THE EFFECT OF SLICE ORIENTATIONS ON AUDITORY fMRI AT THE INFERIOR COLLICULI LEVEL

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Abstract

In spite of a great amount of research dealing with activation of the auditory cortex, little information exists on functional imaging of subcortical auditory pathway [1]. Functional imaging of the brainstem is complicated due to heart beat related motion, blood flow, cerebrospinal fluid movement, tissue deformation and small size of the auditory nuclei. From literature it is reported that the brainstem motion is related to the heart beat in the rostro-caudal and ventro-dorsal directions [2]. The aim of this study is to investigate the effect of the slice orientation on auditory fMRI measurement in the inferior colliculi.

Sparse sampling was used (TR=12 s) to minimize the influence of the echoplanar noise. The stimuli consisted of pink noise modulated in the temporal and spectral domain [3]. BOLD contrast images were acquired at a 3 T MRI system with gradient echo planar imaging, without cardiac gating [2, 3, 4]. Three different slice orientations were used: approximately parallel, at 45 degrees, and orthogonal to the brainstem.

Fourteen healthy volunteers participated for this study. Four data sets were excluded due to excessive head motion. We calculated standard deviation (SD), normalized standard deviation (NSD) of the residuals, effect size, median t-values, signal intensity and number of active voxels to quantify variability in activation between orientations and subjects [5].

T-values are not significantly different for the three orientations. Therefore, their sensitivity is approximately equal. Inter-orientation differences are highlighted in the SD, the NSD and the effect size. The orthogonal slice orientation offers the highest effects size, but also results in the highest SD and NSD. The 45 degrees slice orientation offers the highest spatial accuracy and show the smallest SD and NSD values. We assume that these effects are due to the brainstem motion and less macrovascular artifacts.

Reference

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