

AUDIOMETRY IN CHILDREN (INFANTS)

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In testing the hearing of the very young child, audiologists must be guided by the excellent observations of infant auditory behavior contributed by the field of psychology. One of the greatest of all observers of infant behavior is the Frenchman Piaget, who recorded in meticulous detail the responses of infants to various stimuli from the time of birth. Piaget noted that the newborn child could be markedly disturbed by noises, and that within the first two weeks of life would stop crying momentarily in order to listen to a sound. His continued observations also agree with the Americans, Gesell and Cattell, who reported that by the age of two months the infant is seen to turn his head to a familiar sound and to pay heed to the human voice by "orienting", or localizing the sound source.

It is incumbent upon the audiologist to duplicate these kinds of careful observations, and to add to them the one exclusive contribution that audiology can make: the exact physical measurement of the sounds to which the child responds. Measurement without observation is not enough, for the successful testing of infants rests upon the acceptance of a fundamental premise: that the true hearing-impaired child responds **like** the normal hearing child, when the sound is loud enough for him to hear. We can then extrapolate from the auditory response of the normal infant to that of the hearing-impaired infant. The analogy holds true only for the genuine peripheral hearing loss, and not when other C.N.S. involvements exist.

The easiest time to test is in the first year of life, when the new organism still retains the fresh, uninhibited responses which he brought with him at birth. By the age of two the natural auditory responses of the limited hearing child become more or less inhibited, because in the economy of the Nervous System, that which is not meaningful or helpful to survival becomes non-functional and suppressed. Therefore a screening program at birth and at periodic examinations is essential. It is far more important to detect the existence of a hearing problem at an early age than to do precision audiometry at a later age.

Screening is accomplished by presenting calibrated sound stimuli to the new-born infant in as quiet an environment as possible. A noise of 30 db Sensation Level (S.L.) at two feet should produce an eye-blink response on the first presentation, but the reflex will become extinguished with repeated presentations. A sudden noise of 65 db S.L., 3 feet from the ear will produce Moro's reaction: a startle reflex of the entire body. If the child is lying on his back, it may be possible to produce a beginning neck-turning reflex with a

noise of 30 db S.L. at 2 feet. The child must be awake or in a light sleep when tested, for a deep state of sleep precludes reactions.

By the age of three months the more conscious responses can be noted: an auditory "staring", or cessation of activity at the sound of a voice as low as 20 or 30 db S.L. At this age begins the orienting activity; the searching, or attempt at localization of a sound source of 20 to 30 db by turning the head. Here it is particularly useful to employ calibrated noises of different frequency response. Noises that have been passed through acoustic filters and are reproduced through a loudspeaker or tape give the most accurate measurement of the frequency range to which the child responds. A 20 or 30 db S.L. filtered sound should produce the orienting or "staring" response. If the child turns his head for the sound of a 30 db dog bark that has been filtered so that only the frequencies 250 to 750 cps remain, yet he fails to respond to a bell sound containing the frequencies 1500 to 3000 cps until it reaches 80 db, the suspicion of a high frequency loss is inescapable. We have been guided in the use of such filtered sounds by the investigations of Dr. Huizing of Groningen into the use of "triplet" speech audiometry. The basic technique is useful in measuring the more primitive auditory responses of infants. A "triplet" audiogram of awareness levels to filtered noises has been found to reflect acceptably the pure-tone audiograms of older children, and can therefore be used with confidence on children of 3 months.

By the age of six months the orienting responses to sound are well-defined, and the child's awareness levels can be confidently measured with triplet audiometry and calibrated noisemakers. The same techniques will be valid up to the age of two years, at which time more definitive measures can be applied. It is to be hoped that long before the child reaches the age of two, his hearing problem will have been detected and he will have received the benefit of a sound program of auditory habilitation.

AUDIOMETRIE DES ENFANTS

En éprouvant l'ouïe d'un très jeune enfant, les audiologistes doivent être guidés par les observations faites sur la façon dont les enfants réagissent. De telles observations furent faites par Piaget, Gesell, Cattell, et al.

Observer est nécessaire, parce que l'enfant qui n'est sourd que partiellement, a les mêmes réactions que l'enfant normal, quand le son est assez fort.

Ces observations comprennent un système de séparation tel que:

1. A la naissance: Un bruit de 30 db à 70 cms., fait sourciller l'enfant la première fois qu'il entend le bruit. Un bruit soudain de 65 db, à un mètre, provoque la réaction de Moro, c'est-à-dire un sursaut complet du corps.

2. A 3 moins: Un bruit de 20 à 30 db produit un arrêt complet du mouvement. Un bruit familier, 20 à 30 db, fait tourner la tête du côté où le bruit provient. On emploie des "triplet" audiogrammes qui définissent le point où l'enfant peut réagir selon les bruits familiers qui sont filtrés acoustiquement, pour faire la différence entre les largeurs de bandes sélectionnées.

3. De 6 mois à 2 ans: La voix, les objets faisant un bruit mesuré d'avance, et le "triplet" audiométrie, produisent une localisation définie à 20—30 db S.L.

4. A deux ans: Triplet audiométrie pour la reconnaissance de la source du bruit; Audiométrie par jeu.

Le but de ce système est d'être certain que l'enfant commence son programme acoustique à l'âge de 6 mois.

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