

ADAPTATION MEASUREMENT BY MASKING

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The method I am going to discuss permits a monaural measurement of the slow phase of adaptation or auditory fatigue. It is performed in the following way :

From the normal audiogram a frequency is selected, which is of special interest, e.g. the deepest point of a dip, a tone that just marks the beginning of a slope or any other tone. In most cases it will be useful to do the test on more than one frequency, contrasting normal sections of the hearing scale with pathological parts.

The selected tone is impressed by earphone on one ear at a high intensity level, usually 80 or 90 db above normal threshold. Immediately after turning on this tone a white noise is added to it. The intensity of the tone is kept constant at the established level, the intensity of the noise is adjusted to that liminal level above which the tone just remains audible; that means, we determine the masked threshold of the permanent tone by altering the intensity of the noise.

The intensity found is noted, then the noise is switched off, but the tone is left on at constant intensity. After one minute, during which the test-tone was the only stimulus, the noise is switched on again, and by adjusting its intensity the masked threshold is determined as before. Generally it is now found to be 5—10 db lower than the initial value. This new level is noted, the noise switched off again, while the tone remains at the same intensity. After another minute the procedure is repeated, and so on.

In normal cases we observe a shift of the masking intensity of 10—15 db, which develops within 2 or 3 minutes. After that no further change occurs, even if we continue the stimulus for a much longer period. This signifies a normal perstimulatory adaptation.

Now we switch the tone off and leave the ear one minute at rest. Then it is turned on again at the previous intensity, and the masked threshold is measured as before by adjusting the noise. If it equals the initial value we can state that the recovery is complete and this denotes a normal poststimulatory adaptation.

The masking intensities of each measurement are plotted against the time together with the intensity and duration of the tone. They form a diagram which we have called adaptogram.

Pathological reactions may occur in both phases of the adaptation. In the perstimulatory phase they are characterized by a continuous drop of the masking intensity of the noise. While the tone is on the noise intensity

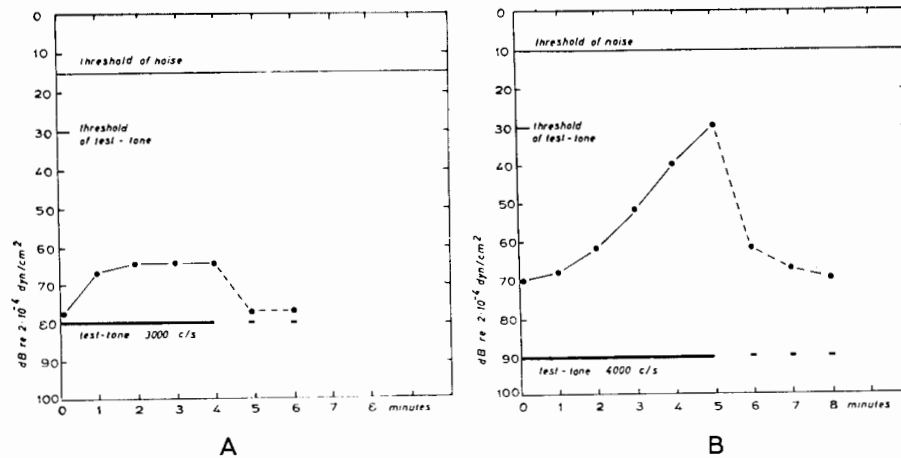


Fig. 1 A and B. The test-tone is impressed at a continuous level for some minutes. At the beginning and at intervals of one minute the masking threshold is determined by adding a white noise. The intensity of the noise required to mask the tone decreases with adaptation. In normal cases it reaches a steady state after 2-3 minutes; in pathological cases it drops off continually. The recovery is measured at intervals of one minute's rest by the same procedure.

required to mask it decreases from minute to minute, and in extreme cases of fatigue even noise at threshold intensity suffices to cover the tone. The diagram demonstrates such a case besides a normal reaction. The test may be ended as soon as the time-course of the reaction is clearly defined. Too long a stimulation may cause damage to a vulnerable ear.

In the poststimulatory phase auditory fatigue presents itself by a retarded recovery. In these cases one minute's rest does not allow the masking threshold to return to its initial value. The measurement should then be repeated at intervals of one minute until the recovery is complete. Perstimulatory and poststimulatory fatigue do not always show conformity, the latter being more dependent on the duration of the stimulus than the first.

The method described is based on the principle that there is a difference of adaptation between the continuous tone which develops full adaptation and the noise which, being impressed only at intervals as a rather short stimulus, does not to the same degree take part in the process of adaptation. Therefore the measurements with the noise turned on should be performed without unnecessary delay.

If there is a considerable hearing loss the stimulation intensity of 80 or 90 db may be only little above threshold. In this case and generally in cases of excessive fatigue the test-tone may fade out during the stimulation, as it does in the tone decay test. It is very difficult for the subject to state when exactly the tone has disappeared. But if all tonal perceptions are wiped out by the impression of the noise once a minute, it is easy for him to decide

whether the tone reappears when the noise is taken away or not. This procedure of drowning the test-tone by noise can, therefore, be recommended also for the tone decay test at threshold levels, because it facilitates the task for the patient and gives more reliable results.

DETERMINATION DE L'ADAPTATION PAR ASSOUDISSEMENT

L'auteur décrit une méthode pour l'étude de l'adaptation perstimulatoire et post-stimulatoire. On émit une fréquence choisie à une intensité invariable de 80 ou 90 db pendant quelques minutes. Immédiatement au début et puis aux intervalles d'une minute on superpose un bruit blanc et recherche l'intensité liminaire du bruit qui laisse le son continu précisément audible. Le bruit est émis seulement pendant quelques secondes nécessaires pour la recherche de l'intensité liminaire. Aux intervalles l'oreille n'est exposée qu'à la fréquence fatigante. Au cours de l'adaptation, à chaque répétition de la recherche, l'intensité liminaire du bruit diminue. Dans le cas normal elle rapproche un état d'équilibre, dans le cas pathologique elle baisse progressivement. On termine l'exposition à la fréquence fatigante lorsque la réaction de l'oreille est évident, en général après 3—5 minutes. Une minute après la cessation du stimulus on recherche l'intensité liminaire du bruit à nouveau émettant la fréquence fatigante à l'intensité précédente. Si elle est encore baissée on répète cette recherche aux intervalles d'une minute, jusqu'à ce que le seuil initial soit rapproché.

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