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Melodic dictation: analysis of the students' performance in the access examinations to music professional grade in Catalonia

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Abstract. Melodic dictation is regarded as a fundamental activity in the aural education of the Music Theory students in music professional schools and conservatories in Catalonia. The objective of the present study was to carry out an exploratory analysis of the performance of students when undertaking the melodic dictation included in the access examination to the first course of professional grade in a music professional conservatory in Catalonia. The sample was composed of 50 students, with an average age of 12.2 years old (SD = 1.6 years old). The durations, pitches and intervals of the transcriptions were analyzed. On the one hand, among other results the study made it possible to confirm the existence of statistically-significant differences among (1) the durations, pitches and intervals, in favor of the durations; (2) the ascending and descending intervals, in favor of the ascending ones; (3) the steps and leaps, in favor of the steps; and (4) the first and second fragment of the melody, in favor of the first one for the three analyzed parameters. On the other hand, no significant differences were detected between pitches and intervals. The rationalization of the performance attained in melodic dictation with regards to the durations, pitches and intervals may encourage and help teachers in understanding the melodic perception of their students. Thanks to that, the teaching practice might be improved by elaborating pedagogical proposals that allow teachers to develop students' relative pitch skills more efficiently.
Keywords: Melodic dictation; aural education; rhythm; pitches; melodic intervals; Music Theory; access examinations.

[es] El dictado melódico: análisis del rendimiento de los estudiantes en la prueba de acceso al grado profesional de música en Cataluña

Resumen. El dictado melódico es considerado como una de las actividades fundamentales en la educación auditiva del alumnado que cursa lenguaje musical en las escuelas y conservatorios profesionales de música de Cataluña. El objetivo del presente estudio fue llevar a cabo un análisis exploratorio del rendimiento de los estudiantes al realizar el dictado melódico correspondiente a la prueba de acceso al primer curso de grado profesional en un conservatorio profesional de música de Cataluña. La muestra de estudio estaba compuesta por 50 estudiantes, cuya media de edad era de 12,2 años (DE = 1,6 años). Se analizaron las duraciones, las alturas y los intervalos de las transcripciones realizadas. Entre otros resultados, por un lado se constató principalmente la existencia de diferencias estadísticamente significativas entre (1) las duraciones, las alturas y los intervalos, a favor de las duraciones; (2) los intervalos ascendentes y descendentes, a favor de los ascendentes; (3) los intervalos por grados conjuntos y disjuntos, a favor de los conjuntos; y (4) el primer y segundo fragmento de la melodía, a favor del primero en los tres parámetros analizados. Por otro lado, no se detectaron diferencias estadísticamente significativas entre las alturas y los intervalos. Conocer el rendimiento alcanzado en el dictado melódico en relación a las duraciones, las alturas y los intervalos puede incentivar y ayudar al profesorado a comprender la percepción melódica de sus alumnos. Gracias a ello, posteriormente se podrá mejorar la práctica docente mediante la elaboración de propuestas pedagógicas que permitan desarrollar más eficazmente el oído relativo del alumnado.
Palabras clave: Dictado melódico; educación auditiva; ritmo; alturas; intervalos melódicos; lenguaje musical; pruebas de acceso.

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1. Introduction

Aural education is considered to be essential in the musical education of students (e.g. Hallam & Bautista, 2012; Karpinski, 2000; Lake, 1993; McPherson et al., 1997; Rogers, 1984). It covers a wide and diverse spectrum of skills and competences, the objective of which focuses on developing capacities like musical memory, musical aural imagery, music literacy and musical understanding, as well as on the improvement of performance, creativity and the expressive abilities (Andrianopoulou, 2020).

One of the fundamental activities that is usually entailed in the aural education syllabus in music schools and conservatories in our country is melodic dictation. It consists in transcribing the durations and pitches of a melody to Western notation while it is being listened for a particular number of times. Some authors consider that such a task is the core of the development of aural skills (Karpinski, 1990) and also a multifaceted learning instrument (Klonoski, 2006), as (1) it makes it possible to develop inner hearing and start integrating analysis and hearing (Rogers, 1984); and (2) it helps in developing attention, extractive hearing, short-term memory, understanding and notation (Karpinski, 2000). Nevertheless, other authors question the efficacy of melodic dictation (Hedges, 1999; Klonoski, 2006; Potter, 1990), suggesting that there is a need to remodel it in order to truly evaluate the students' musical understanding and not only the correct or incorrect transcription of the durations and pitches (Paraczky, 2009).

1.1. Stages in melodic dictation

From the pedagogical point of view, Karpinski (1990, 2000) described a model to perform melodic dictation that entails four stages (hearing, short-term memory, understanding and notation), which take place by following a loop process. The first one –the hearing stage– refers to the reception of sounds at a psychoacoustic level and to the listeners' attention regarding the input of musical information. The second one –the short-term memory stage– alludes to the memory of the heard music to successfully proceed. On this stage, Karpinski specified two processes: the extractive hearing –selective memory of a small part of the melody to thereby reduce the memory load– and fragmentation –fusion of small music elements to expand the information amount that is kept and actively manipulated in the memory–. The third one –the understanding stage– refers to the use of the theoretical knowledge acquired to comprehend the hierarchical relation established between pitches, rhythmic groups and the tonal functions of the melody, among other aspects. The last one –the notation stage– alludes to the transcription of the melody to graphic symbols on a stave. In his work, Baker (2019) pointed out that, in order to have complete information about the melodic dictation, a model should be able to adapt itself both to the individual differences of the students and to the musical ones of the melodies to be dictated. Furthermore, Baker affirmed that we should also be able to explore a model either under experimental or computational circumstances. In this sense, and in order to complete the Karpinski's model (1990, 2000), Baker (2019) designed a factors taxonomy which could exert some influence during the performance of a melodic dictation in an underlying way: cognitive factors (e.g. general intelligence and working memory capacity), environmental factors (e.g. dictation practice and strategies employed), structural factors (e.g. movement and direction of pitches) and experimental factors (e.g. tempo, tonality, length of the melody and number of repetitions). Later on, through the preparation of a computational cognitive model, Baker (2019) evidenced that, when modelling the cognitive decision process during a melodic dictation, useful and precise information was obtained so that teachers could understand the students' inner cognition and thus be able to improve their teaching practice.

The demanding cognitive process that the performance of melodic dictation needs (Foulkes-Levy, 1997; Karpinski, 1990, 2000), as well as the individual and musical parameters that come into play in such process (Baker, 2019) help in explaining the fact that this task becomes one of the most complex ones for students (Andreu et al., 2021; Buonviri, 2015b; Cruz de Menezes, 2010; Foulkes-Levy, 1997; Hedges, 1999; Hope, 1991; Moreno & Brauer, 2007). In this sense, Klonoski (2006) highlighted that, in order to perform a melodic dictation, numerous listening skills are required, in conjunction with a clear comprehension of how to integrate them so that they get supported among them with the final purpose of obtaining a unified listening experience.

1.2. Strategies used and performance of the listeners during the melodic dictation

In general terms, teachers agree on the importance of carrying out melodic dictation, but they differ on which strategies should be followed and how to teach them (Buonviri & Paney, 2015; Karpinski, 2000; Klonoski, 2006; Paney & Buonviri, 2014, 2017; Pembrook & Riggins, 1990; Rogers, 1984). Previous studies revealed that the listeners who obtain the best results tend to (1) prioritize and carefully coordinate the tasks to be followed during the dictation (Buonviri, 2014); (2) use more (and more diverse) strategies than those who perform worse (Cruz de Menezes, 2010; Moreno & Brauer, 2007; Potter, 1990); and (3) consider that the ideal strategy is a flexible system that makes it possible to obtain information of both the intervals and the scale degrees (Cruz de Menezes, 2010; Dowling, 1986; Lake, 1993; Potter, 1990). Contrary, the strategy of guiding students with verbal instructions during the stages of memory and understanding of the dictation does not seem to be useful, since it obstructs the process (Paney, 2016).

Several studies have been undertaken in order to examine the efficiency of some procedural strategies, which were experimented either before listening to the melody or along the course of the melodic dictation. With regards

to the strategies prior to the dictation, Buonviri (2015a) concluded that, after listening to an illustrative sequence of chords, the performance in the dictation significantly increases when writing the melody immediately after listening to it, in contrast to (1) singing a proposed preliminary pattern and (2) leaving a silent time span so that listeners can freely prepare themselves in an individual manner.

With respect to the strategies experienced during the course of the dictation, no improvements were detected between (1) writing while listening, and (2) writing after listening (Buonviri, 2017; Pembrook, 1986), nor between (1) writing while listening, (2) writing after listening, and (3) listening, singing and later writing (Pembrook, 1986). In contrast, improvements in the performance were appreciated between (1) remaining silent during the dictation, and (2) releasing audible sounds, compared to (3) singing and later writing (Buonviri, 2019).

One of the procedures that is usually recommended by teachers during dictation is to sing before writing. However, the results of the previous studies (Buonviri, 2015a, 2019; Pembrook, 1986) suggest that listeners do not experience a significant performance improvement compared to the rest of strategies. In this sense, Pembrook (1986, 1987) highlighted that the low performance reported in comparison to the rest of studied strategies can be attributed to the fact that most students sing the melody in an imprecise way after listening to it (especially when fragments are long), thus obstructing the capacity of remembering and correctly writing it. Similarly, Buonviri (2019) pointed out that singing during the dictation can distract listeners and, in case of being employed as a strategy to strengthen memory, the melody should be sung with precision. Nevertheless, Buonviri (2019) recommended that, when possible, students should be allowed to release some sounds during the course of melodic dictation when they find it necessary.

1.3. Performance of the listeners during the melodic dictation: durations, pitches and intervals

The results obtained in the previous studies pointed towards a better performance of the listeners in rhythmic durations than in pitches (Beckett, 1997; Cornelius & Brown, 2020; Hoppe, 1991; Pembrook, 1986) and in intervals (Pembrook, 1986). With regards to the intervals in the context of a melody, the listeners are observed to (1) obtain worse scores in dictations when more leaps are present (Cornelius & Brown, 2020); (2) identify steps more easily than leaps (Hoppe, 1991; Pembrook, 1986; Taylor & Pembrook, 1983), thus displaying more difficulty for perfect fourth intervals (Taylor & Pembrook, 1983) and when the size increases (Hoppe, 1991); (3) commit less mistakes in the ascending intervals than in the descending ones (Hoppe, 1991). When intervals are found isolated, outside the context of a melody, the results of the studies differ: Samplaski (2005) observed that less mistakes are committed on the ascending intervals, whereas Killam et al. (1975) did not detect any differences between the ascending and descending intervals. Furthermore, Wapnick et al. (1982) pointed out that the identification of the intervals tends to be more accurate inside the context of a melody than outside.

Also, the existence of different factors that play a key role during the course of melodic dictation cannot be omitted: tonality (Dowling, 1978; Long, 1977; Pembrook, 1986), tempo (Hofstetter, 1981), the number of repetitions of the dictated melody (Cornelius & Brown, 2020; Hofstetter, 1981; Pembrook, 1986); the length of the dictated melody (Long, 1977; Pembrook, 1986); and the possession of absolute pitch (Dooley & Deutsch, 2010).

1.4. The present study

The present study focuses on the access examination to the first course of the professional grade in music, which is annually undertaken in the professional conservatories and authorized centers in Catalonia (Spain). Such test is organized by the *Departament d'Educació de la Generalitat de Catalunya* (DEGC) and is structured in two parts –Music Theory and Instrument– which contain several activities, respectively (DEGC, 2021). In a previous study (Andreu et al., 2021), the scores obtained by the candidates (with ages mostly comprised between 11 and 13 years old) were analyzed, more concretely in the Music Theory exercises –song, singing in tune, sight singing (sung and read aloud), dictation (melodic, rhythmic, two voice, and chords, intervals and scales dictations), listening, analysis and creation–. The results corresponding to the analyzed period (2013-2018) revealed that, from 2013 to 2015, melodic dictation was the exercise that recorded the lowest scores; in 2016, it was one of the two exercises with the worst scores and, in 2017 and 2018, it fell among the four exercises with the lowest scores.

After a full literature review, it was observed that, in general terms, the studies related to the strategies employed and the performance obtained during melodic dictations have all been carried out outside our country and with samples essentially composed by adult participants (professional musicians, teachers and college students). Only the research presented by Taylor and Pembrook (1983) entailed high-school students as part of its sample. In this sense, the present work represents the first study to tackle the analysis of the performance in melodic dictation on students with ages comprised between 11 and 13, which are finishing their elementary non-ruled music studies and are ready to undertake the access examination to the first course of the professional grade in music in Catalonia. The importance given to the performance of melodic dictation in the context of aural education (e.g. Karpinski, 2000; Rogers, 1984), its inclusion either in the Music Theory syllabus in schools and professional conservatories or in the access examination to professional grade by itself (DEGC, 2021), the difficulty detected on students to perform such activity (Buonviri, 2015b; Cruz de Menezes, 2010; Foulkes-Levy, 1997; Hedges, 1999; Hope, 1991; Moreno & Brauer, 2007; Andreu et al., 2021) and the lack of studies regarding the performance of melodic dictation on students with ages comprised between 11 and 13

years old, encouraged us to deepen in the transcriptions that were carried out in the context of the mentioned access examination. It is a key test in the musical education of students as, on the one hand, it represents a final evaluation of the musical competences acquired during the non-ruled studies and, on the other hand, it is an initial assessment that makes it possible to successfully face the beginning of the ruled music studies in the professional grade. According to the opinion of the authors, the information obtained in this study can help to promote an improvement of the daily practice and, consequently, of the students' performance in the access examinations.

The present study focuses on the following three research questions: In the transcriptions of a dictated melody, (1) is it possible to detect any differences between the students' performance with regards to the durations, pitches and intervals?; (2) and between the intervals considering its direction (ascending and descending) and size (steps and leaps), (3) and between the two fragments of the melody? To answer such questions, the following objective was proposed: To analyze the performance of the students in terms of durations, pitches and intervals of the dictated melody, corresponding to the access examination to the first course of professional grade in a professional music conservatory of Catalonia.

2. Method

In order to attain the proposed objective, an exploratory study was carried out as, according to Hernández et al. (2006), this sort of methodological approaches is adequate to examine and gain information regarding a topic that has still not been previously tackled in a specific educative context.

2.1. Participants

The study sample was composed of all the students (N = 50) who were carrying out the access examination to the first course of professional grade in a professional music conservatory of Catalonia (Spain). The students sample (26 girls and 24 boys) displayed an average age of 12.2 years old (SD = 1.6 years old) and came from various music schools after having completed their elementary non-ruled music studies. All participants had attended Music Theory and instrument classes during an average period of 6.1 years (SD = 0.8 years). The present research was carried out after obtaining the corresponding informed consent of the students' parents or legal guardians.

2.2. Melodic stimulus

The dictated melody, written in *B-flat major* and in 3/4 meter, was structured in two fragments (1st: measures 1-2; 2nd: measures 3-4) and contained a total of 21 durations, 20 pitches and 19 intervals (Figure 1).

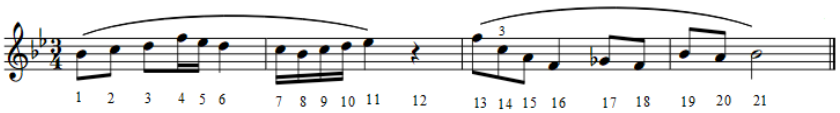

Figure 1. Dictated melody.

As suggested by DEGC and the *Associació de Conservatoris de Catalunya*, this melody was prepared and validated by four teachers with 10-15 years of experience in Music Theory teaching. The cited melody strictly fulfilled the musical content that had been previously established for the access examination (DEGC, 2021). In order to verify the reliability, Cronbach's Alpha coefficient was calculated on the items set of the melody, which resulted in a high inner consistency ($\alpha = 0.938$). The measurement was observed to be stable along the whole scale when each of the items was deleted.

2.3. Procedure

All the students carried out the melodic dictation in the same classroom, which was spacious and silent. A conservatory teacher played the melody on an acoustic piano at MM = 55. Each student had a sheet of paper with staves with the following annotations written on it: clef, key signature, meter and the first pitch of the melody without its duration. In addition to this, students were informed that the melody had a length of 4 measures and that it would be fully played 10 times, leaving a time span of 60 seconds between them. Before playing the melody, the I-IV-V7-I chords sequence was played twice in the *B flat major* tonality, indicating as well the tempo. During the course of the dictation, it was not allowed to release any sound nor provoke any noise. The whole process took approximately 22 minutes.

2.4. Data analysis

The data management and the statistical analyses were carried out with the *IBM Statistical Package for the Social Science*s (SPSS for Windows, 15.0 version). To determine the significance of the differences found in the performance

of students in terms of durations, pitches and intervals, the Friedman test and the Wilcoxon signed-rank test (both non-parametric) were applied, as the Shapiro-Wilk test rejected the existence of normality in the sample of the study. The significance level was set to $p < 0.05$. The *posthoc* analysis was undertaken by applying the Bonferroni correction (Field, 2009). The effect size was calculated by means of the Rosenthal *r* correlation coefficient (Field, 2009) interpreted as: small effect = 0.1; median effect = 0.3 and large effect = 0.5 (Pallant, 2011).

When analyzing the students' transcriptions, each duration, pitch and interval was assessed as correct (1 point) or incorrect (0 points). No partial scores were considered. The Cornelius and Brown (2020) criteria were followed to grade the durations and pitches. To grade the intervals, their ascending or descending direction, as well as their size measure in semitones, were considered to be important. To sum up: (1) each duration received 1 point if its duration and location in the melody were both correct; (2) each pitch received 1 point if its pitch and octave were both correct and (3) each interval received 1 point if its direction and size (measured in semitones) were both correct. The maximum score for the whole melody was 59 points: 21 durations, 19 pitches (the initial pitch was not included in the analysis because it had already been given to the students when proposing the dictation) and 19 intervals (Figure 1).

3. Results

The results obtained on the students' performance with regards to the durations, pitches and intervals are exposed in the same order as the research questions were proposed at the beginning. From the total of 50 transcriptions, 8 of them were excluded from the analysis for presenting an excess (n = 4) or deficiency (n = 4) of transcribed notes in the second fragment of the melody. In such cases, it could not be guaranteed that the written notes corresponded to the dictated ones. Therefore, the analyzed sample was reduced to 42 transcriptions (84% of the initial set).

3.1. Durations, pitches and intervals

The results of the Friedman test ($\alpha = 0.05$) revealed the existence of statistically-significant differences among the scores referring to the durations (*Mdn* = 19.00), pitches (*Mdn* = 11.50) and intervals (*Mdn* = 10.50): $\chi 2$ (2, N = 42) = 54.49; $p < 0.001$. The signed-rank Wilcoxon tests ($\alpha = 0.05$) were applied to gain a deeper insight into such finding with the Bonferroni correction ($p < 0.0167$). The results pointed out that (Figure 2):

- Statistically-significant differences were detected in favor of the durations compared to pitches ($Z = -5.436$; $p < 0.001$) and intervals ($Z = -5.366$; $p < 0.001$), with a large effect size in both cases ($r = 0.83$ and 0.82, respectively).
- No significant differences were appreciated between pitches and intervals ($Z = -1.481$; $p = 0.139$).

The results entail that students obtained higher scores in the durations than in pitches and intervals, and that no improvement was detected between the scores of pitches and intervals.

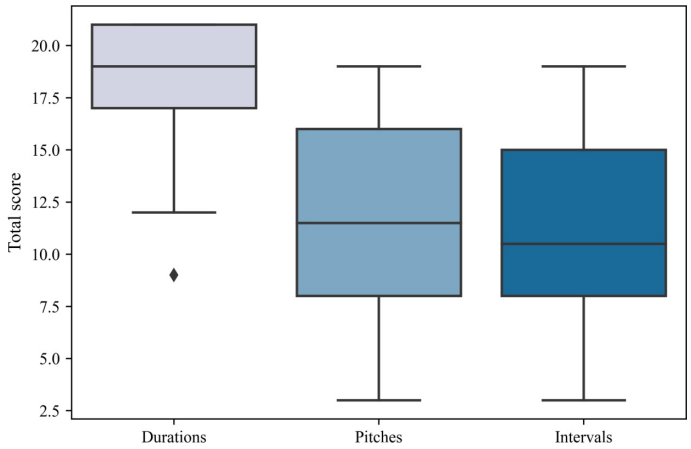

Figure 2. Performance of the students with regards to the durations, pitches and intervals.

3.2. Intervals: direction and size

When considering the direction (ascending: *Mdn* = 6.50; descending: *Mdn* = 4.00) and the size of the intervals (steps [m2-M2]: *Mdn* = 8.50; leaps [m3-M3-P4]: *Mdn* = 2.00) separately, the results of the signed-rank Wilcoxon test ($\alpha = 0.05$), revealed that (Figure 3):

- Statistically-significant differences were detected in favor of the ascending intervals compared to the descending ones (Z = -4.674; $p < 0.001$), with a large effect size (r = 0.72).
- Statistically-significant differences were detected in favor of the m2-M2 intervals compared to the m3-M3-P4 ones (Z = -5.655; $p < 0,001$), with a large effect size (r = 0.87).

These results entail that students obtained higher scores in (1) ascending intervals in front of the descending ones and (2) steps in front of leaps.

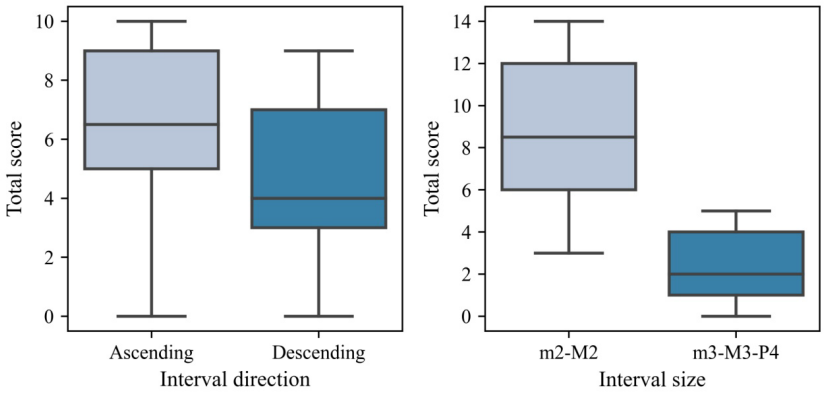

Figure 3. Students' performance with regards to the direction and size of the intervals (both aspects considered separately).

Alternatively, when the direction and size of the intervals were jointly analyzed, the results of the Friedman test ($\alpha = 0.05$) revealed the existence of statistically-significant differences among the scores of the ascending m2-M2 intervals (Mdn = 6.00), ascending m3-M3-P4 (Mdn = 1.00), descending m2-M2 (Mdn = 4.00) and descending m3-M3-P4 (Mdn = 1.00): $\chi 2$ (3, N = 42) = 103.977; $p < 0.001$. The signed-rank Wilcoxon tests ($\alpha = 0.05$) were applied to gain a deeper insight into such finding with the Bonferroni correction ($p < 0.0083$). The results pointed out that (Figure 4):

- Statistically-significant differences were detected in favor of the ascending m2-M2 intervals compared to the ascending m3-M3-P4 (Z = -5.680; $p < 0.001$), the descending m2-M2 (Z = -4.975; $p < 0.001$ and the descending m3-M3-P4 ones (Z = -5.666; $p < 0.001$), with a large effect size in all cases (r = 0.87; 0.76 and 0.87, respectively).
- Statistically-significant differences were detected in favor of the descending m2-M2 intervals compared to the ascending m3-M3-P4 (Z = -5.486; $p < 0.001$) and descending 3m-3M-4J ones (Z = -5.114, $p < 0.001$), with a large effect size in both cases (r = 0.84 and 0.78, respectively).
- No significant differences were appreciated between the ascending and descending m3-M3-P4 intervals (Z = -0.976; p = 0.329).

The results entailed that, on the one hand, students obtained higher scores in the (1) ascending steps than in the rest of the studied intervals, (2) descending steps than in leaps (both ascending and descending). On the other hand, no improvement was detected with regards to the scores of the leaps (neither ascending nor descending).

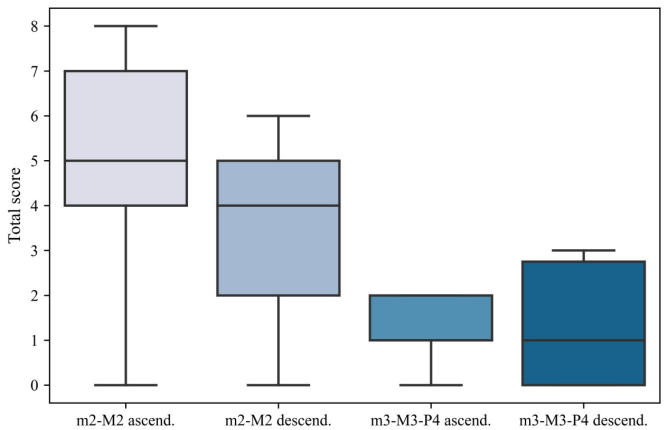

Figure 4. Students' performance with regards to the direction and size of the intervals (both aspects jointly considered).

3.3. Durations, pitches and intervals: comparison between the two fragments of the melody

When comparing the students' performance in terms of durations, pitches and intervals of the two fragments of the melody (1st fragment: measures 1 and 2; 2nd fragment: measures 3 and 4) separately, the results of the signed-rank Wilcoxon test ($\alpha = 0.05$) revealed the existence of statistically-significant differences in favor of the first fragment for all the analyzed parameters (Figure 5): durations (1st: *Mdn* = 10.00; 2nd: *Mdn* = 9.00), $Z = -4.226$, $p < 0.001$, with a large effect size ($r = 0.65$); pitches (1st: *Mdn* = 7.00; 2nd: *Mdn* = 5.00), $Z = -2.722$; $p = 0.006$, with a median effect size ($r = 0.42$) and intervals (1st: *Mdn* = 7.00; 2nd: *Mdn* = 4.00), $Z = -4.999$; $p < 0.001$, with a large effect size ($r = 0.77$). In order to balance the number of intervals of the two fragments, the interval located in the middle between the two fragments was assigned to the second one.

These results entail that students obtained higher scores in the first fragment of the melody than in the second one in terms of the three analyzed parameters (durations, pitches and intervals).

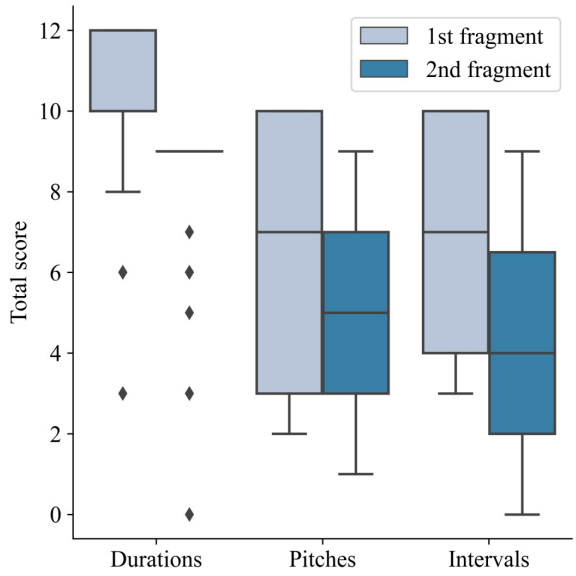

Figure 5. Students' performance with regards to the durations, pitches and intervals: comparison between the two fragments of the melody.

4. Discussion and educational implications

The objective of the present exploratory study consisted in analyzing the students' performance, with a sample that exhibited an average age of 12.2 years old (SD = 1.6 years old). The analysis entailed the durations, pitches and intervals of the melodic dictation corresponding to the access examination to first course of professional grade, which was carried out in a professional music conservatory of Catalonia. The order of discussion below is exposed in accordance with the results that were previously presented, ending with an educational implications section.

4.1. Durations, pitches and intervals

The results regarding the three analyzed parameters in the transcriptions –durations, pitches and intervals– revealed that the students' performance was significantly better in the durations than in pitches and intervals, whereas no significant differences were detected between pitches and intervals (Figure 2). The results obtained in the current research confirm the findings of previous studies, in which the scores for the durations were also better than those for pitches (Beckett, 1997; Cornelius & Brown, 2020; Hoppe, 1991; Pembrook, 1986) and intervals (Pembrook, 1986). It should be emphasized that the better accuracy on durations compared to pitches and intervals seems to be confirmed in several studies in which participants with different educational contexts, ages and musical levels were entailed: while the sample in the present study was composed of Catalan music school students with an average age of 12.2 years old (SD = 1.6 years old) that had concluded their non-ruled elementary music studies, the samples of the previous studies were mostly formed by adult participants belonging to Canadian and American universities, being most of them professional musicians, teachers and college students included. In this sense, the country in which the research was undertaken is not mentioned in some studies.

In accordance with Prince (2014), the pitch and rhythm are probably the musical dimensions that can together better define the identity and the complexity level of a musical piece. From a cognitive point of view, even though pitch has been separately studied (e.g. Krumhansl, 1990; Lerdahl, 1988) from rhythm (e.g. Lerdahl & Jackendoff,

1983; Palmer & Krumhansl, 1990), the way through which both dimensions interact on perception and memory is still uncertain (e.g. Krumhansl, 2000; Prince et al., 2009). The authors' teaching experience suggests that, generally speaking, students tend to be more accurate on the durations than on the pitches and the intervals of a dictated melody, independently of their age and music level. In this sense, Pembrook (1986) affirmed that the rhythmic accuracy seems to be preserved even if the pitches and the interval relations are correct or not, which qualitatively supports the above-mentioned results. Consequently, and fully agreeing with Hoppe (1991) and Beckett (1997), it could perhaps be considered that the identification of durations is easier than that of pitches and intervals. In fact, when analyzing the way in which students transcribe the dictated melody, it is often observed that they tend to externalize the heard fragment, either by beating the rhythm and/or by singing the pitches. The strategies proposed by several pedagogical approaches have probably influenced them in this regard. Nevertheless, students generally identify durations more easily than pitches, perhaps because they are influenced by the fact that, according to Geringer and Madsen (1989), the rhythm is the first element perceived when listening to music. Furthermore, as stated by Krumhansl (2000), it should be considered that the link established between perception and rhythm production suggests a strong motor component in the psychological representation of rhythm. As pointed out by Buonviri (2021) and Potter (1990), firstly attending to rhythm in dictations could probably provide with an organizing framework to locate pitches thus making it possible, according to Beckett (1997), to improve the rhythmic accuracy, though no evidences have still been found regarding the improvement of accuracy on pitches.

4.2. Intervals: direction and size

When considering the intervals direction (ascending or descending) and their size (steps [m2-M2] and leaps [m3-M3-P4]) separately, the students' performance was significantly better for the ascending and steps than for the descending and leaps, respectively (Figure 3). The results obtained confirm the previous finding with regards to the direction of the intervals either in the context of a melody (Hoppe, 1991) or isolated among them (Samplaski, 2005). However, Killam et al. (1975), who also studied the intervals in an isolated way, did not find significant differences between the ascending and the descending ones. In terms of intervals size, the results obtained also confirm the previous findings (Hoppe, 1991; Taylor & Pembrook, 1983). In his work, Pembrook (1986) also found differences between the melodies with steps and leaps. Nevertheless, it should be highlighted that Pembrook considered the 2nd and 3rd intervals as steps, whereas the 2nd, 3rd, tritone, 6th and 7th as leaps.

When analyzing the direction and size of the intervals together, the students' performance was observed to be significantly better for (1) the ascending m2-M2 intervals compared to the descending m2-M2 ones and m3-M3-P4, either ascending or descending; (2) the descending m2-M2 intervals compared to the m3-M3-P4 ones, either ascending or descending, and no differences were detected between the ascending and descending m3-M3-P4 intervals (Figure 4). In the studied educational context, during the course of a dictation, teachers often observe some difficulty, slowness and insecurity on most students when attempting to identify the pitches and the relation established between them (Ponsatí et al., 2014), especially for the descending intervals and the leaps. On the one hand, it should be taken into account that the whole process is carried out without being able to externally release any sound and, on the other hand, that the number of melody plays of the dictated melody is limited. With respect to this, and in accordance with Buonviri (2019), the performance of the dictation mostly quietly and allowing to vocalize or release some sounds softly in some particular occasions could perhaps facilitate such task to the students. However, this procedure could at the same time be prejudicial to the students during the dictation, because this activity is usually carried out collectively in the Music Theory classes. In this sense, the assiduous practice of inner singing the listened fragments could be beneficial, as the development of this skill is considered to be fundamental to perform a melodic dictation. The development of the subvocalization process described by Klonoski (2006) could probably be helpful when strengthening the inner singing of the pitches and the interval relations. At the same time, and among other factors, if the listeners also had flexible strategies when performing the inner singing of the fragments to identify both the scale grades and the intervals (Cruz de Menezes, 2010; Dowling, 1986; Lake, 1993; Potter, 1990) could all together favorably influence on the improvement of the students' relative pitch.

4.3. Durations, pitches and intervals: comparison between the two fragments of the melody

When the students' performances on each fragment are separately compared, it could be envisaged that the first one displays a significantly higher performance than the second one in terms of all the analyzed parameters: durations, pitches and intervals (Figure 5). Such results confirm the findings of Hoppe (1991), who detected, when analyzing the participants' transcriptions of three fragments (initial, medium and final), that the highest performance was attained in the initial fragment and the worst in the final one.

Focusing on the melody of the current study, rhythmic and melodic differences were observed between the two fragments: the first one was denser in rhythmic terms than the second one, as it contained several sixteenth notes, which entails more notes and, therefore, a faster performance of the same. Contrary, the second fragment was denser in melodic terms than the first one because it contained most of the leaps and, furthermore, the unique accidental alteration (*Gb*) of the melody. However, the results showed that the students' performance was rhythmically and melodically minor in the second fragment. In addition to this, it should be remarked that eight transcriptions were

initially excluded from the analysis because it could not be guaranteed that the written notes corresponded to the dictated ones. Actually, in the second fragment, four of them presented an excess of written notes and, oppositely, a deficiency of notes in the remaining four. Among others, some of the following factors might have negatively influenced the performance in the second fragment compared to the first one:

- The higher concentration of leaps, the scores of which are significantly lower than that of steps, and, furthermore, the presence of the unique accidental alteration of the melody, probably demanded students to pay more attention on the melodic elements than on the rhythmic ones, transcribing the durations of the second fragment with a lower accuracy compared to the first one.
- The higher difficulty to remember the second fragment because, similarly to the study of Hoppe (1991), the results obtained contradict the recency effect. In other words, perhaps the initial information was remembered better than the most recent one (Arias, 2006). In this sense, it should be considered whether the number of repetitions of the melody is adequate in relation to its length (Karpinski, 2000) and the number of leaps contained, as both factors might have affected the work memory load (Cornelius & Brown, 2020) and, consequently, reduced the success possibilities in the subsequent stages of comprehension and notation (Karpinski, 2000). Such factors make us think on the need of optimizing memory by developing extractive listening skills, fragmenting the heard melodies (Karpinski, 2000; Klonoski, 2006) and, furthermore, taking into account both the design of the melody and the procedure to be followed during the dictation (Baker, 2019).

4.4. Educational implications

The results obtained in the current exploratory study provide with relevant evidences on the students' performance regarding the durations, pitches and intervals of the dictated melody, despite not disclosing the reasons why such errors are committed along its transcription. Even though there are many variables that might influence on it, a deeper analysis should be carried out in order to cover the following aspects and thus explain some of the causes:

- The stages in which the melodic dictation is carried out. To detect the stage −hearing, memory, understanding and/or notation (Karpinski, 2000)− where students commit mistakes, drawing the attention to their concrete difficulty, probably allowing teachers to design adequate proposals to solve such difficulty and to be able to successfully continue the following stages of the dictation.
- The features of the dictated melodies. Teachers are encouraged to make the melodies adequate in accordance to the students' capacities in each moment of the teaching-learning process. Such features refer to their (1) length (number of measures), (2) rhythmic and melodic density (number of sounds avoiding the accumulation of rhythmic and/or melodic difficulties) and (3) musical content (rhythm, melody and harmony).
- The procedure followed during the course of the dictation. Owing to the above cited melodic features, it is advisable to carefully design the way in which the dictation is performed with regards to (1) the metric and tonal contextualization, prior to the listening of the melody, (2) the tempo of performance, (3) the timbre with which the melody is played, (4) the number of repetitions of the melody and (5) the time elapsed between them. These are fundamental aspects to take into account because, according to Baker (2019), both the features of the melody and the procedure followed can affect to the listeners in an underlying way during the course of the melodic dictation.
- The strategies used during the melodic dictation. The knowledge of which are the most successful strategies that students employ to approach the dictation (Buonviri, 2014; Cruz de Menezes, 2010; Moreno & Brauer, 2007; Potter, 1990) could be extremely useful both for those who present more difficulties and for teachers. Also, the fact of providing students with several strategies and helping them on how to choose the right one in each moment, and the way on how to use them (Buonviri, 2017) could be beneficial to solve the most conflictive parts of the dictated melodies.

At this point, and as a future proposal, authors are encouraged to keep gaining a deeper knowledge on this research topic by using a broader study sample composed by students who start their professional grade in the professional conservatories of Catalonia, with the aim of reproducing and confirming the findings presented herein.

Based on the contents exposed above, it could be concluded that the fact of paying attention (and deepening) on the mentioned aspects, among others, could help teachers to understand the melodic perception of students in order to later improve their teaching practice by preparing pedagogical proposals, which made it possible to efficiently develop the students' relative pitch.

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