MUSIC TEACHERS' NOISE EXPOSURE

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1. INTRODUCTION

Music teachers are exposed to "noise" during the course of their activity. The size and activities of the classes vary, as well as the sound levels. Noise exposure can be classified as "occupational" and evaluated as such, because exposures are the result of the work environment, which some may dispute.

A survey was conducted to determine music teachers' professional noise exposure in secondary schools and to assess their risk of hearing loss. Noise exposures of 6 music teachers at six different secondary schools within the same board of education were measured.

The findings are part of an extensive survey, currently underway, which will continue into the coming school year.

2. METHOD

In each school two noise dosimetry measurements were obtained. One personal sample was collected from a music teacher and an area noise dosimeter was posted on a music stand (close the teacher, in front of the class). All music teachers were willing participants, informed about the objectives of survey. The test period was variable depending upon the individual teaching schedules (lasting from 1 to 5 hours).

Noise dosimetry samples were collected in accordance with the CSA Standard to quantify the time-varying noise levels. Dosimeters collected samples of A-weighted noise, over a range of 50-146 decibel (dB). The prescribed settings were followed - upper limit of 115 dB, slow response time constant, 90 dB criterion level, with 5 dB exchange rate and no lower threshold. This is the maximum permissible level of noise exposure set by the Ontario Ministry of Labour (MOL) established in Occupational Health and Safety Act, Regulation for Industrial Establishments.

Data were also collected as per other widely accepted criterion with an 85 dB exposure limit and 3 dB exchange rate. This criterion is recommended by National Institute for Occupational Safety and Health (NIOSH), as well as the American Conference of Governmental Industrial Hygienists (ACGIH), and is regarded by many health and safety professionals as a guideline for best practice.

Each dosimeter was pre- and post-calibrated with a Quest Electronics, Model CA-32, Permissible Sound Calibrator, which produces a 110 dB pure tone at 1000 Hertz.

During the survey information was collected about hearing protection practices, hearing protection equipment, teacher's concern about noise exposure, as well as individual history related to audiometry. Students played their instruments (flutes, trumpets, clarinets, saxophones, guitars, trombones). The teachers conducted music, instructed class and helped individual students. Often teachers needed to position themselves close to individual students, placing themselves in the middle of the instrument section, directly exposed to the sound from these sources.

Averaged noise levels (L_{avg}, L_{eq}) during the measurement period were recorded. The L_{avg} represents the average noise level based on a 5 dB exchange rate, and the L_{eq} is the equivalent noise level where the average is based on a 3 dB exchange rate. The normalized 8-hour exposure, termed time weighted average exposure (8 hr TWA), was determined to evaluate compliance with MOL requirements. The normalized 8 hr. noise exposure level (L_{ex}) was computed for comparison with the best practices guideline. In the laboratory the logged data, as well as the information from the discussion were downloaded into a database.

Band practice, which is typically held three times per week, also could significantly contribute to individual exposure. Band practice was not a part of this survey. Band practice is a voluntary extra – curricular activity and it may not fit the definition of "occupational exposure", even occurs in the workplace

3. RESULTS

The results of noise dosimetry are shown in Table 1. The findings indicate differences in noise dosimetry results obtained from personal and area samples and differences between teachers due to teaching schedules. In all cases the TWA exposure of the teachers complied with the Ministry of Labour Limit of 90 dB(A). Only half complied with the NIOSH standard of best practice - 85 dB(A) - for noise exposure averaged over 8 hours (personal samples at Schools 1, 2, 4, and 5).

Table 1. Noise Dosimetry Results

Sampling Description		Noise Exposure			
Sample	Duration (min)	L_{avg}	L_{eq}	TWA	L_{ex}
School #1					
Music teacher #1	208	89.0	91.5	86.3	87.9
Area sample #1	209	84.8	87.7	81.2	84.1
School #2					
Music teacher #2	248	92.6	97.8	89.7	95.0
Area sample #2	245	91.5	93.3	88.6	90.4
School #3					
Music teacher #3	71	87.9	90.2	79.6	81.9
Area sample #3	69	84.6	87.2	76.2	78.8
School #4					
Music teacher #4	255	88.5	91.1	85.8	88.3
Area sample #4	255	83.4	86.4	80.7	83.7
School #5					
Music teacher #5	310	89.9	93.1	88.0	91.2
Area sample #5	307	88.1	91.4	86.2	89.5
School #6					
Music teacher #6	245	82.0	84.9	79.1	82.0
Area sample #6	245	76.5	81.3	74.6	78.4

The samples from school #6 were not entirely representative, because of the classroom activities devoted to preparation for final exams.

As the noise in music room is usually intermittent then L_{avg} is several decibels less than L_{eq}. Specifically, the increase in L_{eq} levels is determined by the amount of high intensity "bursts" of noise. When classes play musical compositions in unison the flow of music determines the undulating characteristics of the sound, but when students are allowed to practice individually there is opportunity for more random "noise".

It can be concluded that noise exposure is influenced by the type of performed music activity and teaching approach.

4. DISCUSSION

The results show that there is a potential risk of hearing loss for music teachers. Exposures usually complied with the MOL limit of 90 dB(A), but not with the NIOSH standard of best practice - 85 dB(A). If high noise levels during band practice are included (usually three times per week), then it can be predicted that the risks would increase considerably. This may be controversial, because band practice is a voluntary activity. In other words, the noise exposure occurs in the workplace, but is not "part of the job"...or is it?

Measures should be implemented for reducing noise exposures. The key elements are: training, appropriate usage of protective equipment, audiometric hearing tests, periodic reviews, and written documentation (including record keeping).

Two specialized types of hearing protectors are available for music teachers and professional musicians: custom fitted earplugs (musician's plugs "ER" with 9, 15 or 25 dB NRR) and "ER 20" Hi-Fi earplugs. They have almost flat attenuation properties and they are designed to let the music teacher hear the full range of music. Training on the appropriate usage and care of the protective equipments is important.

Students also can be exposed to high noise levels while playing instruments, but the duration of their exposure is much shorter than the teacher's. It is important to point out that the music teacher is a role model and can set a good example for students by demonstrating appropriate usage of protective equipment.

Audiometry is an objective method for determining whether hearing loss is being prevented and for identifying individuals with established hearing loss. In this regard, audiometric records may be of significant importance pre-employment, as well as on a routine basis for monitoring the risks of hearing loss in music teachers. Periodic audiometry, noise dosimetry and reviews of hearing protection practices are important for effective hearing conservation programs.

Implementation of engineering noise controls (acoustical treatment of music rooms, teachers' offices and practice rooms) also can reduce noise and improve room characteristics. Cost-effectiveness is an issue.

5. REFERENCES:

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