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Ann-Cathrine Lindblad, Åke Olofsson

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ABSTRACT

In military services the noise levels are often extreme. In ordinary shooting training in the Swedish Armed Forces, however, the risk to get a permanent, noise induced hearing loss is very small, provided the safety measures are enforced. Now the question has been raised that urban combat training performed indoors in bunker-like rooms might involve an increased risk at least for the most susceptible individuals.

Hearing tests have been performed on 23 officers before and after a shooting session in a bunker-like room. The function of the outer hair cells and their control system were measured with transient evoked otoacoustic emissions, TEOAEs, with and without contralateral noise, and by measuring thresholds for brief tones in modulated noise, psychoacoustical modulation transfer function, PMTF. Very accurate tone thresholds were measured by Békésy-technique.

Three hours after exposure the mean tone thresholds at 4 and 6 kHz for the groups were 1.2 dB higher than just before exposure, p=0.055 and p=0.09. During the course of the shooting day the variances of the tone thresholds on the left ear for the presumably most affected frequencies 3 and 4 kHz were significantly larger than on the right ear. Three hours after the shooting PMTF-values for the group had changed like towards a sensorineural hearing loss since the afternoon before, p<<0.001. (It was not measured just before the exposure to save time.) However, the TEOAEs increased significantly at most frequencies from the measurements the day before and just before exposure but then changed marginally until three hours after exposure.

To us the results seem contradictory. One problem is that some officers had disobeyed instructions and had been on the shooting range before the measurements in the afternoon before the shooting day. The TEOAE-results may indicate that the effect of that exposure by far exceeded that of our investigation. In that case we must ask ourselves if the PMTF-test has a strong and so far unknown, learning effect. In a just started investigation the test schedule is extended to try to clarify those interpretation problems. Before that it is not worth trying to address the question of the risk for the most susceptible individuals in this investigation.

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contact: Per-Anders Hellström

Mailing address	***Visiting address***	***Phones***	***Fax***	***Org.nr:***
Teknisk och klinisk audiologi, KI	Danderyd hospital area	+46-8 544 966 36, direct	+46-8 544 966 44	01 202100 2973 01
Blå vägen, house 15	Blå vägen, house 15	+46-8 544 966 30, general	***E-Mail***	***VAT-No.:***
S-182 30 DANDERYD	DANDERYD	+46-8 544 966 31, secr	anncat.lindblad@cns.ki.se	SE202100297301
SWEDEN	SWEDEN		***Home page:*** http:// www.ki.se/cns/	

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INTRODUCTION

Excessive exposure to noise is the most common cause of hearing loss, tinnitus and hyperacusis. Moreover, noise induced hearing loss (NIHL) is one of the most common causes of occupational health problems, both in the civil working sector and in the military defence in spite of great efforts to reduce health hazards caused by excessive noise exposure. Tinnitus is common in the population, about 14% have tinnitus often or always, 40% have tinnitus of any type, continuous as well as occasional. Noise exposure is the cause of the problem for between 20% - 40% of them.

In military services the noise levels are often of an extreme character. In the ordinary shooting training within the ordinary training programme in the Armed Forces, however, the risk for military personnel to get permanent NIHL is very small, provided that the safety instructions are enforced. Nevertheless there can be some doubts if hearing protectors provide enough attenuation for all subjects in some situations. One of the most pronounced exposures to noise occurs during shooting in urban combat training. These training sessions are performed indoors in bunker-like rooms. The acoustical properties of these spaces are extremely poor and the noise levels are enhanced, and silent intervals filled in by reflections of the sound by the concrete walls. The Health Authorities of the Swedish Armed Forces are concerned that urban shooting training might involve increased risk for NIHL. Occult, non-symptomatic, transitory influence of hearing function may occur, perhaps quite often. Such occult hearing dysfunction can be detected with modern auditory tests.

Hearing thresholds and other auditory tests were performed before and after shooting in urban combat training in a study carried out in close co-operation with the Swedish Armed Forces (contact: Per-Anders Hellström). The safety instructions (including the use of hearing protectors) enjoined by the Swedish Armed Forces were applied.

METHOD

Test conditions

Two rounds of ammunition, with 20 shots in each, were fired from an automatic gun, Ksp-58, in a bunker used for urban combat training. Two people were in the bunker at the same time – the right-handed shot and a companion placed close by on his/her right side.That means that they had the weapon between them. Both were wearing their standard active hearing protectors. The shooting took place on four separate days with time for hearing tests on the days before and after. Each day of shooting three times two people were exposed. Hearing tests were performed with three measuring systems in a house about 100 m from the bunker on the day before, on the day of shooting, and when considered necessary to monitor effects of the exposure the day after or still later. Originally no measurements were planned after the day of shooting. The test subjects were instructed to avoid noise exposure 24 h before the test.

The test setup with three measuring systems allowed performing hearing tests on three people at a time. The time schedule was adjusted to that. The test parameters for each type of test were chosen to make it possible to start new measurements every 15 minutes. The test subjects were numbered consecutively. Subjects with odd numbers were shots, those with the even numbers immediately after were their respective companions. The hearing tests just after the shooting were performed at the same time for both subjects in a pair. The odd numbered subjects performed all the other hearing tests 15 minutes earlier in relation to the shooting than the even numbered ones. The test schedule for one day is shown in a table in the appendix.

An engineer group from FMV’s test site at Karlsborg registered sound pressure levels at a reference microphone placed on a stand at a certain distance from the weapon in the bunker, in the left ear canals and in the shots right ear canal by three miniature microphones. The maximum sound pressure levels were 164 – 166 dB SPL at the reference microphone and 135 – 154 dB SPL in the ear canal under the hearing protectors. These results are not reported further here.

Test schedule

1) The afternoon before the shooting training (tone thresholds on both ears – from now on called audiogram - all other hearing tests on left ear, audiogram and TEOAEs also on right ear) Test occasion, **df** (the **d**ay be**f**ore)**.**
2) The same morning as the shooting, 75-45min or 60-30 min before the shooting (OAEs on left ear, audiogram). Test occasion **m0**.
3) Directly after the shooting (2 audiograms). On the last shooting day the second of these audiograms was replaced by a PMTF-measurement, on the left ear. Test occasions **m1** and **m2**.
4) 1 hour after shooting (audiogram). Test occasion **m3**.
5) 2 hours after shooting (audiogram). Test occasion **m4**.
6) 3 hours after shooting (audiogram; all tests, left ear). Test occasion **m5**.
7) Those who showed results considered worse than their preexposure results at 3 hours after shooting were tested again the day after shooting (if possible). That regards the audiogram and the PMTF-measurements. Test occasion **nd.** Evaluation of the possible changes in otoacoustic emissions is more time-consuming. It was not possible to check that too after the measurements had come to an end on the shooting days.
8) If the measurements in 7) implied so further measurements were performed a few days later. Test occasions **xd** and **xxd** (e**x**tra **d**ay etc).

Test subjects

Twenty-three officers in the Swedish Army served as test subjects. A twenty-fourth officer participated in the measurements the day before the exposure but broke his ankle in the evening and could not fulfil the experiment. The age of the test subjects ranged from 22 to 50, median 29, mean 31, s.d. 7 years. Two of the officers were women.

Hearing tests

1. Tone thresholds with fixed frequency Békésy technique - audiogram

Tone thresholds for left and right ears separately were measured with pure tones (i.e. sinusoids) at 1000, 1500, 2000, 3000, 4000, 6000 and 8000 Hz..

A pulsating tone is presented. The duration is 275 ms, including attack- and release times, and with a 175 ms long interval between pulses. The level of the tone is increased by 2.8 dB/s until the subject detects the tone and starts pressing the button. The level of the tone decreases with the same speed until the button is released again, etc. Thus a zigzag is formed around the threshold level. The turning points are registered by the computer. The measurement is concluded after 10 turning points. The first two turning points are not used in the calculation. The threshold is calculated as the mean value of the medians of the remaining upper and lower turning points. The threshold is presented with a resolution of 1 dB. The method gives better accuracy than conventional audiometri with 5-dB-steps between stimulus levels.

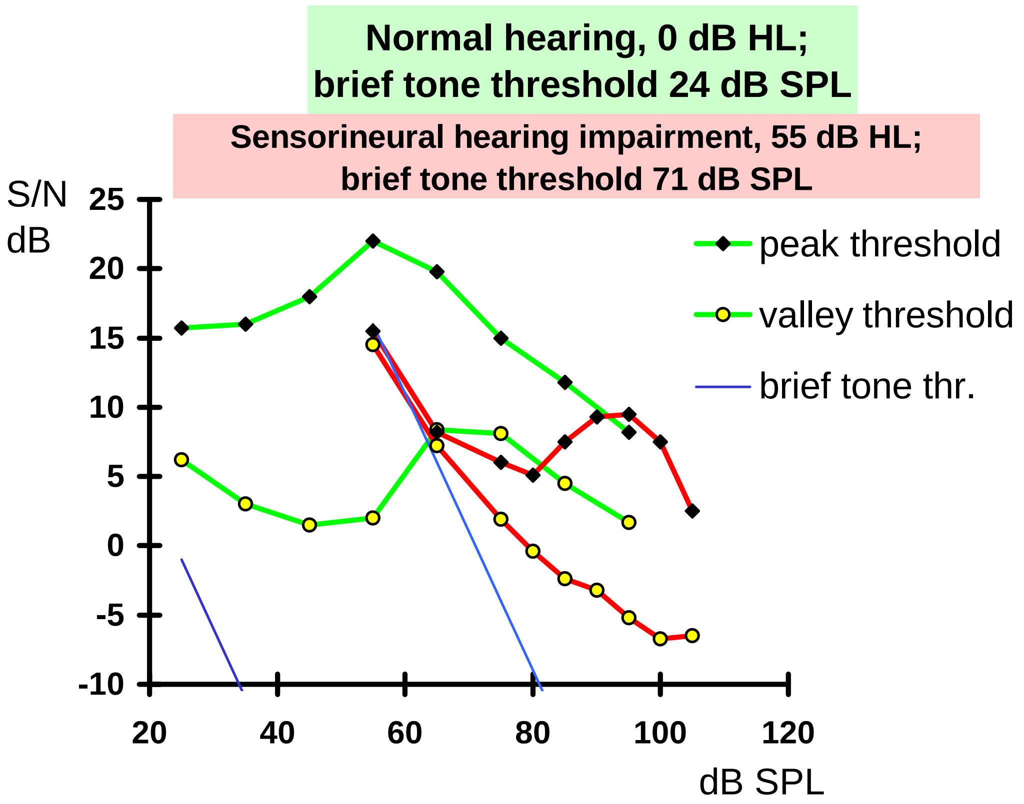
2. Psychoacoustical modulation transfer function (PMTF)

The threshold of a brief tone, 4 ms, is measured in a fluctuating noise. Separate thresholds are measured with the tone at the peaks and in the valleys of the noise. The measurements were performed on the left ear at 4000 Hz, with a modulation frequency of 10 Hz and at the levels 25 to 95 dB SPL. The threshold of the brief tone was also measured without noise.

The PMTF-test reflects the ability of an ear to follow the natural, slow intensity modulation of speech. This modulation origins from syllables, words and intonation. A poor ear has an increased difficulty to detect for example soft sounds after loud sounds.

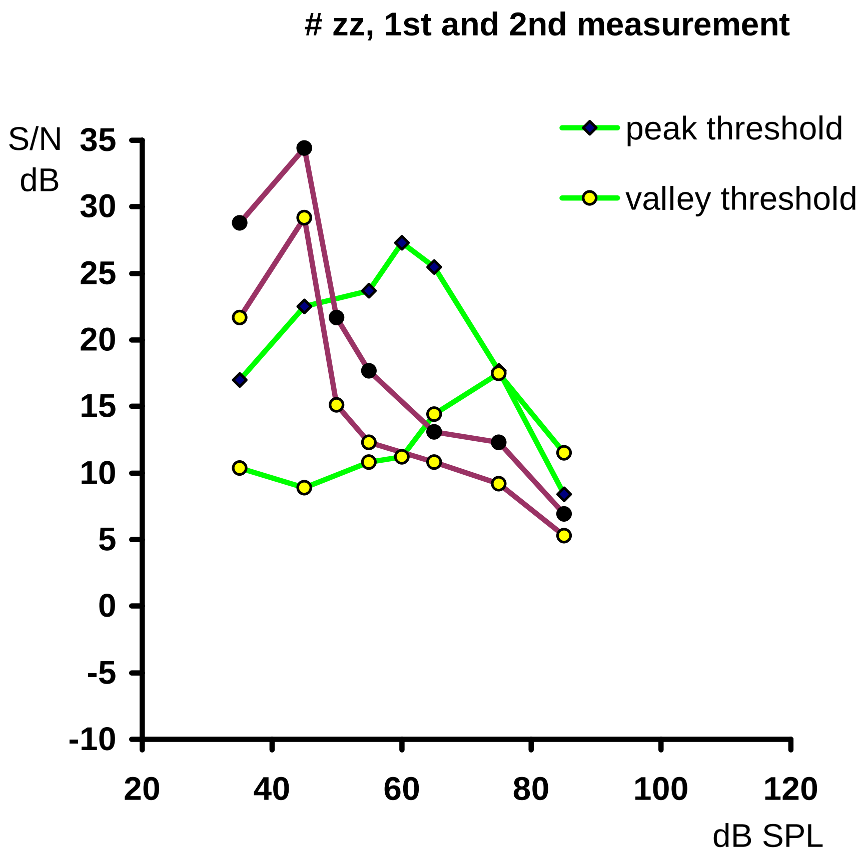
The thresholds were determined with the same Békésy-technique as described earlier. Seven noise levels have been used: 25 to 95 dB SPL (sound pressure level re $2*10^{-5}$ Pa) in steps of 10 dB. The noise consisted of the octave-bands around the test tone frequency 4000 Hz with a sinusoidal 100 % intensity-modulation of 10 Hz. To prevent listening to sounds outside the octave-band, a masking noise is added. It consists of a faint, periodic broadband noise. The degree of accuracy is about 2 dB for peak and valley thresholds, as well as for their difference. Further details about the method can be found in Lindblad et al. (1992). Experiments with quinine, which causes a transitory hearing loss, have shown that PMTF is a sensitive test of the function of the outer hair cells. Thus PMTF-measurements have proved valuable for testing high quality hearing, as required for example from sonar operators.

The principal difference between normal-hearing and sensorineurally hearing-impaired ears is shown in the following figure.



When plotting the thresholds relative to the noise as a function of level of the modulated noise you find that normal-hearing subjects have a maximum around 55 dB SPL on the peak-threshold-curve and on an about 10 dB higher noise level on the valley-threshold-curve (green curves). A sensorineural hearing loss decreases the height of the peaks and moves them towards higher sound pressure levels, Lindblad et al. (1993) (red curves). Note that the shape of the curve is the most important feature, not the individual data points.

In our research about susceptibility to noise induced hearing loss we have found that conscripts with basically continuous noise exposure develop like towards a sensori-neural hearing loss. Those who have been subjected to incidents with shooting with unprotected ears – with impulse noise of not too extreme levels – develop in a contrary way. An example is shown in the figure on the next page, which shows the results of a conscript at the beginning of military service and at the end, and who happened to be in the garage when a blank shot went off. The maxima, both on the peak-threshold-curve and the valley-threshold curve, move towards 45 dB SPL – and they become extremely high. Note the need of en extended scale in the figure! We interpret this as an effect of slackening of the efferent control of still quite vigorous outer haircells. The small differences between peak- and valley-thresholds at all noise levels might cause reduced speech recognition ability. These early indicators of damage to the cochlea are described in Lindblad & Köbler (2002, in Swedish).



3. Otoacoustic Emissions

A reasonably well functioning ear emits sound when stimulated by sound. The emissions are not merely acoustical reflections but also results of active processes in the cochlea. This is recent knowledge, just about 20 years old, that can be used for measuring the functioning of an ear. A probe placed in the ear canal is used to send a stimulus into the ear, and to measure the resulting emissions from the ear. The responses to brief stimuli, e.g. clicks, are called TEOAEs (transient evoked acoustic emissions). To test the function of efferent system controlling the outer hair cells a contralateral noise can be applied. Also spontaneous emissions, SOAEs are emitted from approximately 50% of all normal ears without stimulation. The software used for these measurements is developed at Technical Audiology. The obtained resolution is higher than that of commercial equipment.

3.1 TEOAEs

Clicks with the duration of 80 µs are repeated with a frequency of 50 Hz. The measurement was performed in a non-linear mode to enhance those components in the response which have a non-linear dependence of the stimulus level, and to suppress the linear components. To accomplish this the polarity of every fourth click is reversed and the sound pressure level is increased by a factor of 3. The acoustical responses from 1000 clicks are averaged, after removal of the primary click by windowing-technique. The stimulus level is specified as so called peak equivalent sound pressure level. TOAEs at 75 and 85 dB peSPL with and without contralateral masking consisting of 70 dB broadband noise were used in this investigation. The RMS-value for the broadband response (the response that is correlated to the clicks), over the interval of measurement, is used as a variable in the analyses as well as in 1000 Hz-bands. Also the uncorrelated response is analysed in 1000 Hz-bands For further details see Cheng (1993).

In our noise susceptibility project (Lindblad & Köbler, 2002) the same type of effects as for the PMTF-results appeared for the TEOAEs. Those who were subjected to the continuous noise showed decreasing TEOAEs like going towards a sensorineural hearing loss, whilst those exposed to strong, but not extremely strong, impulse sounds showed stronger TEOAE responses and intensified chaotic activity which might mean still vigorous outer hair cells with less efferent control

3.3 SOAEs

To register spontaneous emissions no stimulus is presented to the ear. The bandwidths of spontaneous emissions are usually very narrow; they are similar to sinusoids. However, spontaneous activity like fluctuating “noise packages” can also be registered from many ears.. We found that the test set-up, with three test equipments and several people in the same room, gave too many disturbances for reliable SOAE-measurements.

Equipment

Three almost identical test systems were used. Each of them consisted of a Tucker-Davis Technologies (System II) module system including signal processor DSP32C, AD/DA-converter and computer controlled amplifiers and attenuators. The TDT-systems were controlled by personal computers. Only one of the systems was used for measuring otoacoustic emissions. The probe system used for that was of type ER-10C from Etymotic Research. Circumaural earphones, Sennheiser HD 200, were used for the psychoacoustical measurements.

Statistical analyses

The statistical analyses were performed with Microsoft Excel to make it possible to study graphs of the time functions of the large amounts of result parameters without a too overwhelming amount of work. T-tests have been performed between results before and after exposure. To do that several times might be considered statistically unsatisfactory although we judge it enough for the time being.

RESULTS

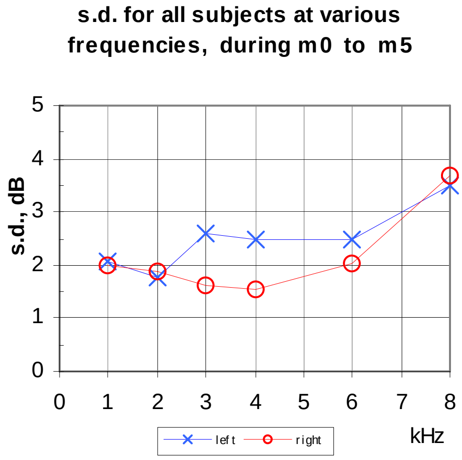
Hearing tests

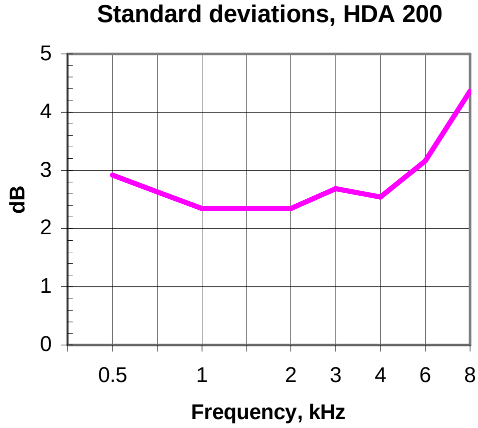
Tone thresholds

Individual tone thresholds are presented in tables in the appendix, frequency by frequency for left and right ears separately. The individual standard deviation for measurements m0 – m5 (on the shooting day) is shown at the end of the row. Large standard deviation may indicate TTS-phenomena or/and uncertainty. Under the individual data means and s.d.s for the group at all the test occasions are shown. Also the results of some t-tests (two-sided, paired comparison) are shown underneath. The time courses for the individuals are shown in four graphs (i.e. one for the individuals on each shooting day) per frequency and ear. That means that the individuals from the same shooting day always appear together in a graph.

Group results do not show any large threshold changes during the shooting day. The means generally fluctuate a couple of dB in the four hours from measurement m0, before shooting, and m5, three hours after. These fluctuations are highly individual as can be expected since susceptibility to noise induced hearing loss is highly individual. The group results show no significant differences with $p<0.05$ between thresholds at m0 and m5. However, there are two p-values near to that worth considering: At 4 kHz, left ear, p equals 0.055, and at 6 kHz, left ear, p equals 0.09, and the means are in both cases 1.2 dB worse at m5 than at m0. These “next-to-significancies” regard the frequency range expected to be affected by the exposure. Moreover it is nowadays known that the left ear is more vulnerable than the right. These arguments speak in favour of true effects of exposure. On the other hand the thresholds measured at df, in the afternoon the day before shooting, are similar to the thresholds at m5, which are also measured in the afternoon. In the time between m0 and m5 there are a few significant differences at 1 or 2 kHz. In these cases the mean threshold is temporarily better than at m0. We have seen corresponding effects in our work with noise suceptibility. It also agrees with the theories of Eric LePage, physiologist at National Acoustic Laboratories, Australia. He means that hearing can be sharpened at lower frequencies when it grows worse at higher frequencies.

Standard deviations for the thresholds during the time course from m0 to m5 for all the individuals in the group are shown in the figure to the left below, frequency by frequency and for the two ears separately.





Comparison with standard deviations for thresholds measured with conventional audiometry and the headphone used, Sennheiser HDA 200, to the right above, show the same general frequency dependence as the s.d. for the right ear in this investigation (but the absolute values are lower because of our method with higher accuracy). Note that in both cases the s.d.s are definitely higher at 8 kHz, where the placing of the earphones is most crucial. For the left ear, however, the s.d.s in the figure are higher than for the right ear at 3, 4, and 6 kHz. A test of equal variances show that the variances are significantly different at 3 and 4 kHz, $p<0.05$ ($F_{97.5}$, d.f.=22). This speaks in favour of the conclusion that there is a temporary effect of the exposure. The corresponding figures for the individuals are also shown in the Appendix.

PMTF

The generally most worth-while way of analysing the PMTF-results is to use the thresholds at the maxima of the peak- and valley-curves and the noise levels at which these maxima occur. In this investigation, with fairly subtle effects on hearing and measurements with as large noise level steps as 10 dB, it is not worth analysing the positions of the peaks. However, the maximum peak- and valley-thresholds show interesting results displayed in tables and figures in the appendix. One complication about extracting the maxima that is worth mentioning is that the measured threshold relative to the noise (the S/N in the figure) at low noise levels can be a reflection of a high threshold for the brief tone rather than an effect of the modulated noise. Because of that, the threshold value expressed in S/N, especially for the valley threshold, can be higher in this area than at the local maximum of the curve that is caused by the nonlinearity of the cochlea. Look back at the red curves for the hearing impaired person in the explanation of PMTF! Visual inspection is therefore generally the best method to determine the maxima although some of the readings are still doubtful. In this investigation a few subjects have thresholds for the brief tone that give the highest valley threshold values at 35 and 45 dB SPL. Comments are made about those readings, and possible corrections are made in the data table.

Please note that the only compulsory PMTF-measurements were the ones the day before and three hours after exposure. Additional PMTF measurements were also performed on most of the subjects the next day and in some cases also a few days later. Unfortunately in some cases there had been some noise exposure in between these unplanned measurements. Furthermore, in spite of the instructions some subjects were exposed to loud noise before the measurements on the day before the planned shooting.

A look at the graphs of individual results reveals that for most subjects there are obvious decreases of the maxima between the day before and three hours after exposure. These decreases are highly significant for the group ($p<<0,001$) both for the peak and the valley-thresholds. The same goes for the measurements the day after. With further measurements the days after the exposure the maximum thresholds start to recover for some subjects but not for all, and in a couple of cases further noise exposure is an obvious reason. The direction of the changes is mainly like the long term effects caused by continuous noise.

For the group on the last shooting day (fp41-fp46), when the audiogram at m2 was replaced by a PMTF-measurement (not shown in the figures), the maximum peak thresholds were practically unchanged from the day before to m2 that actually occurs after the exposure, but just 15 to 30 min after. In the 2.5 hours time from m2 to m5 the maximum peak thresholds decreased significantly, p=0011. This is reasonable since the effect of impulse noise exposure on tone thresholds has a delayed effect. It might be the same for PMTF-thresholds. For the maximum valley thresholds, however, a significant change (p=0.02) occurred between the day before and m2 and not between m2 and m5. The focus on this will be more understandable after taking a look at the TEOAE-results.

OAEs

As mentioned before the results of the SOAE-measurements were considered of no use because of disturbances in the room.

The results of the TEOAE-measurements are very clear, although confusing. Generally the emissions in all frequency bands increase from the afternoon before, df, to occasion m0 in the morning before the shooting. So far it is quite reasonable. We know that some of the subjects had cheated and actually been to the shooting-range the day before. After that the ears may have been thoroughly rested and recovered over night. One possible outcome – if the ears reacted with a temporary sensorineural hearing loss, as it seems from the PMTF-results – would be that the responses decreased again between m0, just before the shooting, and m5, three hours after the shooting, and possibly to such a degree that the response at m5 was lower than it was at df, the day before, when there should not have been any exposure. However, the responses mostly decreased marginally, stayed put or increased just slightly at m5. This behaviour does not really agree with the other possible outcome either – the increased and more chaotic activity after shooting incidents. Since the subjects had quite a variety of initial thresholds we may have had some of each type in the group to complicate the interpretation of the results. In most frequency bands, for the two sound pressure levels and for both correlated and uncorrelated response, changes between results at df and m0 (and between df and m5) are strongly significant or significant, but between m0 and m5 nothing much happens.

The contralateral suppression hardly shows significant changes at any stimulus level.

DISCUSSION

There were some temporary effects on hearing of the shooting of 2 times 20 shots in a bare bunker-like room when wearing hearing protectors as supplied by the Swedish Army. Tone thresholds had some next to significant effects at 4 and 6 kHz on the left ear after three hours. The significantly larger variance in results at 3 and 4 kHz on the left ear than on the right ear during the time from just before shooting to three hours afterwards also indicated effects on tone thresholds for that ear. However, it is impossible to judge what is a true effect in the afternoon after this shooting and what is regular tone threshold performance in the afternoon for these people. Comparison with the measurements the day before suggests that this exposure is not worse than that of a day on the shooting-range. Of course we do not know if there is a practice effect large enough to explain the data at the very first measurements the day before, neither do we know exactly how many of the subjects that cheated and exposed themselves to loud noise the first day of measurements.

As measured, the maxima on the PMTF peak- and valley-curves worsened in the direction of sensorineural hearing loss after shooting and recovered with individual speed. The TEOAEs increased substantially overnight from the day before to the morning of the shooting day. The influence of shooting was smaller. Thus the objective and psychoacoustic measurements on the cochlea show results that seem contradicting and therefore difficult to interpret. One reason might be that they were not measured at the same occasions throughout. A following investigation with an extended protocol, in which TEOAEs and PMTFs are measured at the same occasions and where possible training effects are better taken care of might give the answers. The question of the effect on the most susceptible individuals will be answered when the next investigation has given a basis for that.

CONCLUSIONS

It is most likely that the effects on hearing of shooting 2 times 20 shots in a bare bunker-like room are small. However, this investigation does not give clear answers since there are some seemingly contradictory results. A further investigation with slightly increased test schedule is planned to try to make those matters clear.
After that follows the question of how to interpret the results from such very limited shooting to full days of urban combat training.

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APPENDIX

This appendix contains test schedule, comprehensive tables and figures on hearing thresholds, PMTF results, and TEOAE results.

Scheme (Thursday, week no. 246)

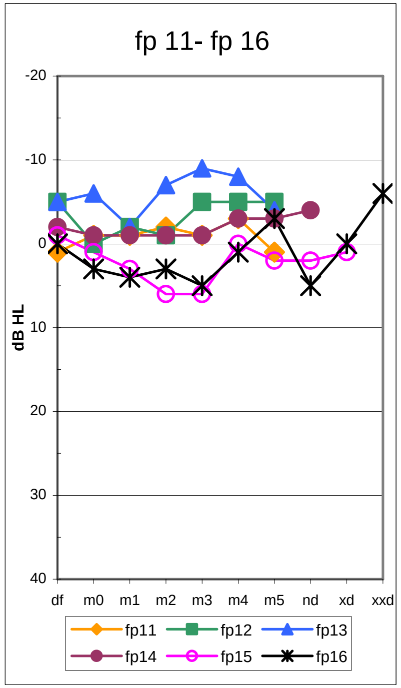
time	rel. time	name:		name:		name:		name:		name:		name:	
		time	**s21**	time	**s22**	time	**s23**	time	**s24**	time	**s25**	time	**s26**
9^{00}	**0.00**	9^{00}	OAEm0										
	0.15		audm0	9^{15}	OAEm0								
	0.30				audm0	9^{30}	OAEm0						
	0.45						audm0	9^{45}	OAEm0				
	1.00		Prep.		Prep.				audm0	10^{00}	OAEm0		
10^{15}	**1.15**		Shooting		Shooting						audm0	10^{15}	OAEm0
	1.30		audm1		audm1		Prep.		Prep.				audm0
10^{45}	**1.45**		audm2		audm2		Shooting		Shooting				
	2.00						audm1		audm1		Prep.		Prep.
11^{15}	**2.15**						audm2		audm2		Shooting		Shooting
	2.30		audm3								audm1		audm1
	2.45				audm3						audm2		audm2
	3.00		?		?		audm3						
	3.15				?		?		audm3				
12^{30}	3.30		audm4						?		audm3		
	3.45				audm4						?		audm3
	4.00						audm4						?
	4.15								audm4				
13^{30}	4.30		audm5								audm4		
	4.45		OAEm5		audm5								audm4
	5.00		PMTFm5		OAEm5		audm5						
	5.15				PMTFm5		OAEm5		audm5				
14^{30}	5.30						PMTm5F		OAEm5		audm5		
	5.45								PMTFm5		OAEm5		audm5
	6.00										PMTFm5		OAEm5
	6.15												PMTFm5
15^{30}	6.30												

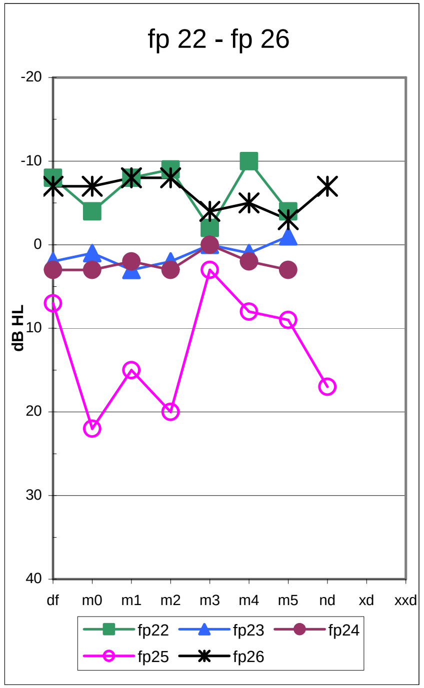
Hearing thresholds nov-02

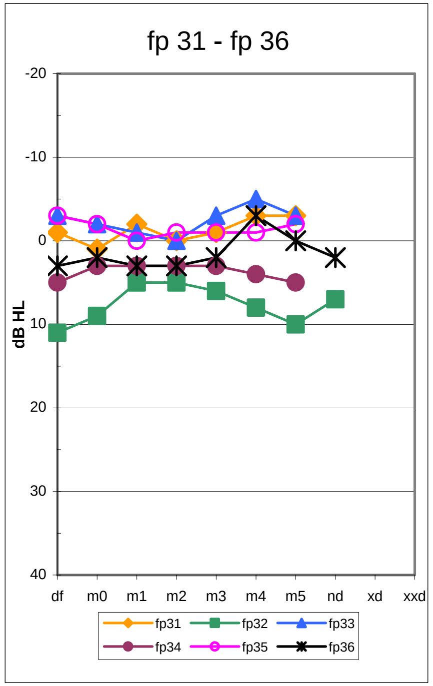
1 kHz left	subj	*df*	m0	m1	m2	m3	m4	m5	*nd*	*xd*	*xxd*	s.d. all occasions	sd m0-m5
	11	1	-1	-1	-2	-1	-3	1				1,5	1,3
	12	-5	0	-2	-1	-5	-5	-5				2,2	2,3
	13	-5	-6	-2	-7	-9	-8	-4				2,4	2,6
	14	-2	-1	-1	-1	-1	-3	-3	-4			1,2	1,0
	15	-1	1	3	6	6	0	2	2	1		2,4	2,5
	16	0	3	4	3	5	1	-3	5	0	-6	3,6	2,9
	22	-8	-4	-8	-9	-2	-10	-4				3,0	3,3
	23	2	1	3	2	0	1	-1				1,3	1,4
	24	3	3	2	3	0	2	3				1,1	1,2
	25	7	22	15	20	3	8	9	17			6,8	7,4
	26	-7	-7	-8	-8	-4	-5	-3	-7			1,9	2,1
	31	-1	1	-2	0	-1	-3	-3				1,5	1,6
	32	11	9	5	5	6	8	10	7			2,3	2,1
	33	-3	-2	-1	0	-3	-5	-3				1,6	1,8
	34	5	3	3	3	3	4	5				1,0	0,8
	35	-3	-2	0	-1	-1	-1	-2				1,0	0,8
	36	3	2	3	3	2	-3	0	2			2,1	2,3
	41	3	-1	-2		-1	-1	-2				1,9	0,5
	42	4	5	3		1	1	3				1,6	1,7
	43	-3	-6	-7		-7	-6	-6				1,5	0,5
	44	1	-1	-3		-2	-5	-4				2,2	1,6
	45	3	-3	0		2	6	3				3,1	3,4
	46	3	2	1		1	-4	0	0			2,2	2,3
												sum of squares	99,2
N=		23	23	23	17	23	23	23	8	2	1	s.d. all	2,1
t-test					0,52	0,26	0,022	0,18					
mean		0,3	0,8	0,2	0,9	-0,3	-1,3	-0,3					
s.d.		4,7	6,0	5,0	6,7	3,9	4,9	4,3					

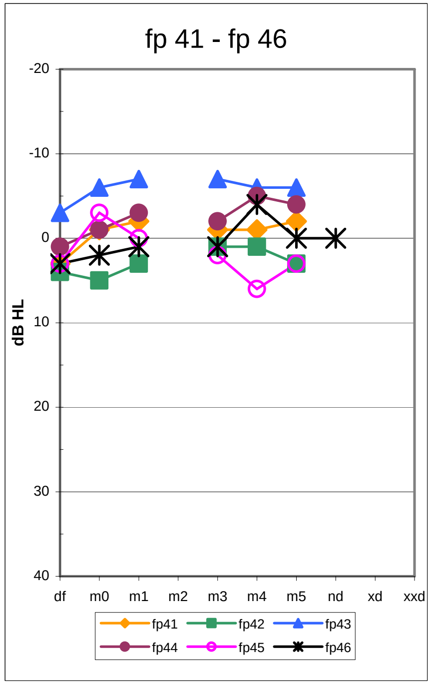
Hearing thresholds left ear, 1 kHz, before and after exposure

df - the day before
m0- just before exposure
m1 - immediately after exposure
m2 - 15 min after exposure
m3 - 1 hour after exposure
m4 - 2 hours after exposure
m5 - 3 hours after exposure
nd - next day
xd - extra day (different number of days in between)
xxd - a further extra day (different number of days in between)









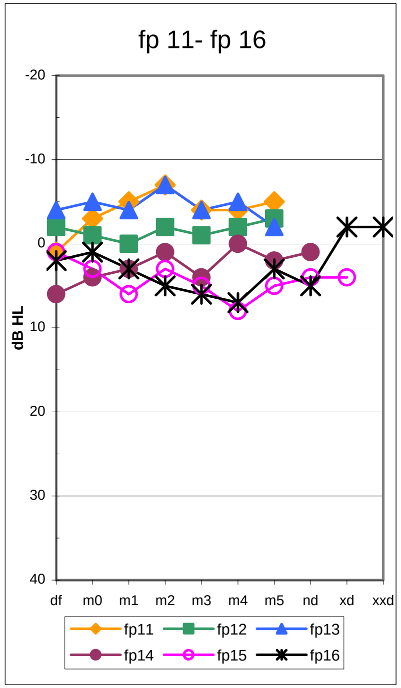
Hearing thresholds nov-02

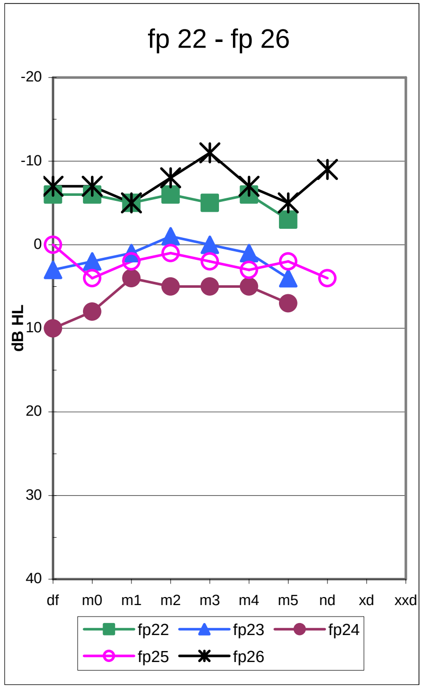
1 kHz
right

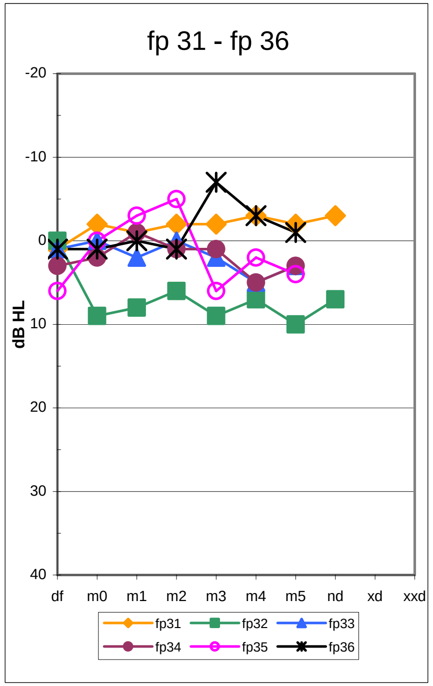
subj	*df*	m0	m1	m2	m3	m4	m5	*nd*	*xd*	*xxd*	*sd*	*sd m0-m5*
11	1	-3	-5	-7	-4	-4	-5				2,5	1,4
12	-2	-1	0	-2	-1	-2	-3				1,0	1,0
13	-4	-5	-4	-7	-4	-5	-2				1,5	1,6
14	6	4	3	1	4	0	2	1			2,0	1,6
15	1	3	6	3	5	8	5	4	4		2,0	1,9
16	2	1	3	5	6	7	3	5	-2	-2	3,1	2,2
22	-6	-6	-5	-6	-5	-6	-3				1,1	1,2
23	3	2	1	-1	0	1	4				1,7	1,7
24	10	8	4	5	5	5	7				2,1	1,5
25	0	4	2	1	2	3	2	4			1,4	1,0
26	-7	-7	-5	-8	-11	-7	-5	-9			2,0	2,2
31	1	-2	-1	-2	-2	-3	-2	-3			1,3	0,6
32	0	9	8	6	9	7	10	7			3,1	1,5
33	1	0	2	0	2	5	3				1,8	1,9
34	3	2	-1	1	1	5	3				1,9	2,0
35	6	0	-3	-5	6	2	4				4,3	4,2
36	1	1	0	1	-7	-3	-1				3,0	3,1
41	-1	3	0		1	-2	-2				1,9	2,1
42	7	9	8		5	7	7				1,3	1,5
43	-1	-2	-5		-7	-5	-4				2,2	1,8
44	2	-3	-2		-6	-3	-5				2,8	1,6
45	8	6	0		3	7	4				2,9	2,7
46	3	2	-1		-1	-4	-1	-2			2,4	2,1
											sum of squares	91,5
N=	23	23	23	17	23	23	23	8	2	1	s.d. all	2,0
				0,011	0,125							
mean	1,5	1,1	0,2	-0,9	0,0	0,6	0,9					
s.d.	4,2	4,5	3,9	4,5	5,1	5,0	4,3					

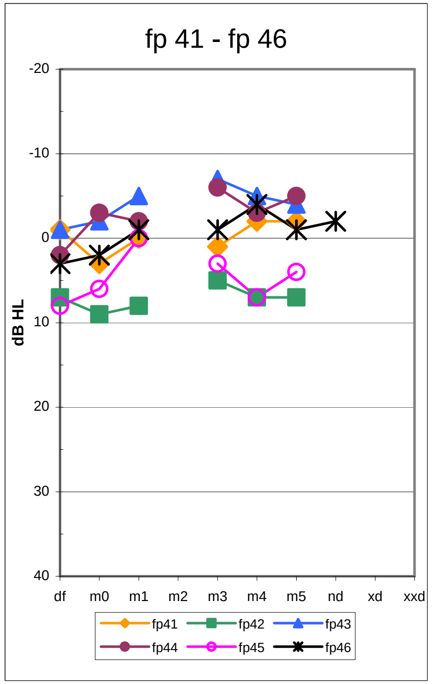
Hearing thresholds right ear, 1 kHz, before and after exposure

df - the day before
m0- just before exposure
m1 - immediately after exposure
m2 - 15 min after exposure
m3 - 1 hour after exposure
m4 - 2 hours after exposure
m5 - 3 hours after exposure
nd - next day
xd - extra day (different number of days in between)
xxd - a further extra day (different number of days in between)









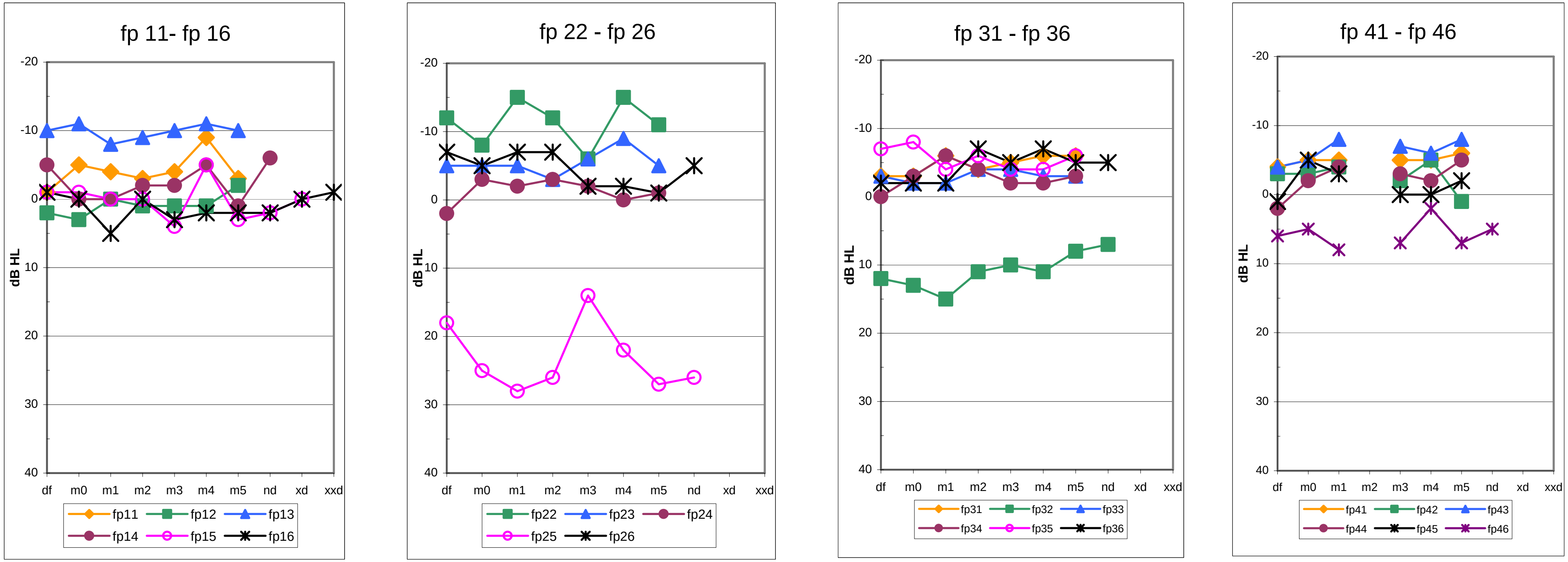
Hearing thresholds nov-02

2 kHz
left

subj	*df*	m0	m1	m2	m3	m4	*m5*	*nd*	*xd*	*xxd*	*sd*	*sd m0-m5*
11	-1	-5	-4	-3	-4	-9	-3				2,5	2,3
12	2	3	0	1	1	1	-2				1,6	1,6
13	-10	-11	-8	-9	-10	-11	-10				1,1	1,2
14	-5	0	0	-2	-2	-5	1	-6			2,7	2,2
15	-1	-1	0	0	4	-5	3	2	0		2,6	3,2
16	-1	0	5	0	3	2	2	2	0	-1	1,9	1,9
22	-12	-8	-15	-12	-6	-15	-11				3,4	3,7
23	-5	-5	-5	-3	-6	-9	-5				1,8	2,0
24	2	-3	-2	-3	-2	0	-1				1,8	1,2
25	18	25	28	26	14	22	27	26			4,9	5,2
26	-7	-5	-7	-7	-2	-2	-1	-5			2,5	2,7
31	-3	-3	-6	-4	-5	-6	-6				1,4	1,3
32	12	13	15	11	10	11	8	7			2,6	2,4
33	-3	-2	-2	-4	-4	-3	-3				0,8	0,9
34	0	-3	-6	-4	-2	-2	-3				1,9	1,5
35	-7	-8	-4	-6	-4	-4	-6				1,6	1,6
36	-2	-2	-2	-7	-5	-7	-5	-5			2,1	2,3
41	-4	-5	-5		-5	-5	-6				0,6	0,4
42	-3	-3	-4		-2	-5	1				2,1	2,3
43	-4	-5	-8		-7	-6	-8				1,6	1,3
44	2	-2	-4		-3	-2	-5				2,4	1,3
45	1	-5	-3		0	0	-2				2,3	2,1
46	6	5	8		7	2	7	5			2,0	2,4
											sum of squares	71,2
N=	23	23	23	17	23	23	23	8	2	1	s.d. all	1,8
mean	-1,1	-1,3	-1,3	-1,5	-1,3	-2,5	-1,2					
s.d.	6,7	7,6	8,9	8,9	5,8	7,5	7,9					

Hearing thresholds left ear, 2 kHz, before and after exposure

df - the day before
m0- just before exposure
m1 - immediately after exposure
m2 - 15 min after exposure
m3 - 1 hour after exposure
m4 - 2 hours after exposure
m5 - 3 hours after exposure
nd - next day
xd - extra day (different number of days in between)
xxd - a further extra day (different number of days in between)



Hearing thresholds nov-02

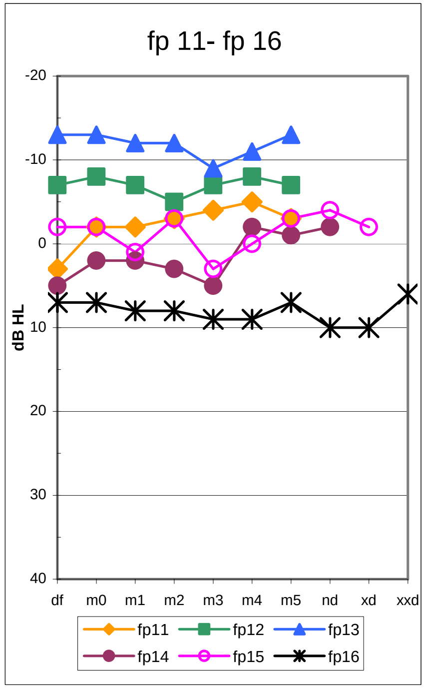
2 kHz

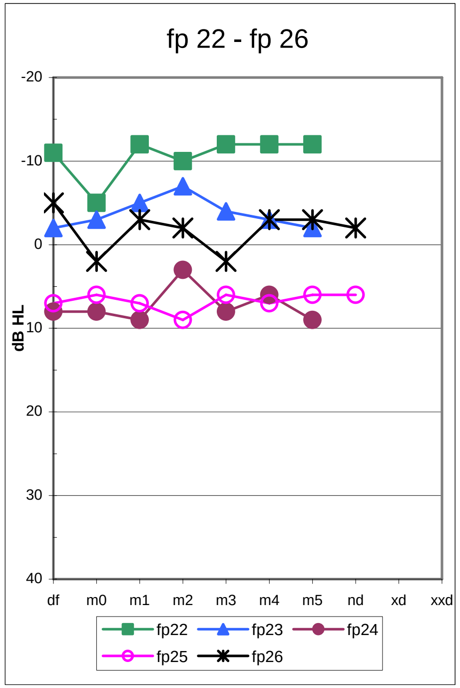
right

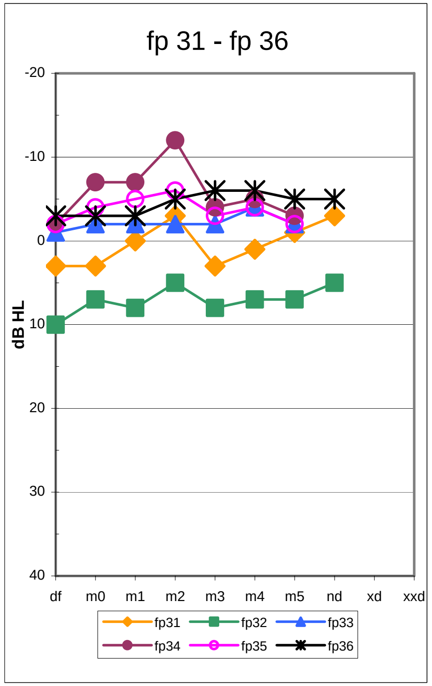
subj	*df*	m0	m1	m2	m3	m4	*m5*	*nd*	*xd*	*xxd*	*sd*	*sd m0-m5*
11	3	-2	-2	-3	-4	-5	-3				2,6	1,2
12	-7	-8	-7	-5	-7	-8	-7				1,0	1,1
13	-13	-13	-12	-12	-9	-11	-13				1,5	1,5
14	5	2	2	3	5	-2	-1	-2			2,9	2,6
15	-2	-2	1	-3	3	0	-3	-4	-2		2,2	2,4
16	7	7	8	8	9	9	7	10	10	6	1,4	0,9
22	-11	-5	-12	-10	-12	-12	-12				2,6	2,8
23	-2	-3	-5	-7	-4	-3	-2				1,8	1,8
24	8	8	9	3	8	6	9				2,1	2,3
25	7	6	7	9	6	7	6	6			1,0	1,2
26	-5	2	-3	-2	2	-3	-3	-2			2,5	2,5
31	3	3	0	-3	3	1	-1	-3			2,6	2,3
32	10	7	8	5	8	7	7	5			1,6	1,1
33	-1	-2	-2	-2	-2	-4	-2				0,9	0,8
34	-2	-7	-7	-12	-4	-5	-3				3,4	3,2
35	-2	-4	-5	-6	-3	-4	-2				1,5	1,4
36	-3	-3	-3	-5	-6	-6	-5	-5			1,3	1,4
41	4	0	0		0	1	3				1,8	1,3
42	-2	-5	-5		-3	-5	1				2,4	2,6
43	-1	-3	-5		-2	-4	-3				1,4	1,1
44	-3	-3	-7		-5	-8	-7				2,2	2,0
45	10	7	6		7	6	6				1,5	0,5
46	-1	3	3		7	2	3	3			2,3	1,9
											sum of squares	81,6
N=	23	23	23	17	23	23	23	9	2	1	s.d. all	1,9
			0,15	0,03	0,34							
mean	0,1	-0,7	-1,3	-2,5	-0,1	-1,8	-1,1					
s.d.	6,1	5,5	6,1	6,3	6,0	5,9	5,8					

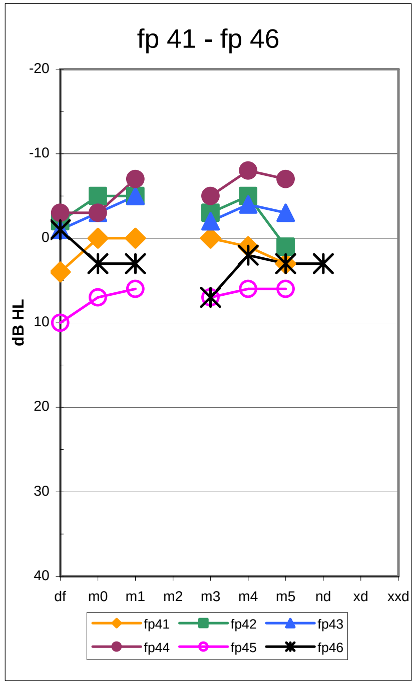
Hearing thresholds right ear, 2 kHz, before and after exposure

df - the day before
m0- just before exposure
m1 - immediately after exposure
m2 - 15 min after exposure
m3 - 1 hour after exposure
m4 - 2 hours after exposure
m5 - 3 hours after exposure
nd - next day
xd - extra day (different number of days in between)
xxd - a further extra day (different number of days in between)









Hearing thresholds nov-02

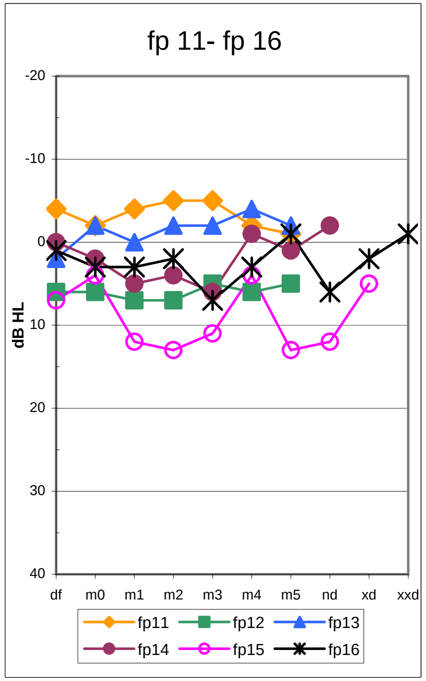
3 kHz
left

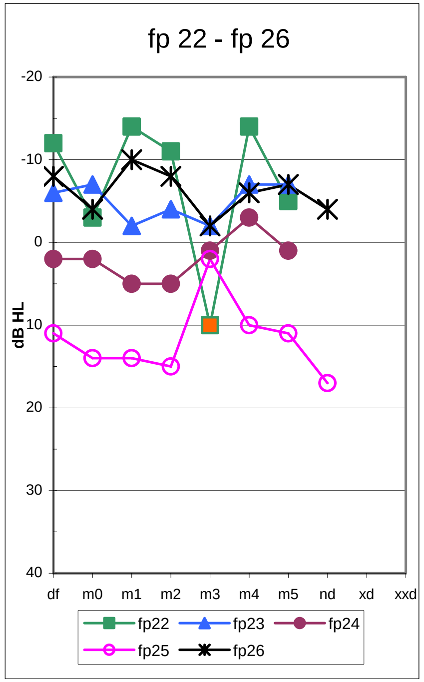
subj	*df*	m0	m1	m2	m3	m4	*m5*	*nd*	*xd*	*xxd*	*sd*	*sd m0-m5*
11	-4	-2	-4	-5	-5	-2	-1				1,6	1,7
12	6	6	7	7	5	6	5				0,8	0,9
13	2	-2	0	-2	-2	-4	-2				1,9	1,3
14	0	2	5	4	6	-1	1	-2			2,9	2,6
15	7	4	12	13	11	4	13	12	5		3,9	4,3
16	1	3	3	2	7	3	-1	6	2	-1	2,6	2,6
22	-12	-3	-14	-11		-14	-5				4,7	5,1
23	-6	-7	-2	-4	-2	-7	-7				2,3	2,5
24	2	2	5	5	1	-3	1				2,7	3,0
25	11	14	14	15	2	10	11	17			4,6	4,8
26	-8	-4	-10	-8	-2	-6	-7	-4			2,6	2,9
31	-2	0	-3	-1	-1	-2	-5				1,6	1,8
32	-2	-4	-4	-5	-8	-7	-3	-4			2,0	1,9
33	-9	-8	-11	-10	-10	-11	-7				1,5	1,6
34	13	11	7	10	9	10	10				1,8	1,4
35	-4	-4	0	-1	2	-3	-2				2,2	2,2
36	6	5	3	-1	1	-2	1	3			2,8	2,6
41	5	-2	-2		-2	-3	-2				3,0	0,4
42	4	0	1		-1	2	2				1,8	1,3
43	3	-1	-2		3	3	2				2,3	2,3
44	13	9	8		8	6	9				2,3	1,2
45	6	2	5		8	6	3				2,2	2,4
46	1	0	3		2	-4	1	2			2,3	2,7
											sum of squares	155,1
N=	23	23	23	17	22	23	23	8	2	1	s.d. all	2,6
mean	1,4	0,9	0,9	0,5	1,5	-0,8	0,7					
s.d.	6,7	5,5	6,9	7,7	5,4	6,2	5,7					

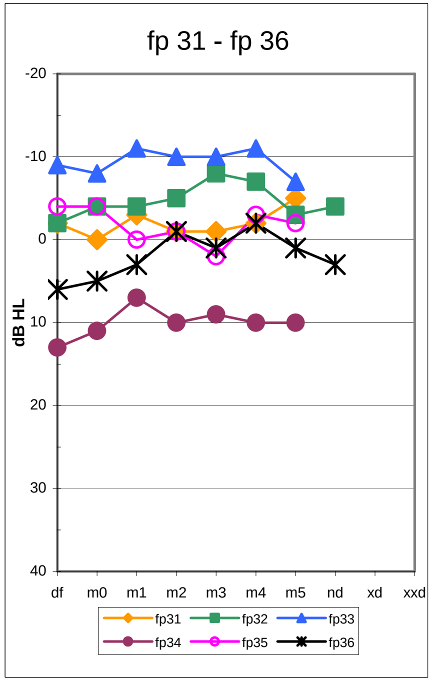
comments fp22 sleepy at m3, HTL=10 not included in statistics but in figure

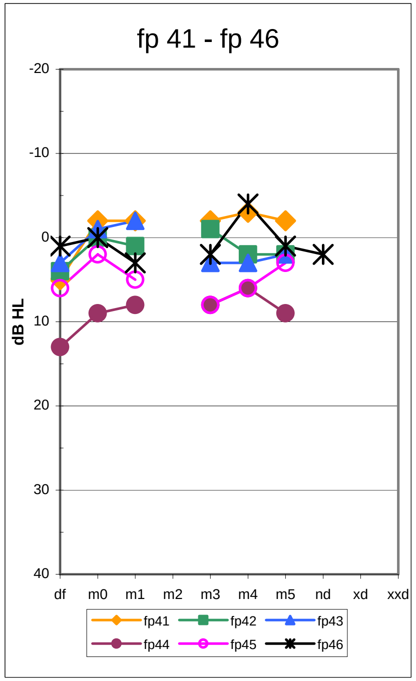
Hearing thresholds left ear, 3 kHz, before and after exposure

df - the day before
m0- just before exposure
m1 - immediately after exposure
m2 - 15 min after exposure
m3 - 1 hour after exposure
m4 - 2 hours after exposure
m5 - 3 hours after exposure
nd - next day
xd - extra day (different number of days in between)
xxd - a further extra day (different number of days in between)









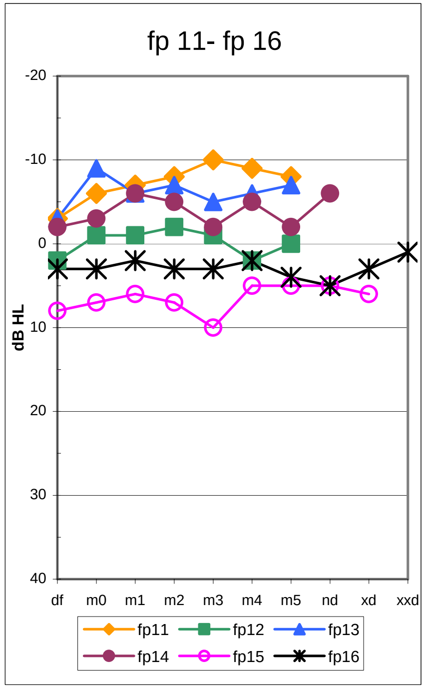
Hearing thresholds nov-02

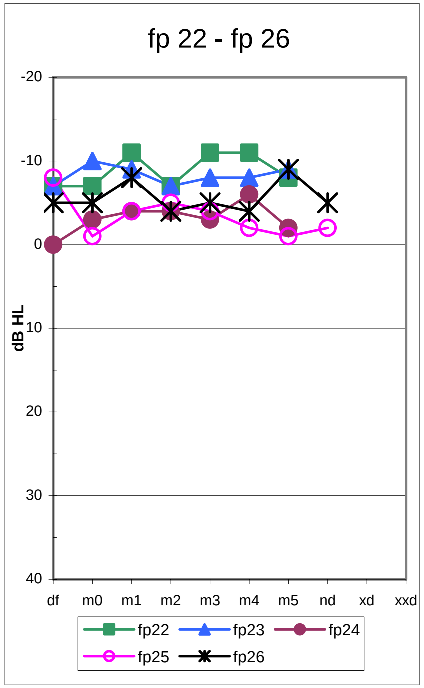
3 kHz
right

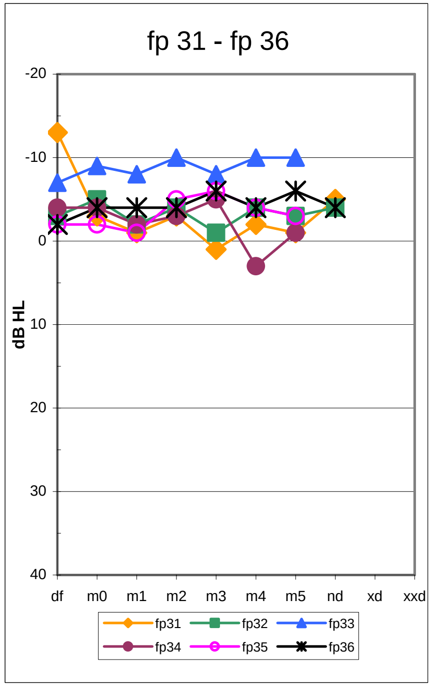
subj	*df*	m0	m1	m2	m3	m4	*m5*	*nd*	*xd*	*xxd*	*sd*	*sd m0-m5*
11	-3	-6	-7	-8	-10	-9	-8				2,3	1,4
12	2	-1	-1	-2	-1	2	0				1,6	1,4
13	-3	-9	-6	-7	-5	-6	-7				1,9	1,4
14	-2	-3	-6	-5	-2	-5	-2	-6			1,8	1,7
15	8	7	6	7	10	5	5	5	6		1,7	1,9
16	3	3	2	3	3	2	4	5	3	1	1,1	0,8
22	-7	-7	-11	-7	-11	-11	-8				2,0	2,0
23	-7	-10	-9	-7	-8	-8	-9				1,1	1,0
24	0	-3	-4	-4	-3	-6	-2				1,9	1,4
25	-8	-1	-4	-5	-4	-2	-1	-2			2,4	1,7
26	-5	-5	-8	-4	-5	-4	-9	-5			1,8	2,1
31	-13	-3	-1	-3	1	-2	-1	-5			4,3	1,5
32	-3	-5	-2	-4	-1	-4	-3	-4			1,3	1,5
33	-7	-9	-8	-10	-8	-10	-10				1,2	1,0
34	-4	-4	-2	-3	-5	3	-1				2,7	2,8
35	-2	-2	-1	-5	-6	-4	-3				1,8	1,9
36	-2	-4	-4	-4	-6	-4	-6	-4			1,3	1,0
41	-7	-7	-7		-7	-10	-7				1,2	1,3
42	-6	-10	-10		-13	-10	-10				2,2	1,3
43	7	6	3		7	5	7				1,6	1,7
44	10	7	3		3	3	4				2,9	1,7
45	6	1	-1		-3	-3	-1				3,4	1,7
46	4	5	2		3	3	2	4			1,1	1,2
											sum of squares	59,1
N=	23	23	23	17	23	23	23	9	2	1	s.d. all	1,6
mean	-1,7	-2,6	-3,3	-4,0	-3,1	-3,3	-2,9					
s.d.	5,9	5,3	4,6	4,0	5,7	5,2	5,1					

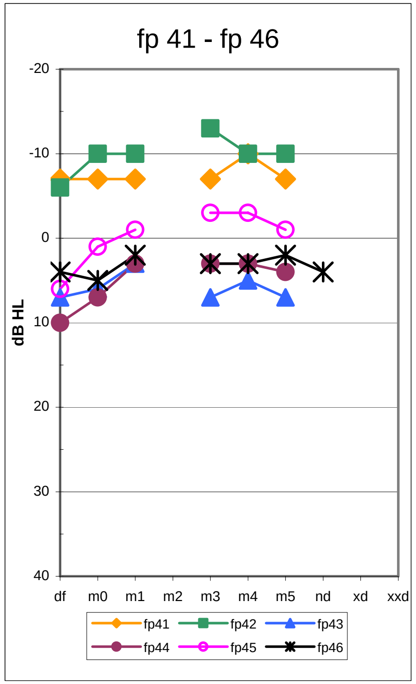
Hearing thresholds right ear, 3 kHz, before and after exposure

df - the day before
m0- just before exposure
m1 - immediately after exposure
m2 - 15 min after exposure
m3 - 1 hour after exposure
m4 - 2 hours after exposure
m5 - 3 hours after exposure
nd - next day
xd - extra day (different number of days in between)
xxd - a further extra day (different number of days in between)









4 kHz

left

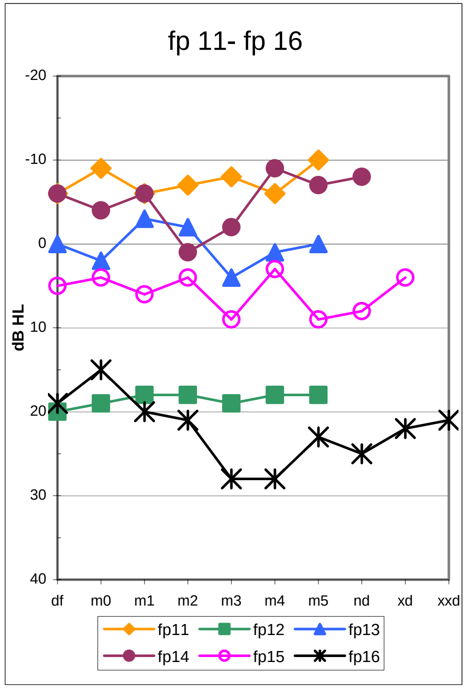
	subj	*df*	m0	m1	m2	m3	m4	*m5*	*nd*	*xd*	*xxd*	*sd*	*sd m0-m5*
	11	-6	-9	-6	-7	-8	-6	-10				1,6	1,6
	12	20	19	18	18	19	18	18				0,8	0,5
	13	0	2	-3	-2	4	1	0				2,4	2,6
	14	-6	-4	-6	1	-2	-9	-7	-8			3,3	3,6
	15	5	4	6	4	9	3	9	8	4		2,3	2,6
	16	19	15	20	21	28	28	23	25	22	21	4,0	5,0
	22	-6	-2	-7	-7		-6	-5				1,9	2,1
	23	-3	-5	-4	-4	-5	-5	-4				0,8	0,5
	24	-1	0	5	4	-2	-3	1				3,0	3,2
	25	23	21	23	19	18	23	26	20			2,6	2,9
	26	-2	-1	-2	3	0	-2	3	-1			2,1	2,3
	31	0	-3	-2	-1	-1	0	1	-3			1,5	1,4
	32	-8	-10	-13	-15	-13	-12	-12				2,3	1,6
	33	-7	-9	-5	-7	-8	-9	-5				1,7	1,8
	34	7	3	4	2	2	5	6				2,0	1,6
	35	3	2	2	-1	8	7	3				3,1	3,4
	36	11	10	9	2	6	5	8	7			2,9	2,9
	41	0	-5	-4		-6	-3	-3				2,1	1,3
	42	10	4	-2		6	6	8				4,1	3,8
	43	0	-1	-2		-1	-1	-2				0,8	0,5
	44	6	-1	-2		-1	1	-2				3,1	1,2
	45	7	5	3		5	8	7				1,8	1,9
	46	14	15	18		17	12	16	15			2,0	2,3
												sum of squares	141,9
	N=	23	23	23	17	22	23	23	8	2	1	s.d. all	2,5
t-test m0/mX,	paired, 2-sided			1	0,86	0,19	0,56	0,0553					
	mean	3,7	2,2	2,2	1,8	3,4	2,7	3,4					
	s.d.	9,0	8,7	9,6	9,7	10,1	10,1	10,0					

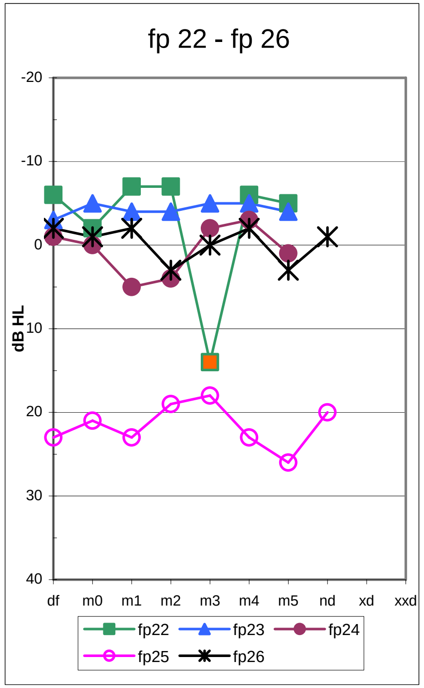
comments fp22 sleepy at m3, HTL=14 not included in statistics but in figure

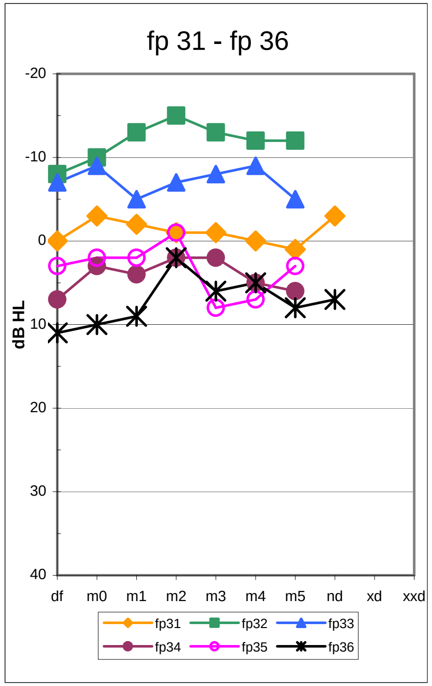
	df	m0	m1	m2	m3	m4	m5
mean+s.d.	12,8	10,9	11,7	11,5	13,5	12,8	13,4
mean	5,0	3,2	3,3	2,5	4,2	3,8	4,7
mean-s.d.	-5,3	-6,5	-7,4	-8,0	-6,7	-7,5	-6,6

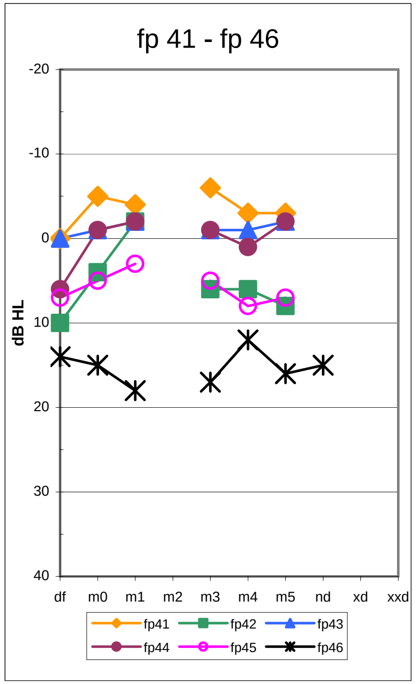
Hearing thresholds left ear, 4 kHz, before and after exposure

df - the day before
m0- just before exposure
m1 - immediately after exposure
m2 - 15 min after exposure
m3 - 1 hour after exposure
m4 - 2 hours after exposure
m5 - 3 hours after exposure
nd - next day
xd - extra day (different number of days in between)
xxd - a further extra day (different number of days in between)









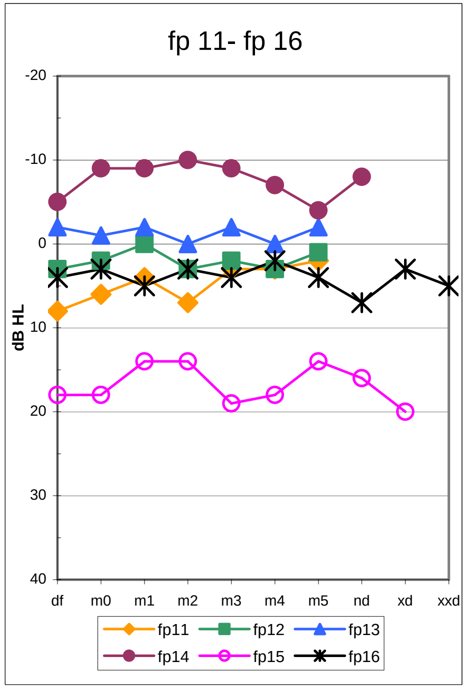
Hearing thresholds nov-02

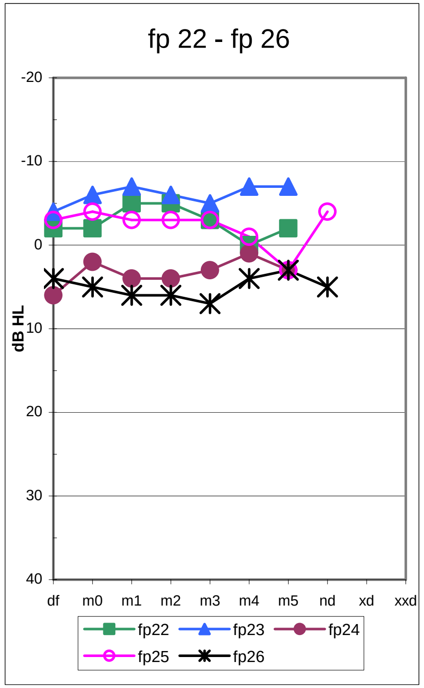
4 kHz
right

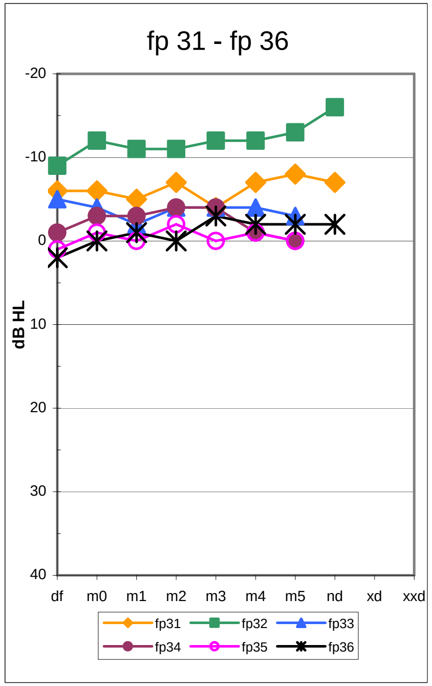
subj	*df*	m0	m1	m2	m3	m4	*m5*	*nd*	*xd*	*xxd*	*sd*	*sd m0-m5*
11	8	6	4	7	3	3	2				2,3	1,9
12	3	2	0	3	2	3	1				1,2	1,2
13	-2	-1	-2	0	-2	0	-2				1,0	1,0
14	-5	-9	-9	-10	-9	-7	-4	-8			2,1	2,2
15	18	18	14	14	19	18	14	16	20		2,3	2,4
16	4	3	5	3	4	2	4	7	3	5	1,4	1,0
22	-2	-2	-5	-5	-3	0	-2				1,8	1,9
23	-4	-6	-7	-6	-5	-7	-7				1,2	0,8
24	6	2	4	4	3	1	3				1,6	1,2
25	-3	-4	-3	-3	-3	-1	3	-4			2,3	2,6
26	4	5	6	6	7	4	3	5			1,3	1,5
31	-6	-6	-5	-7	-4	-7	-8	-7			1,3	1,5
32	-9	-12	-11	-11	-12	-12	-13	-16			2,0	0,8
33	-5	-4	-2	-4	-4	-4	-3				1,0	0,8
34	-1	-3	-3	-4	-4	-1	0				1,6	1,6
35	1	-1	0	-2	0	-1	0				1,0	0,8
36	2	0	-1	0	-3	-2	-2	-2			1,6	1,2
41	1	-2	-1		0	-2	-1				1,2	0,8
42	7	3	3		3	4	6				1,8	1,3
43	13	13	8		12	14	13				2,1	2,3
44	8	3	0		2	2	2				2,7	1,1
45	0	-1	-2		-5	-4	-5				2,1	1,8
46	8	10	9		11	13	9	8			1,8	1,7
											sum of squares	55,8
N=	23	23	23	17	23	23	23	9	2	1	s.d. all	1,6
mean	2,0	0,6	0,1	-0,9	0,5	0,7	0,6					
s.d.	6,5	6,8	5,9	6,5	7,0	7,0	6,3					

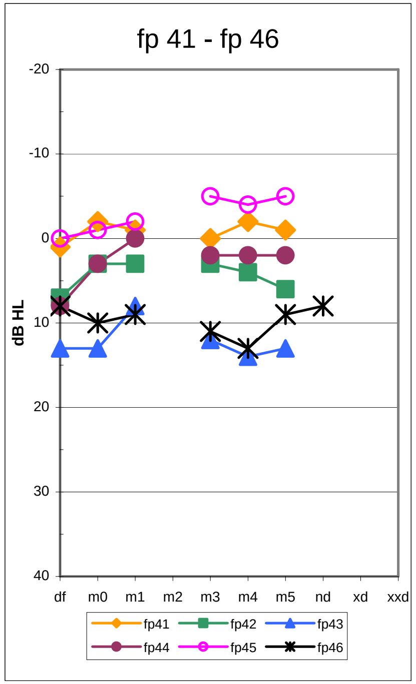
Hearing thresholds right ear, 4 kHz, before and after exposure

df - the day before
m0- just before exposure
m1 - immediately after exposure
m2 - 15 min after exposure
m3 - 1 hour after exposure
m4 - 2 hours after exposure
m5 - 3 hours after exposure
nd - next day
xd - extra day (different number of days in between)
xxd - a further extra day (different number of days in between)









Hearing thresholds nov-02

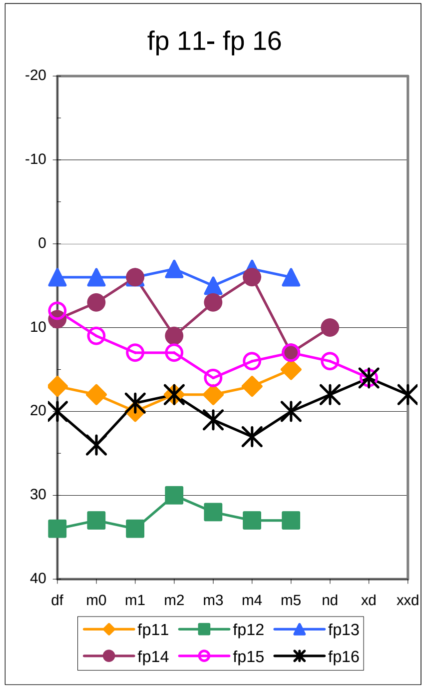
6 kHz
left

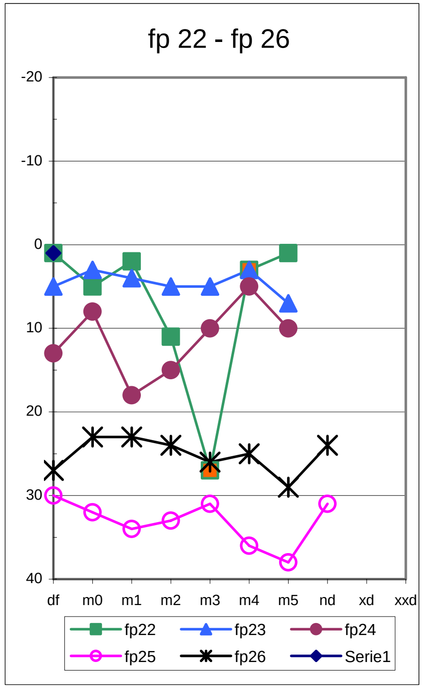
subj	*df*	m0	m1	m2	m3	m4	*m5*	*nd*	*xd*	*xxd*	*sd*	*sd m0-m5*
11	17	18	20	18	18	17	15				1,5	1,6
12	34	33	34	30	32	33	33				1,4	1,4
13	4	4	4	3	5	3	4				0,7	0,8
14	9	7	4	11	7	4	13	10			3,2	3,7
15	8	11	13	13	16	14	13	14	16		2,5	1,6
16	20	24	19	18	21	23	20	18	16	18	2,5	2,3
22	1	5	2	11		3	1				3,8	4,0
23	5	3	4	5	5	3	7				1,4	1,5
24	13	8	18	15	10	5	10				4,4	4,7
25	30	32	34	33	31	36	38	31			2,7	2,6
26	27	23	23	24	26	25	29	24			2,1	2,3
31	3	3	5	6	6	8	5	5			1,6	1,6
32	5	3	3	1	2	4	6	-2			2,5	1,7
33	-2	-2	0	-3	-4	-1	-1				1,3	1,5
34	13	10	11	10	11	12	15				1,8	1,9
35	16	14	10	10	17	24	14				4,8	5,2
36	1	13	11	6	10	8	10	7			3,7	2,4
41	28	17	17		19	20	22				4,1	2,1
42	7	10	6		11	6	8				2,1	2,3
43	11	8	10		11	13	8				1,9	2,1
44	8	1	0		1	-1	-1				3,4	1,0
45	18	11	12		7	11	12				3,5	2,1
46	16	15	21		16	19	17	18			2,1	2,4
											sum of squares	149,0
N=	23	23	23	17	22	23	23	9	2	1	s.d. all	2,5
t-test			0,53	0,90	0,28	0,29	0,09					
mean	12,7	11,8	12,2	12,4	12,6	12,6	13,0					
s.d.	10,0	9,3	9,8	9,8	9,4	10,5	10,2					

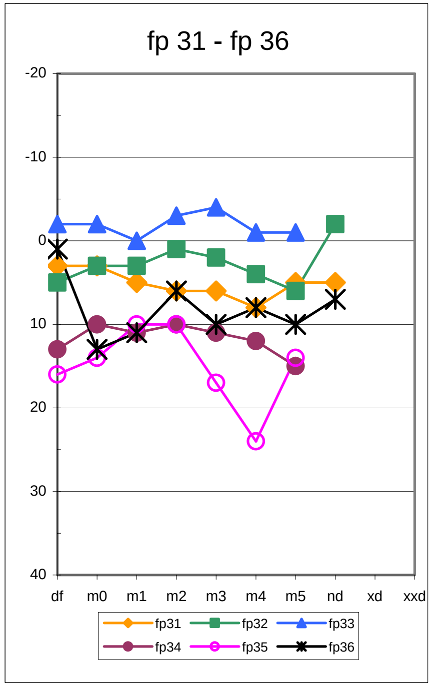
comments fp22 sleepy at m3, HTL=27 not included in statistics but in figure

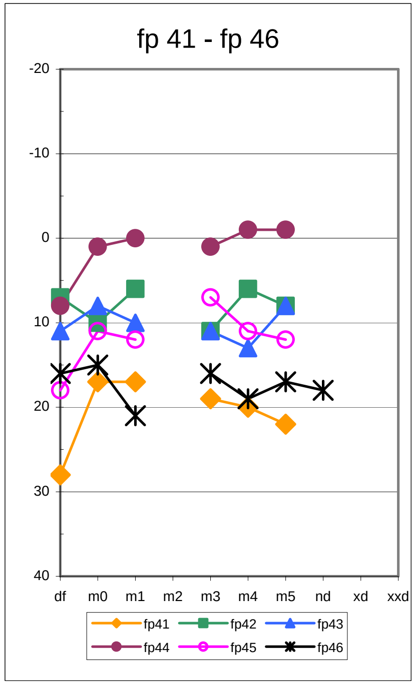
Hearing thresholds left ear, 6 kHz, before and after exposure

df - the day before
m0- just before exposure
m1 - immediately after exposure
m2 - 15 min after exposure
m3 - 1 hour after exposure
m4 - 2 hours after exposure
m5 - 3 hours after exposure
nd - next day
xd - extra day (different number of days in between)
xxd - a further extra day (different number of days in between)









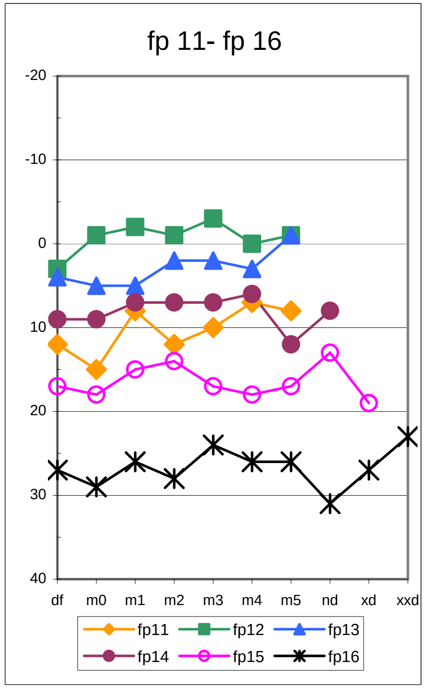
Hearing thresholds nov-02

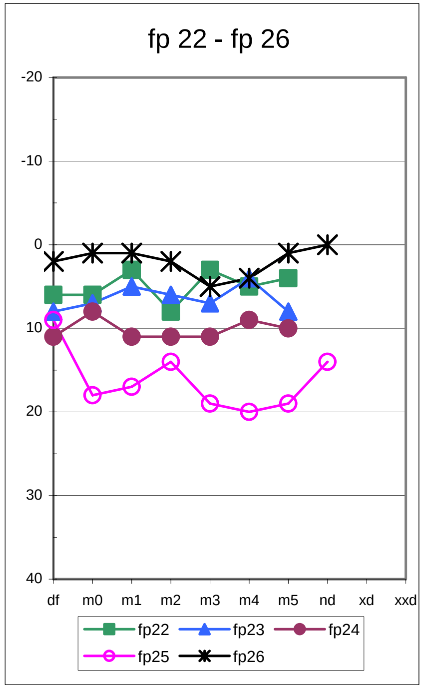
6 kHz
right

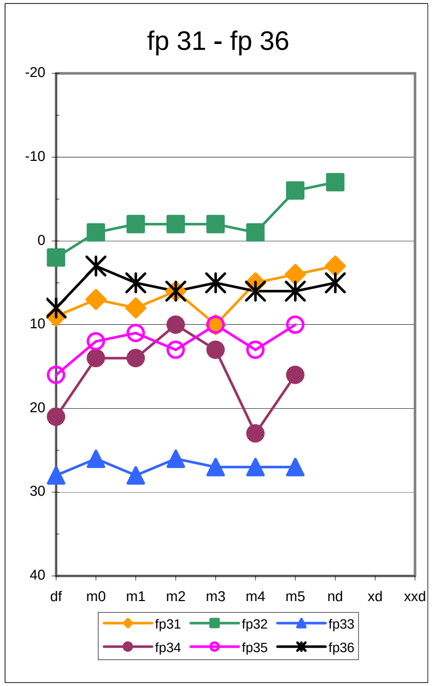
subj	*df*	m0	m1	m2	m3	m4	*m5*	*nd*	*xd*	*xxd*	*sd*	*sd m0-m5*
11	12	15	8	12	10	7	8				2,9	3,0
12	3	-1	-2	-1	-3	0	-1				1,9	1,0
13	4	5	5	2	2	3	-1				2,1	2,3
14	9	9	7	7	7	6	12	8			1,9	2,2
15	17	18	15	14	17	18	17	13	19		2,0	1,6
16	27	29	26	28	24	26	26	31	27	23	2,3	1,8
22	6	6	3	8	3	5	4				1,8	1,9
23	8	7	5	6	7	4	8				1,5	1,5
24	11	8	11	11	11	9	10				1,2	1,3
25	9	18	17	14	19	20	19	14			3,7	2,1
26	2	1	1	2	5	4	1	0			1,7	1,8
31	9	7	8	6	10	5	4	3			2,4	2,2
32	2	-1	-2	-2	-2	-1	-6	-7			2,9	1,9
33	28	26	28	26	27	27	27				0,8	0,8
34	21	14	14	10	13	23	16				4,6	4,4
35	16	12	11	13	10	13	10				2,1	1,4
36	8	3	5	6	5	6	6	5			1,4	1,2
41	17	17	18		18	19	19				0,9	0,8
42	25	21	16		20	23	22				3,1	2,7
43	24	22	20		24	26	24				2,1	2,3
44	-2	-11	-12		-10	-8	-10				3,6	1,5
45	27	26	25		27	27	25				1,0	1,0
46	12	13	17		13	18	16	22			3,5	2,3
											sum of squares	94,0
N=	23	23	23	17	23	23	23	9	2	1	s.d. all	2,0
t-test					0,55	0,34	0,57					
mean	12,8	11,5	10,6	9,5	11,2	12,2	11,1					
s.d.	9,0	10,0	9,8	8,2	9,9	10,4	10,5					

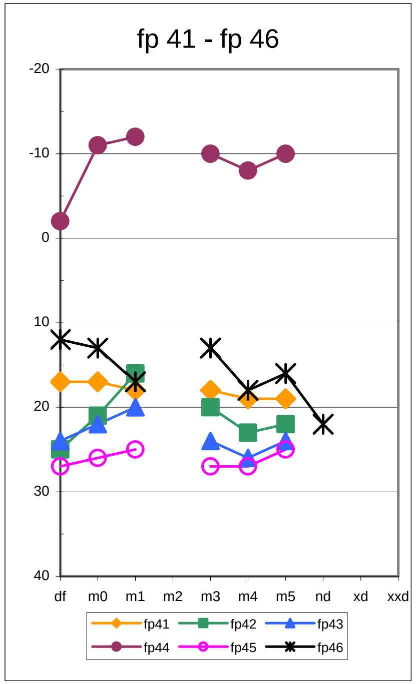
Hearing thresholds right ear, 6 kHz, before and after exposure

df - the day before
m0- just before exposure
m1 - immediately after exposure
m2 - 15 min after exposure
m3 - 1 hour after exposure
m4 - 2 hours after exposure
m5 - 3 hours after exposure
nd - next day
xd - extra day (different number of days in between)
xxd - a further extra day (different number of days in between)









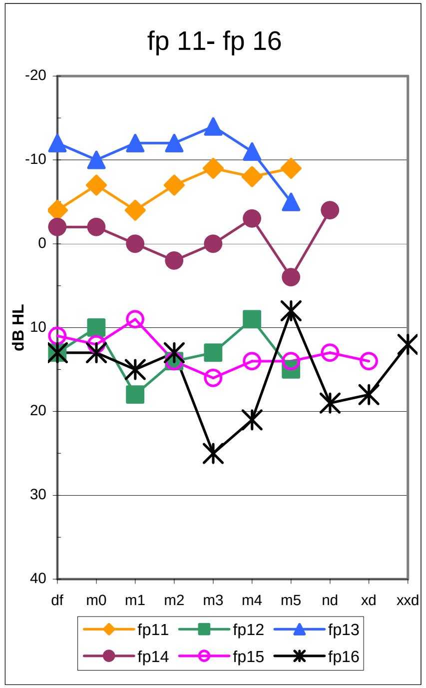
Hearing thresholds nov-02

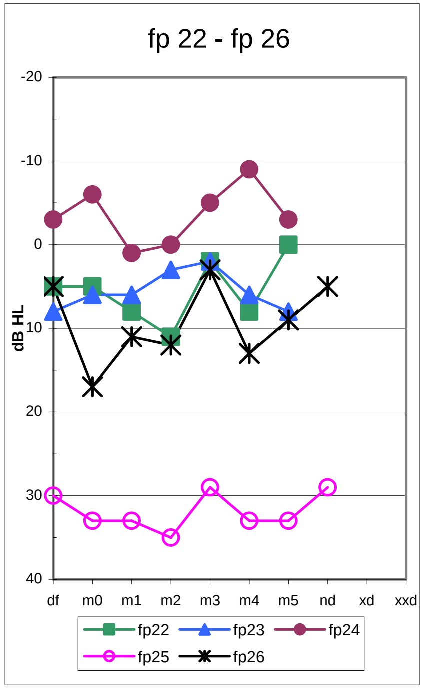
8 kHz
left

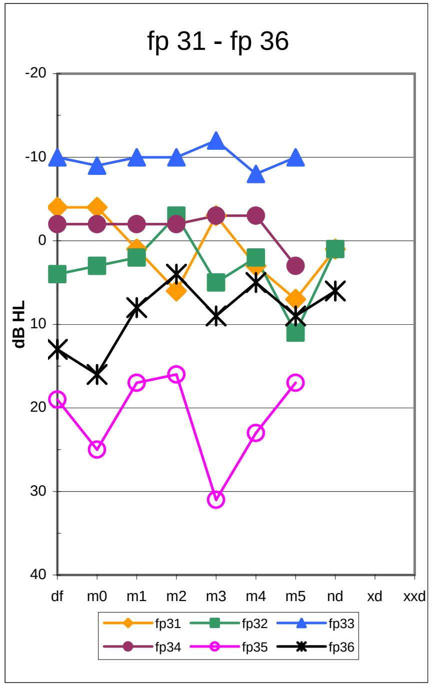
subj	*df*	m0	m1	m2	m3	m4	*m5*	*nd*	*xd*	*xxd*	*sd*	*sd m0-m5*
11	-4	-7	-4	-7	-9	-8	-9				2,1	1,9
12	13	10	18	14	13	9	15				3,0	3,3
13	-12	-10	-12	-12	-14	-11	-5				2,9	3,1
14	-2	-2	0	2	0	-3	4	-4			2,7	2,6
15	11	12	9	14	16	14	14	13	14		2,1	2,4
16	13	13	15	13	25	21	8	19	18	12	5,0	6,1
22	5	5	8	11	2	8	0				3,8	4,1
23	8	6	6	3	2	6	8				2,3	2,2
24	-3	-6	1	0	-5	-9	-3				3,5	3,8
25	30	33	33	35	29	33	33	29			2,2	2,0
26	5	17	11	12	3	13	9	5			4,8	4,7
31	-4	-4	1	6	-3	3	7	1			4,3	4,5
32	4	3	2	-3	5	2	11	1			4,0	4,6
33	-10	-9	-10	-10	-12	-8	-10				1,2	1,3
34	-2	-2	-2	-2	-3	-3	3				2,1	2,3
35	19	25	17	16	31	23	17				5,5	5,9
36	13	16	8	4	9	5	9	6			4,1	4,2
41	16	8	7		8	9	7				3,4	0,8
42	21	4	9		12	13	9				5,7	3,5
43	18	18	13		16	15	10				3,1	3,0
44	-6	-5	-4		-5	-3	-2				1,5	1,3
45	12	10	3		2	3	6				4,1	3,3
46	12	4	12		10	12	10				3,1	3,3
											sum of squares	283,0
N=	23	23	23	17	23	23	23	8	2	1	s.d. all	3,5
t-test							0,66					
mean	6,8	6,0	6,1	5,6	5,7	6,3	6,6					
s.d.	10,8	11,2	9,9	11,6	12,2	11,1	9,2					

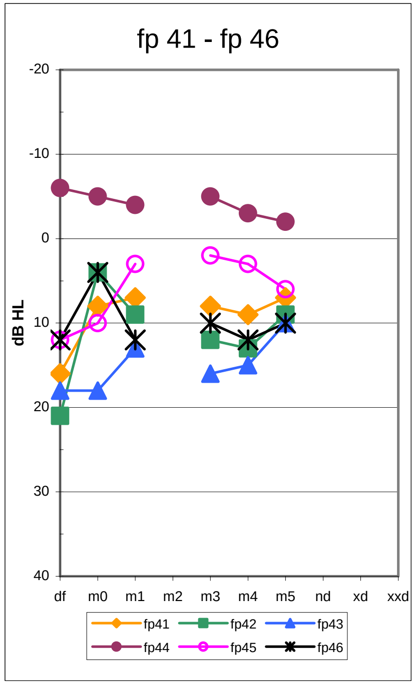
Hearing thresholds left ear, 8 kHz, before and after exposure

df - the day before
m0- just before exposure
m1 - immediately after exposure
m2 - 15 min after exposure
m3 - 1 hour after exposure
m4 - 2 hours after exposure
m5 - 3 hours after exposure
nd - next day
xd - extra day (different number of days in between)
xxd - a further extra day (different number of days in between)









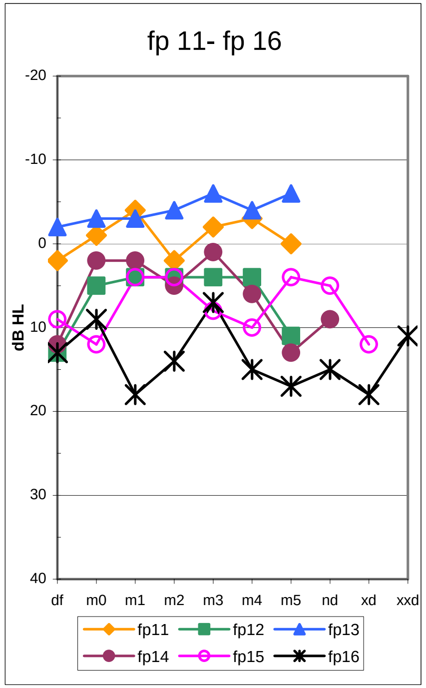
Hearing thresholds nov-02

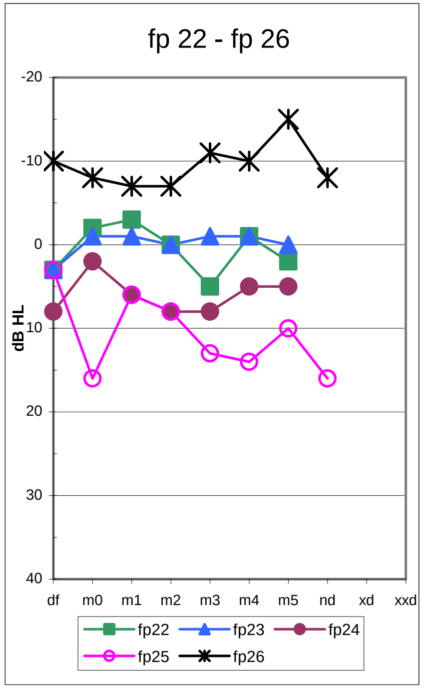
8 kHz
right

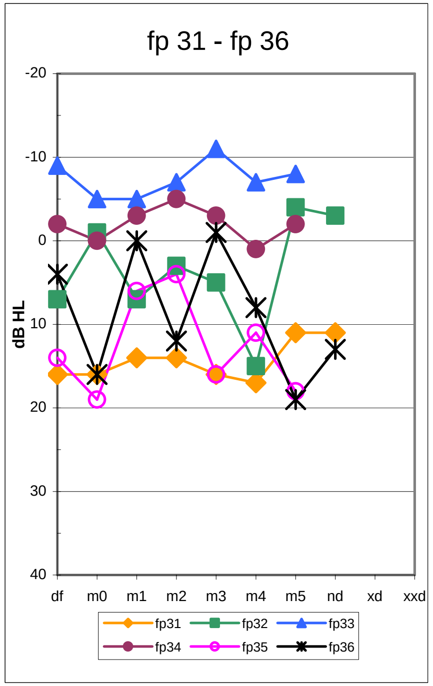
subj	*df*	m0	m1	m2	m3	m4	*m5*	*nd*	*xd*	*xxd*	*sd*	*sd m0-m5*
11	2	-1	-4	2	-2	-3	0				2,3	2,2
12	13	5	4	4	4	4	11				3,9	2,8
13	-2	-3	-3	-4	-6	-4	-6				1,5	1,4
14	12	2	2	5	1	6	13	9			4,7	4,4
15	9	12	4	4	8	10	4	5	12		3,4	3,5
16	13	9	18	14	7	15	17	15	18	11	3,7	4,4
22	3	-2	-3	0	5	-1	2				2,9	2,9
23	3	-1	-1	0	-1	-1	0				1,5	0,5
24	8	2	6	8	8	5	5				2,2	2,3
25	3	16	6	8	13	14	10	16			4,8	3,8
26	-10	-8	-7	-7	-11	-10	-15	-8			2,7	3,1
31	16	16	14	14	16	17	11	11			2,3	2,2
32	7	-1	7	3	5	15	-4	-3			6,3	6,6
33	-9	-5	-5	-7	-11	-7	-8				2,1	2,2
34	-2	0	-3	-5	-3	1	-2				2,0	2,2
35	14	19	6	4	16	11	18				5,8	6,3
36	4	16	0	12	-1	8	19	13			7,4	8,2
41	9	9	9		10	7	6				1,5	1,6
42	16	12	8		14	15	5				4,3	4,2
43	25	24	27		31	26	26				2,4	2,6
44	-3	-5	-6		-5	-5	-8				1,6	1,3
45	25	25	22		19	25	23				2,4	2,5
46	0	4	7		2	8	2	12			4,2	2,8
											sum of squares	313,6
N=	23	23	23	17	23	23	23	9	2	1	s.d. all	3,7
t-test				0,37								
mean	6,8	6,3	4,7	3,2	5,2	6,8	5,6					
s.d.	9,3	9,6	9,0	6,7	10,1	9,7	10,6					

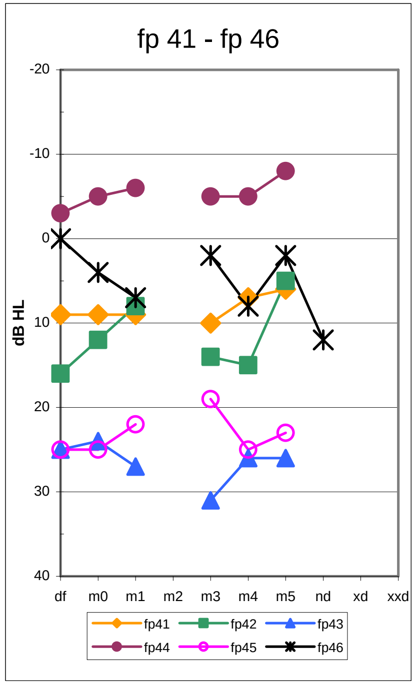
Hearing thresholds right ear, 8 kHz, before and after exposure

df - the day before
m0- just before exposure
m1 - immediately after exposure
m2 - 15 min after exposure
m3 - 1 hour after exposure
m4 - 2 hours after exposure
m5 - 3 hours after exposure
nd - next day
xd - extra day (different number of days in between)
xxd - a further extra day (different number of days in between)









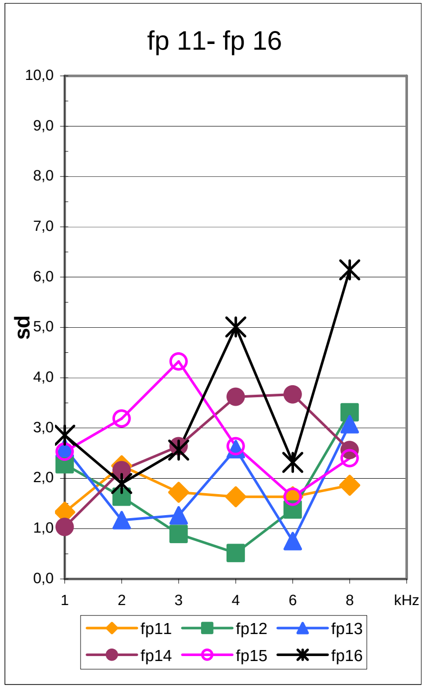
Subject's s.d. at various frequencies during the time course m0 - m5

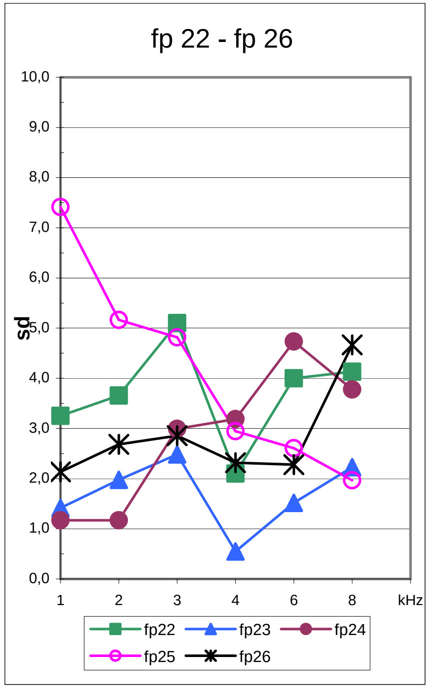
	s.d.(m0, m1, *m2**, m3, m4, m5)				left ear			sum of	subject's
	1	2	3	4	6	8	kHz	squares	s.d.
11	1,3	2,3	1,7	1,6	1,6	1,9		18,6	1,8
12	2,3	1,6	0,9	0,5	1,4	3,3		21,8	1,9
13	2,6	1,2	1,3	2,6	0,8	3,1		26,5	2,1
14	1,0	2,2	2,6	3,6	3,7	2,6		45,8	2,8
15	2,5	3,2	4,3	2,6	1,6	2,4		50,7	2,9
16	2,9	1,9	2,6	5,0	2,3	6,1		86,6	3,8
22	3,3	3,7	5,1	2,1	4,0	4,1		87,4	3,8
23	1,4	2,0	2,5	0,5	1,5	2,2		19,6	1,8
24	1,2	1,2	3,0	3,2	4,7	3,8		58,5	3,1
25	7,4	5,2	4,8	2,9	2,6	2,0		124,2	4,5
26	2,1	2,7	2,9	2,3	2,3	4,7		52,3	3,0
31	1,6	1,3	1,8	1,4	1,6	4,5		32,8	2,3
32	2,1	2,4	1,9	1,6	1,7	4,6		40,9	2,6
33	1,8	0,9	1,6	1,8	1,5	1,3		13,9	1,5
34	0,8	1,5	1,4	1,6	1,9	2,3		16,1	1,6
35	0,8	1,6	2,2	3,4	5,2	5,9		81,9	3,7
36	2,3	2,3	2,6	2,9	2,4	4,2		49,4	2,9
41	0,5	0,4	0,4	1,3	2,1	0,8		7,6	1,1
42	1,7	2,3	1,3	3,8	2,3	3,5		42,1	2,6
43	0,5	1,3	2,3	0,5	2,1	3,0		21,6	1,9
44	1,6	1,3	1,2	1,2	1,0	1,3		9,9	1,3
45	3,4	2,1	2,4	1,9	2,1	3,3		40,3	2,6
46	2,3	2,4	2,7	2,3	2,4	3,3		40,4	2,6
sum of squares	99,2	71,2	155,1	141,9	149,0	283,0			
group s.d.	2,1	1,8	2,6	2,5	2,5	3,5			

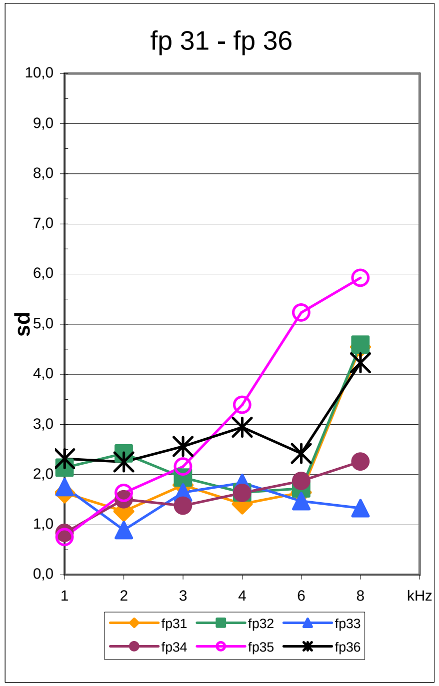
* not fp41 - fp46

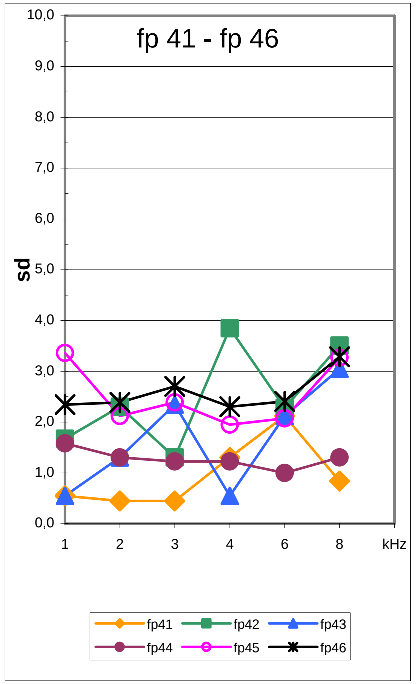
Subject's s.d. at various frequencies during the time course m0 - m5

s.d.(m0, m1, *m2 , m3, m4, m5)** **left ear**







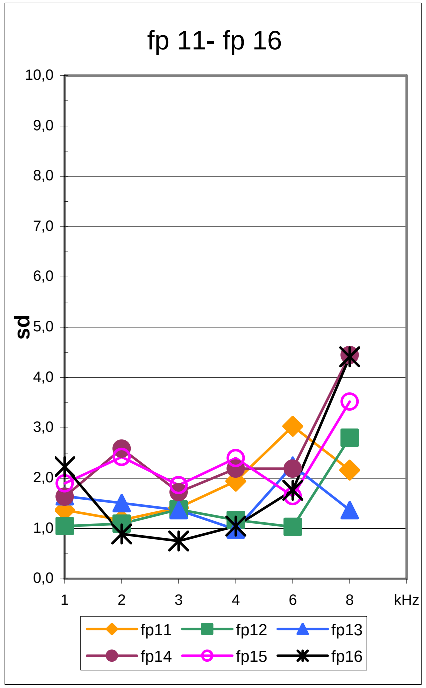


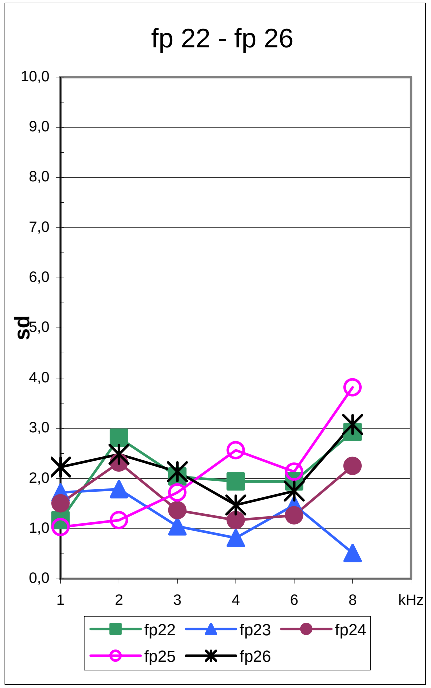
Subject's s.d. at various frequencies during the time course m0 - m5

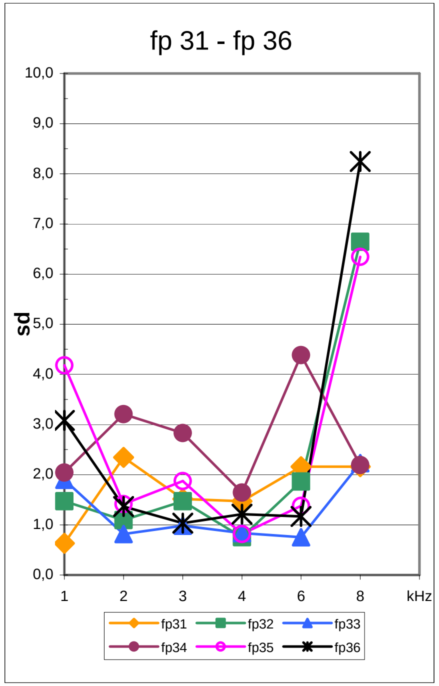
	s.d.(m0, m1, *m2**, m3, m4, m5)				right ear			sum of	subject's
	1	**2**	**3**	**4**	**6**	**8**	**kHz**	**squares**	**s.d.**
11	1,4	1,2	1,4	1,9	3,0	2,2		22,9	2,0
12	1,0	1,1	1,4	1,2	1,0	2,8		14,5	1,6
13	1,6	1,5	1,4	1,0	2,3	1,4		14,7	1,6
14	1,6	2,6	1,7	2,2	2,2	4,4		41,7	2,6
15	1,9	2,4	1,9	2,4	1,6	3,5		33,8	2,4
16	2,2	0,9	0,8	1,0	1,8	4,4		30,0	2,2
22	1,2	2,8	2,0	1,9	1,9	2,9		29,5	2,2
23	1,7	1,8	1,0	0,8	1,5	0,5		10,4	1,3
24	1,5	2,3	1,4	1,2	1,3	2,3		17,5	1,7
25	1,0	1,2	1,7	2,6	2,1	3,8		31,1	2,3
26	2,2	2,5	2,1	1,5	1,8	3,1		30,4	2,3
31	0,6	2,3	1,5	1,5	2,2	2,2		19,7	1,8
32	1,5	1,1	1,5	0,8	1,9	6,6		53,7	3,0
33	1,9	0,8	1,0	0,8	0,8	2,2		11,5	1,4
34	2,0	3,2	2,8	1,6	4,4	2,2		49,1	2,9
35	4,2	1,4	1,9	0,8	1,4	6,3		65,8	3,3
36	3,1	1,4	1,0	1,2	1,2	8,2		83,3	3,7
41	2,1	1,3	1,3	0,8	0,8	1,6		12,1	1,4
42	1,5	2,6	1,3	1,3	2,7	4,2		37,5	2,5
43	1,8	1,1	1,7	2,3	2,3	2,6		24,8	2,0
44	1,6	2,0	1,7	1,1	1,5	1,3		14,8	1,6
45	2,7	0,5	1,7	1,8	1,0	2,5		21,1	1,9
46	2,1	1,9	1,2	1,7	2,3	2,8		25,7	2,1
sum of squares	91,5	81,6	59,1	55,8	94,0	313,6			
group s.d.	2,0	1,9	1,6	1,6	2,0	3,7			

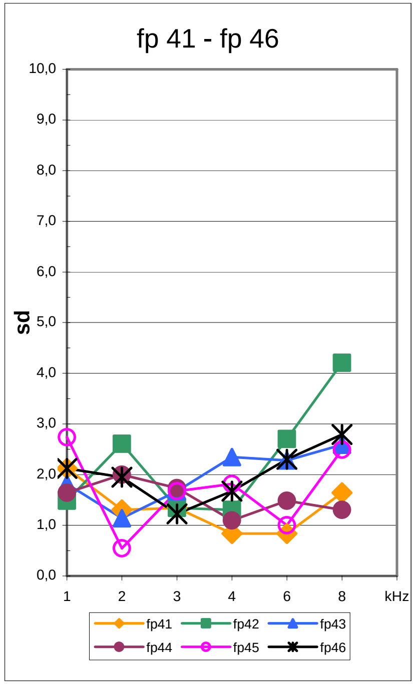
Subject's s.d. at various frequencies during the time course m0 - m5

s.d.(m0, m1, *m2, m3, m4, m5)** **right ear**









Max PEAK-threshold at 35 - 85 dB SPL noise level, left ear

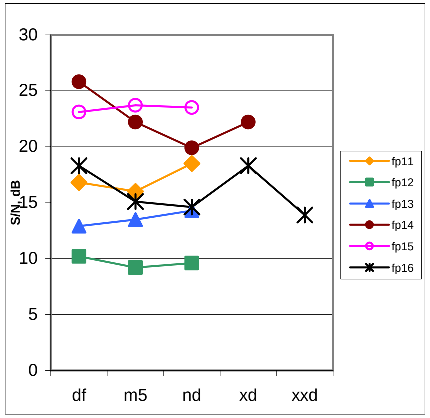
	df	m5	nd	xd	xxd			age
11	16,8	16	18,5			peculiar, rerun nd		26
12	10,2	9,2	9,6					25
13	12,9	13,5	14,3					29
14	25,8	22,2	19,9	22,2				25
15	23,1	23,7	23,5					37
16	18,3	15,1	14,6	18,3	13,9			39
22	16,4	14,6	15,4					22
23	23,3	19,1	19,5	18,9				31
24	27,5	20,1		20,1				25
25	14,3	12,2	12,3					33
26	17,5	15,4	14,6					35
31	25,1	22	21,6	21,6				26
32	20,8	18,3	14,1	17,7				26
33	21,2	18,3	17	17,7				22
34	18,7	17		5,6				23
35	17	13,9		11,9				31
36	20,6	14,3	15,8	18,5			**m2**	23
41	18,5	16,4					19,7	37
42	18,5	18,1	19,1				19,5	42
43	15,8	15,6					17,9	33
44	20,4	15,8	13,9		9,2		17	29
45	23,7	18	17,2				20,4	50
46	21,2	18,3	16,6				20,2	37
N=	23	23	18	10	2		6	23
mean	19,5	16,8	16,5	17,3			19,1	30,7
s.d.	4,2	3,4	3,4	5,0			1,4	7,3
t-testas for HTL		3,8E-06	0,00035	0,0028			0,59	
		df - m5	df - nd	df - xd			df - m2	median
			0,33	0,57			0,0011	age
			m5 - nd	m5 - xd			m2 - m5	29
mean fp41-46	19,7	17,0	16,7				0,039	
	df	**m5**	**nd**				m2 - nd	

Max VALLEY-threshold at 35 - 85 dB SPL noise level, left ear

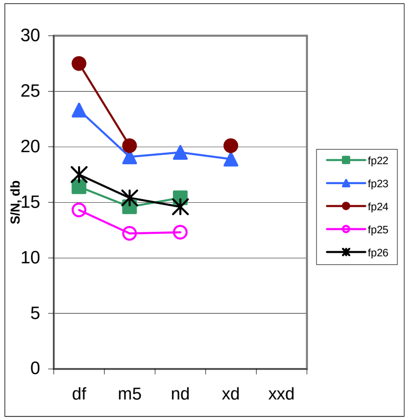
		df	m5	nd	xd	xxd	problem with short tone threshold at 45 dB alt. 35 dB	m2	
valley	11	10,8	7,3	9					
	12	6,1	5,8	5,4			yes!		
	13	10,6	7,3	4,8					
	14	15,6	12,5	10,4	13,3				
	15	19,5	21,4	19,5					
	16	8,9	8,1	8,5	4	5			
	22	6,9	5,4	4,6					
	23	20,1	12,5	12,5	9,2				
	24	16,7	12,3		12,3				
	25	8,5	5,2	4,6			yes, but corrected		
	26	9,4	6,7	4,8			(yes, but corrected)		
	31	15,4	12,3	11,7	12,9				
	32	12,9	8,5	6,9	12,1				
	33	10,2	12,3	10	12,1		maybe		
	34	9,2	7,5		5,6		almost		
	35	13,3	7,5		4,2				
	36	9,2	4	5,6	10				
	41	9,2	8,1					9	
	42	11	7,5	8,7				7,1	
	43	10,4	11					9,2	
	44	11,7	7,1	4,4		0,2	yes!	7,3	
	45	19,8	16,2	12,3			yes v-peaks	15,4	
	46	11,4	9,2	3,2			yes but corr.	10	
N=		23	23	18	10	2		6	
mean		12,0	9,4	8,2	9,6			9,7	
s.d.		4,0	4,0	4,1	3,7			3,0	
t-test as for HTL			2,0E-05 df - m5	1,2E-05 df - nd	0,02 df - xd			0,02 df - m2	N=6
			N=23	N=18	N=10			0,68 m2 - m5	N=6
mean fp41-46		12,3	9,9	7,2					
		df	**m5**	**nd**				0,20 m2 - nd	N=4

Max PEAK-threshold at 35 - 85 dB SPL noise level, left ear

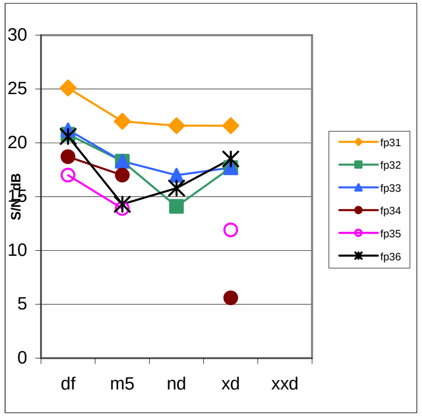
peak 11-16



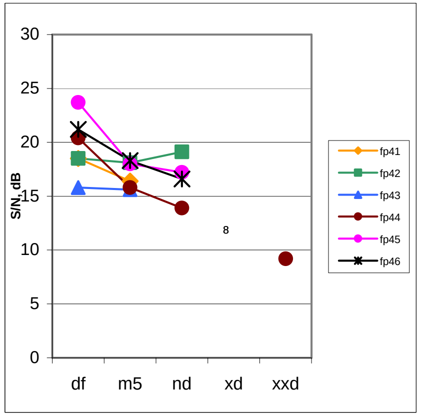
peak 22-26



peak 31-36

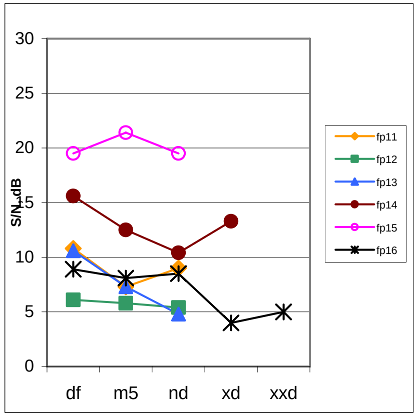


peak 41-46

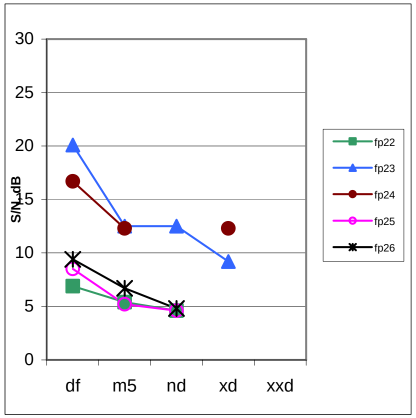


Max VALLEY-threshold at 35 - 85 dB SPL noise level, left ear

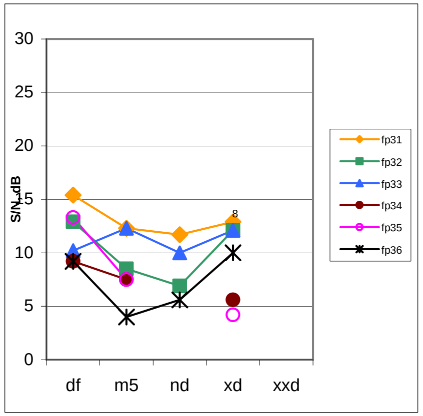
valley 11-16



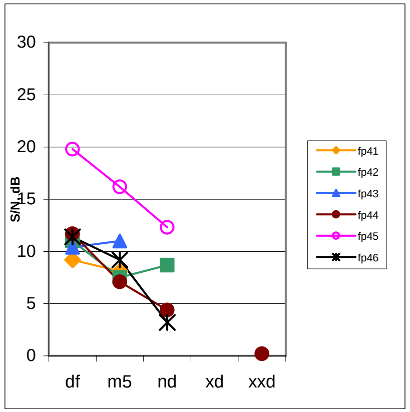
valley 22-26



valley 31-36



valley 41-46



TEOAE — Correlated response, 85 dB peSPL without noise

			K1k	K1.5k	K2k	K3k	K4k	K5k	K6k	K7k	K0.5-2.5k	K2.5-4.5k	K5.5-8k
	Frequency	N=	23	23	23	23	23	23	23	23	23	23	23
85dBnonoi	df	mean	10,7	7,1	2,5	-0,6	-2,1	-6,8	-6,9	-8,7	11,6	2,1	-3,8
		s.d.	6,6	7,2	6,9	5,4	5,0	3,2	3,3	4,2	6,6	4,9	3,8
	m0	mean	12,3	9,1	4,8	0,8	-0,3	-5,9	-5,2	-7,2	13,4	3,6	-2,0
		s.d.	6,1	6,3	6,3	5,9	5,3	4,4	4,2	4,0	5,9	5,3	4,1
	m5	mean	13,1	8,9	4,6	0,8	-0,9	-6,2	-5,0	-7,3	14,0	3,5	-2,0
		s.d.	5,7	6,4	6,2	5,5	5,9	4,0	5,1	4,1	5,6	5,3	4,7
85dBnonoi	t-test df vs. m0		0,085	0,042	0,021	0,047	0,020	0,116	0,017	0,006	0,049	0,027	0,002
	t-test m0 vs. m5		0,23	0,66	0,64	0,91	0,30	0,42	0,78	0,83	0,29	0,71	0,96
	t-test df vs.m5		0,016	0,042	0,011	0,037	0,13	0,32	0,017	0,003	0,012	0,049	0,003

TEOAE — Correlated response, 75 dB peSPL without noise

			K1k	K1.5k	K2k	K3k	K4k	K5k	K6k	K7k	K0.5-2.5k	K2.5-4.5k	K5.5-8k
	Frequency												
75dBnonoi	df	mean	6,6	1,9	-2,2	-4,6	-4,9	-8,1	-7,2	-9,6	7,4	-1,4	-4,3
		s.d.	5,6	6,5	5,8	4,9	4,7	3,3	3,4	2,9	5,5	4,5	3,3
	m0	mean	8,2	4,5	0,7	-2,3	-2,9	-6,9	-5,4	-8,3	9,2	0,7	-2,7
		s.d.	5,1	5,9	5,6	5,1	4,9	4,5	3,6	2,0	5,1	4,8	2,9
	m5	mean	8,1	3,9	0,4	-2,8	-3,2	-6,3	-5,9	-8,3	9,2	0,4	-2,9
		s.d.	5,7	6,6	5,9	4,8	5,0	3,9	4,6	2,8	5,6	4,5	3,9
75dBnonoi	t-test df vs. m0		0,020	0,002	0,001	0,0003	0,002	0,039	0,005	0,021	0,007	0,0003	0,003
	t-test m0 vs. m5		0,94	0,44	0,63	0,33	0,51	0,22	0,40	0,92	0,96	0,51	0,74
	t-test df vs. m5		0,023	0,010	0,003	0,003	0,003	0,001	0,058	0,016	0,005	0,001	0,013

TEOAE

Correlated response, 85 dB peSPL with contralateral noise

		Frequency	K1k	K1.5k	K2k	K3k	K4k	K5k	K6k	K7k	K0.5-2.5k	K2.5-4.5k	K5.5-8k
85dBclatnoi	df	mean	10,0	6,0	1,9	-2,0	-3,3	-7,4	-7,1	-8,6	11,0	0,6	-3,8
		s.d.	5,0	5,8	5,7	4,9	4,9	3,2	3,3	4,0	4,9	4,7	3,6
	m0	mean	11,2	7,8	3,8	0,3	-1,2	-5,9	-5,5	-7,6	12,3	2,9	-2,3
		s.d.	5,1	5,4	5,5	5,6	5,3	3,8	4,0	4,1	4,8	5,1	4,0
	m5	mean	11,2	7,6	4,3	-0,3	-1,6	-5,9	-5,3	-7,0	12,3	2,5	-2,1
		s.d.	4,8	5,4	5,1	5,1	5,5	4,0	5,0	3,4	4,5	4,9	4,4
85dBclatnoi	t-test df vs. m0		0,040	0,010	0,012	0,001	0,004	0,013	0,057	0,053	0,017	0,001	0,017
	t-test m0 vs.m5		0,92	0,67	0,37	0,29	0,30	0,99	0,79	0,16	0,88	0,27	0,69
	t-test df vs. m5		0,020	0,012	0,001	0,003	0,012	0,040	0,031	0,0005	0,005	0,002	0,011

TEOAE

Correlated response, 75 dB peSPL with contralateral noise

		Frequency	K1k	K1.5k	K2k	K3k	K4k	K5k	K6k	K7k	K0.5-2.5k	K2.5-4.5k	K5.5-8k
75dBclatnoi	df	mean	4,9	1,8	-1,4	-4,4	-5,6	-7,4	-7,4	-9,3	6,2	-1,7	-4,4
		s.d.	5,1	6,6	5,9	3,7	4,5	3,9	3,2	2,2	5,0	3,9	2,4
	m0	mean	6,6	4,3	1,8	-3,3	-3,8	-6,8	-6,2	-7,5	8,2	-0,3	-2,9
		s.d.	5,1	5,8	4,7	4,7	4,6	3,7	3,3	1,9	4,7	4,4	2,6
	m5	mean	6,2	3,4	1,1	-3,6	-4,0	-6,9	-6,0	-8,4	7,7	-0,3	-3,1
		s.d.	5,5	5,4	5,1	3,9	4,9	3,9	4,1	2,3	5,1	4,0	3,6
75dBclatnoi	t-test df vs. m0		0,010	0,013	0,005	0,088	0,030	0,40	0,031	0,002	0,005	0,034	0,003
	t-test m0 vs. m5		0,42	0,14	0,34	0,60	0,80	0,81	0,78	0,06	0,31	0,89	0,77
	t-test df vs. m5		0,07	0,11	0,019	0,035	0,009	0,52	0,035	0,016	0,042	0,001	0,018

TEOAE **Suppression of correlated response, 85 dB peSPL**

	Frequency		K1k	K1.5k	K2k	K3k	K4k	K5k	K6k	K7k	K0.5-2.5k	K2.5-4.5k	K5.5-8k
		N=	23	23	23	23	23	23	23	23	23	23	23
85dBsuppr	df	mean	0,7	1,2	0,6	1,4	1,2	0,6	0,2	-0,1	0,6	1,5	0,0
		s.d.	4,0	3,8	4,0	1,8	1,6	2,2	1,9	1,4	4,0	1,3	1,3
	m0	mean	1,2	1,3	1,1	0,6	0,9	0,1	0,3	0,5	1,2	0,7	0,3
		s.d.	2,6	3,4	4,0	1,4	1,6	1,7	1,5	1,7	2,7	1,0	1,2
	m5	mean	1,8	1,3	0,3	1,0	0,7	-0,3	0,3	-0,3	1,6	1,0	0,1
		s.d.	2,7	3,7	3,1	1,6	1,8	1,2	1,8	1,4	2,6	1,4	1,5
85dBsuppr	t-test df vs. m0		0,56	0,89	0,63	0,054	0,48	0,38	0,83	0,20	0,52	0,032	0,33
	t-test m0 vs. m5		0,14	0,97	0,15	0,28	0,65	0,43	0,94	0,14	0,20	0,49	0,59
	t-test df vs. m5		0,17	0,88	0,64	0,40	0,25	0,093	0,88	0,45	0,21	0,19	0,74

TEOAE **Suppression of correlated response, 75 dB peSPL**

	Frequency		K1k	K1.5k	K2k	K3k	K4k	K5k	K6k	K7k	K0.5-2.5k	K2.5-4.5k	K5.5-8k
75dBsuppr	df	mean	1,7	0,1	-0,8	-0,2	0,7	-0,7	0,2	-0,3	1,2	0,3	0,1
		s.d.	3,6	5,2	4,3	2,3	2,3	3,7	1,4	2,2	3,4	2,1	1,6
	m0	mean	1,6	0,1	-1,1	1,0	0,9	-0,1	0,8	-0,7	1,0	0,9	0,2
		s.d.	3,3	3,9	3,5	2,7	2,1	1,9	1,5	1,7	2,9	2,2	1,1
	m5	mean	1,9	0,5	-0,7	0,8	0,7	0,6	0,1	0,1	1,4	0,8	0,2
		s.d.	2,6	4,6	5,0	2,0	1,5	1,6	1,4	1,8	3,0	1,5	1,1
75dBsuppr	t-test df vs. m0		0,78	0,93	0,81	0,03	0,72	0,42	0,17	0,49	0,66	0,23	0,64
	t-test m0 vs. m5		0,49	0,64	0,71	0,75	0,73	0,18	0,07	0,13	0,40	0,68	0,97
	t-test df vs. m5		0,72	0,73	0,93	0,12	0,92	0,08	0,83	0,51	0,74	0,44	0,72

TEOAE — Uncorrelated response, 85 dB peSPL without noise

		Frequency	O1k	O1.5k	O2k	O3k	O4k	O5k	O6k	O7k	O0.5-2.5k	O2.5-4.5k	O5.5-8k	total response	reprod., %
		N=	23	23	23	23	23	23	23	23	23	23	23	23	23
85dBnonoi	df	mean	3,5	-0,7	-2,9	-6,8	-7,2	-7,1	-5,5	-7,2	4,6	-3,8	-2,4	16,4	56,1
		s.d.	5,7	5,4	5,4	3,9	3,6	2,0	2,3	2,0	5,6	3,6	2,1	3,6	33,5
	m0	mean	6,0	1,9	-0,5	-4,9	-4,6	-5,9	-4,8	-5,7	7,1	-1,5	-1,5	18,7	52,5
		s.d.	4,8	4,8	4,7	3,2	3,0	2,3	1,6	1,8	4,6	2,8	1,5	3,3	31,3
	m5	mean	7,2	2,6	-0,6	-5,5	-5,0	-6,5	-4,7	-5,6	8,1	-2,1	-1,1	19,1	52,3
		s.d.	5,7	5,1	3,8	2,5	2,0	1,7	2,5	2,1	5,2	1,9	2,1	3,5	26,4
85dBnonoi	t-test df vs. m0		0,080	0,091	0,14	0,052	0,002	0,008	0,14	0,002	0,074	0,004	0,038	0,003	0,51
	t-test m0 vs. m5		0,37	0,60	0,92	0,28	0,49	0,15	0,89	0,94	0,46	0,29	0,42	0,52	0,96
	t-test df vs.m5		0,007	0,023	0,083	0,16	0,020	0,20	0,13	0,003	0,009	0,038	0,008	0,0003	0,59

TEOAE — Uncorrelated response, 75 dB peSPL without noise

		Frequency	O1k	O1.5k	O2k	O3k	O4k	O5k	O6k	O7k	O0.5-2.5k	O2.5-4.5k	O5.5-8k	total response	reprod., %
75dBnonoi	df	mean	4,2	-0,6	-3,5	-7,2	-6,8	-7,5	-6,5	-7,2	5,1	-3,8	-2,9	14,8	30,1
		s.d.	5,3	4,7	3,8	3,1	2,7	2,0	3,1	1,7	5,1	2,8	2,3	4,6	29,6
	m0	mean	6,1	2,8	0,3	-4,8	-5,1	-6,0	-5,5	-5,5	7,3	-1,8	-1,6	16,4	30,3
		s.d.	5,1	5,3	4,9	3,3	2,3	2,3	2,0	2,1	4,9	2,6	1,9	3,4	35,7
	m5	mean	6,9	1,5	-0,6	-6,0	-5,6	-6,3	-5,4	-6,3	7,9	-2,5	-1,9	16,1	28,6
		s.d.	6,0	5,6	4,8	2,6	2,7	1,9	2,7	1,7	5,7	2,4	2,1	3,8	27,0
75dBnonoi	t-test df vs. m0		0,17	0,013	0,001	0,006	0,020	0,002	0,097	0,006	0,075	0,008	0,026	0,063	0,97
	t-test m0 vs. m5		0,49	0,30	0,45	0,11	0,38	0,42	0,95	0,048	0,57	0,21	0,44	0,65	0,77
	t-test df vs. m5		0,052	0,081	0,006	0,13	0,068	0,0003	0,034	0,089	0,030	0,057	0,025	0,14	0,82

TEOAE

Uncorrelated response, 85 dB peSPL with contralateral noise

	Frequency		O1k	O1.5k	O2k	O3k	O4k	O5k	O6k	O7k	O0.5-2.5k	O2.5-4.5k	O5.5-8k	total response	reprod., %
85dBclatnoi	df	mean	5,1	1,2	-1,7	-6,1	-5,6	-6,7	-6,3	-7,2	6,1	-2,8	-2,7	16,3	44,0
		s.d.	5,2	5,8	5,0	4,0	4,0	2,0	2,1	1,8	5,1	4,0	1,5	3,9	31,4
	m0	mean	6,0	2,3	-0,6	-5,3	-5,2	-5,6	-5,1	-5,9	7,0	-2,1	-1,6	17,3	50,7
		s.d.	5,4	5,0	3,6	2,5	2,8	2,1	2,4	2,1	4,9	2,5	1,9	3,3	28,0
	m5	mean	6,7	2,8	0,1	-5,1	-4,7	-6,0	-4,5	-5,2	7,7	-1,7	-0,9	17,5	46,9
		s.d.	6,2	5,2	4,4	2,9	3,0	2,4	1,6	2,2	5,7	2,8	1,9	3,9	22,0
85dBclatnoi	t-test df vs. m0		0,46	0,44	0,31	0,35	0,63	0,032	0,047	0,010	0,41	0,45	0,010	0,22	0,21
	t-test m0 vs.m5		0,58	0,66	0,47	0,72	0,56	0,37	0,19	0,12	0,55	0,55	0,070	0,80	0,52
	t-test df vs. m5		0,14	0,14	0,067	0,24	0,35	0,21	0,001	0,002	0,11	0,23	0,0004	0,076	0,70

TEOAE

Uncorrelated response, 75 dB peSPL with contralateral noise

	Frequency		O1k	O1.5k	O2k	O3k	O4k	O5k	O6k	O7k	O0.5-2.5k	O2.5-4.5k	O5.5-8k	total response	reprod., %
75dBclatnoi	df	mean	4,3	-1,0	-3,1	-6,4	-6,1	-6,4	-6,2	-7,2	5,2	-2,8	-2,6	13,7	26,1
		s.d.	5,2	4,9	4,4	3,8	3,7	3,3	2,6	2,0	5,1	3,5	2,3	4,2	31,2
	m0	mean	5,7	2,7	1,1	-4,1	-4,2	-5,9	-5,0	-4,5	7,3	-0,9	-0,9	16,1	20,8
		s.d.	5,6	6,3	6,1	3,7	3,0	2,7	1,9	2,4	5,6	3,2	2,0	3,9	29,1
	m5	mean	6,6	1,5	-0,1	-5,3	-5,8	-6,0	-5,1	-5,9	7,6	-2,3	-1,6	15,9	19,8
		s.d.	5,1	4,9	4,2	3,1	2,7	2,4	2,5	1,9	4,8	2,6	1,9	4,0	25,9
75dBclatnoi	t-test df vs. m0		0,25	0,022	0,010	0,014	0,030	0,54	0,034	0,0001	0,10	0,020	0,003	0,015	0,55
	t-test m0 vs. m5		0,42	0,31	0,30	0,16	0,009	0,95	0,78	0,011	0,75	0,047	0,061	0,85	0,88
	t-test df vs. m5		0,070	0,056	0,028	0,22	0,68	0,57	0,10	0,011	0,062	0,47	0,049	0,052	0,34

TEOAE — Suppression of uncorrelated response, 85 dB peSPL

	Frequency		O1k	O1.5k	O2k	O3k	O4k	O5k	O6k	O7k	O0.5-2.5k	O2.5-4.5k	O5.5-8k	suppr. of tot response
	N=		23	23	23	23	23	23	23	23	23	23	23	23
85dBsuppr	df	Mean	-1,5	-1,9	-1,1	-0,6	-1,5	-0,4	0,8	0,0	-1,4	-1,1	0,3	0,1
		s.d.	4,0	5,1	5,2	4,7	3,6	1,9	2,2	1,7	4,1	3,9	1,5	2,5
	m0	Mean	0,0	-0,4	0,1	0,4	0,7	-0,3	0,3	0,3	0,1	0,6	0,2	1,3
		s.d.	4,9	5,2	4,3	2,8	2,4	2,3	1,9	1,7	4,6	2,2	1,4	3,1
	m5	Mean	0,6	-0,2	-0,7	-0,4	-0,3	-0,4	-0,2	-0,4	0,4	-0,4	-0,2	1,6
		s.d.	3,4	3,4	2,6	2,1	2,8	2,2	2,3	1,8	3,1	2,0	1,6	2,6
85dBsuppr	t-test df vs. m0		0,31	0,34	0,42	0,40	0,026	0,87	0,39	0,58	0,29	0,09	0,65	0,13
	t-test m0 vs. m5		0,65	0,91	0,52	0,23	0,25	0,85	0,53	0,16	0,81	0,14	0,51	0,70
	t-test df vs. m5		0,12	0,20	0,74	0,88	0,24	0,91	0,13	0,50	0,16	0,47	0,25	0,024

TEOAE — Suppression of uncorrelated response, 75 dB peSPL

	Frequency		O1k	O1.5k	O2k	O3k	O4k	O5k	O6k	O7k	O0.5-2.5k	O2.5-4.5k	O5.5-8k	suppr. of tot response
75dBsuppr	df	Mean	-0,1	0,4	-0,4	-0,8	-0,7	-1,1	-0,4	0,0	-0,2	-1,0	-0,3	1,1
		s.d.	3,0	5,0	4,0	3,8	3,3	3,1	1,6	1,8	3,3	3,3	1,6	2,8
	m0	Mean	0,4	0,0	-0,9	-0,7	-0,9	-0,1	-0,5	-1,0	0,0	-0,8	-0,7	0,4
		s.d.	3,8	4,5	4,4	3,1	2,9	1,8	1,3	2,1	3,6	2,7	1,3	3,6
	m5	Mean	0,3	0,1	-0,5	-0,7	0,2	-0,3	-0,3	-0,5	0,3	-0,2	-0,3	0,2
		s.d.	3,3	4,8	5,5	3,3	1,9	2,0	1,9	1,8	3,9	2,4	1,2	3,6
75dBsuppr	t-test df vs. m0		0,67	0,84	0,73	0,93	0,89	0,14	0,85	0,17	0,89	0,86	0,37	0,43
	t-test m0 vs. m5		0,90	0,99	0,79	0,95	0,11	0,64	0,68	0,26	0,77	0,43	0,19	0,83
	t-test df vs. m5		0,74	0,85	0,97	0,89	0,34	0,30	0,88	0,49	0,73	0,44	0,97	0,31