Letter to The Editor: Comparative Cognitive Neuroscience: Non-Human Primate Study in the Understanding of Human appreciation of colours

Mohamed Faiz Mohamed Mustafar

Department of Psychology, Kulliyyah of Islamic Revealed Knowledge and Human Sciences, International Islamic University Malaysia, 50728 Kuala Lumpur, Malaysia

Dear Editor,

I read with interest the article "Coping with Brain Disorders using Neurotechnology by Pedro A Valdes-Sosa" in by Pedro A Valdes-Sosa, published in the *Malaysian Journal of Medical Sciences*, Volume 19, Issue 1, 2012 (1), where the future of neuroinformatics was presented. I would like to highlight the use of primates in cognitive neurosciences, where the aims of cognitive neuroscience research are to improve understanding of normal and pathological functions and to develop therapeutic strategies and tools that eventually will help cure and control disease progression in humans.

Cognitive neurosciences utilise a variety of elegant techniques including electrophysiology, magnetic resonance imaging, neuroinformatics, and computational modelling, and these techniques interact with clinical studies in a transdisciplinary manner. Non-human primates are probably the closest species to humans in terms of physiological, biological, and major neurological characteristics; these similarities provide a reason for utilising the non-human primates in important biomedical studies following the conventional ethics in animal research. The brains of non-human primates are like the human brain; they share similarities in terms of physiological characteristic and functioning. This makes non-human primates—for example, those found in Malaysia such as macaques (*Macaca fascicularis*)—accurate models of neurological as well as psychiatric diseases. Non-human primate models offer a unique contribution in the translation of fundamental research findings into clinical applications and in the development of new treatments for neurological diseases (2).

Basic cognitive neuroscience aims to integrate cellular biology (neuron structure and functions) and experimental therapeutics for psychology, neuroanatomy, neurophysiology, and neuropharmacology researches. The study of primates is also an area of interest in fundamental research that bridges the studies of rodent and human cognitive as well as physiological characteristics. Understanding visually based processes that rely on perception, learning, motor response, and behaviour as well as their relationships with regions of the primate brain is the focus of comparative neuroscientists in the next few years (3,4).

The study of colour visual system has brought the interest of neuroscience and psychology researchers to explore how the colours can improve perception, learning, and memory retention in both human and non-human primates. Studies on how animal visual system reacts to a specific type of colour have revealed interesting findings similar to the visual pattern of interaction in human cognition system. Warm colours such as red or yellow were found to have greater impact on attention, which later lead to better retention of information (5). Besides the type of colour used, a recent research on this area has suggested that the combination of colours and the contrast level are also vital to produce such as an effect (5). A study by Osorio et al. (6) on colour and memory in chicks found better memory accuracy when the chicks were given attentive colour and higher level of contrast stimuli. The colour that was used to train the chicks was likely to be chosen in the test phase; the pattern with higher contrast was found to attract the chicks better than the familiar pattern that was used in training. A comparative study of non-human primate (6) also disclosed the similar pattern of interaction in higher-level vision tasks such as visual recognition. An improvement of 6%–8% as well as impairment in visual recognition were observed in both human and non-human primate when the manipulation of the experimental stimuli was conducted using colour noise (6). Specific area of the non-human primate brain responsible for colour information has been revealed, and it matches the colour area in human brain. The posterior inferior temporal cortex and the region of ventromedial occipital of non-human primate were activated in colour discrimination task (7). Even though comparison is difficult, this finding might correspond to the human brain areas related to the knowledge of colour, which was recently found in the ventral

temporal lobe (7). These studies have shown that the non-human primate system is comparable to that of humans, and its understanding is crucial in order to present an extensive comprehension of the human cognitive system.

These are some of the areas where non-human primate or animal studies can be very useful in neurosciences. Even though it is not easy to make a comparison between human and non-human primate, I believe this approach of using non-human primate models has a huge potential in understanding the complicated functions and disorders of the human brain so that preventive actions can be put in practice.

Correspondence

Mr Mohamed Faiz Mohamed Mustafar
MHS Psychology (IIUM)
Department of Psychology
Kulliyyah of Islamic Revealed Knowledge and Human Sciences
International Islamic University Malaysia
50728 Kuala Lumpur, Malaysia
Tel: +017-900 6876
Fax: +609-767 3833
Email: mfaizmm@gmail.com

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