

Applying Gestalt Principles on the Identification of Melodic Phrases

José Fornari

NICS - UNICAMP – e-mail: tutifornari@gmail.com

Abstract: This work presents an empirical study with listeners on the sonic aspects of melody, which is here considered as one of the fundamental elements of music. Starting from a bibliographical research, this work aimed to define which aspects compound and are common to any melodic event and, thus, to find out their relationship with its perceptual aspects. For that, Gestalt theory was here taken as a possible form to understand the automatic perceptual processing of melodic aspects. In this work an experiment was conducted, with the participation of 40 volunteers, that aimed to pinpoint some aspects of the correlation between melody, music perception and music cognition.

Keywords: music cognition, gestalt, melody

1. Introduction

Music and its fundamental elements, such as harmony, rhythm and melody, have been objects of study and analysis of many studies. This fact can be observed in the large amount of works covering topics in this area, from music perception to music theory, such as seen, for example, in the seminal works of Hermann von Helmholtz and Arnold Schoenberg. These studies helped to establish (and sometimes breaking former) standards in many aspects of sound perception and music, covering great lengths of human knowledge, from physics (acoustics), psychophysics (psychoacoustics), music psychology (music cognition) and aesthetics. However, there is still no consensus among different fields on the definition of basic musical elements such as what, in fact, constitutes melody (GALIZIA, 2003, p.12).

This work sought to study some definitions of melody, which is here considered to be the most fundamental element of music. It is seen that the definition of melody and its related elements are not completely clear, although the elementary and fundamental features of melody are immanent in music. Studying the related literature, this work aimed to get a closer and clearer definition of what is melody, as well as its related terms, such as: "theme", "phrase", "motif" and "musical cells". The goal is that, from a more accurate and pragmatic understanding of melody, a clearer understanding of its interaction with musical perception, cognition and emotion will inevitably follow.

A generic definition of melody, found in the literature, defines it as a succession of sounds of opposing character that are harmonious, simultaneous and consistent. (BITONDI, 2006: 29) (RANDEL, 2003: 517). However, a melody is not just a mere succession of sounds. According to (TOCH, 1972) melody is a succession of sounds

"animated" by a rhythm. Therefore, rhythm is here identified as an important element of melody, since this helps to define the shape of a specific melody and, accordingly, a melody can not be separated from its natural rhythm (APEL 1972: 499). Therefore, it's here taken into consideration that melody results from the interaction of a succession of sounds and its rhythmic structure.

As known, melody is structured by sub-components. The literature mentions: "cell", "motif" and "sentence". By "cell" the definition is: "the smallest constituent element of the musical idea" (BITONDI, 2006: 39). In the melodic context, cell is defined as a structure compounded by two musical rhythmic values and one pitch interval.

A "motif" is created from a group of musical cells, or even from one single cell (BITONDI, 2006: 39). The motif is a small pattern of rhythmic or melodic concepts that presents a distinct unity (SEMBOS, 2007, p. 91). Schoenberg explains the transitions between musical cells, which creates different motifs, thus characterizing a melody. It's important to notice that some authors define as "theme" what is here called a "motif". As a formal and unambiguous definition is yet to be reached, this work uses the term "motif".

According to Schoenberg, "musical phrase" is a monophonic unit that can be sung in one single breath and that presents some form of punctuation delimiting its end. This definition becomes questionable when one takes into account musical melodies performed by musical instruments that do not depend on the breathing capacity of a musician – like the piano or violin – to execute a melodic phrase. A more accurate definition of "phrase", for the purposes of this study, makes an analogy with verbal language, which defines musical phrase as: "a set of rhythmic sounds, presenting complete musical sense" (GALIZIA, 2003: 15).

As for the elucidation of the music score, or the entire melody, in its complete musical sense, there is in the Schenkerian analysis a way to seek out for the completeness of a musical phrase, which implies in its capacity to be recognized as a single melodic structure. Schencker argued the, for a melody to have full meaning, it has to present a closure with the tonic of its tonality (PANKHUST, 2008: 8). Ending the melody in other notes creates a tension of expectation and incompleteness that calls for resolution. Certain intervals generate more tension than others. For example, when the melody is not closed in the notes of its tonic triads, it creates the sensation that the sentence is yet to be completed, whereas when it is closed on any note of its tonic triad (E or G, for C major), it presents an almost complete sense of itself, as if it was finished by the tonic.

Regarding the coherence of musical intervals (sequence of sounds) of a melody, as previously mentioned, according to Schoenberg, this can be understood as the reaching of

an equilibrium state. A good melody may progress as in “waves” being the upward movements compensated by the downward ones, and great leaps of intervals compensated by small leaps in the opposite direction.

Schoenberg also introduces the concept of “melodious”, which is related to the concept of a “singable” melody (how easily singable is a melody), which leads to reflect upon the quality of a melodic event. Adapting this concept to musical instruments, this consists of: long notes, smooth passages between different ranges, more contiguous movements, avoiding augmented and diminished intervals, adherence to tonality, moderation in the usage of dissonances (DUDEQUE, 2005: 125).

2. Gestalt principles

As an attempt of deepening the understanding of melody perception and identification, some principles of the theory of Gestalt were here studied. Gestalt is part of the Berlin school of psychology and studies how human perception works, not in the level of psychoacoustics (for sounds) but how the mind automatically recognize and identify patterns, grouping objects and events into one single form or common understanding. Gestalt is a German word that means “form” or “shape”. This theory is widely applied in visual arts. Its main purpose is to study how the mind organizes information to build a mental understanding based on the information given by a sensory stimuli, such as data retrieved by vision and/or audition. Gestalt principles attempts to synthesize basic components and aspects from sensory information, organizing them as to be understood into one single consistent, unequivocal and integral whole. For that, Gestalt theory describes 6 principles that are the components of this automatic mental process of grouping. They are: 1) Proximity, 2) Similarity, 3) Closure, 4) Good continuation, 5) Common fate, 6) Good form.

The principle of Proximity describes the tendency of grouping objects or events that are close to each other. In terms of melody, it is here understood that Proximity between musical notes might refers to the interval between them. As triads are composed by intervals of thirds, here two notes are considered to be close to each other when their interval is equal or smaller than one major third, or 4 semitones (POPPER, 2010: 8).

The principle of Similarity describes the tendency of grouping similar musical phrases. The interval or rhythm between notes can provide material to be compared about their similarity, thus implying its tendency of being grouped into a single melodic events.

The principle of Closure, when applied to melodies, can be inferred as the tendency that musical events, when addressing to the same direction or goal, tend to be grouped. It is understood as the final resolution or cadence of a melody that, once resolved, conveys the sensation of musical completeness. This can be compared with the concept of completeness of Schenker, as already presented, which is the idea of a musical phrase and its analogy with verbal language that gives "meaning" to a melodic idea.

The principle of Good Continuation points to the tendency of grouping a sequence of musical notes as long as this structure does not have a "rupture" or similar break of continuity. In melody, this only occurs when pitch and rhythmic variations occur smoothly and gradually, otherwise, the auditory perception will automatically split this structure into smaller components. The concept of "melodious", as presented by Schoenberg, is here related to the principle of Good Continuation, since that "melodious" is also defined as being related to gradual and smooth changes in the melodic structure.

The principle of Common Fate describes the tendency of grouping events according to its contour, specially when their individual directions are pointing to the same destination. In terms of melody, this principle can be observed, for instance, when the direction of the intervals forming a specific part of melody are all ascending or all descending (POPPER, 2010: 8).

The principle of Good Form, also referred by the German word "*Prägnanz*" (which can be translated as "Conciseness") is formally introduced by the following statement: "the psychological organization will always be as good as the prevailing conditions allow. In this definition the term 'good' is undefined. It embraces properties such as regularity, symmetry, simplicity and others" (KOFFKA, 1935). As such, in the melodic context, this principle seems to be related to other concepts previously presented here, such as Schoenberg's definition of "Melodiousness" and the Schenkerian concept of musical "Completeness". Altogether, they shall help to elucidate the concept of this principle, which may cause the organization of a psychological stimuli to be considered closer to Koffka's concept of "good", which necessarily involves: regularity, symmetry and simplicity.

In terms of music, according to (REYBROUCK, 1997) the application of Gestalt principles is not restricted to the musical structure (composition) but spreads out to the perception of the listener and the interaction between listeners and melody. For that, Reybrouck proposed an interdisciplinary approach linking Gestalt theory with Semiotics (the study of signs) and Neopositivism (theory of knowledge based on empiricism and mathematical formalism), as a mean to understand patterns and forms, as signs that can be

analyzed syntactically, semantically and pragmatically.

For that, an experiment was here proposed, to empirically verify some of the Gestalt principles in melodies. In this work, five Gestalt principles were studied: 1) Proximity, 2) Similarity, 3) Closure, 4) Good continuation, and 5) Good form. The principle of Common fate was here discarded onde that, in this experiment, not the entire melody was used, but only melodic phrases were analyzed, which implies that this principle would not aggregate any meaningful data that were not already covered by other principles, such as Proximity and Closure.

3. Measuring Gestalt principles from melodies

In this experiment, 40 volunteers participated. Their role were simply to listen to a sequence of melodic phrases and judge, to each one of them, the amount of each one of the 5 selected Gestalt principles. This was a diverse group, with listeners from a wide range of age (from 18 to 55 years old) and different music background, as this group was compounded of musicians and laypersons, of both genres. They were asked to listen to a sequence of 19 melodic phrases, excerpted from Brazilian folkloric traditional songs. This was done in order to guarantee that all participants (as all were Brazilians) would immediately recognize these songs, so there wouldn't be a difference of judgement regarding the fact that the a listener eventually didn't know these songs. After the session, each listener was asked if they knew the songs that they had hearing. All participants said that they were able to immediately recognize each one of the 19 songs used in the experiment. All songs were played as a single monophonic melodic line, in the same musical instrument (vibraphone), without singing, accompaniment or rhythm. The experiment was guided by a monitor that explained each one of the 5 principle to be judged, for each listener, and annotate the results, for each song. For each session, there were $19 \times 5 = 95$ measurements. In order to make it easier for each listener to understand the Gestalt principles, in some principles, a new nomenclature was used. For instance, the principle of Similarity, was explained as Self-Similarity, which implies that the listener has to judge the similarity within the melodic line that is currently judging. The principle of Closure was here referred as "Clarity", which is easy for the listener to understand if the melody that he or she is judging is easy to be understood and memorized. The principle of Good Continuation was explained as "Complexity", as it is here understood as related to the existence of "ruptures" or similar break of continuity in intervals and

rhythms. Finally, the principle of Good Form was defined as “Density”, as it is here understood that “conciseness” is related to the sensation of density. The following table shows the results of these measurements. Each one of them was graded in an integer scale from 1 to 5, where 1 represents the lack or the smallest amount of a principle, in the melody, and 5 is the maximum amount of the same principle. The mean value is 3, normally attributed by the listeners when they weren't sure about how much of a principle was found within the melody, or when they judged that such principle were graded in between its extremes.

Tabela 1: Means of the measurements of five Gestalt principles given by 40 volunteers, for each one of the 19 analyzed songs.

Song	Proximity	Self-Similarity	Closure / Clarity	Good continuation / Complexity	Good form / Density
1	3,07	3,65	4,55	2,02	2,1
2	3,08	3,77	4,65	2,25	2,3
3	3,1	3,5	4,4	1,57 <	1,95 <
4	3,05	3,925	4,52	2,35	2,425
5	3,05	3,3	3,95	2,425	2,575
6	3,25	3,72	4,3	2,8	2,625
7	2,92 <	2,8 <	3,47	3,07	3
8	3,25	3,92	4,7 >	2,725	2,8
9	3,12	3,475	3,9 <	3,25 >	3,02 >
10	3,42	3,9	4,55	2,42	2,32
11	3,25	3,82	4,12	3,12	2,85
12	3,32	3,62	4,27	2,2	2,15
13	3,175	3,65	4,12	2,67	2,92
14	3,6 >	4,125 >	4,47	2,87	2,92
15	3,32	3,7	3,47	2,95	2,77
16	3,37	4	4,37	2,92	2,8
17	3,3	4,07	4,47	2,97	2,85
18	3,2	3,85	4,5	2,97	3,02 >
19	3,35	3,6	4,27	3,02	2,8
Min.	2,92	2,8	3,47	1,57	1,95
Max.	3,6	4,12	4,7	3,25	3,02
Mean	3,22	3,71	4,27	2,66	2,64

4. Discussion and Conclusion

In general, the experiment occurred smoothly and without any major problem. The usage of graphic logos to signal to the volunteers each principle, relating their sonic essence with visual symbols, seems to have helped to improve the understanding of the volunteers directing their attention to what they should be judging. The scale of the grades, restricted between 1 (low) to 5 (high) for each principle, also seems to help to narrow

misjudgments by excessive resolution. As said, this experiment analyzed 19 songs of Brazilian folk melodies. The video used for the judgement of the 19 songs is available in the following link: <http://youtu.be/WxkWkn6cq5c>.

The first principle (Proximity), showed the lowest average (2.92) for the clip 7 and the highest average (3.6) for the clip 14. As observed in the link (above) that song has several jumps of intervals and joint movements that occur within an octave of range, while the song 14 has fewer jumps of intervals and practically occurs within an interval range of a fourth.

The second principle (Self-Similarity), had the lowest average (2.8) in the song 7 and highest average (4.12) in the song 14. This seems to be due to the fact that song 7 has a ternary rhythmic structure, ranging between quarter notes and eighth notes, while song 14 is more homogeneous, with a binary rhythmic structure, formed only by eighth notes.

The third principle (Closure / Clarity), presented the lowest average (3.9) in song 8, and the highest average (4.7) in song 9. One possibility for such an occurrence may be related to the fact that the song 8 has larger jumps of intervals and a greater rhythmic variation. On the other hand, song 8 has a very regular structure, both in terms of intervals and as well as in terms of rhythm.

The fourth principle (Good continuation / Complexity), presents the lowest average (1.57) in song 3, and as higher average (3.25) in song 9. It is observed an inverse proportion with the third principle (Clarity). From this observation, it can be inferred that perhaps greater clarity of melodic phrase is related to its lowering of its complexity. In this case, the same relationship of direct proportionality appears to occur between this and the fifth principle.

The fifth and final principle (Density) also presented the lowest average (1.95) in song 3, and the highest average (3.02) in song 9, as well as in song 17. As stated above, it seems that this principle is directly proportional to the forth principle, which may have occurred because of the difficulty of explaining to the volunteers the difference between Density and Complexity, or because that, in fact, there is an interdependence of the perceptual process of these two melodic aspects.

When analyzing sub-groups of volunteers, it was found less variation between the scores assigned among those who had some sort of musical training. It may be due to the fact that volunteers with musical training may naturally have a better understanding and, thus, a greater consensus on the musical definition of such principles. Comparing the group of volunteers who claimed to have a predilection for this style of music (folk songs), with the

group that declared to dislike this genre, a consensus occurred only on the principles of Proximity and Density. This may be a possible indicator of the influence of socio-cultural context in the judgment of listeners, as defended by Meyer in [8] and Reybrouck in [7].

5. Acknowledgements

The author want to acknowledge the contribution given by the participation of all volunteers who participated in this experiment, without whom this wouldn't be possible, as well as Flavia Bassi, the monitor that accompanied the experiment and collected the data as part of her technical training stage sponsored by FAPESP, process 2010/06743-7.

References

- GALIZIA, Fernando Stanzione. *Melodia, tema e frase: conceitos, definições, diferenças e semelhanças*. São Paulo, 2003. Trabalho de Conclusão de Curso (Graduação em Licenciatura em Educação Artística com habilitação em música). USP.
- BITONDI, Mateus Gentile. *Estruturação melódica em quatro peças contemporâneas*. São Paulo, 2006. Dissertação (Mestrado em Música). UNESP.
- DUDEQUE, Norton. *Music Theory And Analysis in the Writings of Arnold Schoenberg (1874-1951)*. Ashgate Publishing, Ltd. 2005
- RANDEL, Don Michael. *The Harvard Dictionary of Music*. 4th ed.. Harvard University Press. 2003.
- TOCH, Ernst. *La Melodia*. 3rd ed.. Espanha. Editorial Labor, S. A.. 1989.
- APEL, W. *Harvard dictionary of music*. Cambridge: Harvard University Press. 1972.
- SEMBOS, Evangelos C.. *The Music Theory: A practical guide*. Nd ed.. Lulu Press, Inc. 2007.
- REYBROUCK, Mark. *Gestalt concepts and Music: Limitations and Possibilities*. Published in Music, Gestalt and Computing. Studies in Cognitive and Systematic Musicology. Alemanha. Springer Verlag, 1997.
- MEYER, Leonard B.. *Emotion and Meaning in Music*. Chicago University Press. 1956.