



BIAP recommendation n° 28/2 : Auditory Education: Objectives and Methodology

PREAMBLE

Importance of early stimulation in the world of sounds

Though maturation of the auditory system continues for several years after birth, the existence of a critical development period should be taken into account.

Hearing impairment affects the anatomo-physiological structures related to the auditory system. In the absence of early, regular and of quality sound stimulation, cortical auditory areas may be colonized by neurons from other pathways. Without excluding other stimuli, auditory functions must be stimulated before structural modifications appear and become permanent.

During the optimal neuroplasticity stage, combined effect of early use of hearing aids with natural exposure and with the discovery of elaborate environmental sounds favors a child's auditory skills development. (Cf. early hearing aids / CT 06.11 and CT 07).

Information gathered from these environmental sounds contributes to the psychological, psychomotor, cognitive, language, and social development of the child. This auditory perception allows for an evolution towards better autonomy.

Auditory training contributes to the optimal development of perceptive and auditory memory by initiating the subject's polysensoriality wherein the visual, tactile, proprioceptive, somatosensory and auditory pathways are used.

Various sound stimuli (noise, music, relevant voice parameters and speech components) will be used progressively.

For the deaf or hearing-impaired, improvement of auditory-sensory abilities depends on the following:

- etiology of deafness
- presence or absence of associated disorders
- degree of deafness
- age at onset of deafness
- age at first use of hearing aids
- age at start of rehabilitation
- family involvement (particularly in children)
- subject's own commitment and abilities

OBJECTIVES OF AUDITORY TRAINING

Ø Take part in the world of sounds

Even if auditory training basically seeks to improve auditory feedback, it also participates in developing the perception of acoustic information by the subject — how environmental sounds are processed and memorized.

It is therefore important to stimulate the processing of sound signals of various types in order to simultaneously train the brain areas concerned.

- Left brain hemisphere for sounds with temporal modifications (phonological processing, syllabication processing according to changes in articulation modes)
- Right brain hemisphere for sounds with spectral modifications

Ø Stimulate phonological decoding

Auditory training promotes the development of phonological representations as well as the awareness of meaning (implicit and explicit learning).

Ø Develop meta-phonological abilities

Auditory training develops the subject's ability to analyze relevant speech components and by this, contributes to improving meta-phonological abilities.

Ø Develop language comprehension

Phonological decoding in relation to grapheme deciphering enables the subject to recognize phonological forms of known words.

METHODOLOGY:

Auditory training should start early and coincide with a polysensorial stimulation approach (auditory, visual, tactile,

proprioceptive, somatosensory and vibro-tactile). This should evolve to become an essentially auditory stimulation approach.

An auditory training program must be pre-established and evaluated regularly.

Regular and intense* auditory training should take into account the subject's potential by choosing appropriate acoustic stimuli and recommended situations and/or tasks.

* At least once a week.

The program should be enjoyable and pleasant to maintain sufficient interest and generate emotions that will improve the memorization of target information.

The family's participation in everyday life contributes to the auditory awakening process and its progress. Overstimulation and unsolicited testing should be avoided. Hearing experiences should be commented on. Recall and memorization should be stimulated.

During auditory training, perceptions must be processed and stored by the brain. These can be retrieved and used when needed (as oral expressions).

Auditory information from the environment must firstly be stored in the sensorial memory. Then, it will be processed by the short-term (working memory) and the long-term memory.

In order to learn and retain auditory information, links with the classification process should be established. Classification (general and specific) of information facilitates processes that consolidate mnemonic pathways.

STAGES OF AUDITORY PERCEPTION TRAINING:**

Ø Detection: (cf. recommendation 28-1)

Subject's ability to react in the presence of stimuli and to distinguish between silence and noise

- Interest of the subject in environmental sounds
- Auditory attention training (alertness, selective attention, sustained attention)

Ø Sound discrimination (cf. recommendation 28-1):

Subject's ability to determine whether sound stimuli are identical or different

- Use of diverse sounds and noises
- Training initially with distinctly different sound stimuli and progressively evolving towards similar to almost identical sound stimuli

Ø Recognition and identification (cf. recommendation 28-1):

Subject's ability to recognize, through analogy, a memorized acoustic configuration

- Recognition of speech sounds, music and environmental noises

Recalled mental representations which are contextual associations of a sound stimulus to its origin, help develop an auditory database. These associations put sense to sound stimuli.

Ø Comprehension (cf. recommendation 28-1):

Subject's ability to understand the semantic value of a verbal stimulus

- Understand the meaning of spoken language (implicit contribution in the development of phoneme to grapheme forms)

**: For a deaf subject, choose appropriate perceptible sound stimuli (cf. tonal audiogram and hearing aid control).

ANNEX: AUDITORY TRAINING MATERIALS

Any material can be used in either a calm/silent or a variable background noise setting. It must be adapted to the subject's ability and needs (modulation of signal/noise ratio).

Auditory feedback can be worked on at each stage.

Ø DETECTION of non-verbal sounds

Sound-producing toys, onomatopoeia utterances, animal sounds, etc.

Sound localization

Auditory-motor activities

Auditory scenes (significant representations of environmental sounds)

Ø DETECTION of speech sounds

Reactions during sound-conditioning procedures, activities like musical chairs, etc.

Reactions to prosodic aspects of voice (intonation, timbre, rhythm)

Auditory feedback training (voice control)

Ø DISCRIMINATION of non-verbal sounds

Sound/phonic games: comparing paired sounds according to their frequency, duration, intensity; reduction of acoustic differences

Specific reactions to specific sound stimuli (for discrimination purposes)

Application of hypothetical processes in recognizing linguistic or non- linguistic utterances by comparing different acoustic stimuli

Ø DISCRIMINATION of speech sounds

Items: minimal pairs, non-sense/significant words

Phonemes/syllables/words/phrases/texts

Prosodic cues: duration, rhythm, frequency, intonation

Loud then subsequently decreasing sound intensity (use of sustained and selective attention)

Coverage of the entire range of frequencies

Varied rhythmic patterns (continuous/discontinuous sounds)

Ø IDENTIFICATION of non-verbal sounds

Auditory-motor schemes (association of intensity/frequency/duration cues to body movements)

Identification of environmental sounds

Classification of environmental sounds (natural sounds, machine-produced sounds, animal sounds, etc.)

Classification of musical sounds (percussion, wind, string instruments, etc.)

Identification of rhythms and rhythmic sequences

Identification of musical sounds

Ø IDENTIFICATION of speech sounds

Vowels

Vowels with distinctly opposing frequencies and gradually, vowels with similar to almost identical frequencies

Nasal vowels

Same vowel sound in different syllable formations

In a word where the same vowel appears once or several times

Find the "Odd man out" activity

Minimal pairs

Consonants

According to acoustic traits: occlusive as opposed to fricative, voiced as opposed to unvoiced, oral as opposed to nasal

Consonant placement in a word

Find the "Odd man out" activity

Words

In closed-set lists, thematic lists, and open-set lists

Words with different word-lengths

Words with different frequencies

Find the "Odd man out" activity

Phrases

Phonetically similar phrases

Phrases with different intonations

Phrases with identical or different initial, median and final wordings

Phrases with different word-lengths and syntactical complexity

Theme-related phrases

Speech tracking

Ø COMPREHENSION

Interactive situations

- Questions and answers (start with closed-set questions, then to questions based on a previously chosen subject, then to open-set questions)
 - Simple and complex instructions
 - Conversations with and without lip-reading
 - Telephone conversations
- *****

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Bibliography.

Bigand.E & Mc.Adams.1994. Penser les sons.

Chevalier.B. Platel.H. EUCTACHE.F. De Boeck 2006. Le cerveau musicien. Neuropsychologie et psychologie cognitive de la perception musicale.

Dehaene.S & Petit.C. 2009. Parole et musique, aux origines du dialogue humain. éd.O.Jacob.

Delaroche.M.2001.Audiometrie comportementale du très jeune enfant .éd. De Boeck

Demont.E – Lutz M.N. Solal 2007. L'acquisition du langage et ses troubles

Jany Lambert- Jean-Luc Nespolous. Perception auditive et compréhension du langage. Solal 1997.

Lorenzi.C & coll.2007.Rôle des informations d'enveloppe temporelle et de structure temporelle fine dans l'intelligibilité de la parole chez les sujets entendants et malentendants.éd.Les cahiers de l'Audition.vol.20.

Rossi.J.P.De Boeck 2008. Psychologie de la compréhension du langage.

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