COMMENTARY

Left Parietal Lobe Activation to Auditory Mismatch?

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Abstract: The original article to which this Commentary refers was published in the November, 2002 issue of *Human Brain Mapping* (Park H-J, Kwon JS, Youn T, Pae JS, Kim J-J, Kim M-S, Ha K-S (2002): Statistical Parametric Mapping of LORETA Using High-Density EEG and Individual MRI: Application to Mismatch Negativities in Schizophrenia. *Hum Brain Mapp* 17: 168–178). *Hum. Brain Mapp.* 21:44–45, 2004.

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There is a certain need in clinical neuroscience for highly sophisticated methods for the analysis of functional data. The reconstruction of cortical activity as measured by EEG or MEG or the calculation of spatial and temporal coupling of brain activity might be regarded as an example for this need. A problem arises when highly sophisticated methods are applied and results are obtained, contradicting most if not all earlier findings. The reader is even more surprised if these discrepancies seem to be completely ignored. This is obviously the case in the study of Park and colleagues in the November 2002 issue of *Human Brain Mapping*.

Park and colleagues recorded the mismatch negativity (MMN) in 14 schizophrenic (9 male, 5 female) patients by means of high-density EEG and reconstructed the MMN by Low-Resolution Brain Electrical Tomography (LORETA). The authors report on a reduced activity in the left superior temporal gyrus (STG) and left inferior parietal gyrus (IPG) in patients in comparison to healthy controls. However,

neither the patient nor the control subject LORETA data are plausible, for the following reasons:

1. In both groups, an activation in the right STG is not observable, although earlier studies analyzing electric MMN data very consistently and reliably reveal a strong activation of this area [e.g., Frodl-Bauch et al., 1997; Kasai et al., 1999; Waberski et al., 2001]. A left-lateralized response might be expected for verbal stimuli, but not for sinusoidal tone pips [e.g., Alho et al., 1998; Paavilainen et al., 1991; Rinne et al., 1999; Shtyrov et al., 2000], but even for verbal stimuli a right hemispheric MMN response is still clearly observable. Instead of discussing recent EEG and MEG findings, the fMRI study of Wible et al. [2001] is cited who indeed observed a left-hemispheric dominance. The authors ignore the fact that fMRI has a temporal resolution other than EEG and reflects metabolic change, as well as the fact that the procedure to obtain the auditory mismatch response in fMRI was completely different, compared to EEG studies.
2. A MMN activation of the left parietal lobe has never been reported. In this brain region, Park et al. [2002] found the main activation. Park and coworkers ignored further that if studies obtained a right parietal lobe activation, this activation occurred clearly at longer latencies than the temporal lobe generators [Kasai et al., 1999; Levänen et al., 1996].

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To summarize, in the data analysis of Park et al. [2002] brain areas show an activation where no activation is expected and expected activation is not seen. For lack of other explanations one can regard only poor data quality as a reason for these discrepancies, although no averaged or exemplary data are shown in the report. Another very recent paper by the same research group [Youn et al., 2003] on an altered hemispheric asymmetry to auditory mismatch in schizophrenics, including 15 schizophrenic patients (9 men, 6 women) sheds some light on this problem. In this report, a potential map of the MMN is presented, which looks odd (compare to Figure 2 in Rinne et al. [1999], depicting a typical MMN potential distribution with a fronto-central negativity and a phase reversal towards the mastoids). Taking into consideration the similar clinical characteristics of the two patient groups in both studies, one wonders whether this report utilizes the same data set as published in *Human Brain Mapping* with the addition of one female patient. In the study of Youn et al. [2003], the MMN was reconstructed by two dipoles in the STG. Not surprisingly, controls again exhibited a stronger left than right-hemispheric response, while patients had a stronger right hemispheric MMN dipole.

More interestingly, Youn et al [2003] do not care about their finding of a left parietal source revealed by the LORETA analysis; they do not even cite their own recent report. One has to wonder how such a distributed activation as obtained by the LORETA analysis or how such unsystematically distributed potentials can be reconstructed by a two dipole model. However, descriptive data about the goodness-of-fit are not given in Youn et al. [2003]. The studies of Park et al. [2002] and Youn et al. [2003] fit nicely into earlier reports on a disturbed lateralization in schizophrenia, but the way the authors analyzed their data does not inspire much confidence in their findings.

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