PEDIATRIC NEUROLOGY BRIEFS
A MONTHLY JOURNAL REVIEW

J. GORDON MILLICHAP, M.D., F.R.C.P., EDITOR

Vol. 17, No. 8 August 2003

LEARNING DISORDERS

MRI BRAIN ACTIVATION DURING INSTRUCTION OF DYSLEXIC CHILDREN

Ten children with dyslexia and 11 normal readers performed tasks of phoneme mapping (assigning sounds to letters) and morpheme mapping (relating suffixed words to their roots) during fMRI scanning, before and after 28 hours of comprehensive reading instruction, in a study of the effects of reading instruction on brain activation in children with dyslexia at University of Washington, Seattle, WA. Performance of dyslexic children improved significantly by the end of the 3-week intervention. On the Word Attack subtest of the Woodcock Reading Mastery Test-R (phoneme mapping), the mean standard score for dyslexics increased from 87.0 to 93.7 ($p=0.03$). On a Comes From task (morpheme mapping), the mean score for dyslexics increased from 70.2 to 74.0 ($p=0.04$). Before treatment and during the initial phoneme mapping task, dyslexics showed less fMRI brain activation than controls in left middle and inferior frontal gyri, right superior frontal gyrus, left temporal, and bilateral parietal regions; during the morpheme mapping scan, activation was significantly reduced in left middle frontal gyrus, right superior parietal, and fusiform/occipital regions. Following instruction, reading scores and brain activation patterns of dyslexics increased, and closely resembled those of controls. The elimination of group differences at follow-up resulted from increased activation in dyslexics and also from decreased activation in controls, presumably due to a practice effect. (Aylward EH, Richards TL, Berninger VW et al. Instructional treatment associated with changes in brain activation in children with dyslexia. Neurology 22 July 2003;61:212-219). (Reprints: Dr Elizabeth Aylward, Department of Radiology, Box 35715, University of Washington, Seattle, WA 98195).

PEDIATRIC NEUROLOGY BRIEFS (ISSN 1043-3155) © 2003 covers selected articles from the world literature and is published monthly. Send subscription requests ($65 US; $68 Canada; $75 airmail outside N America) to **Pediatric Neurology Briefs - J. Gordon Millichap, M.D., F.R.C.P.-Editor,** P.O. Box 11391, Chicago, Illinois, 60611, USA.
The editor is Pediatric Neurologist at Children's Memorial Hospital and Northwestern University Medical School, Chicago, Illinois. PNB is a continuing education service designed to expedite and facilitate review of current scientific information for physicians and other health professionals. Fax: 312-943-0123.

COMMENT. Reading instruction in children with dyslexia is associated with changes in brain activation patterns during specific language processes that resemble those of control normal readers. Previous studies have demonstrated normalization of brain activation patterns in dyslexics during phonological tasks and following successful remedial training (Simos PG et al. Neurology 2002;58:1203-1213). The above study extends this treatment effect to morpheme mapping tasks, and shows that phoneme and morpheme language processes have different brain activation patterns. Treatment of dyslexia increases brain activation in circuits normally involved in processing language function.

Magnetic source imaging (MSI), a combination of MEG and MRI, has been used to study functional neuroanatomy during reading. Dyslexics failed to activate the left visual and receptive language cortical areas during word presentation, but instead, activated the left inferior frontal lobe (Salmelin R et al, 1996). The activation of the left posterior-temporal lobe during reading aloud or silently has been observed in PET studies of normal readers (Price CJ et al, 1994). The most critical area of dysfunction in dyslexic subjects is in the left posterior temporal lobe. A phonological-linguistic basis of dyslexia is most generally accepted (Denckla MB, 1994), and is preferred to the visual system deficit theory (Lehmkuhle S et al, 1993).

VISUOSPATIAL COGNITIVE DEFICITS AND SUBTLE CORTICAL ANOMALIES IN PRETERM ADOLESCENTS

Voxel-based morphometric analysis (VBM) of the MRI scans of a group of adolescents, born preterm with very low birth weights and with deficits in judgment of line orientation, was used to demonstrate anomalies of cortical gray matter in a study at the Institute of Child Health and Great Ormond Street Hospital, London, UK. Subjects were assigned to 2 groups, *deficit* and *no deficit*, 11 in each, based on their scores on the Benton Judgment of Line Orientation test. IQ scores were average in both groups, and Block Design was the only WISC-III subtest showing a significant difference between groups (Deficit group=7.8; No Deficit group=10.4; $p<0.05$). All were neurologically normal and the MRIs showed no consistent abnormalities (thinning of the corpus callosum in 2 of the No Deficit group and 1 of the Deficit group and small hippocampi in 4 of the Deficit group). VBM analysis of scans identified a decrease in gray matter density and increase in white matter density in the ventral extrastriate cortex in children with visuospatial deficits, most prominent in the right hemisphere. These anomalies of cortical architecture were situated close to a temporooccipital area previously implicated in the line orientation task. (Isaacs EB, Edmonds CJ, Chong WK, Lucas A, Gadian DG. Cortical anomalies associated with visuospatial processing deficits. Ann Neurol June 2003;53:768-773). (Respond: Dr Elizabeth B Isaacs, MRC Childhood Nutrition Research Centre, Institute of Child Health, University College London, 30 Guildford Street, London WC1N 1EH, UK).

COMMENT. Children born preterm may have cognitive deficits involving visuospatial processing of line orientation, despite normal neurologic examination and absence of specific abnormalities on conventional MRI. Subtle abnormalities of