

MUSIC AND LANGUAGE: DIFFERENT PERSPECTIVES

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ABSTRACT: This paper surveys literature on the studies that relate music to language from two distinctive yet complementary perspectives/intellectual threads (sub-fields), which current ethnomusicological discourse concerns: anthropological and empirical (cognitive musicology). Highly interdisciplinary in nature, the research in each area seeks to approach the question of music and language from different angles. In this paper I investigate the current state of research by answering these primary questions: 1) What are the types of approaches taken in overall research designs? 2) What has been done in each of these two sub-fields of music and language, including their historical development, intellectual foundations, topics and results of investigation in recent developments? 3) Our current understanding and the outlook for the fields as to the central question that defines the field: the relationship between music and language.

o. INTRODUCTION

Recent years have witnessed a continuously growing interest in the comparative research on music and language, ranging from anthropological (Feld 1974; Feld&Fox 1994; Feld&Fox 1999; McLeod 1974; Faudree 2011) to structural/formal cognitivist approaches¹ (e.g. Lerdahl and Jackendoff, 1983; Pesetsky et al., 2009; Besson and Friedrici, 1998). The breadth of the types of research that can possibly contribute to the understanding of this subject is vast, as exemplified by Patel's book *Music, Language, and the Brain* (2008), an attempt to draw comparisons between music and language by synthesizing a huge body of literature including those from musicology, ethnomusicology, anthropology, music theory, linguistics, cognitive science, neuroscience, and evolutionary biology.

Methodologically, the two sub-fields contradict and complement each other. A humanities/social science approach is predominant primarily in the fields of anthropology (especially linguistic anthropology) and ethnomusicology, both sharing much common intellectual foundations and theoretical frameworks, as well as topics of research interest focusing on the study of music and/or language within the context of human culture/society. In contrast, music cognition takes

1 In this article I use the two terms "anthropological" and "cognitivist" to represent the two distinctive yet complementary approaches to music and language research, within the field of ethnomusicology (which is by its very nature an interdisciplinary scholarly endeavor). In order to be clear, for the rest of this essay I shall therefore not be using the term ethnomusicology/ethnomusicological to denote any of these two approaches, despite the fact that ethnomusicology has been largely moving toward a decisively anthropological perspective in the recent decades.

formal/scientific methodology as its point of entry, and in most cases studies the music and/or language as an independent mental object abstracted/detached from its cultural context and fluidity of usage in order to observe patterns based on mathematical models of distribution.

Research and discourses on music and language has a long history into the ancient worlds (Patel 2008:3). Historically, the study of modern ethnomusicology on this subject has taken intellectual detours before it developed toward a decisively anthropological direction (Feld&Fox 1994) in the 1980s, which continues to define the essential nature of the majority of ethnomusicological research until this day. Widely criticized and discredited by many prominent scholars in the field (Feld 1974; Blacking 1971; Blacking 1982; Feld 1991; Hatten 1980), the outputs of these earlier detours toward the analytical/formal linguistic approaches to music and language were deemed as being unable to yield productive and meaningful results. Rather, criticisms arose contending it to be a mere exposition of the application of the formal approaches themselves in a rather unconvincing manner. Since the 1980s, research in ethnomusicology and linguistic anthropology paralleled each other by sharing the basic stance of viewing music and/or language in its deeply embedded local and translocal forms, social imagination, activity, experience, emphasizing the social, pragmatic, constitution of the musical and/or linguistic structure emerging in discourse, performance, textuality, and poetics (Feld&Fox 1994:25).

In the meantime, the last decade has also seen the gradual revitalization of growing interest in the analytical/formal/cognitivist approaches to music and language. As the Society of Ethnomusicology 2008 National Meeting Pre-Conference Symposium on Cognitive Ethnomusicology (and the increasing visibility of the paper sessions/panels devoted to the subject in recent annual SEM meetings, as well as publication in music cognition journals by ethnomusicologists²) has demonstrated, the interdisciplinary endeavor of ethnomusicology and music cognition coming together is an exciting new area of research that contributes to our understanding of human music perception from a different angle. This also represents a ground-breaking revival of study of music cognition by bringing together the latest research tools (such as brain imaging technology) that were unavailable thirty years ago, and a broad understanding of music as a cross-cultural phenomenon found in all human societies (which is also true for language) by the ethnomusicologists.

In this essay I present an overview of the recent literature found in these two complementary perspectives on music and language, as it is related to the study of ethnomusicology. Primary research questions include: 1) What are the types of approaches taken in overall research designs? 2) What has been done in each of these two sub-fields of music and language, including their historical development, intellectual foundations, topics and results of investigation in recent developments? 3)

² See for example, McGraw, AC. (2008) The Perception and Cognition of Time in Balinese Music. *Empirical Musicology Review*, v3 n2 (April 2008), 38-54. For cognitive musicology papers in SEM meetings, see SEM annual meeting programs and abstracts (2007-), downloadable from SEM website.

Our current understanding and the outlook for the fields as to the central question that defines the research question: the relationship between music and language.

I MUSIC AND LANGUAGE: ANTHROPOLOGICAL PERSPECTIVE

This section focuses on the research literature on music and language from the anthropological perspective, which is predominant in ethnomusicological research. A major literature worth mentioning here is the review entitled “Music and Language” by Feld and Fox in the Annual Review of Anthropology (Feld&Fox 1994). In that review, Feld&Fox identified the historical trajectories, major issues, approaches, methodologies, intellectual foundations, among others, of the existing research on music and language. Drawing from 379 entries from previous literature, the Feld&Fox is no doubt the most comprehensive yet effective and concise review that characterizes the vast field of music and language research to that point,(and in fact, to this day as well, although 20 years have passed) largely from an anthropological perspective (although the cognitivist approach is not strictly excluded). Although written almost 20 years ago, many claims and characterizations/summaries from that review are still worth examining today for an effect grasp on what happened in the field (and to a large extent what is happening). Indeed, in the recent years, although the research trends and technologies changed, the major types of issues on music and language from research literature since 1994 to this day have not appear to fall outside of those identified by Feld&Fox. For this reason, I divide my review on the anthropological perspectives into three sections: (1)a brief outline the major themes of music and language research; (2)pre-1994 research literatures; and (3)the recent literature and trends(also drawing on the next review on music and language to appear in the Annual Review of Anthropology by Paja Faudree, Brown University) (Faudree 2011).

Music and Language: Major Types of Issues in Anthropological Approach

This section focuses on the types of research questions and methodologies that ethnomusicologists have adopted in approaching the anthropological endeavors of music and language. In the next section, research literature up to the 1990s from each type will be briefly reviewed (both the identification of types and the literature review are to a great extent based on the Feld&Fox 1994 Review, with my own reorganization, emphasis, discussions, evaluations, and critique).

I begin by drawing an outline of the types of research questions, and a concise explanation of them, before diving into the individual sections (note that these terms are defined and organized here in a slightly different manner than the Feld&Fox 1994 review in terms of its scope—please refer to the following definitions when reading through the rest of the text):

(1) Music as language: viewing the musical structure as equivalent to a linguistic structure, an organized sound system with rules and constraints from the human mind in the areas of syntax, semiotics, phonology, etc. This is seen in the application of linguistic formal analysis methodology in music analysis.

(2) Language in music: research with focus on the language phenomena within a musical context, such as song texts, poetics, and the interplay of music and language (e.g., musical tones and linguistic tones, stress, phrasal boundaries, etc.) in the composition process of songs/operas/vocal music.

(3) Music in language: the musical aspect of spoken language, i.e. the prosody of speech, or the paralinguistic elements in language (voice quality, tempo, dynamics). This is a major area of interest for contemporary speech scientists, linguists, phoneticians, etc, and less so for musicologists.

(4) Language about music: the dilemma and predicament from using language to talk about music. An idea put forth by Charles Seeger (the “linguistic predicament” of talking about music), research in this respect also flourished in the study of the semiotics of music (semiology of discourse about music) (Nattiez 1989). As some scholars stated, “talking about music is like dancing about architecture” (Faudree 2011).

(5) Music about language: this area of research focuses on the musical forms acting as speech surrogates, e.g., talking drums, humming and whistling.

(6) Music or language/music-language intersections: research on the interface/intersections of music and language phenomena, such as the investigation of the boundaries of speech and song, and the cross-cultural conception/perception of music and speech (as well as other grey areas and verbal arts forms along the song-speech continuum).

Music and Language: Research Literatures From 1960s to 1990s³

Chronological Shifts

A large-scale trend in ethnomusicological enquiries into music and language is a shift from formal linguistic analytical methodology (music and language as entities abstracted from its social and cultural context) toward a decisively anthropological approach (studying music and language

³ This chronology corresponds with Feld&Fox(1994) and Feld&Fox(1999).

in/as context) over the decades (Feld&Fox 1994:25). A fundamental theoretical stance behind this is that, studying music (and language) as an abstracted form, detached from its cultural context of usage and dynamic change, as well as the human agents within the system, is against the basic theoretical validity established in ethnomusicology to view music in its integrated context of culture and social organization (music in culture and music as culture). Another reason of the shift is the research output itself. It has been criticized that the linguistic formal approach to music analysis did not yield productive and meaningful results that can improve our understanding of music in a substantial way. Rather, many of such studies turned out to be an exposition of the analytical methodology itself, i.e., applying the methodology for the sake of the methodology itself, rather than a consideration of how to better achieve the research goal (for a detailed criticism also this strand see Feld 1974).

Finally, McLeod wrote in her 1974 review that “While the terminology of linguistics is clearly present in this period, very frequently the paper lacks the presentation of the basic materials and the explanation of testing procedures so normal to linguistics. As a result, these first attempts at structural analysis in music tend on the whole to be unconvincing.”

While I do agree on the intellectual weaknesses of applying formal linguistic models to music analysis without carefully evaluating its applicability and the different nature of the structural elements and hierarchical organizations in music and language, it is nevertheless worth pointing out that McLeod did have a valid point. This is due to the differences in the fundamental theoretical hypotheses and working procedures/systematic methodologies for deriving conclusions across the academic disciplines (especially those across humanities, social sciences, and natural sciences), in this case, generative linguistics and musicology. I will not elaborate on this point here. Nonetheless, it is suffice to say that as much as interdisciplinary endeavors contribute to our understanding of our research subjects, one still has to be careful in evaluating the effectiveness of the borrowing, and more importantly, the intactness of intellectual foundations on which convincing conclusions can be reached (and to be successfully communicated across the fields).

Beside the methodological shift, recent decades have also witnessed a shift of focus on research topics in music and language endeavors (as well as specialization), a result of the aforementioned methodological shift. Within the anthropological approach, ethnomusicologist and linguistic anthropologist have seen a shift of research topics from the inner relationship between music and language, to the relationship of music/language to the society, culture, agents, imagination, change, and dynamics of signature. Interestingly, on the other hand, the music cognition endeavor (to be covered in the second part of this paper) flourished since the 1990s has taken up the other topic of specialization, namely, continuing exploring the inner connections and cognitive basis of music and language. The advancement and revitalization of this area of research is largely due to the technological advances in the recent decades. Therefore, different from the formal linguistic approach from before the 1980s, modern cognitive musicology investigates the music and language

cognition with research tools based in empirical methods—cognitive science, brain sciences, experimental psychology, etc. Meanwhile, this revival occurs in a large context of growing research interest in music cognition across several fields (mainly neuroscience and cognitive psychology), making a true interdisciplinary understanding of music and language possible.

Music as Language

The application of formal analytic linguistic techniques to music comprises mainly distributional and generative structural approaches (Feld and Fox 1994:29). This includes comparisons between the distributional organization of musical pitch and the phonetic organization of language (Chenoweth 1972;Chenoweth 1979;Hosokawa 1984;Houghton 1984;Jakobson 1987;Nattiez 1972;Nattiez 1983;Nattiez 1990;Nettl 1958;Ruwet 1967;Springer 1956), harmonic or metrical or motivic organization of musical works and the syntactic organization of language—musical grammar based on the widely influential generative theory (the most representative one is Lerdahl and Jackendoff's *Generative Grammar of Tonal Music*). The criticism of these approaches eventually led to the shift of paradigms within the field, as discussed before. Commenting on the criticisms and the intellectual foundations behind the shift, Feld&Fox (1994: 29-30) wrote that

“Both distributional and generative structural approaches have been criticized from the perspective of an anthropological approach to music, for their reification of musical sound structure as a decontextualized code (Blacking 1971;Blacking 1982;Feld 1974;Feld 1984;Hatten 1980) and for their bias toward the hierarchical, architectonic, and metrically regular art music traditions of Western Europe and, to a lesser extent, other stratified complex societies (Powers 1980). They have also been criticized for their emphasis on discrete, macro-syntactic (melody, rhythm, tonality, mode), score-centric, and transcribed/transcribable dimensions of musical products while excluding gradient, nuanced, emergent, oral/aural, or micro-parameters of musical process like pitch, texture, timbre, tempo, dynamics, and performance (Bolinger 1986;Hatten 1980;Keil 1966;Keil&Feld 1986;Lidov 1977;Raffman 1990;Shepherd 1977;Shepherd 1991).....Despite this potential relevance, cognitivist approaches to music are somewhat removed from engagement with ethnomusicology and anthropology (Shepherd 1977;Mannheim 1987;Feld 1984;Blacking 1971;Blacking 1982)”.

Due to the relevance of this section to the anthropological approach to music and language, I will not elaborate on this part here. The second part of this paper will focus on the cognitive ethnomusicology in the 2000s, where I will discuss in more detail the cognitivist approach and its relevance to ethnomusicology.

Language in Music (and Music in Language)

Studies on linguistic components in the musical context constitute an important tradition for

ethnomusicologists working on music and language from earlier periods until this day (even though music and language topics lost its popularity among ethnomusicologists in the most recent decades, there are still studies published in *Ethnomusicology* following this tradition)(Bickford 2009).

Feld and Fox identified several important research themes in this area: linkage of text and tune in copositional formulae; comparisons between the poetic organization of song texts and the musical structure of their settings (Agawu 1984; Boswell 1977; Dixon 1980; Herzog 1950; Hill et al 1976; Longacre 1986; Nelson 1985; Sherzer&Wicks 1982; Yung 1983b; Yung 1983c); comparative phonetics of spoken and sung genres (Chenoweth 1979; Hinton 1984; Sundberg 1977; Waugh et al 1980; Yung 1983b; Yung 1983c); meaningful song texts and vocables: (Frisbie 1980; Hinton 1980; Hinton 1984; McAllester 1954); mutual influences of musical and linguistic structures (Durbin 1971; Hinton 1984; Longacre 1986; Rouget 1966; Rouget 1971); interplay of speech intonation and melody in tonal language traditions (Agawu 1984; Chao 1956; Herzog 1934; Leben 1985; List 1961; Nketia 1971; Richards 1972; Rycroft 1983; Schneider 1961; Yung 1983a); Native American microtonal pitch rising (Hill 1993; Seeger 1987).

A notable stream of scholarship in this area is the studies on the relationship between the musical and linguistic components among tone language cultures, primarily found in East Asia (China in particular) and African cultures. Research in this tradition often focuses on the interplay of musical and linguistic melodic and tonal contours, in the hope of deriving rules and patterns of how the music came to be what it is within a system of creative process where the mind of the composers (in some cases creators, where there are no composers identified)(Yung 1983a) is governed by multilayered complex considerations and constraints coming from linguistic and musical elements. Following Chao's work on Chinese songs (Chao 1956), Levis' work on Chinese music (Levis 1964), Mark and Li's study on the Wu-Ming folk songs (Mark and Li 1966), among others, Pian (1972;1975) considered the multiple layers of constraints in the compositional process and text setting of 24 stanzas of Shipyi animated arias in Peking Opera. Her analysis involves a meticulous process of reasoning and deductions on musical and linguistic considerations in the process of textsetting and composition, including the role of linguistic tone categories vs the melodic contour of the tunes, the imitation of linguistic tonal contour, formal requirements, rhythmic considerations, melodic considerations, meaning of the text, among others. Yung's study (Yung 1983; 1979) on Cantonese opera is of a similar nature.

An observation derived from such studies, as exemplified by Pian's work on Peking Opera and Yung's work on Cantonese Opera, is that, their approach is of a different nature from those criticized above (who borrowed from strictly linguistic formal analysis models such as the generative grammar). A careful reading through Pian's text, for example, would reveal that, although there is a basic linguistics-derived premise at work (the premise that the human mind unconsciously cast a set of constraints in the creative process of musical or linguistic product, which can be revealed through formal analysis), the analytical procedure of the study is in fact very descriptive (meaning the

analysis is closely based on the very nature of the musical object in question, instead of applying borrowed analytical techniques without regarding to the applicability). In a way, these works adopted a self-created analytical methodology based on the subject of study without invoking explicit and strict borrowed analytical techniques from other disciplines (a music-specific analytical technique if you will). Therefore, as ethnomusicological works with a possible linguistics-like outlook, the values of these works still persist today (even though such strictly grammatical research topics has been largely out-of-fashion within the field in recent developments). The reason I am putting an emphasis on this is that, in a most recently published article in *Ethnomusicology* (Bickford 2008 on the expressivity and grammar in vocal performance through analysis of a Bob Dylan song), the author analyzed the textsetting and creative process of a Bob Dylan song by applying an explicitly novel linguistic theory (novel as in the ethnomusicology context)—the Optimality Theory, and the actual procedures involved exhibited remarkable resemblance with those carried out by Pian—multilayered systems of musical and linguistic constraints competing with each other for a ranked and prioritized consideration in textsetting, as seen in the final product of musical composition.

Another area of research in this section is the music-in-language approach, focusing on the musical dimensions (prosodic elements, such as the rhythm, pitch, melody, voice quality, etc) of speech. Since this is a major area of research in linguistics and speech sciences, I will not elaborate on this point here.

Language about Music(And Music about Language)

There are several interrelated but yet separate streams of scholarly discussion on the language about music (or discourse about music) in the modern history of (ethno)musicology, including anthropological, philosophical and semiotic works. Feld and Fox (1994) commented that “the language about music perspective is predicated on the fact that people talk about music, and that music interacts with naturally occurring verbal discourse, not only in song texts, verbal art, and the prosodic, musical structuring of speech, but also in the interpretive, theoretical, and evaluative discourses surrounding musical experiences”. (Feld & Fox 1994:32). In this section I focus on the three research themes/traditions in this area:

(1)Anthropological study of “spontaneous or elicited oral discourse about music, often in small scale societies, where there was no prior investigation of culturally specific music theories” (Feld&Fox 1994:32-33). This includes ethnomusicological/anthropological studies based on extensive fieldwork in minor communities throughout the world, as exemplified by works such as Feld's study on the technical and metaphoric discourse linking musical practices to other forms of social and ecological knowledge in a Papua New Guinea rainforest community (Feld 1981; Feld 1988; Feld

1990; Feld 1991), Zemp's work on how such oral discourse may encode remarkably complex technical systems of theoretical knowledge about musical structures and compositional principles in the panpipe music of a Solomon Island society (Zemp 1978;1979). In addition to these studies, we also found studies in this area focusing on the everyday discourse about music in our society (Crafts 1993), a theme of research linking us to the next scholarly enquiry I am going to discuss.

(2) The second and third themes are particularly interrelated in their subject of enquiry but nevertheless stem from distinct intellectual traditions throughout the 20th century. The first scholarly and philosophical discussion on language about music comes from the “father of musicology”, also a musicologist and musical philosopher, Charles Seeger. Speech and music, especially speech about music, is one of the most important themes reoccurring throughout Seeger's writing. A term which he named “linguocentric predicament”, Seeger is frequently concerned with the fact that as two parallel and separate sound-based communication systems (as well as symbolic systems), speech and music are not treated with equal attention within our academic enquiry. Particularly, using speech to talk about music invites many complicated problems and insufficiencies that we musicologists tend to overlook. His essential notion seems in fact to underline the dilemma of the musicologist: while the musician “speaks in music” of purely musical things, the musicologist must pass through the intermediary of language—what Seeger calls the “bias of speech” (Nattiez 1990:150). For Seeger, there was indeed a level of musical experience that could not be reduced to language. In his other works, he also points out the “danger” of the linguocentric predicament (i.e., the distinction between speech knowledge about music and the musical knowledge about music), and calls for a more wholesome approach to effectively facilitate communication by maximizing the other systems of communication other than speech (including music, graphics, for instance) (Seeger 1977). Unfortunately, due to the obscure nature of Seeger's writing and the uniqueness of his thinking, subsequent scholars often try to interpret his writings while few substantial research following his steps were carried out.

(3) Music semiotics perspective. Nattiez's later works (1987) on music and discourse devoted a considerable amount of text on the discourse about music (particularly, the specialized kind of discourse of music analysis about music). While Nattiez's position as a trained semiologist put much of the theoretical discussions on the various kinds of discourse in music analysis, he did quote many of Seeger's writings as his introduction to the idea that language about music generates complex layers of speculations viewing from a semiotic perspective about music. Contrary to his earlier writings, Nattiez's discussion on speech about music draws on the tripartite model of semiotics, developed by American semiotician Charles Peirce (which is more suitable for a discussion on non-referential symbolic systems such as music. See also Turino 1999).

Following "language about music", the music about language research topic involves investigation of the use of music as a speech surrogate, i.e., transposition of linguistic tonal and temporal contours to surrogate articulatory modes, like humming and whistling, or musical media, like drums and flutes (Boiles 1967; Busnel 1966; Carrington 1971; Chernoff 1979; Cowan 1948; Herzog 1945; Nketia 1971; Ong 1977; Pugh-Kitingan 1977; Stern 1957; Umiker 1974; Umiker-Sebeok 1976; Waterman 1990). These surrogates may alternate between a signal mode (stereotypical texts) and speech mode (new utterances), as well as a variety of musical modes. The referentiality of these alternate modes also invite discussions on a complex interplay of metalingual and metamusical signs (Feld&Fox 1994: 29).

Music or Language/Music-Language Interface

Research in the music-linguist intersecting areas represent a group of prolific research outputs in the cross-cultural enquiries into the diverse verbal art forms around the world, often calling into question the existence of a clear-cut boundaries between speech and song, the conceptualization of the very nature of the term "music" in relation to other varieties of acoustic phenomena, and the interplay of music, speech, and other non-speech components within a verbal art performance context. Essential references in this category include List's (1963) exploration of speech and song boundaries in a hemispheric map scheme, Lomax's (Lomax 1967;1968;1977) work on Cantometrics, Seeger (1987)'s study on the Native Americans in the Amazonian forrest, and the rich literature in ethnomusicology and anthropology on the Lament genre (Ajuwon 1981; Alexiou 1974; Chenoweth 1968; Feld 1990;Graham 1986;Holst-Warhaft 1992;Kauffman&Kauffman 1988;Tiway 1978;Urban 1985). As a vast topic of discussion itself, I am going to discuss this subject more in detail in my other comprehensive paper, Speech and Singing.

Recent developments (1994-)

When Feld&Fox (1994) commented that "ethnomusicology has moved decisively toward a fully anthropological perspective", a call for a disciplinary move toward a "sounded anthropology" was also about to emerge within anthropology itself. Indeed, the fact that the most important reviews on music and language research were mostly pulished in the anthropological journals instead of ethnomusicology indicates a shift of the center of gravity of music/language research from the ethnomusicology before the 1970s to anthropology in recent two or three decades (linguistic anthropology in a large part).

In this section I overview the most recent development since the Feld&Fox 1994 review. First I discuss the main development in the realm of anthropology regarding the disciplinary move toward a holistic approach to sound (including music, language, as well as other sounds in real world and

recordings), namely, a “sounded anthropology”, or “vocal anthropology”, “doing anthropology in sound” (Porcello et al 2010; Sameuls et al 2010; Feld&Brenneis 2004). I then draw from the next review on music and language research to be published in the Annual Review of Anthropology (Faudree 2011) and critique the authors' theoretical construction upon a “total semiotic approach” toward music and language in the past two decades. Finally I outline some of the most recent publications from within the field of ethnomusicology.

Sounded Anthropology

The idea of a “sounded anthropology” stems from the works of a generation of scholars in anthropology (and ethnomusicology), who, fascinated by their field recordings, started paying serious attention to the sound as ethnography rather than merely a means through which anthropologists collect materials for their written ethnography. As Steven Feld commented in an interview about doing anthropology in sound, “...it was in the process of thinking about the relationship between his recordings and his writings [“he” refers to Feld's undergraduate advisor Colin Turnbull] that I realized how important sound and sound recording was, particularly if you did research with people who live in intensely rich aural environments...and that was the origin of my desire to do ethnographic work in and through medium of sound”(Feld&Brenneis 2004:461).

The growing body of literature in sounded anthropology has led to a series of recent overviews and theorizations in the field regarding doing sound in anthropology (Brenneis and Feld 2004), soundscapes(Samuels et al 2010), and the reorganization of a sensory world in anthropology(Porcello et al 2010). Samuels et al(2010) proposed a model of sounded anthropology based on the concept of soundscape, as put forth by Canadian composer R.Murray Schafer(1994[1977]) (which was cast new meanings within the framework of Appadurai's studies on several '-scapes' in the modernity⁴). According to Samuels et al(2010), the central questions to think about regarding a sounded anthropology include, for instance, “how might the discipline of anthropology develop if its practitioners stopped thinking of the field recording only as a source of data for the written work that then ensues and rather thought of the recording itself as a meaningful form?”, and “what if discussions of recording moved beyond inquiries about the state of the art in recording technology to how best to present and represent the sonorous enculturated worlds inhabited by people?”(ibid:330) Their proposal builds upon a theoretical construction of “soundscape” in relation to a history of technology that give rise to anthropological recording practices, film sound techniques, and experiment sound art, and questions the sound's supposed ephemerality as a reason for the discipline's inattention. After considering ethnographies that explore relationships between sound, personhood, aesthetics, history, and ideology, the authors propose a call for an anthropology more seriously engages with its own history as a sounded

⁴ See Appadurai 1990.

discipline and moves forward in ways that incorporate the social and cultural sounded world more fully (ibid:329)

Build on existing ethnographies and recent literature, Porcello et al (2010) constructs a theoretical model where sound is under the umbrella of a broader range of senses, namely, the “reorganization of the sensory world” for anthropology. After tracing three genealogies of studying the senses, Porcello et al situates the sense of hearing as “often articulated not as a separate sense but as one part of the multisensorial dimensionality of ritual performances (Howes 2005, Leavitt & Hart 1990, Stoller 1997)” (Porcello et al 2010:56), as ethnographies that explore local distinctions among the natural, human, and spiritual worlds note that the transformation between worlds often occurs through acts of listening to songs, sounds, and noises (Descola 1994, Levi-Strauss 1969, Seeger 1987, Taussig 1993, Viveiros de Castro 1992). They also cited works on politics of the production of the recorded sound, listening as a cultural practice, in the auditory practices of recording studio engineers (Meintjes 2003, Porcello 2005), through the sampling and creation of hip hop beats (Schloss 2004), and via explorations of timbre or noise through the electronic manipulation of sound (Fales 2005, Larkin 2008), as well as ethnomusicological studies of the politics of musical “identities” and musical genres address the culture of listening (Porcello et al 2010:56).

One noteworthy point that these authors posits is the opposition between language and the senses, which, from a different stream of thought, relates to the “language about music” and the “linguocentric predicament” discussed from earlier periods. The authors wrote, “arguably, a recurring feature in the anthropology of the senses is its rejection of language, discourse, and semiotics as modes for encountering and understanding the sensuous cultural world” (ibid:59). Seremetakis (1994) posits clear differences between the construction of meaning and truth through sensorial experience (such as music) and that constructed through language. The relation between the body and things “points to the perceptual construction of truth as an involuntary disclosure of meaning through the senses” so that truth is “extralinguistic and revealed through expression, performance, material culture, and conditions of embodiment” (ibid:6). Critiquing this strong opposition, Porcello et al proposes an integrating approach to discourse and senses in anthropology by arguing the very sensuous and social nature of linguistic expression itself, instead of viewing the language as a logo-centric abstracted activity based on semantic content of the words, in which “the idea of (rational) thought is based on a separation between culture and nature, between man as the observer, and nature or the universe as the observed”, a “mentalist framing of language” (Porcello et al 2010:60).

“Total Semiotic Fact” Approach

Contrary to the comprehensive approach of writing a review for music and language by Feld & Fox, the next review to appear in the Annual Review of Anthropology, written by Paja Faudree (Brown

University Anthropology), assesses the recent engagement of anthropologists (mainly linguistic anthropologists) and ethnomusicologists on the semiotic property of music and language, namely, an advocacy for placing the “total semiotic fact” at the center of anthropological research. In the light of the recent research focusing on these areas in ethnomusicology, in this section I draw from the Faudree review to discuss the latest literature on music and language research.

As discussed in previous sections, a methodological shift in music and language research occurred in the recent decades (1980s onward), from focusing on the innate connections between the musico-linguistic phenomena as abstracted mental activity, to paying more attention to the parallel relationships between music and society and language and society within a dynamic and contextualized framework. This shift of research paradigm has resulted in the recent formation of a large body of literature in ethnomusicology and linguistic anthropology, with an approach that Faudree termed as “semiotic approach” (Faudree 2011:1).

By semiotic approach, Faudree begins from the premise that both music and language are fundamentally semiotic: they constitute differing, sometimes competing, overlapping, often mutually influencing representational systems that are jointly essential to human societies (ibid:1). Through a semiotic approach, ethnomusicologists and linguistic anthropologists have demonstrated how linguistic and musical signs are centrally involved in vital social processes (Agha 2007, Mertz 2007, Turino 1999). Therefore, Faudree advocated for placing the “total semiotic fact” at the center of the anthropological research, and she sees this as a framework through which one can have a systematic means of illuminating recent scholarship on language and music while also offering a tool of general anthropological value. She further argues that this approach allows the sign-the linguistic, musical, or other social “fact” to become inherently dialectic and unstable, no longer a representation that merely “labels” cultural action and social realities, but rather is cultural action, is itself a dynamic cultural reality, a culture-producing engine (Faudree 2011:1).

In adopting such a framework, Faudree cleverly summarizes the almost unanimity of the nature of recent research on music and language: the paradigm shift described above. This means a shift of the defining central question of the research, namely, the relationship between music and language. Indeed, as Faudree's bibliography indicated, most works in the field in the last three decades have focused on a different question: how music and language, alone or together, worked as representational systems to reflect and embody the ideology, identity, politics, poetics, among others, of human culture and society. Yet the majority of works within this category showed a focus only on music (in ethnomusicology) and only on language (in linguistic anthropology). Therefore, looking at the large picture, we observe a parallel shift and research paradigm between ethnomusicology and linguistic anthropology; on the other hand, a higher degree of disciplinary specialization is seen: while cognitive sciences (and related fields) have taken on the subject of music-language inner-relationships, research on this question has also largely faded out from ethnomusicology and anthropology.

This reorganization of disciplinary specialization is thus reflected in the current review in question: While Feld&Fox (1994) were able to have a rather comprehensive overview on the subject of music and language, exhibiting a wide range of approaches and intellectual streams within ethnomusicology and anthropology, the current review by Faudree organizes the latest literature based on a single focused approach: from the semiotic approach.

Three conceptual themes are identified within the Faudree framework: context, process, and objects. These themes make explicit the connections between particular foci in the literature and three levels of analysis that take on greater critical precision when harnessed to a “total semiotic fact” approach to social life (Faudree 2011:2). I will briefly discuss literatures from each of these three themes.

- (1) **The musical and linguistic contexts: spatial and temporal cartographies.** Works in this category focus on the use of the concept of “scenes”(Bennett and Peterson 2004) to bring into focus relations among linguistic and musical forms, practices, and ideologies by mapping them to particular sites of cultural production, including both musical and linguistic practices tied to particular geographic and national locales as well as to sites that are more “delocalized”, transnational, and virtual(Alim and Penycook 2008, Allen and Wilcken 1998, Bennett 2004, Birth 2008, Brusila 2003, Bryant 2005, Chamberland 2001, Condry 2006, Diehl 2002, Drew 2001, Erlmann 1999, Goodman 2005, Kapchan 2008, Keeler 2009, Largey 2006, Lee and Peterson 2004, Levin 1999, Lipsitz 1994, Luvaas 2009, Lysloff 2003, Meintjes 2003, Mitchell 2002, Rumsey 2007, Simonett 2001). An alternate theme is seen on the discussion on the role that specific temporal contexts and ideologized relationships to the past play in conditioning the creative interaction of linguistic and musical signs in cultural contexts of use (Albiez 2003, Austerlitz 1997, Averill 1997, Birth 2008, Brennan 2010, Ferguson 2010, Fischer 2010, Shannon 2003a, Tomlinson 2007).
- (2) **The musical and linguistic processes: mediation, authentication, politicization.** This theme focuses on how some of the recurring foci in the literature – such as authenticity, global markets, multilingualism in music, resistance, and musical technologies – are intimately linked to semiotic processes: musical and linguistic forms, as deployed in social practices, are tied to specific expressive ideologies, thereby producing particular social effects. Representative works include how research on world music foregrounds the globalization and commodification of locally and ethnically marked musical forms; through ideological discourses about these forms and the international contexts in which they are put to use, some musical forms and practices are legitimated while others are invalidated (Born and Hesmondhalgh 2000, Boudreault-Fournier 2008, Erkmann 1999, Feld 1994 and 2000, Frith 2000, Harker 1997, Kapchan 2007, Meinjtes 1990, Mitchell 2001, Shannon 2003,

Stokes 2003 and 2004, Theberge 2003, Thornton 2000, Turino 2003, Waxer 2002). Meanwhile, we also see other processes that are frequently considered in the scholarly literature and are dependent upon semiotic processes. These include the authentication of music forms, performances, and performers (Condry 2000, Grazian 2004 and 2005, Peterson 1997, Porcello 2006, Potter 2006, Urquia 2004), the linguistic vernacularization of country, hip hop, and other popular music genres (Alim 2009, Kapchan 2006, Mitchell 2003, Sarkar and Winer 2006), the technological mediation of music (Goodman 2003 and 2005, Hirschkind 2001 and 2009, Meintjes 2003, Miller 2005 and 2007, Porcello 1998 and 2002), and the politicization of popular music (Dorsey 2006, Johnson and Cloonan 2008, Pedelty 2010).

(3) **Musical and linguistic objects: identities, voices, texts.** This category involves the ostensible products – or “precipitates” – of the processes discussed in literatures that belong to the second category, also a category that Faudree considers as tied to the center of social research on “semiotic facts”. Though such entities may appear to be static, a total semiotic approach reveals them to be either inherently dynamic or merely naturalized as stable, their apparent imperviousness to change purchased through many kinds of social – and semiotic – labor. Among the most important “objects” to figure in the literature are social identities (Albiez 2003, Alim 2006, Allen and Wilcken 1998, Austerlitz 1997, Birth 2008, Diehl 2002, Faudree n.d., Ferguson 2010, Lyons 1999, Meintjes 2003, Monson 1996, Pegg 2001, Prouty 2006, Sakar and Allen 2007, Samuels 2004, Weidman 2006). Other “things” that figure prominently in the literature discussed in this section include voices (Condry 2006, Fox 2004, Kapchan 1996, Keeler 2009, Meintjes 2003, Tomlinson 2007, and Weidman 2003, 2006, and 2007) and texts, particularly as they relate to literacy (Faudree n.d., Feld 1986, Goodman 2002, Prouty 2006). Building on this final topic, Faudree considers recent work that has attempted to move ethnomusicology and anthropology beyond its traditionally text-based focus, in the interest of reorienting it to embrace the importance of sound to ethnographic research and scholarship (Feld and Brenneis 2004, Feld *et al* 2004, Samuels *et al* 2010) and the multisensory dimensions and potential of ethnographic research, as discussed above in this essay (Porcello *et al* 2010).

Recent Ethnomusicological Works on Music and Language

Previous sections in this essay lead up to an impression that recent ethnomusicological research on music and language centers around theoretical constructions and conceptual frameworks mainly based in anthropological discourses. Indeed, looking at the large picture, the development of

ethnomusicological research has witnessed a history of interdisciplinary discourses with its sibling fields, notably linguistics (in earlier periods) and anthropology (as having the strongest influence on ethnomusicology in recent decades). In addition to the theoretical construction of the sounded anthropology in recent years, it is also true that many recent works with a direct focus on music and language were carried out within the anthropological sphere⁵. It is noteworthy that the ethnomusicological works cited above are mainly in the "semiotic approach" section, which themselves do not have anything to do with music and language per se. It is only included in the review when considering the parallel moves between ethnomusicology and linguistic anthropology on a broader level.

As such, there are also a small body of literature in ethnomusicology (published in ethnomusicological journals and/or written by ethnomusicologists) that, at least in part, continues to employ a more or less strictly grammatical approach to music and language analysis (that also differ themselves from the much criticized and abandoned approaches in earlier periods by adopting a more integrated approach⁶). For instance, Bickford (2007) provides a review of relevant literature in linguistics and anthropology, arguing for a grammatical, phenomenological, and semiotic understanding of the ways language sounds are properly musical in singing. In doing so, Bickford asks an important question: when we consider singing, at which point do we start paying more attention to the lyrics (textsetting) than the melody? And what about the other way around? Bickford presents a detailed analysis of the poetics and music of Dylan's singing and argue that the expressive form of "Down the Highway" cannot be understood without an integrated approach to music and language in the voice—in particular, the Optimality Theory from the recent theoretical constructions in linguistics, which tries to account for the final output of phonological processes by ranking multiple layers of competing constraints⁷. In conclusion, the author acknowledges and accounts for certain contexts of the recording's meaning, performance, and reception, and situates these analytical positions within a broader approach to the layering of meaning and form in discourse.

Other notable contributions that mediate between a grammatical approach and a contextual approach in recent ethnomusicology publications include Mink(2002; 2008)'s discussion on the children's song and other expressive practices built on theories of diffusionism, enculturation, child-cultural autonomy, cultural cognitivism, musical-linguistic acquisition and the contradictory forces of stability and change in children's music and language. Fox's book (2004) analyzes how country music constructs working class identities in the U.S. The social implications of the class-based identities he describes are intimately linked to how the musical and linguistic forms that make up

⁵ Meaning that they are mostly published in anthropology journals, written by anthropologists, rather than within the field of ethnomusicology.

⁶The authors in this category usually has a strong intellectual inheritance from their advisors, e.g. Aaron Fox and his several students (Minks, Bickford, etc.) who published on music and language, as discussed later in this article.

⁷ This theory was also referred to in the previous section of this essay when discussing the Pian's study on the textsetting in Peking Opera.

country music are – when activated in the honky-tonks and beer joints where his ethnography is based – ideologically inflected and politically powerful. Adopting an integrated grammatical approach, Ninoshvili's dissertation (2010) explores the Georgian polyphony and vocables while posing broader questions for the discipline of ethnomusicology as a whole: How can the study of language in world music serve as a forum for the exploration of nonreferential forms of intercultural communication and meaning-making? How can studies of sound and listening as such be rejoined to studies of properly musical creativity and expression, beginning from the voice itself?

II MUSIC AND LANGUAGE: RECENT DEVELOPMENT IN COGNITIVIST MODELS

This section deals with the recent development in the cognitivist models on research into music and language. As discussed before, this area of research grew out of the older models such as the linguistic formal analysis of world music, which was much criticized and somewhat removed from the ethnomusicology since the 1980s. The recent development, however, employed new research tools in the advancement in cognitive science and technology, such as the brain imaging technology and a full empirical methodology based on cognitive psychology and brain sciences. As the interdisciplinary discourses on music and language matured, an emerging discipline of cognitive ethnomusicology is seeking to bridge the humanistic and scientific perspectives on the subject in the new light of bringing together cross-field studies in ethnomusicology, brain sciences, neurosciences, cognitive sciences, evolutionary biology, and linguistics,

Music and Language Cognition: Methodology and Parameters

The study of music and language, much like other domains of human cognition, has been benefited from a wide variety of approaches, each taking a different angle to reveal part of the puzzle. It is suffice to say that such multi-disciplinary approach is necessary in that each angle can compensate, solidify, and test the conclusions derived from others, due to the often-different innate assumptions and logics of the respective research designs and methodologies. For instance, Patel (2008: 72) stressed the possibly similar mechanism in sound category learning in music and language despite the fact that there are good reasons to believe that the brain treats spoken and musical sound systems differently, according to evidences such as the dissociation for perceiving spoken versus musical sounds after brain damage. In other words, “even though the sound category

representations in the two domains, once learned, do not completely overlap in terms of their location in the brain”, “whether or not similar mechanisms are used to *create* these representations is an orthogonal question.”(ibid:73)

On the other hand, it is often necessary to specify exactly on which level the comparison is being made. One attribute that music and language shares is that they both involve multiple levels of representation: phonological prosodic, lexical, semantic, syntactic, and pragmatic in the case of language and rhythmic, melodic, and harmonic in the case of music (Besson & Friederici 1998:2). The mechanisms involved on each level are often different, and the understanding of each level is crucial to the conception of the whole picture. In a study on musical rhythm and linguistic rhythm and their role in human evolution (Patel 2006), for example, Patel comments on the articles by Justus and Hutsler (2005) and McDermott and Hauser (2005), who suggest that musical pitch perception can be explained without invoking natural selection for music. Patel believes that these authors leave the issue of musical rhythm largely unexplored and proposed how various issues might be addressed by extending their conceptual approach to the domain of rhythm. In addition, contrary to the previously firmly held belief of hemispheric asymmetries for music and language, there is increasing evidence suggesting the bilateral representation in the auditory cortex in the brain for both music and language sound categories (Patel 2008:73), making the various levels of comparison more significant (i.e., which level is represented at which hemisphere, or involved in both hemispheres).

In light of these two perspectives, I summarize the parameters involved in current research literature. These parameters, as I define here, include both the approaches taken to compare music and language, and the levels of comparisons, as addressed in the previous paragraphs. By employing and manipulating these parameters and their different roles and functions, the most meaningful comparisons can be made. Parameter 1 through 4 concerns methodology and framework of the research design; parameters 5 and 6 are targeted areas/levels of comparison.

Following the outline of the parameters, the next section will focus on the research literature in each of the music/linguistic parameters of comparison (extracted from Parameters 5 and 6 combined): Tonal functions, temporal functions, syntax, and meaning.⁸ Additionally I also discuss the area of research that has received much attention recently, links between the general musical training and specific linguistic abilities.

Parameter 1 Subject Tested:

- (1) Children/adult with musical or linguistic deficiencies/cognitive disability/brain injuries, such as text dyslexia and aphasia;
- (2) Normal children/adult with no identified cognitive deficiencies. Often further divided into two subgroups:

⁸ The usage of tonal and temporal functions here follows the classification of musical parameters by musicologist Charles Seeger (1977). While Seeger’s writing did not explicitly concern music and language perception, this conceptualization works effectively for the current purposes.

- a. Musically trained;
- b. Musically untrained;⁹

Parameter 2 Time Frame

- (1) Diachronic: Developmental/Acquisition/Process of Learning;
- (2) Synchronic: Subject carrying out perception tasks with skills already acquired;

Parameter 3 Cognitive Domains

- (1) Acoustic: Production and perception of acoustic signals;
- (2) Acoustic-Visual Interface: such as processes involving music reading and language reading;

Parameter 4 Disciplinary-Specific Methodology/Tools (such as empirical method; brain imaging with fMRI and other technological tools; MIT in music therapy; formal analysis in linguistics; etc.)

Parameter 5 Linguistic Parameters

- (1) Phonetics/Phonology (including sound categories and prosodic structures);
- (2) Syntax;
- (3) Semantics;

Parameter 6 Musical Parameters

- (1) Pitch;
- (2) Rhythm;
- (3) Melody;
- (4) Syntax;
- (5) Meaning;

Music and Language: Research in Five Areas of Comparison

1. Tonal Functions

Charles Seeger proposed that the tonal functions of music include three components: pitch, loudness, and timbre, of which the first two are simple functions and the latter, a complex function.¹⁰

Patel (2008) identified two levels of comparison in tonal functions for music and language: sound elements and melody (roughly corresponding to the idea of phonetics and phonology in linguistics). The necessity of this distinction is only apparent after careful consideration of the research literatures. First of all, sound elements include the basic units and smallest building blocks of music and linguistic sound, subdivided into pitch and timbre.¹¹ On a different hierarchical level,

⁹ In some cases the distinction between musician and non-musician is used.

¹⁰ Simple functions differ from the complex in that they can be represented in a unidimensional fashion, (e.g., the pitch and loudness that can vary by (+, -)[higher, lower] or [louder, softer]), whereas the complex function cannot be measured in a similar manner.

¹¹ According to Patel (2008), a basic distinction between music and language systems in sound elements is that the former primarily makes use of pitch contrast, whereas the latter primarily makes use of timbre contrast. While this is a valid and clever way to put it, it has received minor criticisms in that the “timbre” used to indicate the contrast among different speech phonemes (such as [i] and [e]) can be confused with the different “timbre” of different speaking voice, i.e., the voice quality of different individuals’ speech sound (Brown 2009). Nevertheless it is an effective way to distinguish the two systems, and also useful in asking questions

melody can be considered as the meaningful organization of pitch and timbre elements, although it is also much more than the sum of pitch and timbre in that rhythmic and syntactic cues also play crucial roles in the case of the perception of a musical melody, and prosodic structure and pragmatics in the case of linguistic melody. The following section addresses the research on components of tonal functions on these two levels.

(1) Sound Elements

[a] Pitch: Both music and language make use of pitch contrast. Pitch is the most important feature of music. In fact, most cultures in the world make use of rich pitch contrast as their main device in creating music. The pitch also plays a significant role in tone languages, whereas pitch contrast does not infer lexical meanings in non-tonal languages (where intonation plays a role).

Pitch inventories in musical cultures around the world have been investigated in relation to tuning systems and scales since the early 20th century. While little has been theorized about why and how different cultures came to make use of different tuning and scales system, a branch of recent research literature in this area has largely linked pitch perception in music to that in speech sound.

One group of such research concerns the musical illusion known as the tritone paradox (Deutsch, 1991). The tritone paradox occurs when two tones that are related by a half-octave (or tritone) are presented in succession and the tones are constructed in such a way that their pitch classes are clearly defined but their octave placement is ambiguous. Studies have shown that there are large individual differences in how such tone pairs are perceived (e.g. ascending vs. descending), and these differences correlate with the listener's mental representation of pitch range in speech, formed in critical period through language acquisition. Deutsch and colleagues (2004) showed that the perception of tritone paradox could be heavily influenced by speech pattern heard early in life, even for listeners who do not speak their first language fluently.

The same group of researchers also linked data on the perception of absolute pitch in music to one's native language, specifically, the difference in the occurrence of AP between tonal and non-tonal language speakers. Absolute pitch (AP) is the ability to identify or produce isolated musical tones (e.g., middle C, concert A) accurately, rapidly, and effortlessly (Deutsch et al., 2004a). Previous studies have linked AP largely to genetics, due to the observed fact that the occurrence of AP is much higher among professional musicians in East Asia than in Western society. Deutsch and colleagues (2004a; 2009), conducting research on another line of evidence, found correlations between the high incidences of AP and the native speakers of tone languages (such as Mandarin Chinese and Vietnamese) instead of genetic heritage (e.g., AP is not higher among the Asian American musicians of Chinese heritage who do not speak a tone language as their native language).

such as why most music do not choose to make use of timbre as the main contrast device instead of pitch (which Patel also gives an answer in his book) while it is theoretically perfectly possible.

Their findings also linked musical AP to linguistic AP, showing evidence that tone language native speakers tend to reproduce speech patterns more precisely pitch-wise at different occasions than non-tone language speakers (although the difference is relatively small and its significance still under debate). Not surprisingly, this line of argument of linguistic AP in tone language speakers carrying over to music received much criticism and the debate is clearly still not over (Schellenberg & Trehub 2008).

Both of the research discussed above, whether proved to be valid or not, reflect the underlying hypothesis that there exists an overt association in mental representation between musical and linguistic pitch perception, often acquired through musical training and language acquisition during the critical period. The investigation of the mutual influence of such abstract representations between music and language perception are thus of general interest in this area. For example, Stegemoller and colleagues (2008) investigated the effect of musical training on vocal production of speech and song, finding evidence that higher levels of musical experience were associated with decreased energy at frequency ratios not corresponding to the 12-tone scale in both speech and song. Taking a developmental approach, Bolduc (2005) showed that musical pitch processing is significantly linked to phonological awareness performance among kindergarten students.

[b] Timbre perception: Patel (2008) points out that pitch contrast is the main device in most musical systems, while timbre contrast is the prominent device in language. This is evidenced by the existence of high degree intelligibility in speech heard in monotonous (even in the case of tone languages to some degree) with only articulations preserved (timbre information). Due to this divergence, there are relatively few comparative studies on musical and linguistic timbre perception.

An interesting link exists though, between the timbre of vocables (non-sense made-up words used in a variety of singing styles found in world music)/verbalizations (non-sense words used to represent the different timbres of different musical sounds), and the timbres of actual musical sound found in that culture. Patel and Iverson (2003) conducted an empirical study on the sound symbolism, acoustic and perceptual comparison of speech and drum sounds in North Indian tabla tradition. Analysis revealed that acoustic properties of drum sounds were reflected by a variety of phonetic components of vocables (including spectral centroid, rate of amplitude envelope decay, duration between the releases of consonants in a cluster, fundamental frequency, and the influence of aspiration on the balance of low vs. high frequency energy in a vowel), and the superior performance of 7 non-Hindi speakers unfamiliar with tabla drumming on matching the vocables with their corresponding drum sounds showed that the resemblance between speech and musical sounds in this case is based on shared perception rather than convention.

(2) Melody

I have discussed the necessity of this level of comparison in previous sections. Patel (2008) points

out nine areas where human perceptual system concert a two-dimensional sequence (pitch vs. timbre) into a rich set of perceived relationships (melody), which is one of the reasons why musical melodies tend to stick in listeners' mind more persistently whereas linguistic melodies leave little impression. The nine areas (which is not an exhaustive list) include: grouping structure; melodic contour; beat and meter; intervallic implications; motivic similarity; tonality relations—pitch hierarchies; tonality relations—event hierarchies; tonality relations—implied harmonies; and meta-relations generated among the previously listed relations.

A point of interest in this area concerns the interplay between musical and linguistic melodies in vocal music. For instance, a number of scholars studied the interaction between musical and linguistic tones in various forms of Chinese operas (Yung 1989; Pian 1972). Drescher (2008) examined the relationship between Gregorian and Hebrew Chant. By analyzing the different structures in the interactions among words (prosodic structures, stress), speech intonations, and melodies, she revealed the nature of chanting in contrast with singing, and the reason why it should be considered a form of heightened speech melody rather than musical melody.

The question of whether amusia patients (musical tone deafness, a cognitive deficits in the perception of pitch contour) show deficits in linguistic intonation perception has been long held as a major evidence as to whether and to what extent music and language share neural mechanisms for processing pitch patterns. In a recent study, Patel and colleagues (2008) showed that about 30% of amusics from independent studies (British and French-Canadian) have difficulty discriminating a statement from a question on the basis of a final pitch fall or rise, suggesting that pitch direction perception deficits in amusia can extend to speech. Meanwhile, counter examples of dissociation between the two domains are also reported (Ayotte et al. 2002), leading to a on-going debate that calls for detailed research into the question (such as the identification of the types of amusia, and types of discrimination tasks used in experiments and their implications).

Finally, Patel (2006) reports a recent development of a quantified model that allows comparison between speech melody (either lexical tone melody or intonation melody) and musical melody. The most salient feature of speech melody that differs from musical melody is that speech melody does not employ fixed, discrete pitches like music; rather, the phonological analysis has relied on the contour of FO (fundamental frequency) to describe speech melody (an alternate description is offered by the abstract phonological tones such as [H] and [L] tones in autosegmental-metrical theories of intonation). This posits fundamental difficulties in comparing speech melody to musical melody.¹² The new prosogram takes the underlying notion that the raw fundamental frequency (FO) contour, although an accurate physical description of the speech signal, is represented differently in

¹² Interestingly, there are such European composers, notably Joshua Steele (1700-1791) and Leos Janacek (1854-1928), who were fascinated by the speech melody of other people's talking, and transcribed the melody onto a Western staff notation. Janacek did this for over 30 years, whose transcription was discussed and analyzed in a recent article (Pearl 2006). One problem with the transcription, apparently, is the discrepancies between the pitches used in staff notation and its physical pitch height in reality. Patel argues that the newly developed prosogram is one way to resolve this problem and see interesting discrepancies between the results produced by the prosogram and those by human transcription based on perception.

a listener's perception. Rather, empirical data suggest that such perception is subject to several perceptual transformations, most notably, [1] segregation of the F₀ contour into syllable-sized units due to the rapid spectral and amplitude fluctuations in speech signal, and [2] temporal integration of F₀ within the syllable. Based on these ideas, the prosogram converts a sentence's original F₀ contour into a sequence of discrete tonal segments, and allows more meaningful comparisons with musical melodies. These converted segments do not necessarily conform to any musical scale (Patel 2006).

2. Temporal Functions

Although both components of the simple temporal functions, rhythm and tempo are of interest in music perception, research in music and linguistic temporal perception has almost exclusively focused on the rhythm. Even for that part, it was only until recent years that significant progress was made. In this section I focus on the prominent research in recent years regarding comparison and interaction of human music and linguistic rhythm from two different perspectives.

(1) nPVI and rhythmic typology. Virtually most (if not all) significant studies on music and linguistic rhythm in recent years stem from the same methodological framework, developed by Patel and colleagues (Patel and Daniele, 2003, 2003a; Patel, 2003a; Patel, Iversen, and Rosenberg, 2006). This methodology in turn is borrowed from the recent advancement in linguistics that allows a quantitative study of linguistic rhythm typology among languages of the world.

Linguistic rhythm refers to the way language is organized in time, often studied as part of the language prosodic structure. Earlier linguistic theories stressed the idea of isochrony, which attempted to establish the rhythmic typology on the basis of periodicity (similar to the periodicity in musical rhythm). Three types of linguistic rhythm were identified: stress-timed (e.g., English, Dutch, German), syllable-timed (e.g., French, Italian, Spanish), and mora-timed (e.g., Japanese) (Abercrombie, 1967; Pike, 1945). It has been hypothesized that stress-timed languages have equal duration between stresses, while syllable-timed languages show equal duration between syllable onsets (equal duration between moras in the case of mora-timed languages). However, empirical evidence failed to support such hypothesis that such theory has been largely abandoned in phonological research in the 1980s (Roach 1982).

Interestingly, recent research in phonology supported such classification by demonstrating that there is indeed quantitative difference in rhythms between, for example, stress-timed and syllable-timed languages (Low, Grabe and Nolan, 2000; Ramus, Nspor and Mehler, 1999). The key to

understand this new approach is to set aside the concept of isochrony (i.e., periodicity in rhythm) and look for alternate regularities and features in different types of linguistic rhythm. This is also stressed by Patel (2008) in considering the comparison between musical and linguistic rhythm, notably “...the mistaken notion that rhythm *is* periodicity, or that rhythm *is* a regular alternation between strong and weak beats, rather than the broader notion of rhythm as systematic temporal, accentual, and phrasal patterning of sound, *whether or not this patterning is periodic*....Many widespread musical forms lack one and/or the other of these features [periodicity and strong-weak beat alternation] yet are rhythmically organized.” (Patel 2008:151)¹³

Based on such broad conception, the recent approach to linguistic rhythm thus came to focus instead on the durational patterning of vocalic and intervocalic intervals in speech (Grabe and Low, 2002; Low, Grabe and Nolan, 2000; Ramus, 2002)¹⁴. Implications of this approach include (in the case of stress vs. syllable-timed languages): [1] stress-timed languages show a greater degree of vowel reduction than syllable-timed languages (Dauer, 1983), thus having a greater variability in vowel durations; [2] stress-timed languages tend to permit more complex syllable structures comparing to syllable-timed languages, thus having a greater variability in the duration of consonant sequences (Ramus et al., 1999).

Patel and colleagues noticed that the quantitative measurement proposed by Grabe and Low (2002) is appropriate for comparisons of rhythmic features between language and music of a particular given culture (in order to investigate the possible relationship between them). This is the “Normalized Pairwise Variability Index”, also known as nPVI, indicating the durational variability within a given language, or, to put it more plainly, “measures the degree of durational contrast between successive elements in a sequence” (Patel, Iversen, and Rosenberg, 2006).¹⁵

Setting out to test the long held popular notion among certain scholars that speech patterns are reflected in the instrumental music of a given culture (Abraham, 1974; Hall, 1953), Patel and Daniele applied nPVI to the durations of notes in instrumental classical themes from England and France (representing typical stress-timed and syllable-timed languages), and found that English music had a significantly higher nPVI than French music (being consistent with the higher nPVI for British English vs. French)¹⁶. Subsequent works by others showed that this finding could be generalized to a much broader historical sample of composers from England and France (Huron and Ollen, 2003),

¹³ Italicization by Patel.

¹⁴ “Vocalic intervals are vowels and sequences of consecutive vowels, regardless of whether they belong to the same syllable (or word, for that matter) or not. Similarly, inter-vocalic or consonantal intervals are made up of consonants and sequences of consecutive consonants.” (Ramus 2002)

¹⁵ Patel and colleagues also discussed the meaning of nPVI as “durational contrastiveness” despite its name “durational variability” in relation to the computation of nPVI. In a nutshell, the nPVI “is a contrastiveness index and is quite different from measures of overall variability (such as the standard deviation) [within a give language]”. “((Patel , Iversen, and Rosenberg, 2006: 3035). Appendix I gives the computation of the nPVI.

¹⁶ It is often necessary to point to the exact variation of a language when talking about rhythmic typology. For instance, while British English is stress-timed, Jamaican and Singapore English are considered syllable-timed. This is due to the role the rhythm plays in the prosodic structure of speech. One example that illustrates this property of rhythm in language is its role in second language acquisition. Without correct linguistic rhythm, a second language learner can still produce intelligible utterances; however, for native listeners, the misplacement in rhythmic structure is a significant factor in creating foreign accents.

though exceptions are observed (Patel 2003a). Hannon (2009) also showed that after a period of brief training, listeners can successfully classify instrumental arrangement of folk songs as from Britain or France only according to the rhythmic typology cues (i.e., different in nPVI, which is in turn consistent with different linguistic rhythms of French and British English). Similar studies using nPVI are also conducted in Korea (Slobodian 2008; Iverson 2008) and Japan (Sadakata et al. 2004), whose results are generally in consistent with the parallel between music and language rhythmic typology, while the parallels are to a less extent than expected (Sadakata et al. 2004).

In sum, the application of nPVI in linking musical to linguistic rhythmic typology allows quantified comparative studies to be made on a valid theoretical basis that seems to be fruitful so far, especially in the case of French vs. British music and languages. However, much still needs to be done to broaden the scope of the application, and possible difficulties are also present in deciding the historical and cultural influences/interactions in shaping the rhythmic characters in the music of a given culture, not to mention the great diversity of music existing in any one given culture. Before these issues can be carefully and effectively dealt with, the universality of this hypothesis cannot be attested.

(2) Music rhythm, linguistic rhythm, and human evolution. Darwin (1871) was the first scholar to propose the idea that human minds have been shaped by natural selection for music. While recent years have seen the renewed interest in this idea, skepticism also arises as to whether music is a byproduct of other cognitive functions that have more clearly adaptive values such as language. Hypothesis that argues a “musilanguage” stage in human evolution (Brown, 2000; Mithen, 2005; Jordania, 2006) also emerged in recent years.

Following the discussion on the role of pitch perception in music and language in human evolution by Justus and Hutsler (2005), as well as McDermott and Hauser (2005), Patel analyzed the similarity and differences in music and language rhythm that can or cannot be explained as a byproduct of other cognitive domains (such as language). According to Patel (2006a), while perceptual grouping can be viewed as derived from linguistic prosodic grouping abilities, the feature of periodicity (discussed earlier in this paper) seems to be unique to musical rhythm, thus indicating domain specificity. More specifically, Patel stressed the phenomenon of beat perception and synchronization (BPS), the ability to move or tap according to the beat perception of a given tempo, and argued that this aspect of rhythm appears to be unique to music (Patel, 2006a: 100).¹⁷

3. Syntax

For a long time in the 20th century, the link between musical and linguistic syntax remained in the

¹⁷ Following the discussion of BPS in terms of innateness, domain-specificity, and human-specificity, Patel proposed “vocal learning and rhythmic synchronization hypothesis”, which predicts the impossibility to teach non-human primates to synchronize to a musical beat. Further articles were published (Patel et al., 2009) upon the discovery of a cockatoo (a type of bird), which is able to synchronize to the musical beat on various tempos.

application of linguistic analytical methodologies (including quasi-linguistic methodologies) to music analysis, most notably, the now-still-widely-taught Schenkerian analysis and semiotic analysis (which actually deals with musical syntax rather than semantics). The most representative theory and analytic framework inspired by generative linguistics is the Generative Theory of Tonal Music (GTTM) proposed by Lerdahl and Jackendoff (1983), which celebrated its 25 years' anniversary by a volume of *Music Perception* devoted to the subject.

It is noticeable that although the GTTM was inspired by generative grammar in linguistics, the authors did not explicitly compare musical syntax with linguistic syntax. In fact, they were largely skeptical of such comparisons (see later discussions in this paper for the recent article of Jackendoff). Indeed, even the use of tree structure shared by both GTTM and linguistic syntactic theory did not resemble each other on various levels (e.g., the absence of the constituency relationships in musical syntactic trees). Patel (2008) points out several differences between music and linguistic syntax representations, such as the presence of grammatical categories in language (i.e., nouns, verbs, etc.), long distance dependencies in languages, and the tolerance of the interpretation of syntactic ambiguities by listeners of music and language. Formal similarities are also identified, including the hierarchical structure in music and language, and the logical structure in the two domains (Patel 2008: 264-267).¹⁸

Recent debate has focused on the question of whether there is shared or domain-specific¹⁹ processing of music and linguistic syntax from research in neuroscience. Contradictory evidences of the debate include on the one hand, the well-documented disassociations between the two (such as individuals with normal hearing showing impairment of syntactic processing in one domain while remaining intact in the other, e.g., aphasia without amusia, or vice versa), and on the other, neuroimaging data pointing to the overlap in the processing of linguistic and musical syntax.

Drawing research literature from psycholinguistics (Caplan and Waters, 1999; Ullman, 2001), Patel (2003) proposed a possible resolution to this paradox: a conceptual distinction between syntactic representation and syntactic processing in brain structure. A key idea of this “dual-system approach” is that “at least some of the processes involved in syntactic comprehension rely on brain areas separate from those areas where syntactic representation reside.” (Patel 2003: 676)

4. Meaning

The comparative study on musical and linguistic meaning is relatively rare, given the salient difference between the two systems. Traditionally this area falls into the field of music semioticians (Nattiez 1990) or music philosophers (Seeger 1975). Recently, inspired by the concept of linguistic

¹⁸ One study by Jonaitis and Saffran (2009) shows the similarity of music and linguistic syntactic acquisition by studying the role of serial statistics (statistical regularities underlying musical harmony and language learning.)

¹⁹ Meaning specialized processing.

prosody, Palmer and Hutchins (2006) explored the significance of “music prosody” in relation to musical meaning.

Since music is a non-referential system, comparisons of musical and linguistic meanings in recent empirical research often concern the affective response depending on the acoustic cues employed in music and speech. For instance, Ilie and Thompson (2006) used a three-dimensional model of affect to compare affective consequences of manipulating intensity, rate, and pitch height in music and speech. Their results showed that both faster music and speech were judged as having greater energy than slower music and speech, whereas the pitch height showed opposite affective response for speech and music. Similarly, Huron (2009) explained the affective consequences of major and minor scales by relating the effect of pitch height to the physiological cues observed in speech.²⁰

III Music and Language: A Comparative Overview

Despite the previous discussions based on various specific areas and levels, the overall relationship between music and language has been long a subject of debate that continues to fascinate scholars one generation after another. In this section I briefly summarize and discuss the most representative overviews on this matter from recent research literature.

(1) Patel (2008): *Music, Language, and the Brain*. As previously mentioned, this book is the most comprehensive synthesis on the research literature concerning music and language up to date. As also can be seen from research summarized in this paper, Patel has continuously worked on the various aspects of music and language cognition for over a decade. His important publications cover diverse areas such as rhythm, timbre and syntax from a variety of perspectives including cognitive sciences, neurosciences, acoustic analysis, and evolutionary biology. In addition, Patel has consistently showed effective analysis to the topics he dealt with, as well as effective identification of potential research topics. It should not be surprising thus that his book draws from these research literature that he already built over the years of works.

The recent interdisciplinary investigation into music and language has showed a tendency that largely differs from the previous speculative discussions and theories on the subject (e.g. Bernstein’s Harvard Lecture *Unanswered Questions*, Adorno 1956, Seeger 1977), namely, the idea that “language and music cannot be considered single entities; they need to be decomposed into different component operations or levels of processing (Besson & Schon, 2001).” In light of this trend, the research (as exemplified by Patel) has particularly tended to focus on the effective identification of the most meaningful points and areas of comparison, often quite different from one domain to

²⁰ Personal communication with David Huron at SMPC 2009 Conference, Indianapolis, IN, Aug.2009.

another (e.g., the points of interesting comparisons possibly differ in sound elements perception vs. rhythmic perception between music and language). This has also resulted in the shift of the overall goal of the investigation than previously held, as Patel wrote in the Afterword of his book (Patel 2008:417): “[No matter similar or different,] Comparing music and language provides a powerful way to study the mechanisms that the mind uses to make sense out of sound.”

Overall, aside from the compelling evidence that Patel have cited, his enthusiasm and belief that music and language are closely related cognitive and neural systems are apparent.²¹ This is also reflected in his ability (or propelled him to possess such ability) to effectively identify the key links in each domain of comparisons between music and language as well as to propose constructive solutions, even when there are contradictory evidences that may seem to suggest the dissociation between the two in the domain in question (such as the paradoxical evidence on syntactic processing discussed earlier). Patel has also been active in broadening the scope of research by studying non-Western musical systems and non-Indo-European languages, which is exactly the kind of research that needs to be done in order to bring our understanding of music and language to a more general level.

Key Links in each area of music and language, as identified by Patel (2008) include:

- [1] Sound Elements (pitch and timbre): Sound category learning as a key link;
- [2] Rhythm: Nonperiodic aspects of rhythm as a key link;
- [3] Melody: Melodic statistics and melodic contour as key links;
- [4] Syntax: Neural resources for syntactic integration as a key link;
- [5] Meaning: The expression and appraisal of emotion as a key link;
- [6] Evolution: Beat-based rhythm processing as a key research area.

(2) Jackendoff (2009): “Parallels and Non-Parallels between Music and Language.” Although the co-author of the most influential linguistics-inspired music theory (*A Generative Theory of Tonal Music*), Jackendoff has constantly called for caution when drawing parallels between music and language. His recent article (2009) addresses two important questions: [1] How are language and music different? [2] In the respects that language and music are the same, are they genuinely distinct from other human activities? (Jackendoff 2009: 195). The second question, put more specifically, becomes the central argument of the article: “What cognitive capacities are shared by language and music, but not by other cognitive domain?” (ibid)

To consider this usually not addressed question, Jackendoff first outlined several general capacities shared by language and music that are also shared with other cognitive domains: [1] substantial memory capacity for storing representations (shared by the massive storage necessary

²¹ As I will discuss later, Jackendoff wrote in his article that even though he had pretty much the same evidence as Patel did, he would rather believe the glass is half empty rather than half full. (Jackendoff 2009)

for encoding the appearance of familiar objects); [2] ability to integrate stored representations combinatorially in working memory (shared with the ability to understand a complex visual environment or creating a plan for complex action); [3] creating expectations (shared with visual perception); [4] ability to achieve fine-scale voluntary control of vocal production (not required in instrumental music or sign-language, but possibly stemmed from enhanced hand control of tool making); [5] ability to imitate others' vocal production (shared with other cultural practices); [6] ability to invent new items (shared with other cultural practices); and [7] ability to engage in jointly intended actions (shared with human widespread ability of cooperation). (Jackendoff 2009: 197)

Jackendoff also compared the different ecological functions of music and language in human life, and listed many formal similarities and differences in each of the areas of pitch, rhythm, words, syntax, prolongational structure, and complex action (See Jackendoff 2007), much of the evidence not unlike those documented by Patel (2008) and discussed in the current paper. He concluded that the two differ in many aspects of structure and function, and with the exception of the metrical grid, all aspects they share appear to be instances of more general capacities. He in turn argued "In particular, at the moment we do not have a properly laid out account of even one other capacity against which to compare language and music", and acknowledged his different view overall than Patel even though both are drawing from much of the same evidences.

At this point, it is worth considering if such approaches by Jackendoff need to be taken and how can it merit the understanding of the encoding of sound signals by the human minds. One question might worth pondering is that, in terms of shared capacity among music, language, and other cognitive domains, to what extent do they share these capacities, and what are the implications of these sharing?

(3) Pesetsky and Katz(2009): "The Identity Thesis for Language and Music." The Identity Thesis represents the contribution of formal linguistics (more specifically, generative syntax) to the study on the relationship of music and language. Different from the empirical methodology, this approach emphasizes the pure formal description of the structure of music and language on a most abstract level. Theoretically, the Identity Thesis builds on the linguistic theory of generative syntax (especially the Internal Merge theory in the analysis of wh-movement), and the GTTM in music theory developed by Lerdahl-Jackendoff. The main thesis of this theory is: "All formal difference between language and music are a consequence of differences in their fundamental building blocks (arbitrary pairings of sound and meaning in the case of language; pitch-classes and pitch-class combinations in the case of music). In all other respects, language and music are identical (Pesetsky and Katz, 2009: 3)." In other words, it contends that the point of similarity between language and music is not their building blocks, but what they do with them.

Pesetsky and Katz first discuss the nature of GTTM, a generative grammar for music that does

not resemble the appearance and form of the corresponding generative grammar in linguistics, from which GTTM received inspiration. Identifying four types (levels) of theories possible in a generative framework (type 1: Analysis of particular pieces; type 2: Common properties of pieces within an idiom; type 3: Common properties of musical idioms; and type 4: Properties common to UG-M [Universal Grammar-Music] and other cognitive systems), they pointed out that GTTM did not resemble generative syntax in linguistics because these two theories belong to different types of generative theory described above. Thus, through an abstract formal analysis based on GTTM, the authors discussed the corresponding “rules” (the identical ways music and language make use of the “building blocks”) governing TSR (Time-span Reduction) and PR (Prolongational Reduction) in GTTM, and syntax and prosody in linguistics, thus “aligning” the two theories to show that their rules are much identical on an abstract level.

The Identity Thesis offers a valid explanation of the divergence between GTTM and generative linguistics, at the same time illustrates the linguistic analytical methodology that can be directly applied to similar questions in other areas of music-language comparison from a purely structural perspective. In any case, at this stage, in order to broaden the scope of this approach, it is still important to keep in mind the question that the authors themselves asked, namely, “whenever the ‘look’ of the model developed in GTTM and related literature diverges from the ‘look’ of linguistic theory... to what extent do they result from real distinctions between language and music, and to what extent do they result from non-inevitable differences in how research has been pursued in the two domains?” and vice versa.

(4) Saffran (2004): “Music and Language—a Developmental Comparison.” This overview seeks to draw research literatures from development cognitive psychology studying music and language perception at two different stages, namely, among children and adults. The key idea in this study is that, “it seems possible that while adult musical and linguistic processes are modularized to some extent as separate entities, there maybe similar developmental underpinnings in both domains, suggesting that modularity is emergent rather than present at the beginning of life (Saffran 2004: 289).”

Preface to Music and Language Bibliography

This paper surveys literature on the studies that relates music to language, from anthropological and cognitivist perspectives. In this paper I investigate the current state of research on music and language by answering these primary questions: 1) What are the types of methodologies taken in overall research designs? 2) What has been done in each of these two sub-fields of music and language, including their historical development, intellectual foundations, topics and results of investigation in recent developments? 3) Our current understanding and the outlook for the fields as to the central question that defines the field: the relationship between music and language.

Research on music and language cognition examined in this essay differs from those in Speech and Singing in that the current paper involves multiple levels of analysis (with a broader scope of literature), covering the various perspectives in music and language research (contextualized and de-contextualized analysis), as well as elements of music and language processing (sound elements, rhythm, melody, syntax, and meaning).

Regarding the anthropological themes, complex intellectual streams and chronological shifts on research premises and topics of focus are observed. The large quantity of literatures in anthropology indicates that recent ethnomusicological research on music and language centers around theoretical constructions and conceptual frameworks mainly based in anthropological discourses. Indeed, looking at the large picture, the development of ethnomusicological research has witnessed a history of interdisciplinary discourses with its sibling fields, notably linguistics (in earlier periods) and anthropology (as having the strongest influence on ethnomusicology in recent decades). In addition to the theoretical construction of the sounded anthropology in recent years, it is also true that many recent works with a direct focus on music and language were carried out within the anthropological sphere⁵. It is noteworthy that the ethnomusicological works cited above are mainly in the "semiotic approach" section, which themselves do not have anything to do with music and language per se. It is only included in the review when considering the parallel moves between ethnomusicology and linguistic anthropology on a broader level. As such, there are also a small body of literature in ethnomusicology (published in ethnomusicological journals and/or written by ethnomusicologists)

that, at least in part, continues to employ a more or less strictly grammatical approach to music and language analysis (that also differ themselves from the much criticized and abandoned approaches in earlier periods by adopting a more integrated approach).

Regarding the cognitivist themes, two kinds of research in music-language comparison are identified for the discussion of the current paper: (1) Directly comparing aspect(s) of music and language structure or cognition in one single study under one unified theoretical and analytical framework; and (2) Taking what is known from existing research on linguistic theory and music theory (or independent empirical research in each domain) and make comparisons on variously levels. It is worth noticing that in Patel's book (2008), the majority of discussion belongs to type (2) in nature. An examination of Patel's bibliography also reveals that the majority of literature cited belongs to independent research in either domains of linguistics (including psycholinguistics) or music (including music cognition), whereas the amount of type (1) research only occupies a small percentage. This is understandable due to the fairly recent interest in comparing the structure and cognition of music and language, and much more research are expected to be done (which is why Patel's book also contains more than 30 proposals on how such research could be conceived) (Schon, 2009:287). Thus it is the intention of this paper to focus on the current state of type (1) research in the selection of the entries.

In addition to these research literature focusing on various specific areas of investigation, I also examined several larger scale literature, which attempt to assess the relationships between music and language in an overview. It is also worth noticing, as I stated in the paper, that even among these literature a trend to dissecting the problem into smaller issues is present.

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*Herzog, G. (1945) Drum Signalling in a West African Tribe. *Word* (1):217-38.

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Hosokawa, S. (1984) *How Saussurian is music?* In *Musical Grammars and Computer Analysis*, ed M Baroni, L Callegari, pp.155-63. Firenze:Olschki.

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One of the most recent publications, Mink's study on Nicaraguan children's song games brings together theories of performance and language-in-interaction to interpret the socialization and negotiation of gender and sexuality in children's peer groups. Ethnographic research and micro-analyses of transcribed song game performances demonstrate that mobile aesthetic forms are both a communicative resource and a framework for the formation and re-formation of subjectivity in social discourse.

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*Pian, RC.(1975) Aria Structural Patterns in the Peking Opera, in J. I. Crump and William Malm, eds., *Chinese and Japanese Music-Drama* (Ann Arbor: University of Michigan Press), pp. 65-89. (Michigan Papers in Chinese Studies No. 19.)

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*Porcello, T., L. Meitnjes, A. M. Ochoa, and D. Samuels. (2010) The Reorganization of the Sensory World. *Annual Review of Anthropology* 39: 51-66. *One of the recent theorizations about the sensory aspects in anthropological research.*

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Rycoft, DK.(1983) The Relationship Between Speech-Tone and Melody in Southern African Music. In *South African Music Encyclopedia*, Vol.2, ed. K Wachsmann, pp. 301-14. Cape Town: Cape Town /Oxford Univ. Press.

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Sarkar, M., and D. Allen. (2007) Hybrid Identities in Quebec Hip-Hop: Language, Territory, and Ethnicity in the Mix. *Journal of Language, Identity & Education* 6(2):117-130.

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An earlier work proposing the concept of "soundscape", which found resonance in anthropology decades later.

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*Seeger, C. (1977) *Studies in Musicology, 1935-1975*. Berkeley: Univ. Calif. Press.
Several of Seeger's article in this volume concerns the "linguocentric predicament", discussed in "language about music" section in this paper.

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*Stokes, M. (2004) Music and the Global Order. *Annual Review of Anthropology* 33:47-72.

Stoller P. (1997) *Sensuous Scholarship*. Philadelphia: Univ. Penn. Press

*Sundberg, J. (1969) *Articulatory Differences Between Spoken and Sung Vowels*. Speech Transmission Lab Quarterly Progress Status Report, 1:33-46. Stockholm: Royal Institute of Technology.

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Tiway, KM. (1978) *Tuneful Weeping: A Mode of Communication*. *Frontiers* 3(3):24-27.

Tomlinson, G. 2007 *The Singing of the New World: Indigenous Voice in the Era of European Contact*. Cambridge Univ Pr.

*Turino, T. (1999) *Signs of Imagination, Identity, and Experience: A Piercian Semiotic Theory for Music*. *Ethnomusicology* 43(2):221-255.

Turino offers a simplified explanation of the theoretical framework of semiotics by American semiotician Charles Peirce and discussed its applicability to music phenomena.

Turino, T. (2003) *Are we Global Yet? Globalist Discourse, Cultural Formations and the Study of Zimbabwean Popular Music*. 12(2):51-79.

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Weidman, A. (2007) Stage Goddesses and Studio Divas in South India: On Agency and the Politics of Voice. *In Words, Worlds, and Material Girls: Language, Gender, Globalization.* Bonnie S. McElhinny, ed. Pp. 131. Mouton De Gruyter.

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Adorno, T.W. (1956) Music and language: a fragment. In *Quasi una Fantasia, Essays on Modern Music*, (Translated by Rodney Livingstone), London, New York: Verso.

Adorno is one of the well-known examples who subjectively (meaning without empirical evidence) discussed the relationships between music and language from a musicologist's perspective.

Anvari, S.H et al. (2002) Relations Among Musical Skills, Phonological Processing, and Early Reading Ability in Pre-school Children. *Journal of Exp. Child Psychology*, 83:111-130.

Ayotte, J., Peretz, I., & Hyde, K. (2002). Congenital Amusia: A Group Study of Adults Afflicted with a Music-specific Disorder. *Brain*, 125, 238-251.

Besson, M., Friederici, A.D. (1998) Language and Music: A Comparative View. *Music Perception* 16(1):1-9 .

This article offers a literature overview of comparative studies of music and language cognition at the time it is written (1998).

Besson, M, Schon, D. (2001) Comparison Between Music and Language. *Annals of the New York*

Academy of Sciences 930 (June): 232-58.

In this later version of the overview, Besson argues that “language and music cannot be considered single entities; they need to be decomposed into different component operations or levels of processing”.

Bigand, E. (2009) Editorial: Special Issue - Music and Language: 25 Years After Lerdahl & Jackendoff's GTTM. *Music Perception* 26(3): 185-186 .

This issue of the journal Music Perception is devoted particularly to the discussion of music and language in honor of the Lerdahl-Jackendoff's Generative Theory of Tonal Music. Various articles on music and language and specifically on issues relating to GTTM are included in the volume.

Bolduc, J. (2005) Pitch Processing and Phonological Awareness. *Psychomusicology*, 19 (1): 3-14.

Brown, S. (2009) Review of Patel (2008), *Music, Language, and the Brain*. *Musicae Scientiae*, XIII (1):163-182.

According to Patel (2008), a basic distinction between music and language systems in sound elements is that the former primarily makes use of pitch contrast, whereas the latter primarily makes use of timbre contrast. While this is a valid and clever way to put it, it has received minor criticisms in that the “timbre” used to indicate the contrast among different speech phonemes (such as [i] and [e]) can be confused with the different “timbre” of different speaking voice, i.e., the voice quality of different individuals' speech sound (Brown 2009). Nevertheless it is an effective way to distinguish the two systems, and also useful in asking questions such as why most music do not choose to make use of timbre as the main contrast device instead of pitch (which Patel also gives an answer in his book) while it is theoretically perfectly possible.

_____. (2000) Musilanguage. In Wallin, N. L., Merker, B., and Brown, S. (Eds.) *The Origins of Music*. Cambridge, MA: MIT Press.

In this article, Brown proposed a hypothesis where there was a stage in early history of homosapiens when people have not started talking, but used a middle ground of something between music and language to communicate, called “musi-language”.

Caplan, D., Waters, G.S. (1999) Verbal working memory and sentence comprehension. *Behavioral and Brain Sciences*, 22,77-94.

Cohen, A. J. (2004) Parsing of Melody: Quantification and Testing of the Local Grouping Rules of Lerdahl and Jackendoff's "A Generative Theory of Tonal Music". *Music Perception* 21:(4): 499-543.

Collister, B., Huron, D. (2008) Comparison of Word Intelligibility in Spoken and Sung Phrases. *Empirical Musicology Review*, 3(3):109-125.

An example of melody-timbre interface study is found in this article by Collister and Huron (2008) on the comparison of word intelligibility in spoken and sung phrases. It illustrates the interaction between the production/perception of phonetic information (timbre contrast) and the linguistic/music melodies that carry such information.

Darwin, C. (1871) *The Descent of Man, and Selection in Relation to Sex*. London: John Murray.

Is music an evolutionary must, or a biological byproduct of human evolution? Darwin is the first biologist to raise the question of evolution of music, in relation to language: If language has a

clear evolutionary advantage in the course of human evolution, then what is so special about music that it remains a true human universal until today but appears to be evolutionarily unnecessary? Debates is still going on along this line.

Dauer, R.M. (1983) Stress-timing and Syllable Timing Reanalyzed. *Journal of Phonetics*, 11: 51-62.

Deutsch, Diana. (1991) The Tritone Paradox: An Influence of Language on Music Perception. *Music Perception* 8(4): 335.

Deutsch discusses the musical illusion called tritone paradox where pairs of notes clearly defined in interval structure while lacking clarity on its absolute height (i.e. ambiguous in octave placement) are judged by groups of listeners as either distinctively ascending (e.g. ascending fourth) or descending. Through empirical experiments, Deutsch attributes these inter-group differences to the pitch patterns of one's native language environment.

Deutsch, D., Dooley, K., Henthorn, T. and Head, B. (2009) Absolute Pitch Among Students in an American Music Conservatory: Association with Tone Language Fluency. *Journal of the Acoustical Society of America*, April, 125, 2398-2403.

Groups of professional music students from the Central Conservatory of Music in Beijing are studied in comparison with those from Eastman School of Music. Results showed significantly higher percentage of occurrence of absolute pitch in the Chinese musicians than the Americans on all age groups and musical skill levels. Implications are discussed.

Deutsch, D., Henthorn, T., and Dolson, M. (2004) Speech patterns heard early in life influence later perception of the tritone paradox. *Music Perception*, 21, 357-372.

_____. (2004a) Absolute Pitch, Speech, and Tone Language: Some Experiments and a Proposed Framework. *Music Perception* 21:3, 339-356.

In this study, Deutsch proposed a hypothesis that the musical ability of absolute pitch is the result of one's native language (tone vs. non-tone languages). Experiments are conducted to test this hypothesis, while previous hypothesis by other scholars are disapproved.

Deutsch, D., Henthorn, T., Lapidis, R. (2008) The Speech to Song Illusion. *Proceedings of 156th Meeting of the Acoustical Society of America*.

Dresher, E. (2008) Between Music and Speech: The Relationship between Gregorian and Hebrew Chant. *Toronto Working Papers in Linguistics*, 27, [np].

Grabe, E., Low, E.L. (2002) Durational Variability in Speech and the Rhythm Class Hypothesis. In Gussenhoven and Warner, *Laboratory Phonology*, 7. Berlin: Mouton de Gruyter.

Gibson, E. Linguistic complexity: locality of syntactic dependencies. *Cognition* 68, 1-76 (1998).

Gibson, E. The Dependency Locality Theory: A Distance-Based Theory of Linguistics Complexity. In Miyashita, Y., Marantz, A., and O'Neil, W., eds, *Image, Language, Brain* 95-126.

Hall, R.A., Jr. (1953) Elgar and the Intonation of British English. *The Gramophone*, June 1953:6-7, reprinted in *Intonation: Selected Readings*, edited by D. Bolinger (Penguin, Harmondsworth), p282-285.

Hannon, E. (2009) Perceiving Speech Rhythm in Music: Listeners classify instrumental songs according to language of origin. *Cognition*, 111(3): 403-409.

In this study, participants are presented with instrumental music and were instructed to judge the country of origin (either English or French) based only on the rhythmic characters of the music after going through a training phase. Results confirm the rhythmic differences in linguistic rhythm that was reflected in music.

Hébert, Sylvie. (2008) A Case Study of Music and Text Dyslexia. *Music Perception* 25:4, 369-381.

Huppertz, H.J., Knösche, T.R., Wellmer, J., Widman, G., Schulze-Bonhage, A. Sammler, D., Koelsch, S., Ball, T., Brandt, A., Elger, C.E., Friederici, A.D., Grigutsch, M., (2009) Overlap of Musical and Linguistic Syntax Processing: Intracranial ERP Evidence. *Annals of the New York Academy of Sciences* 1169:1, 494-498.

Huron, D. Ollen, J. (2003) Agogic Contrast in French and English Themes: Further Support for Patel and Daniele. *Music Perception*, 21:267-271.

Following Patel's initial study of applying nPVI to compare musical rhythm and linguistic rhythm, Huron and co-workers studies a much larger sample of French and English themes from a database. Results support the conclusion by Patel that French and English musical compositions by respective national composers do show similar rhythmic characters (measured by nPVI value) that correspond to their respective native language.

Ilie, Gabriela. (2006) A Comparison of Acoustic Cues in Music and Speech for Three Dimensions of Affect. *Music Perception* 23:4, 319-329.

In this study, Ilie and Thompson (2006) used a three-dimensional model of affect to compare affective consequences of manipulating intensity, rate, and pitch height in music and speech. Their results showed that both faster music and speech were judged as having greater energy than slower music and speech, whereas the pitch height showed opposite affective response for speech and music.

Iversen, John R. (2008) Review of "Perception and production of linguistic and musical rhythm by Korean and English middle school students" by Lydia N. Slobodian. *Empirical Musicology Review*, 3(4): 208-214.

Jackendoff, R. (2009) Parallels and Nonparallels Between Language and Music. *Music Perception* 26(3):195-204.

In this recent article Jackendoff calls for caution when drawing comparisons between music and language. He discusses the specialization of cognitive abilities in music processing, language processing, and general task processing (other than music and language) and analyzed the conditions where music and language share cognitive functions that are not shared by other domain.

_____. (2007) *Language, Consciousness, Culture*. Cambridge, MA: MIT Press.

Jakobson, L.S., Lewycky, S.T., Kilgour, A.R., Stoesz, B.M. (2008) Memory for Verbal and Visual Material in Highly Trained Musicians. *Music Perception* 26:1, 41-55.

Jescheniak, Jörg D. (2008) Brain Activity Patterns Suggest Prosodic Influences on Syntactic Parsing in the Comprehension of Spoken Sentences. *Music Perception* 16:1, 55-62.

Jentschke, S., Koelsch, S., Sallat, S., Friederici, A. (2008) Children with Specific Language Impairment Also Show Impairment of Music-syntactic Processing. *Journal of Cognitive*

Neuroscience, 20(11):1940-1951.

Jordania, Joseph. (2006) *Who Asked the First Question: Origins of Vocal Polyphony, Human Intelligence, Language and Speech*. Tbilisi: Logos, Tbilisi State University.

This book offers a unique perspective and speculation on the evolution of music and language. Various issues are discussed, such as the geographical distribution of polyphonic singing as evidence of music and language evolution; tone languages and its relationship to the percentage of stuttering in that culture. In general, Jordania shares Brown's view that there might have existed a quasi-musi-language state in early human history.

Jonaitis, E. Saffran, J. (2009) Learning Harmony: The Role of Serial Statistics. *Cognitive Science* 33: 951-968.

Justus, T. Hutsler, J. (2005) Fundamental Issues in the Evolutionary Psychology of Music: Assessing Innateness and Domain-Specificity. *Music Perception*, 23: 1-27.

Kolinsky, R., Lidji, P., Peretz, I., Besson, M. & Morais, J. (2009) Processing interactions between phonology and melody: Vowels sing but consonants speak. *Cognition*, 112:1-20.

Kolinsky, R. (2009) Music Training Facilitates Lexical Stress Processing. *Music Perception* 26:3, 235-246 .

Lerdahl, F. (2001) *Tonal Pitch Space*. New York: Oxford University Press.

In this work, Lerdahl discusses the theoretical construction of tonal pitch space (TPS) from an analytical perspective. This is cited in support of Patel's neurological resource-sharing framework in music and language syntactic processing.

_____. (2009) Genesis and Architecture of the GTTM Project. *Music Perception* 26:3, 187-194.

Lerdahl, F., Jackendoff, R. (1983) *A Generative Theory of Tonal Music*. Cambridge, MA: MIT Press.

The first systematic generative grammar for music, as inspired by the linguistic theory of generative grammar. The GTTM, developed by a linguist and a music theoretician, did not resemble the original linguistic theoretical construction, but provide an alternative understanding and effective description for music analysis. Both authors call for caution that this should not be considered evidence of close similarity between music and language syntactic structure.

Levitin, D., Tirovolas, A. (2009) Current Advances in the Cognitive Neuroscience of Music. *Annals of the New York Academy of Sciences* 1156:1, 211-231.

Low, E.G., Grabe, E. and Nolan, F. (2000) Quantitative Characterizations of Speech Rhythm: Syllable-timing in Singapore English. *Language & Speech*, 43(4): 377-401.

Madell, J., Herbert, S. (2008) Eye Movements and Music Reading: Where Do We Look Next? *Music Perception* 26:2, 157-170 .

Magne, C. et al (2006) Musician Children Detect Pitch Violations in Both Music and Language Better than Nonmusician Children: Behavioral and Electrophysiological Approaches. *Journal of Cognitive Neuroscience*, 18: 199-211.

Marin, M. (2009) Effects of Early Musical Training on Musical and Linguistic Syntactic Abilities. *Annals of the New York Academy of Sciences* 1169:1, 187-190.

McDermott, J. Hauser, M.D. (2005) The Origins of Music: Innateness, Development, and Evolution. *Music Perception*, 23: 29-59.

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

Nattiez, J-J. (1990) *Music and Discourse: Toward a Semiology of Music*. Princeton, NJ: Princeton University Press.

Overy, K. (2009) Dyslexia, Temporal Processing and Music: The Potential of Music as an Early Learning Aid for Dyslexic Children. *Psychology of Music*, Vol. 28, No. 2, 218-229.

Palmer, C. Hutchins, S. (2006) What is Musical Prosody? In Ross. B et al, *The Psychology of Learning and Motivation*, Vol. 46. New York: Elsevier Inc.

Parsons, K. (2006) Preserved Singing in Aphasia: A Case Study of the Efficacy of Melodic Intonation Therapy. *Music Perception* 24:1, 23-35.

Patel, A.D.(1998) "Syntactic Processing in Language and Music: Different Cognitive Operations, Similar Neural Resources." *Music Perception* 16:1, 27-42.

In this study, Patel presents data from neuroimaging and music/speech therapy that seem to contradict each other regarding the association/disassociation between music and language syntactic processing. He proceeds to resolve this paradox by proposing the resource-sharing framework of music and language syntactic processing and representation.

_____. (2003) Language, music, syntax and the brain. *Nature Neuroscience*, 6:674-681.

_____. (2003a) Rhythm in Language and Music: Parallels and Differences. *Annals of the New York Academy of Sciences* 999: 140-143.

_____. (2006) An Empirical Method for Comparing Pitch Patterns in Spoken and Musical Melodies: A Comment on J.G.S. Pearl's "Eavesdropping with a Master: Leos Janáček and the Music of Speech." *Empirical Musicology Review*, 1(3):166-169.

_____. (2006a) Musical Rhythm, Linguistic Rhythm, and Human Evolution. *Music Perception* 24(1): 99-103.

_____. (2008) *Music, Language, and the Brain*. New York: Oxford University Press.

This is the most comprehensive reference on music and language cognition research up to date. Much of the book is cited and analyzed throughout my current paper.

_____. (2008a) Music and the Brain: Three Links to Language. In *Oxford Handbook of Music Psychology*. New York: Oxford University Press.

Patel, A.D., Iversen, J.R., Bregman, M.R., & Schulz, I. (2009). Experimental Evidence for Synchronization to a Musical Beat in a Nonhuman Animal. *Current Biology*, 19: 827-830.

This study reports the first case of the discovery of a bird (cockatoo), who is empirically proved to be able to move according to the tempo and rhythm of musical beats (synchronize to a musical beat). Previously this ability is only thought to be possessed by human being.

Patel, A.D., & Iversen, J.R. (2007) The Linguistic Benefits of Musical Abilities. *Trends in Cognitive Science*, 11(9): 369-372.

Patel, A.D, Iversen, J.R, and Rosenberg, J.C. (2005) Comparing the Rhythm and Melody of Speech and Music: The Case of British English and French. *Journal of the Acoustic Society of America*, 119(5): 3034-3037.

Provides the first empirical evidence of the correlation between the music rhythm of composers of a particular culture to the speech rhythm of that culture.

Patel A.D. & Iversen, J.R. (2003). Acoustic and perceptual comparison of speech and drum sounds in the North Indian tabla tradition: an empirical study of sound symbolism. *Proceedings of the 15th International Congress of Phonetic Sciences, Barcelona, 2003*, pp.925-928.

This study provides a fascinating example of a musical system where timbre contrast (instead of pitch contrast) is used as a main device of composition (the Indian tabla system). Acoustic analysis is conducted and the results confirmed the sound symbolism (the linguistic sound is named because of its acoustic similarity to the musical sound) based on acoustic similarity rather than convention.

_____. (2003a) An Empirical Comparison of Rhythm in Language and Music. *Cognition*, 87: B35-45.

Various aspects of linguistic and musical rhythm are discussed. Of the primary importance is the notion of viewing rhythm as a regulated pattern without making periodicity a necessary parameter. Therefore the view of speech rhythm is broadened.

Patel, A.D, Wong, M., Foxton, J., Lochy, A., & Peretz, I. (2008a) Speech Intonation Perception Deficits in Musical Tone Deafness (Congenital Amusia). *Music Perception* 25:4, 357-368.

In this study, Patel and co-workers found evidence that contrary to previous belief, music tone-deafness can be associated with deficiencies in speech intonation perception.

Pearl, J. (2006) Eavesdropping with a Master: Leos Janacek and the Music of Speech. *Empirical Musicology Review*, 1:131-165.

Pesetsky, D., Katz, J. (2009) *The Identity Thesis for Language and Music*. Unpublished draft.

This thesis is a linguistic re-analysis of GTTM. The basic contention of the thesis is that, the only difference between music and language lies in the building blocks. In all other aspects, music and language are identical.

Pian, R.C. (1972) Text setting in the Shipi animated aria. In Laurence Berman (ed), *Words and Music: The Scholar's View; a medley of problems and solutions compiled in honor of A.Tillman Merritt by sundry hands*. Cambridge, MA: Dept.of Music, Harvard University.

Piro, J., Ortiz, C. (2009) The effect of piano lessons on the vocabulary and verbal sequencing skills of primary grade students. *Psychology of Music*, 37:325.

Ramus, F. (2002) Acoustic Correlates of Linguistic Rhythm: Perspectives. *Proceedings of Speech Prosody 2002, Aix-en-Provence*, 115-120. Aix-en-Provence: Laboratoire Parole et Langage.

Ramus, F. Nespor, M. Mehler, J. (1999) Correlates of Linguistic Rhythm in the Speech Signal. *Cognition*, 73: 265-292.

Roach, P. (1982) On the Distinction Between "Stress-timed" and "Syllable-timed" Languages. In

D. Crystal (ed.), *Linguistic Controversies: Essays in Linguistic Theory and Practice in honour of F.R. Palmer*, 73-79. London: Edward Arnold.

Sadakata, M., Desain, P., Honing, H., Patel, A. D., & Iversen, J. R. (2004). A Cross-Cultural Study of the Rhythm in English and Japanese Popular Music. *Proceedings of the International Symposium on Musical Acoustics (ISMA)*, 41-44. Nara.

Saffran, J. (2004) Music and Language: A Developmental Comparison. *Music Perception* 21(3):289-311.

Schellenberg, E.G., Trehub, S. (2008) Is There an Asian Advantage for Pitch Memory? *Music Perception* 25:3, 241-252.

Schön, D. (2009) Review of *Music, Language, and the Brain* by Aniruddh Patel. *Music Perception* 26(3): 287-288.

Schlaug, G., Marchina, S., Norton, A. (2008) From Singing to Speaking: Why Singing May Lead to Recovery of Expressive Language Function in Patients with Broca's Aphasia. *Music Perception* 25:4, 315-323.

Seeger, Charles. (1977) *Studies in Musicology, 1935-1975*. Berkeley and Los Angeles: University of California Press.

In the current paper I use Seeger's notion of "tonal functions" and "temporal functions" as a framework to discuss the various aspects of music and language.

Slobodian, Lydia N. (2008) Perception and production of linguistic and musical rhythm by Korean and English middle school students. *Empirical Musicology Review*, 3(4): 187-204.

This is a study on the relationship between music and linguistic rhythm of a given culture using the recent advancement of linguistic rhythm typology index, namely, the nPVI. Results are in favor of the correspondence between the two but to a lesser degree than expected.

Stegemöller, Elizabeth L. (2008) Music Training and Vocal Production of Speech and Song. *Music Perception* 25:5, 419-428.

Thaut, Michael H. (2008) Musical Structure Facilitates Verbal Learning in Multiple Sclerosis. *Music Perception* 25:4, 325-330.

Thompson, W.F. et al. (2004) Decoding Speech Melody: Do Music Lessons Help? *Emotion*, 4: 46-64.

Ullman, M.T. (2001) A neurocognitive perspective on language: The declarative/ procedural model. *Nature Reviews (Neuroscience)*, 2:717-726.

Wong, P.C.M. et al. (2007) Musical Experience Shapes Human Brainstem Encoding of Linguistic Pitch Patterns. *Natural Neuroscience*, 10:420-422.

Yung, B. (1989) *Cantonese Opera: Performance as Creative Process*. Cambridge [Cambridgeshire] ; New York : Cambridge University Press, 1989.