtingoms sritims aptinkama daug įrodymų apie kalbos ir muzikos ištakų bendrumą. Žvelgiant toliau, pastebima, kad ir muzika, ir kalba savo garsine ar struktūrine hierarchija apibūdinamos bendromis charakteristikomis. Be to, kalba ir muzika artimos ir kognityvios sąmonės bei neurologijos srityse. Taip pat svarbus argumentas – šių žmogiškųjų išraiškos potencialų integravimas sėkmingai taikomas mokant. Tyrėjai pateikė pozityvias išvadas apie savo atliktų eksperimentų ir muzikos poveikio formuojant kognityviąją sąmonės sritį ir ypač kalbos gebėjimus taikant muziką kaip mnemoninę priemonę tyrimų išdavas. Atskiros didaktinės mokyklos ir teorijos apie mokymosi stilių, išmanumų ir gebėjimų įvairovę išskiria mokymą muzikos priemonėmis ir įvardija muzikinį mokymosi stilių tarp kitų mokymosi stilių. Pastebėtas ir plačiai aptariamas itin sėkmingas muzikos, ir ypač jos tarimo, taikymas. Šiame straipsnyje taip pat siekiama išmatuoti muzikos įtaką siekiant įsisavinti kalbas ir pažymėti skatinantį muzikos mokymo metodo poveikį fonetiniam anglų šnekamosios kalbos formavimui tarptautinėse studentų grupėse mokantis ASK. Pastebėta, kad tiriamieji pagerino gebėjimus atpažinti ir atkartoti skubiai kintančius tikslinius garsus, kirčius ir balsių redukciją mokydamiesi su muzika.*

Reikšminiai žodžiai: *muzika, kalba, evoliucija, kognityvumas, AUK (EFL), fonetika, redukcija*

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