

Sample term paper on evolutionary explanations for the left-handedness

[Science](#), [Genetics](#)



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Introduction

Handedness can be considered as the use of the hand for better, faster and more precise performance or control in certain tasks. In the concept of handedness, right and left hands are considered, and generally the use of one hand more than the other is considered. However, there are four kinds of people in terms of handedness: right-handed people, left-handed people, mixed-handed people, and ambidextrous. Left-handedness is less frequently found than right-handedness. Researchers have found that left-handedness is fairly more common in men as compared to women (Papadatou-Pastou, Martin, Munafo, & Jones, 2008).

Theories of left-handedness

Several theories have been presented in order to evolutionarily explain the left-handedness. Some of these theories are as follows:

- Postural Origins Theory: According to this theory, handedness developed to enhance the stability of posture and movement.
- Random Mutation Theory: According to this theory, handedness developed as a result of the development of human genes. These genes were developed somewhat later in the development of human beings.
- Carrying Mothers Theory: According to this theory, many mothers in the history carried their babies on the left side resulting in the increased use of left-hands by the people. However, this theory has several inconsistencies and drawbacks.
- Complementary Tasks Theory: This theory can be considered partially evolutionary. According to this theory, handedness has been developed in

order to complement the work of the dominant hand as the two sides of the body are developed to perform different functions.

- Fighting Hypothesis: According to this theory, left-hand gives more help in fighting and combating. This theory also explains the common occurrence of left-handedness in males by telling that male-male fighting is more common that is why left-handedness is common in males.

Scientists have also suggested that evolution of human speech is related to the hand use. In all these theories, genetic theory of handedness is one of the first attempts to explain it.

Genetic Theories of left-handedness

Researchers have found that two right-handed parents rarely produce left-handed offspring, whereas two parents, who are left-handed, produce greatest number of left-handed children, i. e. about 30-40% of left-handed parents produce left-handed offspring. This finding is showing that hand preference moves from parents to children either genetically or through learning (Llaurens, Raymond, & Faurie, 2009).

Researchers have reported that mothers have stronger influence on the preference of hand in offspring. They found that if right-handed men are married to left-handed women, they have more chances of producing left-handed offspring as compared to the couples in which left-handed men are married to right-handed women. However, this could be either due to hereditary effect on the offspring, or from a huge social influence of mother on the life of children. In another research, it has been found that maternal effect is for sons only, not daughters, and paternal effect is for daughters

only, not sons (Llaurens et al., 2009).

Handedness runs in the families but genetic component is not strongly supporting factor in this case, as parents may also transmit a specific environment to their offspring. One way of doing research in this case is to study the families who have adopted the children in the early stages of their life. Researchers have reported that handedness of adopted children are not similar to their adoptive parents, while the handedness of the control group represented a significant correlation with their biological parents (Llaurens et al., 2009).

Another possibility is the study of twins that can help in distinguishing the effect of genetic and environmental factors on the preference of hand. Researchers have found the monozygotic or identical twins were more likely to be concordant for hand preference than dizygotic or non-identical twins (Sicotte, Woods, & Mazziotta, 1999), i. e. even identical twins having 100% same genes don't share handedness. These data showed that genetic contribution is playing some role in handedness, but is not conclusive in genetically transferring handedness.

Although the role of genetics and culture on hand preference is not clear, these findings are clearly showing that there is significant heritability permitting the action of natural selection on this trait.

Right Shift Theory

Right shift theory is considered as one of the most-widely accepted genetic model for hand preference. This theory was proposed by British psychologist Marian Annett in 1972 (Annett, 2013). According to this theory, there is a

hypothetical gene referred to as RS+ gene that produces the motor cortex and speech processing systems in the left side of the brain resulting in the preference of the right side of the body, i. e. “right shift”. On the other hand, hypothetical RS- gene is proposed to be carried by left-handers, but is not involved in “left shift”. This model works on the additive level rather than dominant/recessive model; it shows that the absence of RS+ gene is responsible for the dominant left hemisphere, i. e. left-handedness is dependent on the absence or presence of the gene for right-handedness.

Dextral/Chance Theory

Chris McManus proposed almost the similar genetic theory. According to McManus, there is a “dextral” (D) allele that is in strong favor of right handedness and regulation of speech by the left cerebral hemisphere (McManus, 1991). There is another “chance” (C) allele that is considered as neutral. According to this theory, the DD genotype is responsible for right-handedness, CC genotype results in the random mixture of 50% left-handers and 50% right-handers, and DC genotype is responsible for about 25% left-handers and 75% right-handers. These probabilities are showing that chances of left-handedness in left-handed families are not more than 50%. Moreover, left-handedness is actually the absence of handedness. It is also supposed that the D gene was also responsible for the separation of humans from other apes about 2-3 million years ago. Michael Corballis supported this theory, and proposed that human alleles emerged somewhat later in evolution.

Random Mutation Theory

Michael Corballis supported the genetic theory of handedness by McManus, and evolutionarily considered that the genes that played an important role in handedness are unique to human beings, and these genes are thought to be emerged during the later stages of evolution. This random mutation of genes is thought to be developed during the evolution of Homo sapiens in some countries of Africa, probably 150, 000- 200, 000 years in the past, and then spread throughout the world. He also proposed that speech and gesture are directly related, and our brain lateralization is probably related to asymmetric hand use.

Some adaptive problems of left handedness that may have recurred over many generations

Researchers have found that left-handedness has some link to psychiatric and developmental disorders. Left-handed people have more chances of schizophrenia, dyslexia, attention deficit hyperactivity disorder (ADHD), and some mood disorders that is probably due to brain lateralization. It has been found that nearly 30% of lefties have dominant right hemisphere or distributed pattern of the brain that is probably resulting in brain disorders (Wang, 2011). Researchers have found that problems of schizophrenia and psychosis can be transmitted from parents to offspring (Goldstein, Buka, Seidman, & Tsuang, 2010).

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