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ERP MEASUREMENTS AND ULTRASOUND SCANNING FOR INVESTIGATING CHIMPANZEE BRAIN CHARACTERISTICS

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This presentation reports on two studies that revealed the characteristics of chimpanzee brains using noninvasive electroencephalography and ultrasound techniques with voluntary participation by the chimpanzees. The first study measured event-related potentials (ERP) in response to auditory stimuli in a fully awake chimpanzee, with reference to a well-documented component of human studies, namely mismatch negativity (MMN). In response to infrequent, deviant tones that were delivered in a uniform sound stream, a comparable ERP component could be detected as negative deflections in early latencies. This demonstrated an MMN-like component in a chimpanzee for the first time and indicated that chimpanzees and humans share cognitive and neural processing for detecting deviant stimuli. In the second study, ultrasound was applied to awake pregnant chimpanzees, and the biparietal diameter (BPD) of the fetus was measured as an index of brain size development during the prenatal period. The data were compared with existing data on humans and macaque monkeys. No difference was found between chimpanzees and humans in the increase in BPD until a gestational age of about 100 days, after which the speed of BPD growth was slower in chimpanzees than in humans. This deviation from the human BPD growth curve took place later than in macaques, consistent with the phylogenetic relationships among humans, chimpanzees, and macaques. In summary, these two studies demonstrate the utility of ERP measurements and ultrasound for exploring the chimpanzee brain noninvasively.

Keywords: chimpanzee, brain, event-related potential, fetal development