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Relationship between Regional Brain Glucose Metabolism and Temperament Factor of Personality

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Purpose: Temperament factor of personality has been considered to have correlation with activity in a specific central monoaminergic system. In an attempt to explore neuronal substrate of biogenetic personality traits, we examined the relationship between regional brain glucose metabolism and temperament factor of personality. **Methods:** Twenty right-handed healthy subjects (age, 24 ± 4 yr; 10 females and 10 males) were studied with FDG PET. Their temperaments were assessed using the Temperament and Character Inventory (TCI), which consisted of four temperament factors (harm avoidance (HA), novelty seeking (NS), reward dependence (RD), persistency) and three personality factors. The relationship between regional glucose metabolism and each temperament score was tested using SPM99 ($P < 0.005$, uncorrected). **Results:** NS score was negatively correlated with glucose metabolism in the frontal areas, insula, and superior temporal gyrus mainly in the right hemisphere. Positive correlation between NS score and glucose metabolism was observed in the left superior temporal gyrus. HA score showed negative correlation with glucose metabolism in the middle and orbitofrontal gyri as well as in the parahippocampal gyrus. RD score was positively correlated with glucose metabolism in the left middle frontal gyrus and negative correlated in the posterior cingulate gyrus and caudate nucleus. **Conclusion:** We identified the relationship between regional brain glucose metabolism and temperamental personality trait. Each temperament factor had a relation with functions of specific brain areas. These results help understand biological background of personality and specific feedback circuits associated with each temperament factor.

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Voxel Based Statistical Analysis Method for microPET Studies to Assess the Cerebral Glucose Metabolism in Cat Deafness Model : Comparison to ROI Based Method

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Purpose: Imaging research on the brain of sensory-deprived cats using small animal PET scanner has gained interest since the abundant information about the sensory system of this animal is available and close examination of the brain is possible due to larger size of its brain than mouse or rat. In this study, we have established the procedures for 3D voxel-based statistical analysis (SPM) of FDG PET image of cat brain, and confirmed using ROI based-method. **Methods:** FDG PET scans of 4 normal and 4 deaf cats were acquired for 30 minutes using microPET R4 scanner. Only the brain cortices were extracted using a masking and threshold method to facilitate spatial normalization. After spatial normalization and smoothing, 3D voxel-wise and ROI based t-test were performed to identify the regions with significant different FDG uptake between the normal and deaf cats. In ROI analysis, 26 ROIs were drawn on both hemispheres, and regional mean pixel value in each ROI was normalized to the global mean of the brain. **Results:** Cat brains were spatially normalized well onto the target brain due to the removal of background activity. When cerebral glucose metabolism of deaf cats were compared to the normal controls after removing the effects of the global count, the glucose metabolism in the auditory cortex, head of caudate nucleus, and thalamus in both hemispheres of the deaf cats was significantly lower than that of the controls ($P<0.01$). No area showed a significantly increased metabolism in the deaf cats even in higher significance level ($P<0.05$). ROI analysis also showed significant reduction of glucose metabolism in the same region. **Conclusion:** This study established and confirmed a method for voxel-based analysis of animal PET data of cat brain, which showed high localization accuracy and specificity and was useful for examining the cerebral glucose metabolism in a cat cortical deafness model.