

Evidence for different susceptibility to auditory damage between men and women

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We are working on the relationship between exposure to sound and auditory performance, and we are not involved in any form of medical treatment. Instead, we are studying groups of persons that are of interest to us. We give all volunteers a questionnaire, and we determine the auditory performance using pure-tone audiometry up to 16 kHz. Persons without previous audiometric experience get an individual training session in audiometry. Over the years data on about ten thousand persons have been collected. In order to analyze these data by program, we determined the usual ageing in Germany, up to the age of 70 years. It is similar to the ageing in ISO1999 for persons not exposed to noise, but extends up to 16 kHz. All audiograms are compared to the normal hearing for the age of the person. Data from men and women are analyzed separately. Data from persons with sudden hearing loss and with diseases of the ear were excluded from this analysis.

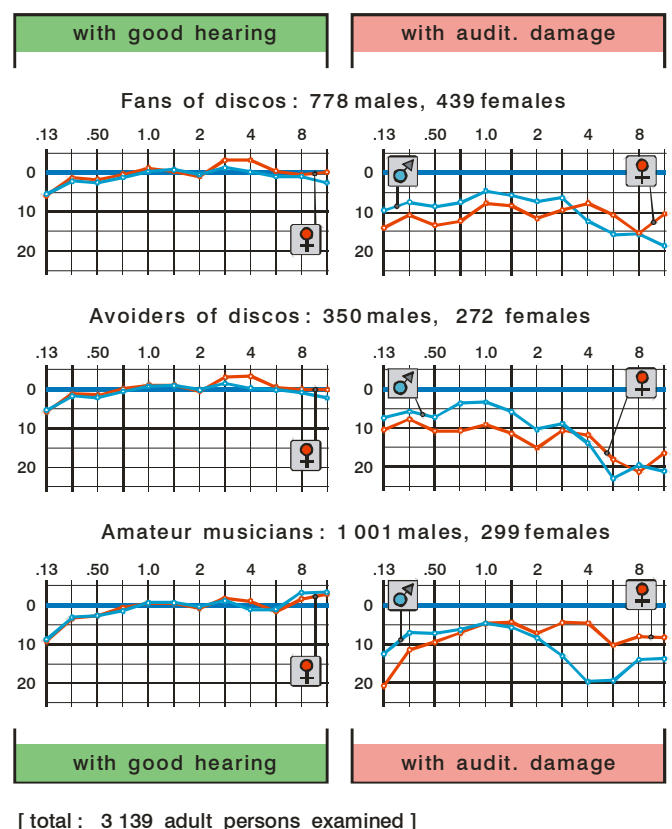
To determine persons with auditory damage, it was decided to use a 20-dB-down limit. All audiograms that contained one or many audiometric values that were more than 20 dB below the line for normal ageing were characterized as auditory damage. This standardized procedure makes it possible to compare the auditory performance of various groups directly, regardless of the size of the group and the age of the various persons. It also separates each group automatically in ears with good hearing and in ears with auditory damage. This separation is in itself quite informative. In a few groups there are only about 5% with auditory damage while this percentage can increase in other groups to values of more than 50%. Of course, it is quite natural to analyze both subgroups further, those with good hearing and those with auditory damage. In male office personnel e.g. we found 24% with auditory damage, while male orchestra musicians show only 17% with auditory damage. Of course, it is tempting - and easy - to compare the persons with damage between those - or other - groups.

Comparing men and women of the large group who regularly go to the discotheque, it is apparent that the good-hearing persons - about 90% - hear very similar, across the entire frequency range. However, a comparison of the persons with auditory damage - about 10% - reveals that women have more damage than men at low frequencies, but less at high frequencies. Doing the same comparison for persons who principally avoid discotheques, the result is the same. The straight horizontal 0-dB line of the illustration represents the normal ageing. Values above this line indicate an auditory performance of the group that is better than normal, while values below this 0-dB line indicate values for the group that are below normal.

The illustration shows results of three groups, males versus female, and it is based on the examination of 3.139 persons.

There is nearly no difference between the good-hearing persons of both genders. In persons with damage, women show more hearing loss at low frequencies than men, but less at higher frequencies. If we have the same effect in fans of discos and avoiders of discos, the reason may not be the acoustical environment.

Overview : males vs females (disco; amat. mus.)



In all groups that are large enough to have a larger number of persons with auditory damage, the same effect can be observed, and it is statistically significant. This effect is also present in nomadic people who live with their sheep and yaks on the Tibet Plateau, and who are not exposed to any noise. We find the same effect in peasants of the mountain range in central China who are also not exposed to technical noise at all. In a loud metropolitan area in China the situation is the same. Over all, the difference is only in persons with auditory damage, but it is independent of the acoustical environment. Hence, we conclude that the causes for this difference among men and women is a difference in vulnerability of the ear.

