

Study about the sonorous impact characterization in singing/instrument classes among music students in Brazil

Abstract

Background: The undergraduate music course students' routine involves curricular musical practices and instrumental studies. This practice certainly exposes the students to the so called continuous or intermittent noises.

Aims: To establish the sonorous exposure profile among the students of the music course of the UFSJ; describe the eventual differences among the diverse musicians groups; detect the presence of structures to protect against the noise during the musical instrument class; point out potential protective strategies for the exposed students.

Subjects and methods: 01student from each of the 11musical instrument emphasis and their respective professors, 02Big Musical Instruments Groups and 02chamber groups were included. There were sonorous impact mediations during the musical instruments classes and rehearsals of the groups through decibel meter. 30-second samples in each of the moments (orientations/speeches; low and high intensity) were used.

Results: It was verified that the different moments of the practical activities occupied 1/3 of the activities.

Discussion: The results indicated that the majority of the practical activities are within the security levels from the sonorous exposure point of view, although there are certain bordering circumstances that call for a special attention.

Conclusion: Despite the acoustic treatment of the building facilities, there can still be a risk due to such exposure. The preventive strategies are extremely important among which the earplugs and orientation to the students are highlighted, preferably in the beginning of the course.

Keywords: musical practices, sonorous impact, musicians' health, sound monitoring, musical education

Volume 4 Issue 1 - 2020

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Received: January 07, 2020 | **Published:** January 28, 2020

Introduction

The students' entry in the university marks a new life experience phase for them. Regarding the music course, this process has peculiarities of its own. One of them is the existence of individual instrument classes. The duration of the classes is 55min/week. What happens is that beyond these individual classes, there are many curricular activities that also involve instrumental practice. Besides the curricular activities, there is all the routine concerning the instrumental study. This practice certainly exposes the students to the so called continuous or intermittent noises. According to NR 15,¹ it is understood by continuous or intermittent noise, for the Tolerance Limits application, a noise that is not an impact one. The noise impact is that which presents peaks of acoustic energy of duration inferior to 1 (one) second, in intervals superior to 1 (one) second.

Many students have this daily routine for years uninterrupted which potentially can contribute to the occurrence of problems related to hearing loss. Russo et al.,¹ point out that in a study involving orchestra musicians, there is a hearing loss in various groups of the orchestra musicians. According to these authors this is due to years of practice and the sonorous intensity to which they are submitted. This

hearing loss can cause a negative impact on the musical perception levels of the individuals affected.² This impairment in the musical perception among the music course students can impact directly on their academic performance. Philips et al.,³ point out an alarming incidence of hearing loss among music students, achieving as much as 52% of them!

There are studies that try to delineate the sonorous exposure profile of the musicians. According to Schmidt et al.,⁴ the sonorous exposure depends significantly on the specific instrument and the repertoire played by the exposed musician. Concerts, rehearsals in group and individual practice were all significant contributors to the sonorous exposure. The greatest sonorous intensity average was found among the musicians of the metal family² (86–98dB) followed by the strings³ (82–98dB). The percussion musicians section despite having the lowest average among all musicians groups, showed the highest sonorous intensity peaks (115dB).

The present study searches to delineate the sonorous exposure profile among music students of the UFSJ. This study can generate other researches for the university, for example, the diagnosis of the level of hearing loss among students of this course, as well as the discussion and implementation of protective strategies for the instrument practices in this kind of environment.

¹NR 15: Regulating Norm 15 that verses about unhealthy activities and operations (Brazil).

Objetives

General

Establish the sonorous exposure profile among music students of the UFSJ.

Specific

- i. Describe eventual differences among the various musicians' groups, according to their exposure patterns;
- ii. Detect the existence of protective structures against noise during the instrument class;
- iii. Point out some protective strategies for the students exposed to intermittent noise.

Methodology

Methodological design description

Adopting the classification proposed by Hochman et al,⁵ the present research was a primary, observational, transversal (sectional) and descriptive study.

Subjects of the research

All students of the music course of UFSJ that coursed instrument/singing disciplines were included. Therefore, there were approximately 6 students, distributed in 11 emphasis (cited below), 02 Big Instruments Groups (Big Band and Orchestra) and 02 chamber groups (choro regional and trombone quartet).

- a. Strings

- i. By friction: Violin, Viola, Violoncello;

- ii. Struming: Guitar;

b. Metals

- i. Trombone;

c. Wood

- i. Clarinette;

- ii. Flute;

- iii. Saxophone;

d. Keys

- i. Piano;

e. Percussion

- i. Drums;

- ii. Marimba.

Sonorous intensity measure (decibel meter)

The sonorous noise was measured in each instrument/singing and musical practices class. A measurement was made in each instrument class in the individual classes as well as in the collective ones (group musical practice, big groups (big bands, for example). The measures were made according to NR15, that is, the decibel meter was positioned close to the students' auditory canal. Below is the description of the decibel meter and its specifications. The measures were made in three distinct moments: 1) professors speeches and orientations; 2) low sonorous intensity stretch; 3) high sonorous intensity stretch (Figure 1).⁶

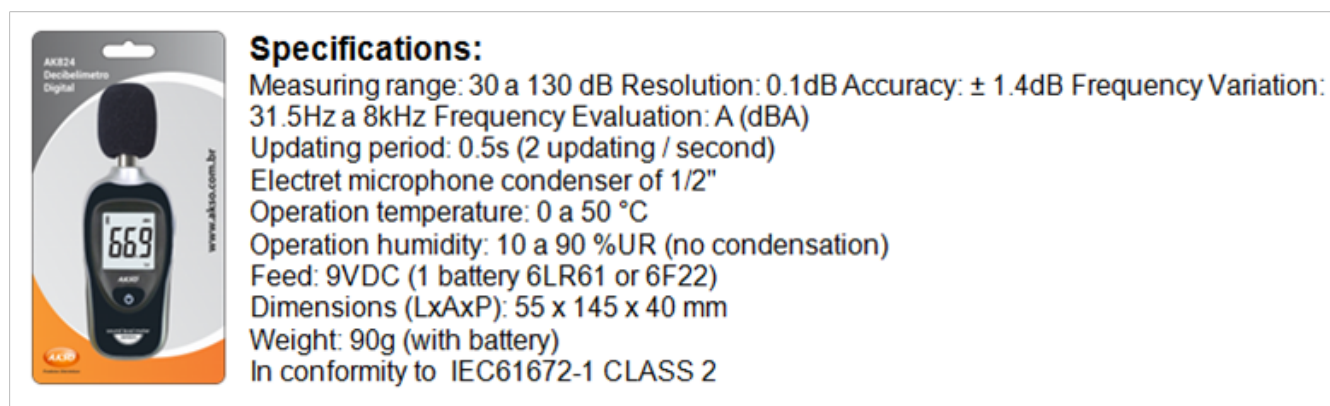


Figure 1 Decibel meter metro digital - AK824.

Characterization of the music course building at UFSJ

All the strategies used in the construction of the classrooms in the music course building at UFSJ, which have as its objective to decrease of the impact of sonorous noise over the students hearing health, were listed, being therefore, an acoustic treatment (and not an acoustic isolation).

The music course building at UFSJ has two floors. On the first floor there is the administrative sector, 06 professors' offices of the theoretical subjects, study rooms, correpetitors⁴ pianists' room,

recording studio, percussion room and a multiuse room. On the second floor there are 03 classrooms fitting 40 students each, a room for chamber music and 14 offices of the professors with instrument emphasis where the individual classes are ministered.

All rooms were built with walls that have asymmetries aiming at reflecting the sound in an irregular way. Besides, in all rooms there are devices to absorb high, medium and low frequency sounds. In the rooms used for individual wind instruments classes, besides the devices described above; there is an antechamber of a square meter to stifle even more the noise generated inside the classroom.

Results

The following data were collected in instrument classes and practices inside the music course building at UFSJ. It was observed that in all the activities there were three moments with a very similar profile in all practices: orientation, low intensity sonorous noise

generation and high intensity sonorous noise generation. Each one of them lasted about one third of the class/training time. For the purpose of a graphic registration, we measured 30seconds of each one of these moments. Some records of collective and individual activities will be shown. Here is the measure descriptive Table 1.

Table 1 Sonorous impact profile

Activity	Orientations/ speeches Measures in decibels (dB)	Low intensity	High intensity
Collective Activities			
Big Groups			
Big Band	71.31	74.58	87.56
Orchestra	79.2	77.9	79.18
AVERAGE/STANDARD DEVIATION	$\bar{X} = 75.26/s=5.57$	$\bar{X} = 76.24/s=2.34$	$\bar{X} = 83.37/s=5.92$
TOTAL SONOROUS IMPACT AVERAGE/ STANDARD DEVIATION (CA)	$\bar{X} = 78.29/s=4.42$		
Chamber Groups			
Performance Atelier	66.15	78.1	81.05
Regional Choro	69.27	84.09	86.06
Trombones Quartet	77.44	76.85	79.17
AVERAGE/STANDARD DEVIATION	$\bar{X} = 70.95/s=5.83$	$\bar{X} = 79.68/s=3.87$	$\bar{X} = 82.09/s=3.56$
TOTAL SONOROUS IMPACT AVERAGE (CG)	77.57		
Individual Activities			
Drums	71.31	82.65	84.37
Clarinete	70	75.23	77.76
Transversal Flute	72.88	78.21	79.01
Marimba	73.01	74.31	82.14
Piano	69.76	80.21	80.8
Saxophone	78.42	78.85	80.67
Trombone	65.68	76.56	82.08
Viola	71.98	79.03	83
Guitar	77.15	78.47	77.35
Violin	74.91	74.91	78.82
Violoncello	66.15	76.36	82.08
AVERAGE/STANDARD DEVIATION (IA)	$\bar{X} = 71.93/S=4.02$	$\bar{X} = 77.70/S=2.51$	$\bar{X} = 80.73/S=2.25$
GENERAL AVERAGE (IA+BG+CG)	$\bar{X} = 72.71/S=2.25$	$\bar{X} = 77.87/S=1.72$	$\bar{X} = 82.06/S=1.32$
TOTAL SONOROUS IMPACT AVERAGE (IA)	$\bar{X} = 76.79/S=4.47$		
GENERAL SONOROUS IMPACT AVERAGE (IA=CA-BG)	$\bar{X} = 77.55/S=0.75$		

Individual Activities: IA
Collective Activities: CA
Big Groups: BG
Chamber Groups: CG
 \bar{X} =Average
s=Standard deviation

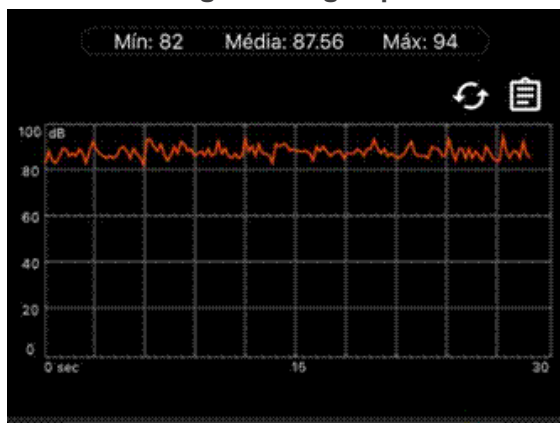
Table 2 Tolerance for continuous or intermittent noise limits

Sonorous intensity (dB)	Exposure time
85	8hours
86	7hours
87	6hours
88	5hours
89	4hours e 30minutes
90	4hours
91	3hours e 30minutes
92	3hours
93	2hours e 40minutes
94	2hours e 15minutes
95	2hours
96	1hours e 45minutes
97	1hours e 15minutes
98	1hours
100	45minutes
102	35minutes
104	30minutes
105	25minutes
106	20minutes
108	15minutes
110	10minutes
114	8minutes
115	7minutes

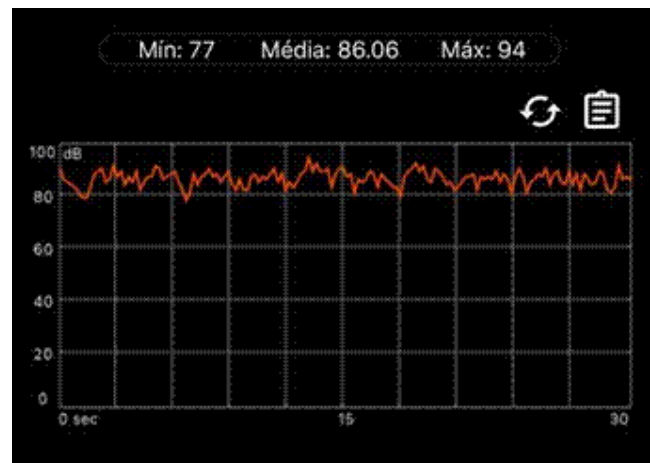
Source: Decree MTb n.º 1.084, December 18, 2018 (Brazil)

Below are the illustrative graphics of some situations of exposure in the music course at UFSJ. In these situations, the averages of sonorous impact in moments of high intensity are above 82dB. The situations that presented this profile were: Big Band rehearsal, choro regional presentation (collective activities); and in the following individual classes: Drums, Marimba, Trombone, Viola and Violoncello.

Collective classes/big musical groups

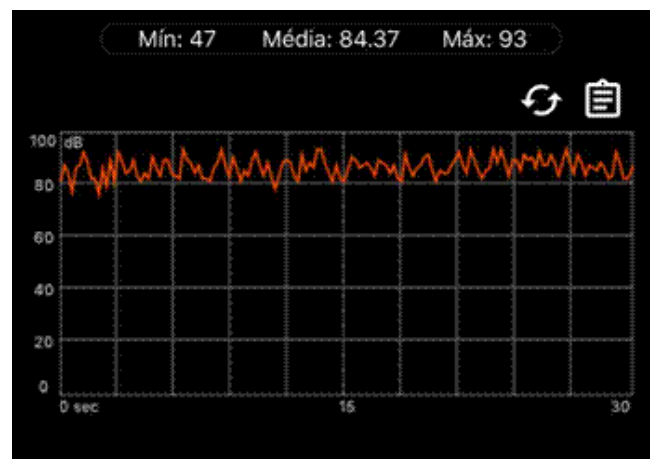


Graphic 1 Big band (high intensity).



Graphic 2 Recital with "choro group" (guitar, 7-string guitar, cavaquinho, tambourine, trompete, trombone) - (high intensity).

Individual classes



Graphic 3 Drum class (high intensity).

Discussion

The results indicate that the majority of the practical activities are within the security levels from the sonorous exposure point of view, although there are certain circumstances which call for special attention. One must consider that all activities have three very distinct moments: a) professor speech or comment, or from the one taking part in the class/rehearsal; b) a moment when there is the sonorous emission by the instrument(s) or singing, but of low intensity; and c) a moment when there is the sonorous emission by the instrument(s) or singing, of high intensity. This third situation, in general takes about 1/3 of the class/rehearsal time which means about 20 minutes in individual instrument/singing classes, approximately 40 minutes of the joint classes and 80 minutes of the Big Band rehearsal. Therefore we have clearly bordering situations in relation to the tolerance for continuous or intermittent noise according to the Regulating Norm number 15, according to the table below:

One of the main restrictions of this preliminary study was that the records were carried out from activities samples with a distinct exposure profile. That is to say that there were no continuous records of the activities which could provide a more reliable profile of the

sonorous exposure to which the subjects were submitted. Another issue to be considered, despite all the acoustic treatment in the building structure of the music course, is that what is being considered in terms of exposure is only the activities relating to the curricular program although most of the students dedicate their study daily time⁵ in course building facilities itself. This means that the weekly exposure to the sonorous impact, added to their curricular activities and study time, can reach about 16hours, with a daily average of approximately 02hours. With 13years of existence, few were the opportunities for discussion and approach of these issues among the music students of UFSJ. The elective course “Musician Health Topics”, which is currently offered in the music under graduation and in master degree course, is one of the few possibilities for consideration about this theme. The events promoted by the department, like the “Music Week” also try to offer courses and workshops contents that include the musician’s health theme, however, up to now this topic has not been discussed in these opportunities.

Conclusion

The big offer of subjects in the music course of UFSJ previews an extensive course load of the practical subjects in which the students are exposed to the sonorous impact. Despite the acoustic treatment applied in all the facilities of the music course building, there still can be a risk due to such exposure. For future researches it can be suggested a continuous record of the activities in order to supply a more accurate profile about the sonorous impact that reflects all the sonorous overload situations. Other possible lines of action can be focused not on the sonorous measurement but on the impact of the music practices and person’s habits that affect their hearing acuity. Resources such as audiometry can point out certain deficiencies due to the sonorous overload during the extended period of exposure, which is the case of the majority of professional musicians. The preventive strategies are extremely important among which it is highlighted the use of ear plugs and orientation so that the students, especially

those whose practice is involved in musical groups if higher sonorous impact (big groups like big band and instruments as percussion, trombone, viola and violoncello), are enlightened, preferably, in the beginning of the course.

Acknowledgments

To the program PIDAC - Affirmative Actions (Arts) - Federal University from São João del Rei (UFSJ).

Conflicts of interest

The authors declare that there is no conflict of interest.

Funding

None.

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