Introduction

It has been known for long that the cytoarchitectonic organization of the human visual cortex is associated with functional organization. We here compare retinotopic fMRI mapping and anatomical probability maps derived from post-mortem studies of cytoarchitecture to establish whether or not the two methods lead to converging results. To allow for a comparison, 3D-probability maps for occipital areas V1 and V2 were created from functional data and compared to cytoarchitectonically defined probability maps of V1 and V2.

Methods

- 12 subjects, fMRI and T1-weighted measurement on Siemens Sonata 1.5T-scanner
- standard periodic retinotopic stimuli [1]:
  - preprocessing in spm99 including normalization to ICBM 152 brain
  - calculation of 3D-fieldmaps according to [2]
  - creation of probability maps of areas with positive (V1) and negative (V2) field sign as mean images
  - comparison to anatomical probability maps of BA17 and BA18 from cytoarchitectonic analyses of post-mortem brains [3]
- statistical test using a-priori measure \( \kappa \) [4]:
  \[
  \kappa = 1 - \frac{NE(H1)}{NE(H0)} \]
  with \( NE(H1) \) = number of errors under H1 and \( NE(H0) \) = number of errors under H0, where H1 = ‘a voxel is only in V1 if it is also in BA17’ and H0 = ‘a voxel being in V1 or BA17 is independent’ or equivalently for V2 and BA18
  (\( \kappa = 1 \) means that a brain region can only be in the functionally defined retinotopic area if it is also in the anatomically defined one. \( \kappa = 0 \) means that being in the functionally defined area and the anatomically defined could equally be independent)

Discussion

Comparison of functionally derived probability maps of V1 and V2 with cytoarchitectonically derived anatomical probability maps shows a good spatial agreement. Observed discrepancies are likely to reflect restrictions in the maximum angle of visual stimulation during the functional measurements and inter-subject variability.