"Asymmetry, Lateralization, and Alternating Rhythms of the Human Body"

Part 2: What Does Asymmetry Provide for a Human Being?

From the perspective of asymmetrical brain function, asymmetry has served a huge role in the evolution of human intelligence and motor control. Lateralization and increased specialization of the human brain developed in response to handedness and language evolutionary developmental demands. Human evolution shows a correlation between the origins of the ability to perform pincer, three point, and power grips and the need for a dominant hemisphere controlling these advanced motor skills. Efficient function required being able to master these tasks with one hand under the control of the contralateral cortex. The evolution of language also required brain specialization and efficiency thus resulting in the lateralization of these centers. (Vallortigara & Rogers, 2005)(McManus, 2003)

Not only does cortical asymmetry enable high level cognitive and motor tasks, it is also important from a physical functional perspective in the human body. First, it is the asymmetrical nature of the gastrointestinal tract in addition to peristalsis that enables proper digesta transit. Gut characteristics such as the alternating fixed and free coils serving as sphincters throughout the intestine, its inverted truncated conical shape, and sections composed of progressive luminal thickness are all asymmetrically structurally necessary for efficient transit. (Arun, 2004) Ron Hruska of the Postural Restoration Institute has proposed that the alternating 3 dimensional left and right asymmetrical forces imparted by the thoracic respiratory cavity via walking and efficient diaphragmatic breathing are transferred to the abdominal cavity in a pumping fashion also contributing to a healthy functioning gastrointestinal system. The Postural Restoration Institute also maintains that it is the achievement of obtaining asymmetrical postures that comprise a normal gait pattern. The ability to obtain an asymmetrically positioned body in either the right or left stance of gait corresponds to the ability of the body to propel itself forward via the alternating conversion of potential and kinetic energy. Each left and right maximal position of asymmetry (initial contact/contralateral push-off) corresponds to the highest amount of potential energy while the position of maximal symmetry (midstance) relates to the most kinetic energy. In other words, it is asymmetry that gives the human body the potential to move.

It appears that in some cases decreased amounts of asymmetry in the brain or reversed patterns of typical asymmetrical dominance (example-larger right language center instead of the usual left) are associated with functional deficits. We actually lose asymmetry as we age. The following table describes these associations.

Relationship between dysfunction and brain asymmetry (Zaidi, 2011)	
Anterior Cingulate Region	Larger right experience greater worry, fearfulness, fatigability
Prefrontal cortex	Decreased left anterior paralimbic cortex volume asymmetry associated with increased duration of aggressive behavior
Hippocampus and Amygdala	Lower bilateral volumes associated with schizophrenia, and early identification of Alzheimer's disease. Decreasing hippocampus asymmetry associated with normal aging while increased asymmetry associated with Alzheimer's. Larger right amygdala associated with increased post-traumatic stress syndrome
Temporal Lobe	Schizophrenia associated with reduced asymmetry in certain parts of this area.
Temporal and Parietal Lobes	Decreased blood flow on the left in Autism. Asperger's syndrome associated with a 27% larger right sided language related area of the cortex. Pediatric language disorders also associated with larger right language areas.
ADHD	Associated with smaller right frontal lobe
Autoimmune disorders and developmental language disabilities.	Left handers are more likely to have

Over the past century, the incidence of left handed individuals has increased in the western world. In Canada and the UK the population has measured 12.5% lefty but as one travels east across the globe left handedness becomes less prevalent to 4% in Japan. One explanation is that there are less lefty genes in the eastern parts of the globe compared to west. Another proposed reason is that left handed individuals were not socially accepted in the earlier parts of the 20th century which did not allow as many reproductive opportunities for lefties compared to the righties. Left handedness is not negatively regarded anymore in the modern era and lefties are living with less stress and more procreation chances. Perhaps that is why it has become more common now vs. 100 years ago. (McManus, 2003)

However, it is also worth considering that other environmental factors are significantly different now compared to a century ago in the western world such as dietary habits and the increased prevalence of toxins. The rate of autism has been increasing at an alarming rate over the past few decades which has shown an association with cortical lateralization differences. Protein deficiency has also been linked to decreased cortical asymmetry. (Zaidi, 2011) We are learning that there are significant correlations with gut dysfunction in autistic children as well. (De Theije et al., 2011; Horvath & Perman, 2002) Perhaps there is a relationship between modern nutritional and environmental factors that also correspond to decreased cerebral asymmetry or reversed common cerebral asymmetry patterns described above. Furthermore, it is possible that these environmental variables can create epigenetic changes influencing the asymmetrical cerebral development of future generations thus also explaining the increased prevalence of left handedness in younger generations. Francis Pottenger's research demonstrated how a deficient diet created significant degenerative progressive epigenetic changes among 3 generations of cats to the point of being unable to further reproduce. (Pottenger, 1945)

The importance of asymmetry in a human brings up the question of how it was possible for humans to become asymmetric in the first place. Part 3 of "Asymmetry, Lateralization, and Alternating Rhythms of the Human Body" will provide an answer.

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