IJEAST

INTERNATIONAL JOURNAL
OF ENGINEERING APPLIED SCIENCE
AND TECHNOLOGY

VOLUME : 7 ISSUE : 09 Print / Issue Publication Date: 09-Mar-2023

ISSN : 2455-2143

DOI : 10.33564/IJEAST.2023.v07i09.012

Indexed In

Google SCHOLAR OPEN ACCESS doi Crossref

WWW.IJEAST.COM

editor@ijeast.com

International Journal of Engineering Applied Sciences and Technology, 2022
Vol. 7, Issue 9, ISSN No. 2455-2143, Pages 71-75
Published Online January 2023 in IJEAST (http://www.ijeast.com)

LEFT HANDEDNESS AMONG HUMAN BEINGS: A REVIEW

Ajita Rani
Associate Professor & Head
Department of Psychology
Government Raza Post Graduate College,Rampur, UP

Ravinder Singh
Associate Professor & Head
Department of Medical Anthropology
IHBAS Hospital, Faculty ofMedical Sciences
University of Delhi, Delhi-110095

I. INTRODUCTION

Handedness is the preference to use right or left hand among the human beings. Humanshave shown a preference for the use of the right hand in performing unimanual task for more than 17,000 years which is documented on the basis of the study of historic and prehistoric drawing, painting and sculpture. The lateralised representation in the left cortex of mechanismsfor language mediation and object manipulation are likely to be a consequence of the requirement of the asymmetric employment of the forelimbs in the making and use of tools during the hominid evolution. It is well recorded that tool use by the hominid has been described in the fossil record dating lock to 2.6 million years ago and is probably unique to human evolution (Rani and Singh, 2012).

The stone tool, artefacts, associated with various hominids fossil attest the initial role which these have played in evolution of man. The development of tool use in turn must implyasymmetrical use of the limbs in such a way that the left hand was used to steady the object being manipulated which right hand was used to perform the skilled manipulation. The emergence of right - handedness is therefore closely related to asymmetry of the cortex in turn must be closely related to the need for asymmetrical development and arrangement must follow from a new assumptions of brain organization and evolution. The colateralisation of language mechanisms in present day Homo sapiens to the left hemisphere is therefore held to be a consequence of the coupling of these linguistic mechanisms to the motor mechanisms already lateralised to the left hemisphere at an earlier point in hominid evolution. The evolution of laterality can therefore be accounted for within current concepts of human evolution (Ibid).

Human beings and many other species, including mammals, birds, and amphibia show preference for the left or right hand (Bisazza et al, 1996). In the case of the human beings, thepreference first appears several months before birth and can be recognized on ultrasound scanning (Hepper et al, 1990). Approximately 5-8% of babies are born left-handed and the remaining right-handed. It is not very clear that how these preferences originate and is an interesting area of research. But some studies observed that embryos and the structure of biological molecules such as proteins etc. may be responsible.

Vertebrate embryos are considered to have a symmetrical arrangement when they begin development, so the question could be expanded into how and when embryonic symmetry break and then how preference of hand use originate. The first physical signs of asymmetry in the embryo have been detected at the primitive streak stage - for example, the node region at the future cranial end of the streak in chick embryos is deviated to the left (Cooke, 1995), and in mouse embryos the cilia of cells lining the node beat in an anticlockwise pattern (Vogan andTabin, 1999). Therefore it is proposed that this early asymmetry may be a result of the 'handedness' (chirality) of the molecules that drive the cilia, and result in a cascade of events,which produce asymmetric development of the internal organs. Subtle asymmetries in gene expression have also been detected in early embryos before any morphological differences become apparent: two genes called nodal and lefty are expressed only on the left side of the midline (Beddington, 1996).

Although the human body has a symmetrical appearance when viewed externally, many of the internal organs are arranged asymmetrically. So for example the heart is biased to the left, and the liver to the right, while the right kidney is positioned lower than the left kidney. Occasionally, someone is born in whom all the asymmetries are the other way round, a mirror- image arrangement, which is called situs inversus. This occurs in about 1 in 10,000 people (Galloway, 1990). Complete reversal like this does not necessarily create any additional problems for the person. It is interesting that in conjoined twins who are joined at the thorax orabdomen, one of the twins will show situs inversus

(Ibid). This probably results from cross- signalling between the two primitive streaks in the embryonic disc (Levin et al, 1996). However, if there is only a partial reversal of position, as for example when the heart is biasedto the right (dextro-cardia) and all the other organs are in their usual positions, then clinical problems can arise because of the changed inter-relationships within the body. In mouse embryos, a mutation in the gene called inv causes situs inversus (Mochizuki et al, 1998), and is associated with a reversal of the normal distribution of nodal and lefty. It is becoming clear that the asymmetries of the body are tightly controlled by genes that have been conserved during evolution, and are implemented by cascades of signalling molecules (Ryan et al, 1998).

The preference for a particular hand appears to be linked with an asymmetry in the brainthat controls it. White et al (1994) found that the regions of the cerebral cortex, which control each upper limb, do indeed differ in volume by about 7%. Thus, in right-handed people the left soma to-motor cortex controlling the right upper limb is about 7 % larger than the corresponding cortex of the right side of the brain (motor pathways to the limbs cross the midline), although it is difficult to decide whether this difference is causing the preference or a result of the preferential use of one hand. There is also evidence for a link between hand preference and speech: in most people, the speech centre is located in the left cerebral hemisphere, the same side as the cortex controlling the preferred hand (Rani and Singh, 2012). Thirty percent of left-handed people have their speech centre located in the right hemisphere (only 5% in right- handers). So, internal asymmetries arise early in embryonic development, perhaps triggered by preferred molecular configurations and/or genetic events, and in some way lead to behavioural bias in the use of the upper limbs several months before birth (Singh and Rani,2018; 2003).

1. Body Size and handedness: any correlation?

There is a correlation between handedness and body asymmetries. However, this is more marked and clear cut in right-handers than in left-handers. Many studies have shown asymmetries from one side of the body to the other. Generally the right hand is larger than theleft, regardless of whether the person is right-handed or left handed (Plato, Wood, and Norris, 1980; Neumann, 1992). However, in right-handed people the difference is more marked, and in left-handed people the hands are generally more nearly symmetrical. We note in your case that your left limbs are your preferred limbs and that they are significantly larger than the right,indicating that although generalizations can be made there is still a wide range of possibilities for individual cases. This is often the case for biological systems. It is interesting that one writewith his right hand - perhaps this is a consequence of experience in school where there may have been an expectation for them to learn to write with their right hand. If so, it would be an example of how social pressures can over-ride biological tendencies. Alternatively, it might be because in some case language is lateralised to the left cerebral hemisphere, the same hemisphere that controls the right hand. Asymmetries of the skull are also more marked in right-handers than left-handers (LeMay 1977). So it seems that asymmetries in left-handed people arise by different developmental rules compared with the more marked asymmetries of right-handers (Purves, White, and Andrews, 1994).

Anatomical and functional asymmetries are linked with individual differences in cerebral organization (Kertesz et al, 1992). For right-handed people, the dominant hand is controlled by the left cerebral hemisphere, and for them the volume of cortex involved in controlling the right hand is approximately 7% greater than for the other side (White et al, 1994). The expansion of hand motor cortex in the dominant hemisphere may allow the development of an enhanced repertoire of motor skills for the preferred hand (Volkmann et al,1998).

It is interesting to think about the way that these asymmetries arise. At this stage it is not clear which comes first - the structural asymmetries in brain and limbs giving the potential for preferred use, or the predominant use of a preferred limb followed by changes and enhancements in the regions of the nervous system controlling them. Probably it will turn out to be an iterative process involving both.

2. Handedness: When it appear?

Although many babies begin to show hand preferences before they are born, others takelonger to become either left-handed or right-handed, and a small number of people remain truly ambidextrous throughout their lives. Preferences in hand use are linked with asymmetries in brain organisation, so for example the part of the brain controlling the preferred hand generallyhas a larger volume than the corresponding region on the other side that controls the non- dominant hand. In the human there is also a link between language development and handedness, so it could be that your son's hand preference will become more obvious as his language skills emerge. In right-handed people the dominant right hand is controlled by the left cerebral hemisphere, and language development tends to be localised on the same side of the brain. In left-handed people the picture is less clear-cut: 30% of left-handers have language functions localised in the right hemisphere, which is controlling their preferred left hand, while in the remainder language is either bilateral or left-sided.

McCartney and Hepper (1999) studied arm movements during the middle third of pregnancy. Throughout all periods of observation, 83% of fetuses showed more right-arm than left-arm movements. The number of arm movements observed peaked at 15 to 18 weeks' gestation and then declined rapidly in mid-gestation. The presence of lateralized arm movements in early gestation was suggested

International Journal of Engineering Applied Sciences and Technology, 2022
Vol. 7, Issue 9, ISSN No. 2455-2143, Pages 71-75
Published Online January 2023 in IJEAST (http://www.ijeast.com)

to be a trigger for later asymmetries in the brain, and thought to have a genetic origin (c.f. Rani and Singh, 2012).

Left-handedness occurs in about 8% of the human population. It is more likely in a child if one or both parents are left-handed, and since adopted children do not show similar links this is taken as evidence of a genetic rather than an environmental origin (McManus, 1991). However, environmental factors may influence hand preference: there is some evidence that a difficult birth may delay the establishment of preferential hand use and slightly increase the probability of left-handedness (Liederman and Coryell, 1982).

3. Handedness in Primates

There is an on-going debate about handedness in non-human primates - not everyone is yet convinced that monkeys and apes show hand preferences in the way that humans do. However, a relationship between hand preference and approach-avoidance behaviour in chimpanzees has been reported by Hopkins and Bennett (1994). Right-handed subjects approached and touched novel objects significantly faster than non-right-handed subjects. There was also a gender difference in that males touched the objects significantly faster than did females. The overall results were in line with theoretical models linking hemispheric specialization with the expression of affective behaviors. The same authors also found a genetic component in the expression of hand preferences in chimpanzees (Hopkins, Bales, and Bennett, 1994). In an interesting study by Morris et al (1993), two language-trained chimpanzees exhibited a right-hand preference for precise manual tasks.

4. Dematoglphys indicate Gender Difference

It is observed that higher percentage have more ridges on left hand. In 1994 Canadian researchers have found a link between the number of ridges in fingerprints and male homosexuality and adding to the theory that sexual orientation is determined before birth. The researchers have compared the number of ridges on the fingertips of 66 homosexual men with 182 heterosexual men. Thirty percent of the homosexual men showed more ridges on their left hands than their right, while only 14% of the heterosexual men showed the same pattern. Most men and women have more ridges on their right hands. Fingerprints are completely developed in fetuses by about the 16th week after conception, and are largely genetically determined. This certainly suggests sexual orientation is somehow determined by prenatal events. The fingerprint patterns are not distinctive to gay men or a marker of homosexuality. Most homosexual men show the more typical pattern of more ridges on the right hand. There is a statistically significant difference between groups of heterosexual and homosexual men. The connection between ridges on the fingers and sexual orientation is a multifaceted behavior and it's unlikely that one gene, that one hormone, that one environmental experience--or that one fingerprint--is going to be an explanation for everything (Rani and Singh, 2012; Singh and Rani, 2003).

5. Left-Handedness among Aged

The percentage of left-handed people among those over age 60 is lower than in the rest of the population, there is no indication that left-handedness leads to an early demise. Rather, a complex combination of factors combine so that fewer of the old and oldest old report left- handedness. Some factors involved include pressure to switch hands, more women than men in the older populations, adaptation to a predominantly right-hand world and a rightward trend caused by the aging process. Recent work reports that over 80 percent of left-handers older than 75 remember an attempt to switch hand preference to the right side as compared with a report rate of 24 percent among young adult left-handers. Those over 75 years were children, pressures to change preference from left-handed to right-handed, especially for writing, were strong. Since then, these pressures have lessened greatly. Studies of age difference in the incidence of right and left-hand preference published since 1980. There are two possible sources of confusion related to the exact nature of age-related differences in hand preference.

Relatively few individuals over the age of 60 participated in hand preference research over this 20-year period. The various studies used different methods to define the oldest group and some included children in their studies while others did not. In another recent study the researchers looked at 1,277 elderly people to determine the incidence of left versus right- handedness, if this incidence was age related and the relationship of handedness to life experiences such as efforts to switch left handers to a right-hand preference. The study includedboth older adults -- aged 60 to 74 -- and oldest-old adults -- aged 75 or over. Participants wereasked which hand they used for five actions -- writing, picking up an object, throwing, striking a match and eating with a fork without a knife. These particular activities were chosen to encompass both skilled and unskilled actions -- writing and picking up an object -- and culturally pressured and unpressured behaviors -- writing and throwing.

Overall, study classified 6.9 percent of the individuals as left-handed and 93.1 percent as right handed. At the same time, 10.3 percent reported an attempt to convert a left-handed preference to right handedness, while only 1.8 reported an attempt to shift toward left-handedness. The remaining 87.9 percent indicated no attempt to change hand preference. The study divided the participants into four age groups -- 65 to 69, 70 to 73, 75 to 79, and 80 to 100 -- and looked at individual activities. "Age-related reduction in the incidence of left-hand preference across the 35-year age span

of the participants in this study was found only for the writing hand behavior.

As the age of the subgroups increased, so did the incidence of right-handed writing. For the youngest group (65 to 69), 6.8 percent were left-handed writers, while for the oldest group (80 to 100) only 3 percent were left-handed writers. For the oldest-old group, the numberof left-handed writers was 5 to 6 percent lower than the number of people who indicated a preference for left-handedness in the other three categories. Pressures in the first quarter of the past century to force children to write right handed appear to have had some effect, but they donot totally account for all the discrepancy in the amount of left-handed people in elderly and young populations. Gender differences in the make-up of the oldest old population may have an effect because women predominate in populations of the oldest old.

"The data revealed that women over the age of 73, who had experienced a rightward shift attempt, showed a very low incidence of left-hand writing compared to men. Women are more likely to report being pressured to switch their hand preference and are more frequently among those who have been shifted to the right side successfully. Even accounting for high numbers of women, the numbers of left-handed oldest old is still too low. Biologically related developmental effects shift toward right-sided preference with increasing in age. This is exhibited in a shift toward right footedness as well. One other factor may be that left-handed people shift their hand preference to accommodate pressures of a right-handed world. While more research is needed to account for the existing discrepancy, the researchers believe that the shift to right-handedness is not caused by a propensity for accidents or premature death.

6. Gender Differences in Cognitive Functioning

Several studies have examined differences in cognitive functioning between the genders (Eagly, 1978; Wright, 1975; and Darley & Smith, 1995). Each has presented a different definition of cognitive functioning, which has made comparison between studies difficult. For example, Eagly (1978) cites the ability to be influenced, and the ability to conform as factors of cognitive functioning. In contrast, Wright (1975) makes reference to females' general self confidence, information processing confidence, and topical opinion leader ability as cognitive responses. Additionally, there are several studies which define cognitive functioning as the ability to perform cognitive processing tasks (Burstein, Bank, & Jarvik, 1980; Meyers-Levy, 1989; McGuiness & Pribram, 1979; and Darley & Smith, 1995).

Due to this definitional difficulty it has been argued that no real difference in cognitive functioning exists between the genders (Block, 1976). A stable definition of cognitive functioning needs, therefore, to be established in order to ascertain any differences in cognitive functioning between males and females. In this paper, the definition of cognitive functioning which is used will be "the process whereby the capacity to make accurate categorisations is met with the ability to evaluate outcomes or make accurate decisions" (McGuiness & Pribram,1979).

II. CONCLUSION

We have summarized handedness and gender differences in body size and handedness, handedness- when it appear, handedness in primates, dematoglphys and gender difference, left-handedness among aged, gender differences in cognitive functioning in this paper. Further it supports for gender differences between males and females in cognitive functioning. These differences include the use of heuristic/message cues, spatial abilities, and linguistic skills. The evidence indicates that men use more heuristics, men specialise in spatial ability, and females are superior in linguistic skills. Why these differences occur has been attributed to the cortical organisation of the genders. It was found that males are right hemisphere dependent. In contrast, females are left hemisphere dependent. Each hemisphere is accorded different skills.The final explanation suggests males are more specialised in their hemispherical abilities. Although a comprehensive argument was put forward to the contrary, the majority of literature supports male specialisation. However, further research into the causes of gender differences in cognitive functioning may need to consider other factors. For example, how much influence does an individual's up-bringing and environment have on its cognitive processing? (Rani and Singh, 2012; Singh and Rani, 2018; 2003). We believe that future areas of research could include an examination into the implications of the finding that males are right hemispherical dependent and females are left hemisphere reliant which could indicate the impact on the production of cognitive variation in males and/or females.

III. REFERENCES

[1]. Beddington, R. (1996) Left, right, left... turn. Nature, 381(pp116-117). Bisazza, A., et al (1996) Right-pawedness in toads. Nature, 379, (p408).

[2]. Connor, S. (1991) Odd side-effects of the original fall. The Independent on Sunday, 24 November, (pp86-87).

[3]. Cooke, J. (1995) Vertebrate embryo handedness. Nature, 374, (p681). Galloway, J. (1990) A handles on handedness. Nature, 346, (pp223-224). Hepper, Shahidullah, and White (1990) Nature, 347, (p431).

[4]. Kertesz, A., Polk, M., Black, S.E., and Howell, J. (1992) Anatomical asymmetries and functional laterality. Brain, 115 (Pt 2), (pp589-605).

[5]. Levin, M., Roberts, D.J., Holmes, L.B., and Tabin, C. (1996) Laterality defects in conjoined twins. Nature, 384, (p321).

[6]. LeMay, M. (1977). Asymmetries of the skull and handedness. Phrenology revisited. Journal of Neurological Science, 32(2), (pp243-253).

[7]. Liederman, J., and Coryell, J. (1982) The origin of left hand preference: pathological and non-pathological influences. Neuropsychologia, 20(6), (pp721-725).

[8]. Mochizuki, T., et al (1998) Cloning of inv, a gene that controls left/right asymmetry and kidney development. Nature, 395, (pp177-181).

[9]. McManus, I.C. (1991) The inheritance of left-handedness. Ciba Foundation Symposium, 162, (pp251-267),

[10]. Plato, C.C., Wood, J.L., and Norris, A.H. (1980) Bilateral asymmetry in bone measurements of the hand and lateral hand dominance. American Journal of Physical Anthropology, 52(1), (pp27-31).

[11]. Purves, D., White, L.E., and Andrews, T.J. (1994) Manual asymmetry and handedness.

[12]. Proceedings of the National Academy of Science USA, 91(11), (pp5030-5032).

[13]. Rani, Ajita and Ravinder Singh (2012). Handedness and Gender Differences in Spatial Abilities of University Students. Lambert Academic Publishing, Germany, (pp116).

[14]. Ryan, A.K., et al (1998) Pitx2 determines left-right asymmetry of internal organs invertebrates. Nature, 394, (pp545- 551).

[15]. Singh, Ravinder and Rani, Ajita (2018). Against left handers a Bias that's not right. Deccan Herald, Panorama, 10th October, 2018, Page-11,

[16]. Singh, Ravinder and Rani, Ajita (2003). Handedness and Gender Differences in Spatial Abilities. Anthropologist, 2003, 4(1), ISSN 0972-0073 (pp113-118)

[17]. Vogan, K.J., and Tabin, C.J. (1999) A new spin on handed asymmetry. Nature, 397, 295-298.

[18]. Volkmann, J., Schnitzler, A., Witte, O.W., and Freund, H. (1998) Handedness and asymmetry of hand the National Academy of Science USA, 91(11), (pp5030-5032).

[19]. White, L.E., Lucas, G., Richards, A., and Purves, D. (1994). Cerebral asymmetry and handedness. Nature, 368, (pp197-198).

IJEAST

INTERNATIONAL JOURNAL
OF ENGINEERING APPLIED SCIENCE
AND TECHNOLOGY

ABOUT IJEAST

International Journal of Engineering Applied Science and Technology (IJEAST) is a peer-reviewed, open access journal that publishes high-quality research papers in the field of Engineering, Applied Science and Technology.

IJEAST aims to provide a platform for researchers, academicians, and professionals to share their innovative ideas, research findings, and practical experiences with the global scientific community.

FOCUS AREAS

- Engineering
- Applied Science
- Technology
- Innovation & Development
- Interdisciplinary Studies

PEER REVIEWED
All submissions are rigorously peer reviewed to ensure quality.

OPEN ACCESS
Free and unrestricted access to research for all.

GLOBAL REACH
Connecting researchers and professionals worldwide.

TIMELY PUBLICATION
We ensure a swift and efficient publication process.

For more information, visit our website
www.ijeast.com

INTERNATIONAL JOURNAL
OF ENGINEERING APPLIED SCIENCE
AND TECHNOLOGY

editor@ijeast.com
www.ijeast.com
India

2455-2143