

Audiological Examination of a Group of Music Professionals

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Introduction

The goal of psychoacoustic experiments provided in Musical Acoustics Research Centre Prague is the study of the perception of musical sounds and the search for the relationships to their acoustic properties and to physical properties of musical instruments.

The permanent group of music professionals was established to follow the long term stability of judges and to study the potential influence of their individual auditive dispositions on the results of provided listening tests.

The group of music professionals originated of several subgroups of different professional specialization was subjected to audiological examination. The results of the examination were evaluated from the point of view of psychoacoustic research as well as medical treatment of music professionals.

Method

The audiological examination of music professionals was realized at Medical Healthcom Prague.

Among other tests (tympanometry, speech audiometry, stapedial reflex) the pure tone audiometry was provided. The degree of monaural hearing loss for air conduction in standard set of frequencies (125, 250, 500, 1000, 2000, 4000, and 8000 Hz) was probed by adaptive up-down method [1] with the step of 5 dB in test room using Interacoustics AC audiometer. From the audiograms of both ears the hearing loss according to Fowler [2] was calculated. The measured hearing threshold was also corrected to age according to ISO 7029 [3].

Personal anamnesis was also acquired which consisted of age, sex, the length of professional sound loading, day exposure, tinnitus, mesotitis, smoking, family loading, long term medication, etc.

Statistical treatment of the results was made in STATISTICA software package [4]. Due to relative small sample size and the discrete character of the data the nonparametric statistics were used: Gamma correlation, Wilcoxon and Sign tests for dependent samples, Kolmogorov-Smirnov, Mann-Whitney U and Wald-Wolfowitz tests for independent groups and 2x2 table tests for dichotomous variables. The statistical significance of $\alpha = 5\%$ was considered as reliable indicator of the tested relation between variables or groups.

Results

The investigated group was assembled of 37 music professionals, mostly professors and students of Music Faculty and also members of faculty Sound Studio. The subgroups of the group are in Table 1. The mean age in subgroups does not differ significantly.

The comparison of results between ears showed significantly higher hearing loss only on the left ear in the whole group and frequency 8000 Hz, other differences between ears were not significant. Also the difference in hearing loss according to Fowler between ears (Table 2) revealed as not significant.

Table 1: Investigated professional subgroups and mean age

| Professional subgroup | Number | Mean age (years) |
|------------------------|--------|------------------|
| string instruments | 10 | 54.6 |
| wind instruments | 6 | 55.3 |
| keyboard instruments | 7 | 53.4 |
| conductors & composers | 5 | 45.2 |
| sound designers | 6 | 46.3 |
| others | 3 | 45.0 |
| the whole group | 37 | 51.1 |

Table 2: Hearing loss according to Fowler (in %)

| Professional subgroup | Right ear | Left ear |
|------------------------|-----------|----------|
| string instruments | 7.1 | 11.3 |
| wind instruments | 3.2 | 4.5 |
| keyboard instruments | 2.1 | 1.3 |
| conductors & composers | 0.9 | 2.2 |
| sound designers | 1.2 | 1.2 |
| others | 1.5 | 1.7 |
| the whole group | 3.3 | 4.6 |

The mean values of measured and according to age corrected hearing losses are in Figure 1. There is no significant deviation of hearing in the subgroups of conductors & composers and sound designers but some significant losses in subgroups of interpreters of musical instruments which substantially influenced the losses of the whole group.

The analysis of anamnesis data revealed that the vanishing of stapedial reflex is often accompanied by tinnitus. The professionals with higher family loading are less frequently smokers and use little drugs which can influence hearing when used for a long time. Older professionals use fewer drugs, have smaller family loading and in the childhood suffered less from the mesotitis.

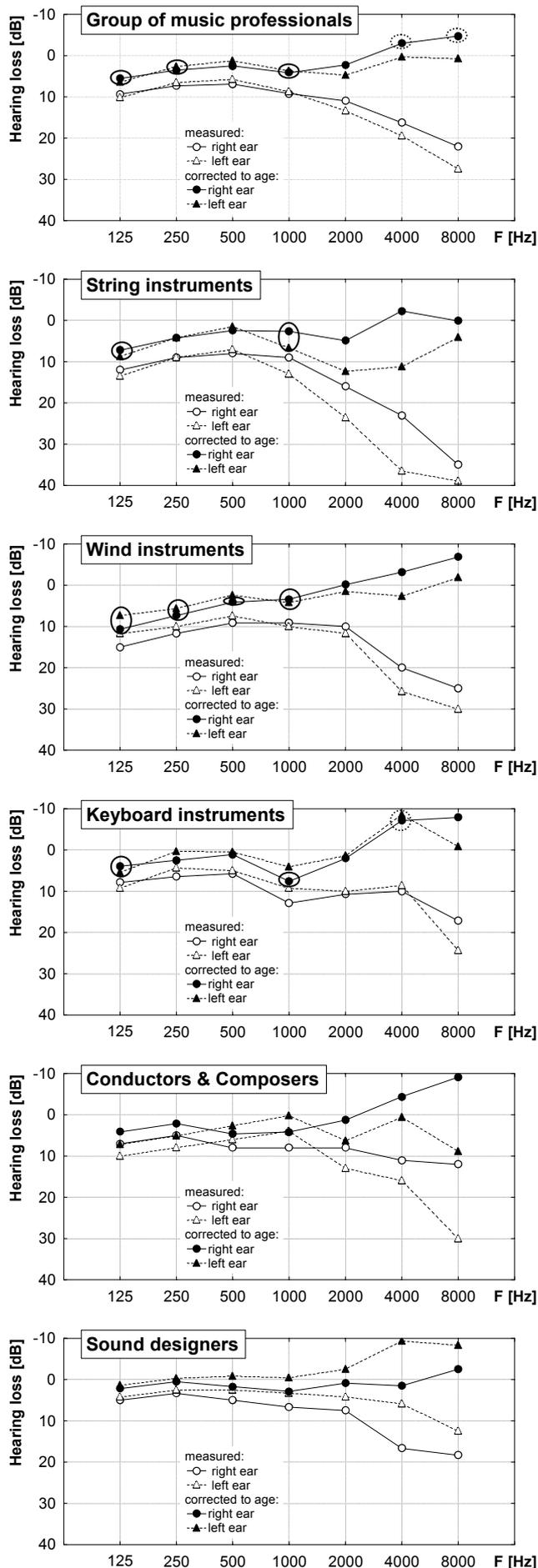


Figure 1: The mean values of hearing loss (measured and corrected to age according to ISO 7029). Significantly deviated losses corrected to age are marked by ellipses (full line for higher loss, dashed line for lower loss).

The analysis of potential influence of anamnesis risk factors on hearing (represented here by audiometric results) revealed that the hearing loss increases with age significantly in both ears of frequencies 125, 4000 and 8000 Hz. But losses corrected on age are in older professionals significantly lower on frequencies 250, 1000, 2000, 4000 and 8000 Hz (right ear) respectively on frequencies 500 and 8000 Hz (left ear). The length of day exposure adversely influences hearing on 125 Hz on both ears. The family loading and use of drugs increases hearing loss on lower frequencies (500 Hz respectively 250 and 500 Hz) on the left ear.

Discussion and conclusion

Even if the group of music professionals is rather small from the statistic point of view, some interesting results revealed. The hearing loss is comparable (except for 8000 Hz) on both ears. The losses corrected to age are significantly higher than the population on 125, 250 and 1000 Hz on both ears, which is caused predominantly by the losses of musical instrument interpreters. This fact supports an idea of their workload by musical sounds. Even if the older professionals use more drugs (which is perhaps natural) they have smaller family loading, in the childhood suffered less from the mesotitis, and their corrected losses are smaller on the several frequencies on both ears than in younger professionals. These findings indicate the trend toward the generational degradation of hearing in music professionals like it is in the whole human population.

The measured hearing loss will be used for the explanation of possible disagreement of perceptual judgements of music professionals in listening tests, loss corrected to age and anamnesis data will be used for the prevention of their hearing loss [5].

Acknowledgement

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References

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