CAUDNAL NUCLEUS PERFORMANCE FOR ARRANGEMENT CHANGING CONDITION: USING IMAGE PREPROCESSING

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I. INTRODUCTION

Previous fMRI studies have demonstrated preferential involvement of the perirhinal cortex in the tasks of object changes and spatial memeory respectively. Here we investigated caudnal memory waas present when object and spatial discrimination was assessed in the absence of explicit declarative memory demands. The trail in the scanner, participants were present with two arrays of objects with respect to spatial arrangements of objects. It was found that detection of object identity change was associcted with caudnal memory .we suggest that a caudnal activity perform a role of this structure in process beyond declarative memory . significantly greater perirhinal cortex was not perform the object identity during spatial arrangement condition .

Keywords:Perirhinal cortex,caudnate nucleus,fMRI, image preprocessing.

II. BACKGROUND

It is possible that the absence of significantly greater hippocampal activity during the arrangement change trials can be explained by considering the cognitive demands of this task condition. In our previous patient's studies, a high demand on spatial processing was necessary for patients with selective hippocampal damage to exhibit difficulties in visual discrimination tasks that placed a minimal demand on declarative memory. For instance, hippocampal lesion patients were found to be able to discriminate images of three dimensional virtual reality rooms that were presented from the same view point but struggled when these rooms were shown from multiple vantage points. Similarly, the same patients exhibited difficulties differentiating two dimensional scence images when these were blended to create a high level of overlapping features. The present arrangement change condition simply required the subjects to detect the relocation of a single object within a two dimensional plane and thus , it is plausible that this task did not place a sufficient demand on spatial processing to produce significant hippocampal activity in comparison to the object and no change condition.

Activity in the parahippocampal cortex and caudal nucleus has often been observed durig spatial memory tasks,particularly tests that involve object – location associations. The participants were forced to process object,spatial and spatial object bindings on every trail.it produce a greater hippocampal activity during arrangement change condition.
The caudnal nucleus produce a more accuracy and response time for arrangement change condition than hippocampal activity.

III. SPATIAL MNEMONIC PROCESSING

The caudate nucleus integrates spatial information with motor behavior formulation. Selective impairment of spatial working memory in subjects with Parkinson's disease and the knowledge of the disease's impact on the amount of dopamine supplied to the striatum have linked the caudate nucleus to spatial and nonspatial mnemonic processing. Spatially dependent motor preparation has been linked to the caudate nucleus through event-related fMRI analysis techniques. Activity in the caudate nucleus was demonstrated to be greater during tasks featuring spatial and motoric memory demands than those that involved nonspatial tasks.[7] Specifically,

spatial working memory activity has been observed, via fMRI studies of delayed recognition, to be greater in the caudate nucleus when the activity immediately preceded a motor response. These results indicate that the caudate nucleus could be involved in coding a motor response. With this in mind, the caudate nucleus could be involved in the recruitment of the motor system to support working memory performance by the mediation of sensory-motor transformations.

IV. MEMORY

The dorsal-prefrontal cortex subcortical loop involving the caudate nucleus has been linked to deficits in working memory, specifically in patients. Functional imaging has shown activation of this subcortical loop during working memory tasks in primates and healthy human subjects. The caudate may be affiliated with deficits involving working memory from before illness onset as well. A larger caudate nucleus volume has been associated with increased errors on spatial working memory tasks.[15]

The amygdala sends direct projections to the caudate nucleus. Both the amygdala and the caudate nucleus have direct and indirect projections to the hippocampus. The influence of the amygdala on memory processing in the caudate nucleus has been demonstrated with the finding that lesions involving the connections between these two structures “block the memory-enhancing effects of oxotremorine infused into the caudate nucleus". In a study involving rats given water-maze training, the caudate nucleus was discovered to enhance memory of visually cued training after amphetamine was infused post-training into the caudate.

V. PARKINSON'S DISEASE

Parkinson's Disease is likely the most studied basal ganglia disorder. Patients with this progressive neurodegenerative disorder often first experience movement related symptoms (the three most common being tremors at rest, muscular rigidity, and akathisia) which are later combined with various cognitive deficiencies, including dementia.[29] Parkinson's disease depletes dopaminergic neurons in the nigrostriatal tract, a dopamine pathway that is connected to the head of the caudate. As such, many studies have correlated the loss of dopaminergic neurons that send axons to the caudate nucleus and the degree of dementia in Parkinson's patients.[30] And while a relationship has been drawn between the caudate and Parkinson's motor deficiencies, the caudate has also been associated with Parkinson's concomitant cognitive impairments. One review contrasts the performance of patients with Parkinson's and patients that strictly suffered from frontal-lobe damage in the Tower of London test. The differences in performance between the two types of patients (in a test that, in short, requires subjects to select appropriate intermediate goals with a larger goal in mind) draws a link between the caudate and goal-directed action. However, the studies are not conclusive. While the caudate has been associated with executive function (see "Goal-Directed Action"), it remains "entirely unclear whether executive deficits in [Parkinson's patients] reflect pre-dominantly their cortical or subcortical damage.

VI. ROLE OF IMAGE PROCESSING

The patients were asked to identify the object firstly, the identified object preprocessed and located in various array matrix. Commonly, 4X4 matrix has been chosen. The first row first column matrix occupy original image. The patients were asked to identify the object in given matrix .Within 2s various image preprocessing methods such as image mask, image Spatial filter operations are involved to change the original picture and place the modified pictures in various row and column of the given arrays. After the participants were asked to identify arrangement changed picture with respect to arrangement change condition. With respect to spatial memory, activation of the caudate nucleus has been found in the context of navigation tasks involving vitual reality environments and typically has been observed when spatial processing has been kept to a minimum.

In the present study, it is difficult to comprehend how this interpretation can account for the grater caudate activity that was found during the arrangement change condition given that this task was not designed to assess specifically habit formation.

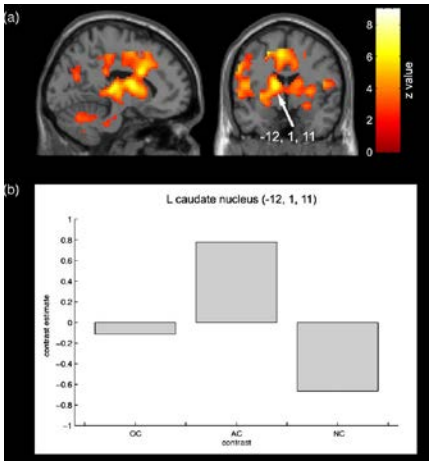

Fig. 1 Significant caudate nucleus activity ($p \leq 0.05$ FDR) during the arrangement change condition, shown on a sagittal and coronal brain template slice (for all 20 subjects prior to BOLD sensitivity analysis, correct trials only).

DISCUSSION AND CONCLUSION

To summarize, the current study has demonstrated perihinal cortex activity during object discrimination task that did not explicitly demand long term declarative memory. It is possible that this finding may reflect incidental declarative memory processes,for example,episodic memory encoding or semantic knowledge retrieval. An alternative interpretation,however,is that the observed perirhinal cortex activitation may support a role for this MTL area in processes beyond declarative memory, such as short-term working memory or even the higher order perception of objects. Significantly greater hippocampal activity was not observed when participants carried out the arrangement change condition. Given our previous findings of spatial discrimination deficits in hippocampal lesion patients, this absence of significant hippocampal activity is surprising and may be explained by the relatively low spatial processing demands of the spatial discrimination task employed.

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