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A five-year follow-up: Noise exposure and hearing loss in classic orchestra musicians

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Abstract

Noise exposure and hearing loss was assessed in different instrument groups of a professional ballet orchestra. Those group members experiencing the highest levels of exposure also had the highest pure tone thresholds. We found that thresholds were not uniform across instrument groups. The greatest difference in thresholds was observed at test frequencies above 2000 Hz, peaking at 4000 Hz where the average difference between groups was as high as 15 dB. Five years have elapsed since these initial measurements were taken. In this follow--up we reassess differences across the instrument groups in pure tone thresholds, and noise exposure. We also include a measure of functional hearing. This study provides information that extends current understanding of the occupational risks faced by professional musicians playing in orchestras.

Keywords: hearing loss; classical orchestra musicians

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1 Background

Quian et al. [1] conducted a noise exposure survey on musicians of the National Ballet of Canada orchestra, to assess the risk of hearing loss. The survey was repeated 11 times during rehearsals and performances of the ballet Romeo and Juliette. Results indicated that there was no risk to musicians' hearing on the basis of measured noise exposure levels.

Russo et al. [2] performed audiometric tests on musicians from the same orchestra studied by Quian et al. (2011). They found that instrument groups varied with respect to their audiometric thresholds. The greatest difference in thresholds was observed at test frequencies above 2000 Hz, peaking at 4000 Hz where the average difference between groups was as high as 15 dB. However, differences across groups could not be accounted for on the basis of occupational noise exposure. These measured audiometric thresholds were subsequently compared to predicted losses determined on the basis of noise exposure using ISO (1999) [3]. Differences between predicted and measured hearing losses were found to be negligible.

2 Present study

The present study represents a follow-up test of the musicians in the same orchestra. Fortunately, there has been minimal turnover in this period allowing for comparisons over time. The study is divided into three phases.

The first phase of the follow-up consists of a noise exposure survey during 11 rehearsals and performances of Le Petit Prince with music by Kevin Lau. The music is supposed to be less loud than Romeo and Juliette, which was the ballet measured in the previous study. The survey will be done using 5 Casella Dbadge micro noise dosimeters. Compared to the instruments used previously, they have the advantage of having the microphone as integrated with the dosimeter. This avoids the problem of the cable between the instrument and the microphone, which sometimes led to annoyance on the part of the musician. The weight of the dosimeter is of only 71 g making it quite unobtrusive. The information is transmitted wirelessly to a central monitor that saves measurements for future use. Dosimeters will be switched on at the beginning of the session (rehearsal or performance) and kept on for the entire duration (approximately 3 hr.). In this manner, we will be able to obtain the real noise exposure level from each musician. Dosimeters will be switched between performing musicians. Some will be ask to wear them more than once to assess the variation of the exposure between performances/rehearsals.

The second phase of the follow-up comprises hearing tests on all available musicians. As in the previous study, we will be performing air-conduction tests at 500 through 8,000 Hz, allowing us to assess permanent threshold shifts that may have occurred since the time of last testing. These differences will also be modeled on the basis of measured noise exposure.

The final phase of the follow-up involves the administration of the Speech, Spatial and Qualities of Hearing Scale [4]. This scale was designed to measure a range of functional hearing across several domains: (a) speech perception in a variety of competing contexts, (b) directional, distance and movement components of spatial hearing, and (c) perception of sound quality in music and everyday sounds.

Through this follow-up study we will be able to assess whether noise exposure experienced by a professional orchestra predicts (a) audiometric thresholds, and (b) different aspects of functional hearing. The study is in progress and will be completed in full prior to ICA'16.

References

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