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Lerdahl and Jackendoff's Grouping Structure Rules in the Performance of a Hindemith Sonata
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In the last decades, musical cognitive psychology has intervened to build a bridge towards the comprehension of musical structures. The present paper studies the behavior of several students and music professionals in relation to grouping structure and it does so through the performance analysis of the first movement of Hindemith’s sonata for flute and piano, according to the rules formulated by Lerdahl and Jackendoff, movement chosen because of its tonal ambiguity. The participants of this experiment are three medium level female Conservatory students. They performed the aforementioned piece after studying it for a whole trimester. The performance of the same piece by three professional musicians was also analyzed, using the appropriate commercial recordings for this purpose. This analysis includes the choice of group limits used in performance by both professionals and students and the comparison of both groups’ results. Differences were observed in the placement of said limits by the different groups but all of them respected the set of rules formulated by Lerdahl and Jackendoff.

Keywords: musical cognition, Gestalt and music, grouping structures, segmentation, music education.

En las últimas décadas la psicología cognitiva de la música ha intervenido en el acercamiento hacia la comprensión de las estructuras musicales. Este trabajo estudia el comportamiento de algunos estudiantes y profesionales de la música en relación con la estructura de agrupación. Se trata de un análisis de la interpretación del primer movimiento de la sonata para flauta y piano de Hindemith según las reglas formuladas por Lerdahl y Jackendoff, movimiento elegido por su ambigüedad tonal. En este experimento participan tres alumnas de grado medio de conservatorio. Las alumnas interpretarán la obra mencionada después de haberla estudiado durante un trimestre completo. Además, se analiza la interpretación de la misma obra por parte de tres profesionales, utilizando para ello las grabaciones comerciales correspondientes. Se analizan los límites de grupo realizados en la interpretación, tanto por parte de las alumnas como de los profesionales y, a continuación, se comparan los resultados entre los grupos. Se aprecian diferencias en cuanto a los puntos elegidos para la colocación de los límites, pero todos ellos pueden encuadrarse dentro de las reglas formuladas por Lerdahl y Jackendoff.

Palabras clave: cognición musical, Gestalt y música, estructuras de agrupación, segmentación musical, educación musical.

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When we listen to music, we do not listen to isolated, successive sounds that are more or less coherent; we perceive different melodic lines, chords, rhythms, etc. That is, successions of sounds that are organized and structured so our mind can understand them. Our mind is able to organize these impulses according to the nature of the perceptive laws (Deutsch, 1994; Pineau & Tillmann, 2001).

Koffka (1935/1973) notes that the "all-temporals," such as rhythms, melodies, phrases, cannot be theoretically addressed without using the concept of organization. Within the context of Western tonal music, we hear and organize according to the perceptive laws, which are probably the same ones that the composer used to write his work, and the performer used to understand and perform it. Thus, we could say that all musical activity, from the time of its creation until it is heard, is organized and based on similar perceptive laws, and therefore—but not only because of this—a performer can understand what the composer wrote and the hearer can understand what the interpreter transmits.

As of 1890, Gestalt psychology explained how elements are combined with each other to make up perceptive entities (de la Motte-Haber, 1994; Imberty, 2005; Neuhaus & Knösche, 2006). Thus, the first study of the properties of form or the more global concept of perceptive organization (the whole is more than the sum of its parts, or form can be transported) was carried out precisely to describe one of the attributes of melody. However, although the principles of proximity and similarity are used to explain the perception of contiguous elements, it is not clear whether these principles, which are valid in the sphere of visual perception, can be applied to the sphere of audition and musical art, which consists of structures that are developed in time (Neuhaus & Knösche, 2006).

In the decade of the 1950s, Cooper and Meyer (1960) studied the problem as a function of proximity in height. Moreover, they show how the closest sounds in time are perceived as a group, which they indicate as the temporal spaces between the attacks of successive notes. Subsequently, Lerdahl and Jackendoff (1983) will apply the Gestalt principles when they formulate their preference rules to establish the boundaries in grouping formation. Deutsch (1994) illustrates frequent cases with musical examples in which the principles of musical continuity, similarity, and common destiny are satisfied in musical perception.

One of the aspects of Gestalt that will influence the construction of grouping structures is predisposition, human beings' tendency to listen and organize according to their prior experiences (Best, 1999/2001). Our perceptions are somehow predetermined by our experience. This will influence the perception of metrical structures, which leads us to think that performers, in addition to having the general qualities of the human being for musical perception, will be conditioned by their own experience and by their degree of musical training. Thus, the role of education and the context in which the musician develops (in our case, Western culture) can be considered to be decisive for perception (Laucirica, 2004), and, consequently, for the construction of grouping structures.

Imberty (2003) indicates that during audition, certain traits are created that are grouped to make up prototypes, which are essential for the identification of musical works. These statements of Imberty with regard to style recognition could also be applied to the construction of grouping structures. It is also related to Narmour’s (1991) model of implication/realization because, although it was established to understand expectations in emotion, it owes its origin to the cognitive interaction between the subjects, their prior experience, and the object. This formation of cues that generate imprints or traits that allow us to identify a musical work are also relevant in the generation of grouping structures. When musicians perform a work, they construct the groupings not only in accordance with certain implicit rules to form groupings within a specific grammar; they must also recover from the memory the elements from which to build the musical discourse. According to Imberty (2005), the mental simplification operations that the listener carries out to better understand the complexity of the musical surface will be used by the performer to reconstruct that complexity from the simplified schema that was previously memorized.

With Chomsky’s (1957) formulation of the theory of generative grammar, a new period of study unfolded in the world of psychology of music that attempted to offer a similar explanation, however, in the sphere of music. Previously, Schenker (1935/1993) had intuitioned the Ursatz or fundamental structure, and lent an important impetus to the study of the analysis. Subsequently, works were carried out aimed at the study of the musical structure, from the viewpoints of rhythm, melody, harmony, etc., but always with common elements such as perception and cognition. From the works carried out in this context emerge the studies of Lerdahl and Jackendoff (1983), specifically their work, A Generative Theory of Tonal Music (GT TM). They attempt to synthesize the viewpoints and the methodology of contemporary linguistics and the ideas of musical theory. Lerdahl and Jackendoff will soon realize that the discoveries from the sphere of linguistics cannot be transposed to music. Thus, they needed a grammar capable of generating a large quantity of alternative structures, from which they would subsequently choose the most stable. From this process emerged the rules for a generative theory of tonal music. These rules are organized around four important groups: grouping structure, metrical structure, time-span reduction, and prolongational reduction.
After the publication of the GTTM, a new stage unfolds in which we find an important number of works that attempt to validate, study, or develop these rules. Normally, these works focus on listeners with or without musical training (Cambouropoulos, 2006; Deliège, 1987; Drake & Palmer, 1993; Frankland & Cohen, 2004; Imberty, 2005; Jackendoff & Lerdahl, 2006; Krumhansl, 1996; Lerdahl, 1989; Marsden, 2005). Particularly relevant for this study is the research of Deliège, who examined the validity of the rules proposed by Lerdahl and Jackendoff. For this purpose, she carried out a study with musicians and non-musicians in which she gathered information about whether the segmentations reported by the subjects responded to Lerdahl and Jackendoff’s predictions, she tested whether the rules are susceptible to be applied to both types of subjects (musicians and non-musicians), she determined whether the rules cover all the grouping situations, and she verified whether they are the same in the perceptive points of higher intensity. She carried out two experiments: in the first one, she used Western music compositions (from Bach to Stravinsky) and, in the second one, she contrasted the rules with simple melodic sequences in which she designed a combination of all the possible comparisons between pairs of rules. The result revealed the validity of the rules and found no obvious differences between the two categories of subjects in their behavior with regard to rhythmic groupings.

Another relevant study, in this case carried out with interpreters, is that of Drake and Palmer (1993), in which they investigate whether performers emphasize the accents of rhythmic grouping, melodic, or metric accent structure with variations of systematic performance (intensity, inter-onset timing between attacks, and articulation). A group of pianists performs sequences that only contain accent structures; then, they proceed to perform more complex sequences either with coincidental or non coincidental accent structures and, lastly, they perform a sonata that contained non coincidental structures. No significant variations were observed in any of the three cases in the interpretation of each kind of accent. In musical contexts, the variations corresponding to the rhythmic groupings accents were more consistent and stood out when the accent structures were non coincidental.

Krumhansl (1996) carried out three tests with listeners in which they performed three tasks while listening to the first movement of Mozart’s K.282 sonata in Eb major for piano. She analyzed the way music is perceived in order to be segmented, the way the experience of tension varies while listening, and the third task determined the way the listeners identified the new musical ideas in the piece. Frankland and Cohen (2004) carried out two experiments: in the first one, experienced listeners marked the grouping boundaries in two well-known children’s melodies and an unknown tonal melody. In the second experiment, they repeated the same task with different stimuli. Marsden (2005) studied schematic representation as a form of expression of musical structure. For this purpose, he examined previous works based on the generative and reduction theories of Schenker (1935/1993) and Lerdahl and Jackendoff (1983), in the light of the six properties that a structural representation should have. He defined these properties as: constructive, derivable, meaningful, decomposable, hierarchical, and generative. He commented on important aspects of the development of a schematic representation, which particularly concerns the representation of polyphonic music, rhythmic models, and no accented beat. Cambouropoulos (2006) studied the way parallelism affects grouping formation. Thus, he presents a computational model that extracts melodic samples from a given melodic surface. The models discovered so far were merged into a simpler segmentation profile. This refers to the points on the surface that are more likely to be perceived as segmentation points.

In the above-mentioned investigations, we can observe a tendency to study grouping perception in listeners and in the ambit of tonal music. This work represents an approach to the behavior of performers (students and professionals) in the construction of groupings with a tonal work, although with a harmonic development that is not based on the more traditional tonality (Morgan, 1991). This construction will be analyzed from the perspective of Lerdahl and Jackendoff’s grouping structure rules, established for tonal contexts, in order to observe whether these rules are applicable to a work of the characteristics of the first movement of Hindemith’s sonata for flute.

This study analyzes the construction of rhythmic groupings from the score of a 20th century work performed by some professional musicians and by various intermediate students of formal conservatory instruction. Interviews and the students’ analysis of their performance will lead to a better understanding of their process of rhythmic-musical-structure construction. The goal is to determine how conservatory students construct rhythmic groupings in the course of a musical performance, to compare students’ construction of groupings with that of the performance of professional musicians, and to compare students’ construction of groupings with their analysis of score and their own statements concerning it.

Method

The investigation used a descriptive and comparative methodology that combines musicological analysis of score, according to the guidelines of Lerdahl and Jackendoff, with the same analysis carried out on the performances, to which we add a psychoacoustic study with the Sonic-Visualiser program, and the elaboration and analysis of open and non-standardized interviews according to Goetz and LeCompte (1984/1988).
Participants

This empirical study was carried out with three intermediate flute students, who by chance were female, and who carried out their studies in various conservatories of the Autonomous Basque Community. In addition, we used commercial recordings of three famous international soloists who, also by chance, were male.

Instruments

In order to perform this work, we used diverse musical material such as the score of the first movement of Hindemith’s sonata, composed in 1936, and records of Rampal and Veyron-Lacroix (1992), Schulz and Bognár (1996), and Válek and Hála (1995).

With regard to computer material, we used the Sonic-Visualizer computer programs for the psychoacoustic analysis and the Finale program for the reproduction of the fragments of the score needed for the analysis.

Lastly, the students’ performances and interviews were recorded with a digital recorder with a Sony microphone.

Justification of the work selected

Firstly, we feel it is necessary to briefly explain why we chose the target work of this study. As mentioned above, we intend to analyze a work of the 20th century, which presents, among other characteristics, tonal ambiguity, understood not as the denial of tonality as a form of organization, but as a way to treat harmonic developments within tonality, or, as noted by Morgan (1991) with regard to this stage of Hindemith, it is an approach to flexible tonality that is not at all traditional. This composer published in his Unterweisung im Tonsatz (“The Craft of Musical Composition”), the bases of his harmonic world through a variety of acoustic phenomena (Anderson, 2000) or a system of intervallic relationships classified according to their level of consonance or dissonance (Morgan, 1991). Delière (2005) carried out a very pertinent review of Hindemith’s publication. This author observed that the German composer attacked the conventional theory of harmony and that his language is “that of a chromatic tonality with tonic, dominant, and subdominant” (Deliège, 2005, p. 321).

This first movement of P. Hindemith’s sonata for flute fulfills the requisites of tonal chromatism and, moreover, it is one of the works in the repertory of the three students who participated in the empirical study. It was not very difficult to find three quality recordings performed by famous concert performers.

Procedure

First, we carried out the analysis of the score corresponding to the first movement of Hindemith’s sonata for flute and piano. As noted, we followed the guidelines of Lerdahl and Jackendoff (1983). These authors organize musical intuitions into four hierarchical dimensions: grouping structure, metrical structure, time-span reduction, and prolongational reduction. The first two are independent, and for the latter two, some relative stability criteria of pitch events must be met.

Subsequently, after reaching an agreement with the corresponding teachers, the participant students studied the target score as of February 2005, and in June, we made the recordings of the musical work. The study of the work was carried out with the aid of their respective teachers, as we considered it appropriate to preserve the context in which the students carried out their music studies, specifically, with regard to their musical instrument. The recordings were downloaded onto the computer program Sonic-Visualizer for subsequent analysis. The groupings (group beginnings and endings) were studied, as well as the variations of intensity and accents placed in the setting of each grouping.

Likewise, the three recordings of the professional musicians were downloaded onto the same computer program in order to carry out the above-mentioned analyses.

At the same time, open, non-structured interviews were prepared, which were validated by external judges. The interview followed an established guideline that contained the main issues of the investigation. We hoped the students would feel free to express their opinions.

Lastly, the analysis of the score, the performances, and the statements collected in the interviews were compared.

Results and Discussion

The first movement of this sonata of Hindemith could be divided into two parts, the first from the beginning, with a piano introduction, until bar 43. The second part begins at this bar, with only the piano, which carries out the transition until the beginning of the flute. This second section lasts until bar 101. At bar 102, the piano once again introduces a small coda that the flute continues from the fourth beat of bar 110 and which concludes the movement.

At this movement of the work, the author totally or partially repeats the rhythmic motifs in different metrical situations (see Figure 1). This displaces the metrical accents with regard to the rhythmic accents, and could produce a feeling of rhythmic maladjustment or imbalance.

At bar 102, the author changes from 4/4 to 2/4, and this is a transition bar that breaks the metrical continuity and in which only two eighth notes appear in the second beat in the part of the piano. These repeat the motif that had already appeared at the beginning of the work (bar 7 anacrusis) at the same metrical position. This change could be considered to respond to the composer’s desire to perform a time reduction.
As mentioned above, we analyzed the grouping as a function of the Grouping Well-Formedness Rules (GWFR) and the Grouping Preference Rules (GPR) defined by Lerdahl & Jackendoff (see Table 1). Thus, the groupings in four hierarchical levels were marked on the score, thus defining the segmentations or group beginnings and endings.

Table 1

<table>
<thead>
<tr>
<th>GPR 2 and GPR 3 Rules of Lerdahl and Jackendoff</th>
</tr>
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<tbody>
<tr>
<td><strong>GPR 2 (Proximity)</strong></td>
</tr>
<tr>
<td>Consider a sequence of four notes n1, n2, n3, n4. All else being equal, the transition n2-n3 may be heard as a group boundary if:</td>
</tr>
<tr>
<td>a. (Slur/Rest) the interval of time from the end of n2 to the beginning of n3 is greater than that from the end of n1 to the beginning of n2 and that from the end of n3 to the beginning of n4, or if</td>
</tr>
<tr>
<td>b. (Attack-Point) the interval of time between the attack points of n2 and n3 is greater than that between the attack points of n1 and n2 and that between the attack points of n3 and n4.</td>
</tr>
<tr>
<td><strong>GPR 3 (Change)</strong></td>
</tr>
<tr>
<td>Consider a sequence of four notes n1, n2, n3, n4. All else being equal, the transition n2-n3 may be heard as a group boundary if:</td>
</tr>
<tr>
<td>a. (Register) the transition n2-n3 involves a greater intervallic distance than both n1-n2 and n3-n4, or if</td>
</tr>
<tr>
<td>b. (Dynamics) the transition n2-n3 involves a change in dynamics and n1-n2 and n3-n4 do not, or if</td>
</tr>
<tr>
<td>c. (Articulation) the transition n2-n3 involves a change in articulation and n1-n2 and n3-n4 do not, or if</td>
</tr>
<tr>
<td>d. (Length) n2 and n3 are of different lengths and both pairs n1-n2 and n3-n4 do not differ in length.</td>
</tr>
</tbody>
</table>

Figure 1: The same rhythmic motif, two eighth notes and two quarter notes, in different metrical situations. Bars 6-7 and 76-77.

Figure 2: Overlapping of the A natural. This note can appear as the group ending or the beginning of the next group.

As mentioned above, we analyzed the grouping as a function of the Grouping Well-Formedness Rules (GWFR) and the Grouping Preference Rules (GPR) defined by Lerdahl & Jackendoff (see Table 1). Thus, the groupings in four hierarchical levels were marked on the score, thus defining the segmentations or group beginnings and endings.

With regard to grouping structure, we observe some right overlapping at bars 61 and 62 (Figure 2), that is, the initial note of the following grouping is overlapped.

If we observe these two points of the score and try to decide which of the grouping rules could be applied, we can carry out the following analysis:

At the overlap point, there is a triplet of eighth notes, a quarter note and a continuous note with two eighth notes. The overlapping takes place at the quarter note. Below, we shall clarify which rule we shall apply. Between the last eighth note of the triplet and the quarter note, we would apply rule 2a, but we could not apply 2b which would appear between the quarter note and the next eighth note. In contrast, rule 3a would be applied between the quarter note and the eighth note, and 3b would not be applied, and 3c should be applied between the triplet and the quarter note.

Rule 3d would not be applied. These rules are only applied weakly. This means that it is not clearly defined which of the rules is the strongest. On the one hand, rules 2a and 3c are applied between the triplet and the quarter note and, on the other hand, rules 2b and 3a are applied between the quarter note and the eighth note. In order to support the quarter note as the beginning of the grouping, we could go back to the beginning of this movement, where both the piano and the flute have the same rhythmic motifs (quarter note, two eighth notes, and quarter note) with the same melodic sequence (Figure 3). To select the quarter note as the group ending, we must examine the piano, where there are two sixteenth notes linked to a quarter note on the right hand, at the end of the triplet and the quarter note of the flute, which reinforces our choice of the flute’s quarter note as the group ending (Figure 4). Although neither of the two options is strong enough, we decided to consider the quarter note as the group ending, which indicates a right overlapping, as noted at the beginning.

Analysis of the Performances

Through audition, the segmentations carried out in the performance were marked on the score. A listener...
who was “blind” to the purpose of this investigation also participated in this task. Subsequently, the criteria of the students’ segmentations were unified, and the points were established at which one, two or all three students made the segmentation.

Then, we applied the Grouping Well-Formedness and Grouping Preference Rules to these points in order to determine which of the rules could be applied and whether to apply them intensely or weakly to the diverse segmentations or points. It can be observed that they are applicable to the points selected by the students to mark a group ending or beginning, although at some segmentation-points, these rules are applied somewhat weakly, mainly rules GPR 2 and GPR 3, which refer to proximity and to change (in register, dynamic, articulation, and length).

We proceeded in the same way with the recordings of the three professionals. The segmentations or breaks in their performances were marked. They were analyzed from the viewpoint of the Grouping Well-Formedness and Grouping Preference Rules. In this case, also we observed that, at the same points, rules GPR 2 and GPR 3 were applied.

Analysis of Segmentations by Groups (Professionals and Students)

Below, we contrast the analysis of the students’ performance with that of the professional musicians (Table 2). In the first column of Table 2, the bars and the beats where there is segmentation are represented, and in the second column, the segmentations carried out by the professionals, and in the third column, the students’ segmentations.

We eliminated all the segmentations where there is a quarter rest or a major rest from this table. We think that in such a long rest, a group ending or beginning will necessarily be found, at least at the more superficial levels of the grouping structure. When we refer to long or short rest, we actually mean time spaces without any sound. The length or duration of these time spaces depends on the tempo with which a movement of a work is played; the duration of a time space in slow tempo is not the same as a fast one. Thus, we obtained 47 segmentation-points (see Figure 5) of which the professionals carried out 85.1% (40 points), and out of these segmentations, 67.5% (27 points) were carried out by all three subjects, 17.5% (7 points) were only carried out by two of the subjects, and 15% (6 points) were carried out by only one subject (Figure 6). In the case of the students, they carried out 95.74% (45 points) of the segmentations, of which 75.55% (34 points)
were carried out by all three students, 6.66% (3 points) corresponded to only two of the students, and 17.77% (8 points) were carried out by only one student (Figure 7). The professionals carried out 4.25% (2) segmentations that the students did not and the students carried out 14.89% (7) segmentations that the professionals did not. The professionals and the students coincided in 80.85% (38) of the points out of the total of 47.

**Analysis of the Segmentations by Subject**

If the subjects are taken into account individually when conducting the analysis, we observe that they carried out 47 segmentations. Thus, and correlatively, from the first subject to the sixth, the following segmentations are presented: 68.08% (32 breaks), 74.46% (35), 72.34% (34), 78.72% (37), 80.85% (38), and 87.23% (41) (see Figure 8).

**Psychoacoustic Analysis**

Using the Sonic-Visualizer program, we can observe the waveforms generated in the performance of the work by the different subjects. However, we should clarify some aspects of the material used for this analysis. As mentioned, we used commercial recordings of the professionals’ performances and recordings of the performances of the students carried out for this investigation. Thus, it can be seen that the recordings were not performed under the same conditions and this affects the visualization of the frequency and spectral waves. Likewise, in Hindemith’s
sonata, composed for flute and piano, the waves generated by the piano conceal and overlap the formation of the waves derived from the flute player’s performance. However, when proposing this work, we considered the pertinence of the piano because, if only the flute was played, the performance would be de-contextualized and would have little to do with the real performance. Nonetheless, the points at which a group ending or beginning is performed can be clearly observed.

By means of this computer tool, the points at which the professionals and the students differ in the formation of groups can be observed. Thus, in Figure 9, between the second and third part of bar 7, the students carried out segmentation but the professionals did not. The figure corresponds to the recording of the performance of one of the students. In the fragment of the score, the segmentations carried out can be seen, marked with a thin line that crosses the pentagram. Their correspondence in the lower diagrams is marked with a circle. We can observe the drop in decibels and in frequencies. Figure 10 corresponds to the same fragment performed by one of the professionals. As mentioned, in this case, there are no segmentations and we can observe the differences with regard to the student.

Interviews of the Students

According to their interviews, all the students began their music studies at an early age (between 6 and 8 years). When asked about the musical level they thought they had achieved, all three students stated that, in general, they understand the technical and stylistic aspects. They were not familiar with the theory of rhythmic groupings, and they admitted that their first contact with this work comes from intuition. Subsequently, with the teachers’ aid and with that of their studies, they analyzed the melodic, metrical, harmonic aspects, etc., to shape their performance. They were requested to mark the rhythmic groupings as they heard them on the score they had studied and interpreted, and to indicate the most important accents within each group. Subsequent analysis indicated discordance between their responses and the recorded performances. Thus, in some cases, the segmentations marked on the score did not correspond with those of the recorded performance. The same could be said for the accents, which, in some cases, were marked at a different place on the score. These differences were not quantified because of the place they occupy in the musical phrasing. That is, their relation with the structure of the work is more important than their quantity. Moreover, these students’ musical performance may have been more intuitive than conscious. Please recall that their level of technical skill (they were intermediate students) might condition their musical performance, making it different from its mental representation, and that when performing this exercise, they may not have listened internally to what they marked on the score.

Conclusions

To conclude, we can state that the Grouping Well-Formedness and Grouping Preference Rules of the segmentations carried out by the professionals and the students are clearly relevant. When comparing the groups, we find that, out of the 47 total segmentation-points, the professionals performed
85.10% of them and the students 95.74%, 40 and 45 respectively. But they only coincide in 80.85% (38) of them. This reveals a difference with regard to the points selected for segmentation, but it does not mean that these segmentations do not fulfill the rules we used as reference, that is, those formulated by Lerdahl and Jackendoff. At all the points, these rules are followed, although not all the subjects segment in all of the points.

After a careful audition of the different performances, we suggest that some of these differences may be due to the different degrees of skill, both technical and expressive, shown by each of the groups, a difference that is predictable because the two groups comprised professional musicians and intermediate conservatory students, respectively. However, taking into account the different skills shown by each group, the Grouping Well-Formedness and Grouping

Figure 9. Bars 7-8. We observe the segmentations carried out by the students, which are marked with a cross-sectional line, and their correspondences in the diagram in the form of a wave and spectrogram.
Preference Rules are nonetheless applied, therefore, the cognitive aspects involved in the performance of this musical work do not vary despite these differences.

Future research should continue in this vein with more extensive studies using more subjects, and more profound studies insofar as the musical repertory to be analyzed and the analyses of the differences in rhythmic accenting and its relation to the metrical structure.

References


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