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LEARNING AND ATTENTION DISORDERS

AUDITORY PROCESSING DISORDER IN DYSLEXIA REVERSED BY AUDIOVISUAL TRAINING

Auditory processing skills of 23 children with dyslexia and 23 average readers were compared at the Hôpital Edouard Herriot, University of Lyon, France. A categorical perception task that assesses the processing of a phonemic contrast based on voice onset time (VOT), and medial olivocochlear (MOC) function, an inhibitory pathway under central control, were measured. VOT refers to the time between onset of "voice" (laryngeal vibration) and its release from mouth closure. The phonemes /b/ and /p/ are voiced and voiceless cognates, sounds produced using the same motor patterns, only differing in terms of the presence of voicing. The phoneme /b/ is produced with voice and /p/ is produced without voice. Stimuli were taken from a synthetically created natural speech voiced-voiceless continuum ranging from /ba/ (voiced) to /pa/ (voiceless) by step-wise deletion. The percentage /ba/ and /pa/ responses were graphed as a function of VOT. Both parameters and reading skills were measured before and after an audiovisual training program focused on voicing contrast. Dyslexics were mean age 10yr 11m (range, 8yr 4m to 13yr 11m); 11 were male and 12 female. Reading levels were at least 18 months behind chronological age; intelligence quotient was above 80 on the WISC III-R. None had ADHD. Controls had no learning disability. All children were monolingual French speaking with normal hearing. Some children with dyslexia had an altered voicing sensitivity sometimes associated with abnormal MOC functioning and lateralization. Audiovisual training significantly improved reading and shifted the categorical perception curve of some dyslexics toward the normal pattern of voicing sensitivity. Training increased the normal asymmetry of MOC function in favor of the right ear. Training-related improvements in reading score correlated with the greatest changes in MOC lateralization.

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Dyslexic children have an auditory processing disorder, sometimes associated with an altered perception of voicing and MOC dysfunction that may be reversed following audiovisual training. (Veuillet E, Magnan A, Ecalle J, Thai-Van H, Collet L. Auditory processing disorder in children with reading disabilities: effect of audiovisual training. **Brain** November 2007;130:2915-2928). (Respond: Dr Evelyne Veuillet, Hopital Edouard Herriot, Pavilion U Service d'Audiologie et d'Explorations Orofaciales, Place d'Arsonval, 69437 Lyon Cedex 03, France).

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COMMENT. Auditory system processing may be impaired in some dyslexics, and audiovisual training is an effective method of remediation. (Magnan A et al. **Dyslexia** 2004;10:1-10). A sensory temporal processing deficit impairs the ability to relate word sounds and letter sounds and to associate the printed letter (grapheme) with the appropriate speech sound (phoneme). Most dyslexics have deficient phonological awareness and difficulty converting graphemes to phonemes. Researchers at the Univ of Florida, Gainesville, suggest that deficits in motor-articulatory programming or feedback are the basis for developmental dyslexia (Heilman KM et al. **Ann Neurol** 1996;39:407-412) (**Ped Neur Briefs** April 1996). A disconnection syndrome hypothesis is proposed based on PET studies conducted at the MRC Cognitive Development Unit, London, UK (Paulesu E et al. **Brain** 1996;119:143-157). Brain regions normally activated in phonological processing (left inferior frontal lobe, temporo-parietal and subcortical regions) are defective, leading to weak connections between anterior and posterior language areas. Background noise, frequently found in a classroom, aggravates impairment of cortical encoding of phonemes in learning disabled children. (King C et al. **Neurosci Lett** 2002;319:111-115, cited by author). The medial olivocochlear (MOC) system is probably involved in speech intelligibility-in-noise, a system that functions more strongly in musicians and may become more resistant to noise with auditory training. (Hayes EA et al. **Clin Neurophysiol** 2003;114:673-684). A link to some examples of voiced/voiceless cognate words: <http://www.speech-language-therapy.com/tx-voiceless-vs-voiced-2.pdf> These include Paul ball/ pig big/ pat bat/ pin bin/ (from Caroline Brown), provided courtesy of Denise Boggs MS-CCC/SLP, Speech, Language and Swallowing Services, Children's Memorial Hospital, Chicago.

SLEEP EEG IN BOYS WITH ATTENTION DEFICIT DISORDER

Researchers at the University of Montreal, Canada, studied spectral analysis of non-REM sleep (stages 2, 3 and 4) and REM sleep EEG in 6 boys (age 10.3 +/- 1.2) with ADHD compared to 6 healthy controls. None had comorbidities, and none had received methylphenidate for at least 48 hours. Compared to controls, ADHD boys had less slow-wave activity (SWA; 0.75-2.25 Hz) in frontal and parietal regions. The findings point to an impairment of the thalamo-frontocortical loop in ADHD. (Gingras MA, Labrosse M, Chevrier E et al. Spectral analysis of Non-REM and REM sleep EEG in boys with attention-deficit/hyperactivity disorder. Abstracts of presentations at the 4th Annual Joint Meeting of the EEG and Clinical Neuroscience Society (ECNS) and the International Society for Neuroimaging in Psychiatry (ISNIP) in Montreal, Quebec, Canada, September 19-23, 2007.