

TOWARD CROSS-CULTURAL NEUROSCIENCE

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We all agree that brain development, brain aging, and functional organization of the brain are a product of complex interaction between biological and cultural factors, but the exact nature of these interactions is not well understood. Virtually all of our neuroimaging studies (both structural and functional) are conducted in Western or Westernized societies, and we assume that the findings are invariant across humanity. But are they and to what degree? Cross-cultural cognitive research has a long and rich history. It is time to expand this research using the tools of state-of-the-art neuroscience, this laying the foundation for “cross-cultural neuroscience.” In order to pursue this approach comprehensively, one must converge access to subjects from radically different cultural environments with a sophisticated neuroscientific/neuroimaging infrastructure.

The immediate question which triggered my interest in “cross-cultural neuroscience” is this: To what extent is brain maturation preordained and invariant across cultures and environments, and to what extent is it shaped by the latter at least to a degree (and to what degree)? I talk about this in my books *The Executive Brain* (2001) and *The New Executive Brain* (2009) in reference to the frontal pathway myelination, which according to North American studies is not complete until the age of 35yo or even later. But since the frontal lobes are in charge of highest-order decision making, planning, foresight, impulse control and other meta-cognitive functions, this would mean that much of human history was shaped by immature brains, since the kings and emperors of antiquity, middle ages, and even more recent times were often teenagers or in their early twenties – Pharaoh Ramses II, King David, Alexander of Macedon, Louis XIV of France, Peter the Great of Russia, etc. Or is it per chance the case that in environments where people assume “adult” roles and have to make “adult” decisions at an earlier chronological age brain matures along different time trajectories? In my books I write that the only way to ascertain this is by conducting neuroimaging studies in members of drastically different cultures. The basic idea is simple: to compare frontal myelination rates in matched groups of Western and indigenous children/adolescents/young adults, using diffusion tensor imaging (DTI) and/or white matter magnetic resonance (MRI) volumetry methods. Any differences that may arise will then have to be explained – in itself a challenge, since the potential contributing factors are many: cultural, nutritional, viral exposure, etc. But given the increasing homogenization of the planet, such indigenous cultures are rapidly disappearing, they can only be found in the Amazon, Papua New

Guinea and perhaps in a few other locations; and thus such studies would be logistically very challenging.

While the question about the maturation of the frontal lobes is of great relevance to neuroscience, cognitive psychology, education, neurology of development and aging, it opens the door for a much broader inquiry. A broad, systematic approach to “cross-cultural neuroscience” would entail a comprehensive and well-thought-through set of structural (DTI, morphometry), resting (default networks, seeds) and activation (mapping various cognitive domains) MRI studies, and perhaps other modalities as well. The implications of such a systematic approach may be profound on many levels – both fundamental and applied – and potentially full of surprises, possibly upending some of our basic assumptions about the factors shaping brain development, brain aging, and brain function. The approach will be highly innovative. There has been some discussion in the literature about cultural factors in functional brain organization, but to my knowledge nothing systematic or programmatic.

The implementation of such a research program is complicated by the fact that the necessary equipment is not portable and the subjects will have to be brought to the research center(s) in possession of such equipment, with all the attendant procedural and logistic challenges. At a minimum, it would require collaboration with a cutting-edge neuroscience center within reasonable geographic proximity to relatively culturally isolated tribal societies. I can think of only two such juxtapositions: Brazil/Amazon and Australia/New Guinea and surrounding islands.

I am currently in the process of exploring such collaboration with University of Queensland/Queensland Brain Institute located in Brisbane, Australia. The advantage of developing the project in collaboration with UQ/GBI is two-fold: Brisbane is the closest city with a major biomedical research center to New Guinea and other islands of South Pacific (e.g. Solomon Islands); and UQ/QBI has a state-of-the-art neuroscience research infrastructure with excellent resources, both intellectual and technical. Through sheer serendipity, the idea of the project has been brought to the attention of an Australian diplomat stationed in the Solomon Islands who may be a great source of advice, and possibly even assistance, with the access to isolated tribes, as well as with the legalities and logistics of recruiting subjects for the project. A number of colleagues at New York University (which is my own academic base) also find the concept intriguing and promising. Should the process advance to the next step, any formal proposal would be US/Australian collaboration.

I believe that if properly designed and funded, this can be a landmark project with far-reaching implications for fundamental and applied neuroscience, education, social sciences, etc. The terms “cultural neuroscience,” “cross-cultural neuroscience” are just beginning to percolate, but these have yet to coalesce into a coherent discipline, and ours may be an inaugural project launching a new discipline in a coherent and planned way.

I hope that the concept will resonate with The National Geographic Society. Its participation and imprimatur may make all the difference between an armchair fantasy and the launch of a groundbreaking scientific research program. I welcome any further discussion of the concept.