Instituts thématiques

Inserm

Institut national de la santé et de la recherche médicale

Fiche Synthétique

Macaque_Fonctionnel

UNIVERSITÉ TOULOUSE III PAUL SABATIER

Université de Toulouse

Titre de l'étude

Quelles sont les régions du cerveau qui traitent les informations visuelles lors de nos déplacements ?

Auteurs/PI/Institution/Labo

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Contexte/Objectif de l'étude

Etudier les réseaux corticaux impliqués dans le traitement de la locomotion chez le singe et permettre une meilleure connaissance de l'évolution des fonctions cérébrales chez le primate.

Prestation du Plateau Technique

Développement de séquences IRM, installation d'antennes spécifiques,

Séquences :

T1 TFE : 0,4*0,4*0,35

EPI :

Matériel :

- Antenne tiers RapidBiomed
- Eye tracker
- Vidéo-projecteur

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Original Article

ORIGINAL ARTICLE

Processing of Egomotion-Consistent Optic Flow in the Rhesus Macaque Cortex

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Abstract

The cortical network that processes visual cues to self-motion was characterized with functional magnetic resonance imaging in 3 awake behaving macaques. The experimental protocol was similar to previous human studies in which the responses to a single large optic flow patch were contrasted with responses to an array of 9 similar flow patches. This distinguishes cortical regions where neurons respond to flow in their receptive fields regardless of surrounding motion from those that are sensitive to whether the overall image arises from self-motion. In all 3 animals, significant selectivity for egomotion-consistent flow was found in several areas previously associated with optic flow processing, and notably dorsal middle superior temporal area, ventral intra-parietal area, and VPS. It was also seen in areas 7a (Opt), STPm, FEFsem, FEFsac and in a region of the cingulate sulcus that may be homologous with human area CSv. Selectivity for egomotion-compatible flow was never total but was particularly strong in VPS and putative macaque CSv. Direct comparison of results with the equivalent human studies reveals several commonalities but also some differences.

Key words: egomotion, heading, monkey fMRI, optic flow, vision

Introduction

In macaques, numerous regions of the cerebral cortex contain at least some neurons that are selectively responsive to the direction of motion of a moving visual stimulus. These regions have diverse locations including large parts of the occipital cortex, posterior portions of the temporal cortex, the inferior parietal cortex, and even parts of the frontal cortex. Although the most obvious use of sensitivity to image motion is to specify the motion of external objects, it is also valuable for monitoring the animal's own movements. Two cortical regions in particular, the dorsal middle superior temporal area (MSTd) and the ventral intra-parietal area (VIP), are associated with the specialized function of encoding visual cues to self-motion. Both contain many neurons that are selectively sensitive to specific components of the optic flow that occurs during self-motion, including direction of heading during locomotion (Tanaka et al. 1989;

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