

Music, Language, and the Brain

BY ANIRUDDH PATEL

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IMAGINE YOU WERE OFFERED A JOURNEY going from San Diego to Papua New Guinea, via Nicaragua, Bolivia, Brazil, Europe, Congo, Nigeria, Cameroon, Ethiopia, India, Thailand, China, Japan, and Australia. Imagine that you were accompanied by a very gentle guide who speaks all the languages, can sing all the songs you encounter, and who explains all the nuances of the different cultures. Imagine that such a journey cost less than filling up your car with oil, and that you could buy it or order it in a book shop. If you have all that imagination, and if you want to realize a journey that may first seem as unbelievable and impossible, you should read Aniruddh Patel's book *Language, Music and the Brain*.

This book is the result of a tremendous effort to synthesize a huge amount of empirical research (1300 references!) coming from different fields (linguistics, musicology, psychology, neurosciences, etc.) in order to understand what are the most meaningful parallels one can make between music and language. The book is dense, but not heavy, clear but not simple, rich but not arrogant. It is the type of book that needs to be discussed with other people, to savor, sip by sip, like a 10-year-old Bourgogne.

All chapters have the same structure, treating the musical and linguistic aspects of a given topic, followed by what the author believes to be the key link; a promising area of research with regard to music-language relations. Topics change from chapter to chapter in a logical and fluent manner: going from sound elements to evolution, via rhythm, melody, syntax, and meaning.

Patel is adept at comparative research, comparing music and language in different cultures and at different ages of development. In studying such a complex object as the brain, it can be invaluable to have more than one point of observation. Indeed, studying the brain with only one specific cognitive function is probably worse than staring at the statue of David without going around it. Of course in comparing two points of view of the same object (the brain), there are two different approaches: one emphasizing the differences and another emphasizing the similarities. Patel is very clear in choosing the

latter view. I can only agree with his choice, which is an epistemological position, possibly driven by a greater challenge in looking for similarities where there seem to be none. The reward is eventually to find that there exist several basic cognitive mechanisms that might be shared by language and music (and why not other systems).

Patel also is an imaginative scientist. His book contains around 30 proposals and ideas on how to improve the actual knowledge in the field. Some are proposals concerning ways of improving previous experiments, some are ideas on unanswered questions. In several cases he also gives precise advice on the way research should be conducted in order to correctly interpret the data. Indeed, if Patel is an imaginative scientist, he is also a very rigorous one, and he does not fear criticizing published studies or theoretical approaches. In a constructive way he points to methodological weaknesses or alternative explanations. For instance, in the field of neuropsychology, the double dissociations between amusia and aphasia have been used to claim that music and language do not share common neural substrates. Patel first describes neuroimaging evidence that stands as evidence to the contrary. Second, he points to the fact that several aphasics without amusia are professional musicians whose data cannot be generalized to ordinary individuals. Third, he suggests that musical tests used to verify musical competences are not very sensitive and well refined. Finally, he proposes an explanatory theory to account for discrepancies between neuroimaging and neuropsychological data.

For each topic, Patel chooses what he believes to be the key link between language and music. Most of the times this link lies in a deep similarity that goes far beyond the surface differences of the two cognitive systems. In the second chapter (Chapter 1 being the introduction) on sound elements, sound category learning is chosen as the key link. The notion of domain-general developmental mechanisms for category learning is supported by studies showing a correlation between musical tasks and linguistic abilities such as reading (Anvari, Trainor, Woodside, & Levy, 2002) and second language proficiency (Slevc & Miyake, 2006), as well as by comparative research on the perceptual magnet effect (a within-category perceptual effect first studied in the context of vowels perception). In Chapter 3, the nonperiodic aspects of rhythm are chosen as the key link. Building on empirical evidence that speech rhythm influences musical rhythm in Western composers (Patel & Daniele, 2003), Patel proposes that composers internalize linguistic rhythm during an early age, and that these linguistic rhythms

remain “in their ears” and have an impact on the musical rhythm of compositions and on the way we all perceive rhythmic grouping. In Chapter 4, melodic statistics and melodic contour are chosen as key links. In trying to explain why small intervals dominate melodies, Patel suggests the idea that “the preference for small intervals in music arises out of experience with speech” (p. 220). This would be possible via an implicit learning mechanism of prosodic patterns that functions very early in life and influences the creation of melodic musical patterns. Patel goes on to argue that the speech/music dissociation described in amusic patients (where language prosody is preserved), may actually “disguise a neuronal commonality” (p. 238). Indeed, a deficit in the direction of pitch seems to account quite well for such a dissociation; while speech prosody would be robust in nature to such a deficit, music perception would not. The next chapter on syntax describes neural resources for syntactic integration as the key link, as previously proposed by the author (Patel, 2003). The “shared syntactic integration resource hypothesis” (SSIRH) is based on the idea that “neural areas and operations that provide the resources for difficult syntactic integration” overlap (p. 283). Most interestingly, this hypothesis makes two important predictions: first, that interference should appear in tasks combining linguistic and musical syntactic integration; and second, that agrammatic aphasic patients’ syntactic comprehension deficits in language should be accompanied by harmonic processing deficits in music. The following chapter on meaning describes comparative research of emotional expression as the key link, supported by studies on how acoustic cues are used to express emotions in speech and music, and by studies on transfer effects from one domain to the other in discriminating vocal affects (Thompson, Schellenberg, & Husain, 2004, but see Trimmer and Cuddy, 2008). The last chapter on evolution does not properly identify a key link, but still suggests a promising area of research for music, that possibly may demonstrate that “music is not a byproduct of cognitive mechanisms that also serve other, more clearly adaptive, domains” (p. 402). Patel

chooses beat-based rhythm as an aspect of cognition that is not related to language processing, and discusses the issues of domain-specificity, development, and human-specificity.

Of course once an oeuvre is completed, there are some inevitable imperfections. The more general one is that at the end, the reader wants more of this elegant writing, synthesis, and resynthesis of data and thoughts. One wants Patel to keep going with the topics that are missing or not treated in depth, such as speech and music production, song, development (only treated with respect to evolution), reading, pathology (Alzheimers, dyslexia), auditory memory, and attention. Given the acuity of thought of the author, the result would probably resemble more closely an encyclopedia than a book.

Given the word “brain” in the title, neuroscientists might also be surprised to find that their field does not have a prominent role in the book (about 10%). However, the use that Patel makes of behavioral studies and corpus analyses allows him to build hypotheses on very precise cognitive mechanisms. Moreover, the field of neurosciences of music (and neurosciences in general) is still young, and well-posed questions are often subjugated by the charm of the techniques.

My final thought is to the next Patel book (which I already ordered to avoid long queues at the book shop), whose title might well be *Not Music nor Language: The Brain*, wherein the author will go beyond the “simple” two-facets comparative approach, into a multi-dimensional comparative approach including other artistic means (such as painting), mathematics, environmental sounds, and contemporary music in order to improve further our understanding of how the brain processes sounds, builds structures, extracts meaning, and generates aesthetic reactions.

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