Correlation between Handedness and Intelligence among School Children

Susie Jeyalyn David[1], S. Rajasankar[2]

ABSTRACT

Introduction: Biological or pure priority for using one hand more than other while performing special tasks based on which cerebral hemisphere is dominant for such tasks is called as handedness. Different characters of left handers display inclination to high intelligence which is also supposed to have association with handedness. This study was conducted to find out the correlation between handedness and intelligence among left and right handers in school population.

Materials and methods: A sample of 210 student volunteers were selected from various schools. Edinburgh Handedness Inventory was used as a tool for the assessment of handedness and Raven's Standard Progressive Matrices was opted to assess the level of intelligence.

Results: In the present study, it was concluded that the left-handers are more intelligent than the right handers which was calculated on the basis of raw scores and time of completion in the test for intelligence

Conclusion: The cerebral asymmetry of a left handed individual gives him/her good retention, memory and co-ordination to achieve furtherance academically.

Keywords: Handedness, Left handers, Right handers, Intelligence, Brain asymmetry.

INTRODUCTION

In the cerebral cortex of the forebrain, when viewed from the top is divided into two mirror images which are known as the left and right hemisphere. Lateralization means for one or other cerebral hemisphere, there is often a strong disposition to be dominant in different function or processes.Depending upon the predominance of cerebral hemisphere, in performing special tasks there is a preference for using one side of the body more than other which is called as lateralization.[1,2] Depending upon the dominance of cerebral hemisphere, in performing special tasks there is a preference for using one side of the body more than other which is called as lateralization. In a right hander the left hemisphere is more dominant and left hander use the left hand more than the other when the right hemisphere is more dominant.

According to a survey about 10–12% of the Indian population is left-handed. Handedness is perhaps the most overt reflection of lateralization of the central nervous system in humans.[3] In daily life mono-manual activities the preferred use of hand in 90 percent of the cases is right side which is also a behavioural phenomenon of hand dominance.The hand preference behaviour and hemisphere asymmetries of language were the reflection of grey matter macrostructure in the form of structural hemispheric asymmetries.In the left handed there is a tendency for rightward asymmetry whereas in the right handed is deeper on the left and the MI hand area is hosted in the upper region of central sulcus due to structural asymmetries of the cerebral hemisphere.[4,5] An increased contralateral M1 hand area surface is thus associated with the greater abilities of the preferred hand.

There are variations among the unfavourable suggestions and organisation among various cultures for the use of left hand. Where hygiene was an issue in some places, the dominant right hand was used for eating, social interactions and handling food in an attempt to maintain tidiness. For personal cleanliness the left hand was used after excreting faeces and voiding. No matter which was their dominant hand, on all people these rules have become obligatory. The left hand become the unclean hand because of these practices.[6] Most of the left handed children are forced to write or encouraged to do other activities using their right hands due to pressures in the culture and society. During the development of the left handed children, the conversion to right hand may create multiple problems like dyslexia,[7] stuttering[8] or other learning and speech disorders.[9] Due to cultural pressures or misfortune associated with the left hand most of the children in Asian countries are imposing or supporting their children to become right handed. It is considered socially incorrect to have food with the left hand in countries like India and Indonesia.[10] Due to false beliefs society is not ready to accept that left handed children can give to higher level of intelligence. Studies have indicated that left handers have higher IQ and handedness has some relation with intelligence level. Using left hand is an inauspicious practice in many cultural and orthodox families. Hence, it is difficult to accept that there is a contribution of higher level of intelligence by left handers in the society.[11] However every day left-handed schoolchildren, living in a world dominated by right-handed people, face many challenges and frustration the so called "dextral-stress". Furthermore there are evidences in the history that Intelligence is correlated to laterality of the cognitive skills of the individual. If we confirm scientifically that left handed individual has some relation with intelligence level, they can achieve better.

This study was conducted with an intention of finding the correlation between Intelligence and Handedness in young students, with the hypothesis that left handers are more intelligent than right handed counterparts. There is no documented evidence of such a work or any work similar to this study done in this part of the country.

[1]Ph.D Scholar, (Medical Anatomy), Bharath University, Selaiyur, Chennai, [2]Professor, Department of Anatomy, Velammal Medical College and Hospital, Madurai, Tamilnadu, India

Corresponding author: Dr. Susie Jeyalyn David, Ph.D Scholar, (Medical Anatomy), Bharath University, Selaiyur, Chennai -73, India

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MATERIAL AND METHODS

A sample of 210 student volunteers were selected from various schools in Kanyakumari District for the study. They were selected in such a way that the sample for our study consists of equal number of right handed and left handed volunteers. Systematic random sampling method was adopted to select the sample.

Inclusion criteria

1. Consenting individuals both male and female between 13-18 years.
2. Individuals resident of Kanyakumari District, Tamilnadu.
3. Consenting right handers matching to left handers were rolled in.

Exclusion criteria

1. Individuals having any gross deformity were excluded
2. Individuals who cannot give consent to participate in the study.

The parents of these volunteers were informed about the intended study, its procedures and consent was also obtained from the parents of each volunteer before inclusion in this protocol, which received the approval of the Institutional Human Ethical Committee.

- Edinburgh Handedness Inventory was used as a tool for the assessing handedness[12]
- Raven's Standard Progressive Matrices was opted to assess the level of intelligence[13]

In educational settings typically this nonverbal group test were adopted. For age group ranging from 5 years to the elderly this test were administered which was the most popular and common test. It consisted of 5 sets and each set inturn consisted of 12 questions which was in order of difficulty thus making a total of 60 questions with multiple choice options. It was designed in such a way to measure the General intelligence i.e, the reasoning ability a (meaning-making) component of the Spearman'S of the test-taker.

Demographical sheets were given to obtain the required personal information and also confidentiality was ensured. The objectives and the nature of the present study were briefed. According to the instructions participants were asked to take RSPMT. Test was conducted in 105 separate setting with one left and right hander in each setting, and were asked to choose suitable option in all the sixty questions. During the performance of RSPMT the time taken to complete the test by the students were noted and later analyzed with reference to their handedness.

STATISTICAL ANALYSIS

The continous variables of study subjects were interpreted by Students "t" tests for their significance in terms of arithmetic means. The confirmation and contributions of associations were confirmed Binary logistic regression. The above statistical analysis and interpretations were performed by the statistical package namely IBM statistics-20. The P-Values less than or equal to 0.05 ($P \leq 0.05$) were considered as statistically significant.

RESULTS

The left and right handers were compared in respect of their intelligence and handedness.

The timings of completion between the left and right handers were compared in the above table-1. The mean completion time of left handers was 28.2±7.9 minutes and the right handers was 31.9±7.7 minutes. The difference between the left and right handers was statistically highly significant ($P<0.01$). The time taken by the students during the test (RSPMT) ranged from 16 to 47 minutes.

The components of the raw score and its total were compared between the left and right handers in the table-2. The mean values of set A of left and right handers were 10.7±1.3 and 10.5±1.2 respectively. Statistically significant difference was not seen between these factors ($P>0.05$). With respect to set B, the mean of left handers was 10.4±2.0 and the right handers was 9.4±2.2. The difference was statistically highly significant ($P<0.01$). Regarding the set C, the mean values of both left and right handers were 8.4±2.1 and 7.8±2.1. The difference between them was also statistically significant ($P<0.05$). The mean raw scores of set D of left and right handers were 8.4±2.4 and 7.4±2.5 respectively. The difference between them was statistically highly significant ($P<0.01$). The mean values of set E of left and right handers were 5.2±3.2 and 4.1±3.3 respectively. Statistically significant difference was seen ($P<0.05$). The mean values of total raw scores of both left and right handers were 43.2±9.4 and 39.2±9.1 respectively. The difference between the left and right handers was statistically highly significant ($P<0.01$).

The SPM grading of left and right handers were compared in the table-3. The mean SPM grading of left handers was 14.1±7.0 and the right handers was 11.8±6.0. The difference of SPM grading between them was statistically significant ($P<0.05$).

Handedness	n	Mean	SD	Difference	t	df	Significance
Left	105	28.2	7.9	3.7	3.492	208	P=0.001
Right	105	31.9	7.7				

Table-1: Comparison of Intelligence between the right and left handers in terms of time:

Raw Scores	Left		Right		Difference b/w means	't'	df	Significance
	Mean	SD	Mean	SD				
A	10.7	1.3	10.5	1.2	0.2	1.428	208	P=0.155
B	10.4	2.0	9.4	2.2	1.0	3.476	208	P=0.001
C	8.4	2.1	7.8	2.1	0.7	2.323	208	P=0.021
D	8.4	2.4	7.4	2.5	1.0	2.987	208	P=0.003
E	5.2	3.2	4.1	3.3	1.1	2.292	208	P=0.023
Total	43.2	9.4	39.2	9.1	4.0	3.114	208	P=0.002

Table-2: Comparison between Raw score and its component of the right and left handers

Handedness	n	Mean	SD	Difference	t	df	Significance
Left	105	14.1	7.0	2.3	2.518	208	P=0.013
Right	105	11.8	6.0				

Table-3: Comparison of Intelligence between the right and left handers in terms of RSPMT grading:

Handedness	n	Mean	SD	Difference	t	df	Significance
Left	105	93.1	16.1	5.1	2.424	208	P=0.016
Right	105	88.0	14.6				

Table-4: Comparison of handedness between the right and left handers:

The handedness of left and right handers was compared in the table-4. The mean handedness of left handers was 93.1±16.1 and the right handers were 88.0±14.6. The difference of handedness between them was statistically significant (P<0.05).

DISCUSSION

The left and right handers were not significantly differed in respect of their age, sex, religion and school of studying. They were homogenous groups for comparison.The intelligence was tested between them. The left handers have showed significantly lesser time than the right handers which is similar to the earlier studies.[11,14]

The raw scores at the starting point (A) between the two were not significantly different since it was easier. From the categories B to E, the left handers were significantly greater than their counterparts. Similarly, in the RSPMT and handedness scores also the left handers were significantly greater than their counterparts of right handers which is consistent with the previous studies.[11,14]

From the above results and discussions the research hypothesis has been accepted. “Left handers are more intelligent than the right handed counterparts”

The results of the present study are consistent with earlier work on hundred thousand and twelve participants.[11] In the scholastic aptitude test around 300 participants scored higher who were left handers. Intelligence both verbal and non verbal characters had risk at the cost of rs^{++}genotype.[15] In relevance to right and left handedness, same perceptual tasks were given in a study for split brain patients. Left handed patients matched the same drawing and easily reassigned some blocks and when tried to match the same drawing many errors were made by right-handed participants.[16] The current findings were supported by the perceptual superiority which was indicated in left handers.In the right cerebral hemisphere, blood flow, glucose consumption and level of activity of brain waves increases white performing perceptual task.[17] In the brain left hemisphere is dominant for right handers and right hemisphere is dominant for left handers, which also controls the perceptual functions of the body and a factor for processing the information with a higher speed in left handers.[18] The present study revealed the same by stating the time taken to accomplish the test by right handers were more due to lower perceptual speed. Different researches showed that perceptual speed is enhanced in intelligent people.[19] Highly intelligent people have higher neurological speed as a reflection of the stimulus for perception. In many studies, the brain wanes have registered a simple stimulus faster with creative complexity in intelligent people.[20] The research unveil innovative levels are high for intelligent people. It is viewed that in general, people with high intelligence scores do well on the creativity tests.[18]

Other related studies tend to support the view that intelligence and creativity are not exclusively independent characteristics.[21] Studies have proved that task done by highly intelligent people are with more creative complexity though intelligence and creativity are not dependent on each other always.

CONCLUSION

This study examined handedness and intelligence among among adolescent School students.

From results gathered, it was obvious that left handedness offers an additional advantage over right handedness.

Parents of left-handed children face problem in their bringing up. Usually they keep on suppressing and discriminating them without realizing the impacts it will bring. So this study would be helpful in educating parents, who generally occupy the position of greatest responsibility in child care and development and, therefore, play an important role in the development of their children’s personalities and their lives. It will help them to know that they should support their left-handed children and should try to make things easier for them. Teachers play an important role in creating supportive learning environments for students in school. There is very little information available to teachers about left-handers. The negative attributions to left-handed children can be changed in a positive direction by bringing awareness to teachers. This vital information can help teachers better understand their left-handed students’ problems and hence teach them more effectively.

For the future research a confident step is suggested by the results of the present study in handedness. On the relationship of handedness and intelligence research is needed to be done to a further extent. To generate deep and interesting insight, relationship between handedness and various types of intelligence which had been proposed by modern theories should be focussed.

The cerebral asymmetry of a left handed individual gives him/her good retention, memory and co-ordination to achieve furtherance academically. On this right dominant world, to develop their own identity, a society is also needed for the left-handed people.

REFERENCES

1. Rice, P. F. Human development. 1998; 3rd ed. New Jersey: Prentice Hall.
2. Cardwell, M. Complete A – Z Psychology Handbook. 2003; 3rd ed. London. Hodder and Slottghoton.
3. Vallortigara, G., Chiandetti, C., And Sovrano, V. A. Brain asymmetry (Animal). Wiley Interdisciplinary Reviews:Cognitive Science. 2011;2:146–157.
4. Amunts, K., Schlaug, G., Schleicher, A., Steinmetz, H., Dabringhaus, A., Roland, P.E., Zilles, K. Asymmetry in the

human motor cortex and handedness. Neuroimage. 1996; 4:216–222.
5. Amunts, K., Jancke, L., Mohlberg, H., Steinmetz, H., Zilles, K. Interhemispheric asymmetry of the human motor cortex related to handedness and gender. Neuropsychologia. 2000;38:304–312.
6. Coren, Stanley. Left-Handedness: Behavioral implications and anomalies. Amsterdam: Elsevier Science Publishers 1990; B.V. ISBN 0-444-88438-6.
7. Orton, S.T. Reading, writing, and speech problems in children 1937; London: Chapman and Hall. Isbn 0-89079-179-1.
8. Bryngelson, Bryng; Clark, Thomas B. Left-handedness and stuttering. The Journal of Heredity (American Genetic Association). 1933;24:387–390.
9. Ballard, Pb. Sinistrality and speech. Journal Of Experimental Pediatrics. 1912;1:298–310.
10. Binns, Corey. What makes a lefty: Myths and mysteries persist. March 21, 2006. Live Science.
11. Bower, B. A child's Theory of Mind. Science News. 1993; 177, 40-42
12. Oldfield Rc. The assessment and analysis of handedness: The Edinburgh Inventory. Neuropsychologia. 1971;9:97–113.
13. Raven, J.C Guide to using progressive matrices 1938 London: H.K. Lewis And Co Ltd.
14. Rajeshwari. C. Eligar Correlation of handedness and intelligence in adolescents. International Journal of Medicobiological Research. 2011;1:118-120.
15. Annett, M and Manning, M. Reading and a balanced polymorphism for laterality and ability. British Journal of Child Psychology and Psychiatry. 1990;31:514.
16. Sperry, R.W. Some effects of disconnecting the cerebral hemispheres. Science. 1982;217:1223-1226.
17. Feldman, S. R. Understanding psychology. 2003; Toronto: Mcgraw- Hill Inc.
18. Myers, G. D. Psychology. 2001; 6th ed. New York: Worth Publishers.
19. Richard, B. R. Psychology today. 1991; 7th ed. New York: Mcgraw- Hill.
20. Barlow, H. D. Casebook in abnormal psychology. 2001; 2nd ed. New York: Wadsworth Thomson Learning.
21. Lugo, O. J., and Hershey, L. G. Human Development. 1974; New York: Macmillan Publishing Co. Inc.

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