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Tonal music and verbal languages: a short (structural) review

Duilio D'Alfonso
PhD, University of Palermo
Conservatory of Music 'O. Respighi', Latina
duilio.dalfonso@tin.it

Abstract A rather particularized comparison between tonal music and natural languages is pursued, in order to show commonalities and divergences of tonal music with ordinary languages and, as a consequence, to evaluate its rootedness in the human language faculty. The aim of this examination is not that of answering to the question 'is music a language?'. The goal is rather to scrutiny the issue of the undoubted relevant structural features tonal music shares with verbal languages considered in general, in their 'universal' aspects. The comparison is performed mainly on syntax, and only sketched for the semantics of tonal music, widely considered as, at least, vague and hard to formally characterize. In the conclusion, some arguments are provided to display a wider foundation of tonal music in the human 'language-ready' brain, as well as in the basic temporal cognitive units underpinning the developmental construction of social cognition.

Keywords: tonal cognition, syntax, language universals, social cognition

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0. Introduction

Tonal music is the musical idiom characterizing the history of Western music for the three centuries of the so-called 'common practice' – the European music from the seventeenth to the nineteenth century. As such, it is confined within a specific historical period and related to cultural praxes and socio-political contexts and functions, in the history of the complex interrelations between music, poetry, ideologies, philosophy, politics, society, and so forth. But there is an aspect of tonal music preventing to simply and summarily regard to it as a particular musical style, relegated to specific historic and cultural contexts: it shares plenty of essential structural features with verbal languages.

Hence, the comparison with verbal languages began early in the musicological theoretical tradition, already in the eighteenth century, when the use of terms borrowed from grammatical theory and from rhetoric began to spread into the field of music

theory and pedagogy (well-known is, for example, the H. Koch's (1984) use of terms like 'sentence', 'period', etc. applied to musical syntax).
However, it is in the last decades of the XX century that tonal music has been thought of as a nearly full-fledged language, earlier under the influence of the 'structuralist turn', then as a consequence of the generativist and cognitive turn. Leonard Bernstein, one of the most important conductor in the XX century, forecasted, in his Harvard lectures (delivered in 1973 and published in 1976), the advent of the generativist turn also for music theory, and more generally, for a renewed imagine of human musicality. Winograd (1968) and Longuet-Higgins (1978), among others, have suggested and sketched a formal grammar approach to tonal syntax, so exploiting the language/music formal commonalities, but the real turn appears with the groundbreaking 'generative theory of tonal music', by Lerdahl and Jackendoff (1983), as preconized by Bernstein.
Notwithstanding the general prudence of Lerdahl and Jackendoff about the relationship between their theory and generative grammars, their approach, more or less explicitly, lead towards a strong assimilation in music theory of concepts and methodologies from the generative linguistic tradition. The so-called 'prolongational trees', with the strictly hierarchical representation of pitch relations and dependencies in a tonal piece, straightforwardly suggest the confrontation with the phrase structure characterization of linguistic expressions, as featured by generative grammars, and especially in their later format as X-bar theory of natural language phrase-structure. Provided that Lerdahl and Jackendoff did not explicitly allow it, the application of linguistic formal methods and models to characterizing listeners' musical interiorized competence and the music understanding process, became a rather unavoidable consequence of the new perspective on music cognition introduced by their cognitive theory of tonality.

1. The syntactic side

Let now give a closer look at the syntactic aspects of tonal music assimilating it to the syntax of verbal languages.
Ordering of tones and chords. In a tonal piece tones and chords are combined according to strictly regulated ordered sequences: some tones, i.e. those belonging to the diatonic scale on which the piece is based (the 'key' of the piece), are more frequent and occur in a typical order. Among such tones, those belonging to the chord built up on the *I* degree of the scale (the 'tonic') are the most representative, and this chord is considered the most stable one. A tonal phrase often departs from it, and, after touching tones (or chords) perceived as distant and generating a tension, returns to the most stable tones of the tonic. Krumhansl (1979) synthetizes the point as follows: "A musical phrase typically begins with the establishment of certain tones as stable reference tones, followed by a series of less stable tones which move toward and finally return to the structurally stable tones, particularly the tonic itself."
Functional and recursively hierarchical organization of harmony. In a tonal piece chords play a syntactic function, although such functions are strictly contextual. The tonic function (T) is assigned to a chord perceived as stable, as the resolution, and conclusion, of a harmonic sequence perceived as a whole; the dominant function (D) is assigned to a chord generating the expectation of the tonic; the subdominant function (S) generates the expectation of the dominant. Therefore, the typical functional cycle of a tonal phrase is T-S-D-T. Each single function can be attributed to a chain of chords, rather than to single chords, when such sequence presents small variant of

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a chord governing the functional span – the *I* degree chord is the governor of the tonic functional prolongation, the *V* of the dominant prolongation, the *IV* chord heads the subdominant prolongation. Thus, such functional areas are governed by a chord in a hierarchical fashion. Some music theorists have developed a conception of tonal pieces according to which the final tonic of the piece is the governor of the entire piece, and all the other pitch-events are recursively hierarchically clustered around the final tonic (see SCHENKER 1979 and the literature on Schenkerian analysis in music theory). Such hierarchies can be easily represented by tree graphs with a unique root representing the expansion of the final tonic of a tonal sentence, whose leaves point to single tones or chords (in LERDAHL and JACKENDOFF 1983 such trees are called 'prolongational trees', but also 'parsing tree', borrowing a term from linguistic analysis).
In fig. 1 a parsing tree for the harmonic syntax of a typical (simplified) tonal sentence is paralleled with (simplified) trees for syntax and prosody of an English sentence.

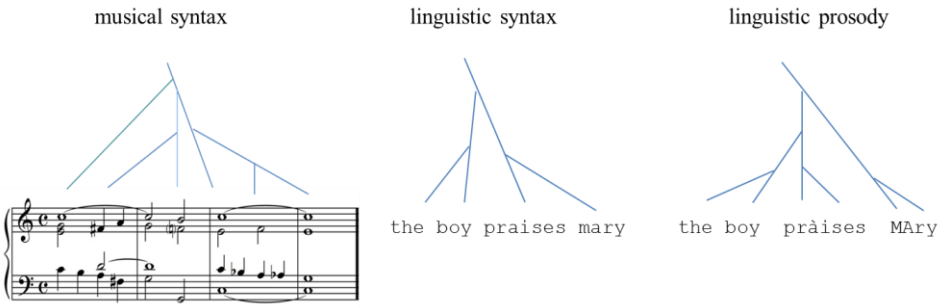

Figure 1

Musical expectation. From what said, a crucial psychological feature of tonal music should be manifest: tonal listening is a strong oriented experience. Listeners acquainted with the tonal idiom produce specific expectations during the listening process (the so-called 'schematic expectations', according to BHARUCHA 1987). Expectancy is an essential feature of musical experience in general, involving different parameters, as widely witnessed by cognitive musicology and psychology of music (from MEYER, 1956 to NARMOUR, 1990 and HURON, 2006), devoted to demonstrate the role of expectation in music perception, as well as its neurophysiological and evolutionary correlations. Expectation, for example, is crucial in meter perception: when a metrical pattern is perceived as stable, hearers are acquainted with it, so predicting its continuation. If some irregularly stressed beat is received, hearers try to fit it in the ongoing stable pattern – for example, in the case of a syncopation that is perceived for a short time span and then the underlying meter is recovered. Only when the attempt to fit irregularities in the current stable rhythmic pattern fails, hearers are forced to change prediction on the rhythmic continuation.
Expectancy is even more crucial in tonal cognition, since it is active not only at an 'infrastructural' level (the level of metrical structure), but it is at work at the conscious level of the emotional interaction with musical structure. Specifically, a well-formed harmonic progression, in experienced listeners, generates the prediction of its proper continuation – for 'experienced listeners' we intend listeners passively familiar with tonal music, being such familiarity acquired by means of environmental exposure. Such predictions can be satisfied or violated, and on this aspect rests the interaction between structure and emotion in tonal music. Expectation is so crucial in

RIFL (2017) Vol. 11, n. 2: 123-133
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tonal music that we can identify the basic psychological function of a chord concatenation with its *expectancy generation/change potential*, i.e. with the capacity of modifying the "mental predictive state" of the hearer, during the listening process. Indeed, tonal sense is strongly "implicative": given a chords progression, it consists on the representation, not necessarily accessible to consciousness, of what are the implied continuations of that passage. Tonal hearing not only is based on a step-by-step prediction generation; it is, in some sense, biased by the overall expectation of the recovering of the basic tensing-relaxing pattern of a tonal sentence. Such pattern is a kind of deep structure, or a 'gestalt', listeners attempt to project to a perceived musical stream. We will call it the "tonal template", and it can be displayed as in the following figure (fig. 2):

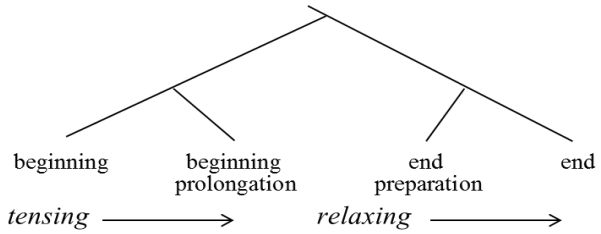

Figure 2

This is the typical (or 'archetypical', one can say) pattern characterizing the overall trajectory of a tonal syntactic unit, with an expandable beginning that imply an increasing of tension, and a conclusion usually prefigured by a prefixed expansion, implying a relaxation (a similar figure is showed by LERDAHL 2013).
It is not difficult to see that these three main features of tonal music essentially, in a sense universally, endow verbal languages.
Word order in languages. The well-known Greenberg's universals (1963), in linguistic typology, demonstrated that verbal languages show some tendencies in the ordination of the main elements of the sentence. Maybe, the most known Greenberg's universal is that on Subject/Object disposition, stating that human languages statistically tend to prefer the SO order. The 'subject tends to precedes object' universal can be cognitively interpreted: the subject is usually the topic of the sentence, and the order 'topic before comment' is usually easier to process. There is here a possible counterpart in tonal music, to the extent that a typical tonal sentence begins with the establishment of the tonic, and rarely with a subordinate chord of a key (whose non-tonic function is evidently later revealed). The hearer tends to assign the most relevance to the initial pitch-events of a piece, interpreting such events as the reference context for what follows, with an evident priming effect.
More remarkably, it is known that the Greenberg's notion of the 'basic word order' is somewhat problematic because some languages exhibit a free word order and other languages show different typical word order. Now, it has been observed that, generally, languages with a rich lexical (inflectional) morphology are characterized by an unrestricted word order (as in Latin), while languages with a poor overt inflection tend to constrain word order to contextually curry on functional information (case, theta-role, etc.) not formalized in the lexical items (as in English). This tendency can be significant for the language/tonal music confrontation: tonal music can be viewed as a language almost deprived of inflection, so realizing functional information at a pure syntagmatic level.

X-bar theory of language phrasal structure. Especially in the *Minimalist frame of generative linguistic* (CHOMSKY 1995), syntactic constituents are conceived as headed by a lexical item, usually projecting two phrasal levels (the intermediate and maximal projections), as showed in the leftmost tree in fig. 2.

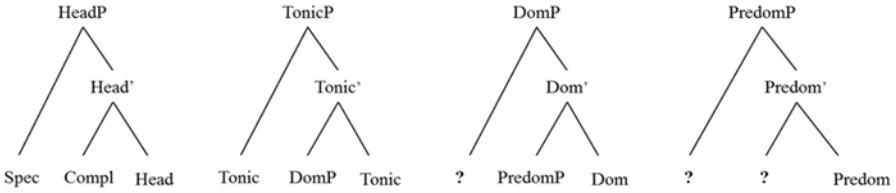

Figure 3

Such levels can be fully realized: for instance, transitive verbs project an intermediate phrase level when merged with its complement and a maximal phrase level when a nominal is merged in the subject position, the so-called 'Specifier' position. Now, does tonal music syntax exhibit a correspondingly constrained phrasal layering? Indeed, the tonic chord, as a functional head, seems to project the two levels: the concluding tonic is complemented by the dominant chord preceding it in the cadence, while the Specifier is filled by the opening tonic (see the second tree in fig. 3). For the other functional heads, i.e. dominant and predominant, it is not clear if they project the two levels. The dominant phrase (DomP) has its complement, i.e. the predominant phrase, but not its specifier (the third tree from the left in fig. 3). The predominant phrase (PredomP) seems to possess neither a complement nor a specifier (the rightmost tree in fig. 3). Surely, one can hypothesize that such components are nevertheless projected, even when unrealized. Also in language phrase structure, the projected constituents of a lexical item often remain empty, but they are slot that can be filled. Now, how could be filled the specifier or the complement in the predominant phrase?

Hence, it is possible that only the closing tonic project a full X-bar template, characterized by a maximal projection, i.e. the 'sentential level', and its complement, the dominant phrase, c-controlled by the zero-level head. This is how to say that only the tonic can generate the sentential level in tonal syntax, evidently because it projects a maximal projection level. But here caution is mandatory. In language, it is a word that projects its phrasal frame, and this is an important difference with the tonal music syntax, where it is impossible to determine a proper lexical level. The syntactic frame, in tonal music, is, so to say, an emergent property at the syntagmatic level. As said, one can putatively suggest that tonal music syntax is quite closer to the syntax of those verbal languages with a poor morphology, where the syntactic functions are almost totally contextually determined. However, although the property of 'being a tonic' is purely contextual, the sentential level in tonal music can be equally considered as the maximal projection of the (closing) tonic chord. Ultimately, this is in accordance with both the Schenkerian theory of tonality and with Lerdahl and Jackendoff prolongational theory.

Expectation/prediction in natural languages. The prominent role of expectation in language processing has been widely studied. The still valid study of Fodor, Bever and Garrett (1974) showed as expectation plays a fundamental role in sentence real-

time comprehension, role confirmed in several experimental approaches (see DUFFY 1986 for the facilitation effect of expectation in discourse integration).
Here, a more theoretical analogy would be suggested. Insisting on the strong directional and intentional character of tonal listening, one can find an analogy with the Sperber and Wilson inferential theory of communication (1986). Indeed, tonal understanding should be conceived as a 'top-down' procedure, because deeply biased: listeners attempt to recover a complete tonal template from the musical stimulus they are progressively receiving and processing. In other terms, listening to music, for listeners familiar with the tonal idiom, is a strongly oriented process, oriented by a strong dispositional attitude. Under this respect, it is very similar to language understanding, oriented by the expectation of recovering a propositional content from a string of words, given a context of utterance. This is exactly in accordance with the Sperber and Wilson theory of linguistic communication, in which speakers' meaning retrieval is at the same time strongly biased by the search of relevance and massively contextualized.
Moreover, it is here worth noting that expectancy is important when predictions are satisfied, but also when predictions are frustrated. Expectancy violation, forcing a reanalysis of an ongoing linguistic expression, is a well-known phenomenon in language processing, widely observed in psycholinguistics (see PICKERING *et al*. 2006 for a review). Speakers show a difficulty in processing a sentence when a partial ambiguity rises in its real-time understanding (for example, in *The attorney advised the defendant was guilty*). In such cases, comprehenders are forced to reanalyze the sentence in order to accommodating interpretation to the new material received (in the example, when they receive *was guilty*), i.e. to perform a revision of the current parsing. In (tonal) music, the mechanism is structurally quite similar, but with a very different semiotic function and expressive relevancy. Indeed, within this strong parallelism language/music processing, an important difference can be detected, relatively to the relevance of expectancy violation: in language it is a marked, somewhat marginal, phenomenon, specific to the performance aspects of language understanding, and forcing a reanalysis of the words' stream perceived. In music, expectancy violation is emphasized and in some sense integrated as a core feature of the processing task. This difference specifically concerns user's performance and its pragmatic conditions, and it is relative to the real-time computing of hierarchical structures. We can say here that what in language is a particular phenomenon, involving a 'difficulty' in processing, in music is fully exploited as an expressive device, linking music temporal processing with emotions – as, for instance, in a sense argued by Jackendoff (1991).

2. The semantic side

That music, and tonal music, lacks the semantics allowing verbal languages to represent propositional content, i.e. the truth-conditional semantics, is quite undisputable. Much more controversial is the issue of the music's lack of semantics at all. Emotional or figurative content is often attributed to music in general, and to tonal music in particular (apart from its capability to induce sensory-motor reactions in the hearer). For example, the modal dualism 'major/minor keys' is considered as a vehicle of the opposition positive/negative in the emotional and sentimental values. Moreover, often an emotional/situational meaning has been associated with particular key (D minor is the 'liturgical' key, while F major is a bucolic key – the key of the Beethoven's Sixth Symphony, known as 'Pastoral').

There have been some attempts to systematically elaborate a semantics of tonal music: Cooke (1959) and more recently Zbikowski's theory of musical text-painting (1999). Probably, such attempts are a consequence of the challenge represented by particular musical traditions and repertoires, such as, for instance, the German Lied, also known as the Romantic Lied – an extraordinary repertoire of songs, or cycles of songs, for singer(s) and instrumental accompaniment (usually the piano), developed by the major composers of the nineteenth century, such as Schubert, Schumann, Brahms, Wolf, etc. In these songs, the music/poetry relationship is an essential, poetic and aesthetic, aspect of the composition, and musical text-painting techniques are widely at work. But here one cannot forget that the 'painting' relation (pictographic, analogic or iconic if you prefer) with the poetic text is established by music with the essential contribution of the text itself, whose meaning interact with music, in a sort of reciprocal, circular, co-interpretation (if music can be thought of as a Peircean *interpretant* of the poetry, the other way around is also true).
Now, the semantic issue of music is not the topic of this paper. With respect to its well-founded structural organization, tonal music is characterized by a semantic 'vagueness'. Such vagueness has been cyclically raised in the aesthetical reflection on music, giving room to the returning 'formalist' stance, especially when the aesthetic thought is turned to instrumental music. For example, the focus on the symphonic music of the XIX century can be considered the motivation of Hanslick's formalism in the aesthetical debate on music of the second half of the XIX century: in his famous *Vom Musikalisch-Schönen* (1854, Eng. trans. in 1986), he defined music as "sonically moving forms" (it is known that he was especially thinking to Brahms' symphonies), with the principal objective of confuting the widespread tenet regarding music as the 'language of feelings'.
Successively, the strongest and deeply suggestive formalist claim is to be attributed to one of the major XX century composer. Igor Stravinsky wrote:

> For I consider that music is, by its very nature, essentially powerless to express anything at all, whether a feeling, an attitude of mind, a psychological mood, a phenomenon of nature, etc. Expression has never been an inherent property of music. That is by no means the purpose of its existence (STRAVINSKY 1935, eng. transl.: 53).

And, one can object, what about the 'psychological power' of, say, Wagnerian harmony? This is a long controversy. No one, supposedly, can negate the capability of music to convey emotional meaning (often inducing embodied reactions), but this fact by no means implies a musical codified semantics, in contrast with a strongly structured (Western tonal) music syntax, objectively formalized by a long history of a theoretical engagement with music.

3. Concluding: is tonal music a byproduct of the language-ready brain?

The strong parallelism, mainly at the syntactic level, between tonal music and verbal languages allows to formulating a challenging hypothesis of a significant grounding of tonal music in language faculty: tonal music represents a kind of concretization, culturally and historically determined, of what we can call a universal 'formal skeleton' of human natural languages. We can recall here the 'identity thesis' of Katz and Pesetsky (2011): "All formal differences between language and music are a consequence of differences in their fundamental building blocks. In all other respects, lan-

guage and music are identical." Its strong rootedness in the human language faculty is undoubtedly related to the sense of universality of the musical language that has always been accompanying tonal music for the three century of the common practice in the Western music history. If so, one could answer with a 'yes' to the interrogative heading this conclusive section (persisting the doubt: a 'byproduct' or a 'superb achievement'? – but this doubt is unavoidably related to the perspective adopted, evolutionary or not).

However, a suspect resists, a suspect of 'glossocentrism'. It is not easy to remove this suspect, but tonal cognition can be regarded also from a different theoretical standpoint, more psychological and less linguistic, nevertheless showing its strong rootedness in the human cognitive faculties.

Indeed, tonal cognition is surely related to phenomena such as pitch spelling, pitch equivalence, pitch integration and grouping, melodic segmentation, and so forth. These processes can be considered as characterizing a 'low-level' inferential processing of tonal music, and they share a lot of features with the organization of spatial-visual perception (as early noted by philosophers such as Mach and Von Ehrenfels, and more recently exploited by the seminal work of BREGMAN, 1990). But a higher level of tonal experience, more related to time-dependent dynamic profiles, seems to be equally relevant. This level seems to be relevant for tonal music as well as for languages, especially regarding their organization in syntactic and prosodic units.

As a pure cognitive structure, what we have called the 'tonal template' can be defined as a temporal structured pattern, with a coherent psycho-dynamic contour, i.e. an experience of a coherent and unitary temporal span, of an event with a beginning, an end, a given duration, and a goal-oriented trajectory (see fig. 1). So defined, the tonal template shows its abstractness as a deep 'prototype' generally involving time experience in consciousness, as articulated in temporal coherent units. According to Stern (2002), this kind of organization of time cognition begins in the very initial stages of children cognitive development, playing an important role in children's development of the abilities underlying social interactions. It can be worth quoting the Stern's notions of 'vitality contour' and of 'proto-narrative envelop': "What we mean by vitality contours are the continual shifts in arousal, activation, and hedonics occurring split-second-by-split-second that are evoked by events taking place in the body and mind of the self which are integrated into temporally contoured feelings" (STERN 1999: 70). Vitality contours are very fundamental patterns of consciousness, giving form to the experience of time, i.e. to the 'perceived present', whose length is about that of the working memory (some scholars prefer to speak of 'echoic memory'). Elsewhere, STERN (2002) introduced the 'proto-narrative envelop', as an alternative definition of the vitality contours (named also 'vitality forms'):

> The infant relational experiences' unit has a beginning, a middle, an end and a line of dramatic tension. The 'proto-narrative-envelope' represents the incarnation of the internalized interactive unit. This unit is fully subjective, temporally dynamic, multi-modal, and narrative-like (STERN 2002: 6).

Hence, exploiting this analogy, the tonal template could be intended as a 'cultural' (aesthetic?) expansion, sublimation, projection of the basic unit of the subjective experience of time. Proto-narrative envelop is the developmental (and maybe evolutionary) root of the time experience as narration, and indirectly, of the tonal template. Time as narrative and the tonal template are in a strong structural or, here we can

say, 'semantic' relationship: the tonal template derives its meaningfulness as a 'high-level formal pattern' of the social construction of time in the consciousness. Given this hypothesis, the received view according to which tonal listeners are acquainted with the tonal template because of the environmental exposition to tonal music is only 'one side of the coin', so to say, the other side being that tonal music is based on the tonal template because of its cognitive affordability, as a sublimation of a fundamental structure (somewhat inborn and very early developed) of the human representation of time in social interactions.

Summarizing, tonal music appears as a musical language linguistically, psychologically, and neurologically deeply rooted in the human linguistic faculty, as well as in cognitive processes underlying social cognition. Marginally, not few, in the recent years, are the researches on the neurological basis of its processing. Just to mention a case, the Patel's 'shared neural resources hypothesis' (2003) results from experimental evidences that syntactic integration in language and (tonal) music shares the same neurological resources, mainly in the processing aspects. This envisage is not necessarily in contrast with the awareness of its cultural, social and historical development: tonal music is the result of a long, secular, 'gestation', the result of a long and complex cultural 'parabola' in the history of Western music, started in the Medieval age with the Gregorian Chant, and culminated in the three centuries of the 'common practice', when in all Europe different verbal languages were spoken, but a unique musical idiom was practiced. Not surprisingly, it is exactly the 'aura of universality' surrounding tonal music in its 'classical age' that Beethoven intended to celebrate with the Ninth Symphony.

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