HUMAN-LIKE BRAIN SPECIALIZATION IN BABOONS: AN INVO ANATOMICAL MRI STUDY OF LANGUAGE AREA HOMOLOGS IN 96 SUBJECTS

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Language is a unique system of communication in humans and involves complex hemispheric specialization of the brain (Vigneau et al., 2006, 2011). Brain regions such as the motor cortex, Broca's area and the Planum Temporale play key-roles within the language network. Given the phylogenetic proximity between humans and nonhuman primates, the investigation of the cortical organization in apes and monkeys within a comparative approach might enable detecting the potential precursors of hemispheric specialization for language processing. Most comparative studies have focused on great apes, particularly chimpanzees (Hopkins & Cantalupo, 2008). Similarly to humans, leftward asymmetries of the planum temporale (Gannon et al., 1998; Hopkins & Nir, 2010) and rightward asymmetries of the superior temporal sulcus (Leroy et al., 2015) have been documented in chimpanzees, but not in non-hominidae species. The aim of the present study is to investigate the neuroanatomical asymmetries of some of these key-cortical regions for language in an non-hominidae Old World monkey species. T1-weighted anatomical images were acquired *in vivo* in 96 olive baboons (*Papio anubis*) at the Centre IRMf (Institut de Neurosciences de la Timone) from anesthetized baboons housed in social groups at the Station de Primatologie CNRS. The depths of the central sulcus (CS) following the motor cortex and of the superior temporal sulcus (STS) have been quantified in both hemispheres in each subject using semi-automatic procedures from the free software BrainVisa. For the planum temporale (PT), the surface area was manually traced on a computer in both hemispheres (Analyze 11.0 software). We

found, for the first time in a non-hominidae species, human-like significant neuroanatomical asymmetries in favor of the left hemisphere for the PT surface and in favor of the right hemisphere for the STS depth. Interestingly, inter-hemispheric asymmetries of the CS depth were significantly driven by the contralateral direction of hand preference (*i.e.*, left- or right-hand), which were previously assessed in those individuals using a bimanual coordinated task. These collective findings suggest that the continuity of hemispheric specialization between apes and humans extends to baboons for key structures of language and handedness. These findings argue that prerequisites of hemispheric specialization for language and handedness might date back not to the common ancestor of hominidae at 14-17 million years ago but to the common ancestor of Catarrhini at 30-40 million years ago.

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