

## Brain Plasticity and Human Adaptation: A Political Perspective for Nepal

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The Nepal Journal of Neuroscience, this academic 'Chautari,' is a success! It is easier to give birth in a high infant mortality setting than it is to continue life through the first year. The editors have survived the hazardous early period.

This issue continues the fine tradition begun earlier this year. The goal of this important journal must be to set the standards for understanding the science behind the nervous system in order to provide the care necessary to produce a healthy and engaged society.

What are the critical aspects of a nervous system that society requires to sustain itself? Nepal has a high maternal mortality ratio. Difficulties with parturition figure prominently here and the challenges include getting the infant's head out of the birth canal. Why does the fetus grow such a big head? Surely we would be better off coming out with a smaller cranium. If a large brain is really needed, then enlarging it more safely after birth would make better sense. Why would evolution's forces have us develop such a large hard sphere *in utero* that makes birthing so difficult? Could there be benefits to beginning life with such a huge gelatinous mass of white and gray matter? Could there be distinct survival advantages for our species?

Our large brain is not a vestige of phylogeny, for Dunbar has demonstrated that size of social groups for brains on two legs is related to the neocortex ratio.<sup>2</sup> We humans require such big cerebrums to survive in the larger societal associations we form. For most of human existence as hunter-gatherers, our maximum group size was on the order of a hundred. The *Raute*, hunter-gatherers who survive in Nepal today, live in smaller associations. Our brains can successfully cope with such numbers. With the erosion of the extended family in Nepal, Nepalese increasingly carve out individual domains linked by technology to groups of hundreds, and even thousands. Our brain has not enlarged to cope with the demands made by myriad people we relate to in a country whose population approaches three *crores*! The pathology expressed by our attempt to cope will be found in the pages of this journal.

The brain is extremely plastic in its first few years of life. Synapses are formed and reformed constantly in response to many factors. Mean synaptic density in the visual cortex increases first, peaking by the end of the first year. This is followed by increased activity in the auditory cortex over the next year or more. Finally in the second through fifth years of life the prefrontal cortex is most active and this focus persists through adolescence.<sup>3</sup>

John Bowlby's studies of attachment on World War II orphans help us understand the important of visual gaze, usually on a mother's face, that allows an infant to venture forth and return to a secure base.<sup>1</sup> In adulthood people who were securely attached as children are comfortable with both intimacy and autonomy. Emerging studies even suggest that they comply better with doctor's health advice.

The auditory cortex is similarly crucial. If the vocabulary to which an infant is exposed comprises mostly cease and desist orders with little stimulating variety, then later school performance is compromised. And for the rest of childhood if our social organ, the prefrontal lobes, is not stimulated in the caring and sharing fashion that was the norm for most of human pre-history, societal strife may result, such as that seen in the major conflicts in Nepal today.

Doing all we can to foster the brain's forming salutary neuronal connections in the first few years of life pays off. It seems unlikely that this process can be relegated to the television, video games, or computer web sites that are becoming a surrogate family in today's urban life. Nor may day care do the job well. In Sweden, the critical role of day care to a child's development is seen to be so important that workers in such a setting are required to have a master's degree in play. A child who socializes well through play, is more likely to play fair as an adult.

Thirty-five years ago in Nepal, infants were always with their mothers, and securely attached. A baby was never allowed to cry. Mothers breast-fed, talked to, and massaged their young children. When they were older, parents helped them contribute to the social and productive life of the extended family. For centuries, visitors to Nepal have remarked about the good-natured, hard working, very social Nepalese people. Headlines today suggest that this core aspect of the Kingdom is changing, especially among urban youth. Nepal's economic changes may produce wealth for a few, but may not help most people as they struggle to compete in the market rather than live off the land. Families will have to work even harder than at present with time constraints requiring leaving child-rearing to TV and computer technology. Some studies suggest that infants exposed to television early in life endure significant handicaps later.

What relevance do these ideas have for Nepali neuroscientist scholars and clinicians? When providing care to families with small children, keep in the forefront of your decisions the importance of maintaining healthy development. Clinicians have the ability to dictate choices and steer patients and families in the direction of spending considerable money, even going into massive debt, to pay for neurosurgical or other care for a loved one. Or they may advocate a more nuanced “watch and wait” approach instead of counseling for aggressive treatment. The savings may be more than monetary if they may allow the family to pursue more life sustaining nurturing that will benefit society in the long term.

This second issue of the Nepal Journal of Neuroscience discusses many interventions that aspire to state-of-the-art clinical care. Often this costly care may have scant demonstrated health benefits although it will increase your own income and status. In such cases, rather than follow the “don’t just stand there, do something” *mantra*, consider “don’t just do something, stand there.” This may not only benefit the family in question, but Nepalese society by allowing families to maintain their traditional child rearing

customs. That the big brain is there for a societal purpose, and its nurturing in the first few years of life is the critical component of health for a country. Geoffrey Rose’s seminal *The Strategy of Preventive Medicine* says it well.<sup>4</sup> “The primary determinants of disease are mainly economic and social, and therefore its remedies must also be economic and social.”

### References

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