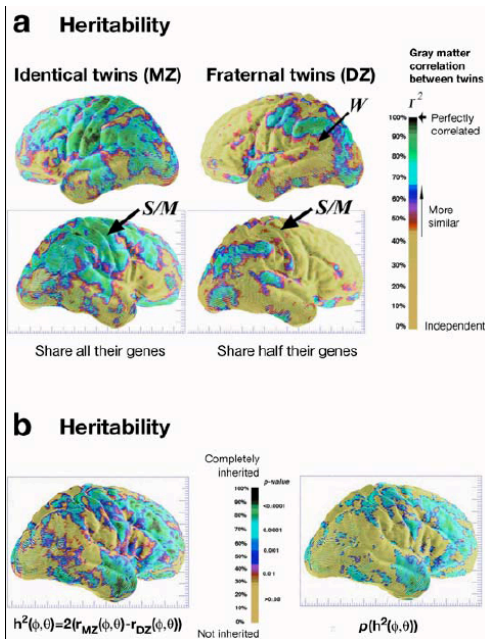


Genetic Influences on Brain Structure and Intelligence

Rebekah Wigton ELE 482 2.12.07

UCLA brain mapping researchers Paul Thompson and Arthur Toga have created the first images to show how an individual's genes can influence their brain structure and intelligence. Their research offers new insight into how parents pass on personality traits and intelligence as well as how brain disease runs in families.

Using MRI technology they scanned a group of 20 identical twins and 20 same-sex fraternal twins. Identical twins share the same genes and fraternal twins share half their genes. From the MRI scans they were able to construct color-coded images which showed which parts of the brain are determined by genetic make-up, and which are more adaptable to environmental factors, like stress and learning.



The results showed that the amount of gray matter in the frontal areas of the brain is determined by the genetic makeup of a person's parents and that it strongly correlates to their IQ.

These images were the first to show how normal genetic differences influence brain structure and intelligence. In the identical twin's brains they found that the regions of the brain controlling language and reading skills (Broca's and Wernicke's areas) as well as the frontal and sensorimotor cortices were almost identical. But siblings showed only 60% of the normal brain differences. Fraternal twins showed significant similarities in the sensorimotor and parietal lobe but not the frontal territories. In behavioral genetics a feature is heritable, passed on from parents through

DNA, when the correlation between the feature is greater in identical twins than it is in fraternal twins. Therefore our brain structure and thus our intelligence, to some degree, is inheritable.

These close similarities in brain structure also help explain why different mental diseases, such as schizophrenia and certain types of dementia, run in the family. Thompson speculates that those areas of the brain that are most similar amongst family members could also be the most vulnerable to mental diseases that run in the family.

Research also shows that there are strong genetic influences on verbal and spatial abilities, reaction times, and some personality qualities, such as emotional reactions to stress.

This study has helped shed light on how much genotype accounts for the wide variations in each person's brain as well as how it affects intelligence.

Environment and nurture also play a role in the development of intelligence. It is not as defining as genetics but it will affect a person's IQ. When identical twins are raised apart from each other their intelligence still correlates at 0.72. When identical twins are raised together and with their parents this number jumps to 0.84. This shows that genetics have a higher impact on intelligence but a positive environment will also have an impact on intelligence. Things like the way and place a person is raised, socioeconomic status, diet and school can all have either a negative or positive impact on IQ. Thus intelligence is not solely dictated by genes.