



IJEAST

INTERNATIONAL JOURNAL
OF ENGINEERING APPLIED SCIENCE
AND TECHNOLOGY



VOLUME : 7 ISSUE : 12 Print / Issue Publication Date: 06-Jun-2023



ISSN : 2455-2143



DOI : 10.33564/IJEAST.2023.v07i12.003

Indexed In



WWW.IJEAST.COM

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HAND PREFERENCE (HP), DISEASES AND TALENT- IS THERE ANY ASSOCIATION?

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Abstract: Paper presents a study conducted on hand preferences (Hp)-right and left handed men and women, to reveal the relationship with their respective talents and health disorders. The four tests were used to determine the relationship between the talents and disorders: i. Mental Rotation Test (MRT), ii. Words and Spelling Test (WST), iii. Health Related Questionnaire (HRQ) and iv. Hand Preference Questionnaire (HPQ). It revealed the extent of talents and frequencies of various neurological & physical disorders among right and left handed male and female subjects. It further shows the left handers revealed no elevated spatial ability and no elevated incidence of learning problems, allergies, psychological, accidents and other diseases. It indicates to some extent a relationship between Hp and sex with talents and disorders. The observation of sex and Hp in spatial and verbal ability do not support for the effect. Males did not report any particular disorders. But there was a complex relationship between Hp and allergic and physical disorders in right and left-hand preferences.

Key Words: Left Handedness, Hand-Preference, Talents and Diseases.

I. INTRODUCTION

Hand preference (Hp) studies have shown the patterns and incidence of left handedness in living human populations groups. The hand preferences (Hp) among infants appears in first two year of post natal life and about half of the infants exhibit it in first two years (Michel, et al 2016). Relationship between Handedness and Mathematics as non-linear and, moderated by gender, age, and type of task were examined in more than 2000 Italian school students. It was observed that handedness does represent a correlate of achievement in mathematics, however the shape of this relationship is more complicated (Sala et al, 2017). A recent meta-analysis of human handedness concludes that evolutionary mechanisms should apply across geographical regions to maintain the roughly 1:10 ratio, while cultural factors, such as pressure against left-hand use, moderate the magnitude of the

prevalence of left-handedness. Although handedness appears as a straightforward trait, there is no universal agreement on how to assess it. Therefore, this analysis urge researchers to report complete study, participant characteristics, detail of process of handedness assessment and declare the raw data as publicly available (Papadatou-Pastou et al, 2020).

Recent research reveals that children with consistent early hand preferences exhibit advanced patterns of cognitive development as compared to children who develop a hand preference later (Michel, et al 2016). Our studies on these aspects, particularly on left handedness and Gender differences in spatial abilities, epilepsy patients, have shown the stigma and cultural belief system embedded in their mind for neuropsychiatric diseases (Singh and Rani, 2003; Singh and Rani, 2004; Rani, 2005; Rani and Singh 2012a, 2012b, 2012c; Rani et al 2014; Singh and Rani, 2018, 2015; Rani and Singh, 2023).

The performance in cognitive tasks or the incidence of specific disorders i.e. reading disability or immune diseases have been well studied and have been compared between right- hander and left hander. A sex difference was observed for handedness, footedness, use of hand in space and relative hand skill, with higher proportions of right preferences and higher degree of lateralization i. e. relative between hands asymmetry in females (Singh, Manjary, Dellatolas, 2001) and relationships among hand preference, ocular dominance, and the degree of ocular shifting were examined (Dane and Gümüstekin, 2002).

On average, lefthanders as a group show a more symmetrical pattern of laterality of functions with estimate of left hemisphere language dominance, typically between 50% and 70%, well below the 95% for right handers (Goodglass and Quadfasel, 1954; Rasmussen and Milner, 1977). Appropriate questionnaires have been developed recently to measure such preference e.g. the Edinburgh handedness inventory (Oldfield, 1971) is one of the most famous and widely used for neuropsychological investigations. It has been estimated that approximately 85%-90% of individuals are right handed, while the



remaining 10% to 15% are left-handed or without hand preference (Porac and Coren, 1981).

Halpern (1986) have studied the life expectancy among lefthanders. Left handedness has been found to be linked to three leading causes of death viz. alcoholism, breast cancer and smoking. Studies have shown that left handed women develop breast cancer earlier than right handed women. Individuals who are left-handed have higher rates of immune thyroid disorders, type-I or insulin-dependent diabetes, ulcerative colitis and regional enteritis (Geschwind and Galabwida, 1986). Left handedness has been examined for the association with various diseases. It has been associated with dyslexia, stuttering, hyper activity, or attention deficit disorder (ADD), autism, schizophrenia, mental retardation, epilepsy, early onset of Alzheimer's, severe pre-maturity, cleft-palate and chromosomal abnormalities (London 1987, Seltzer, Burres and Sherwin, 1984). It has been studied for association with life expectancy, family history of left-handedness, alcoholism, cerebral laterality related to alcoholism, and consideration of birth season with geographic latitude (London, 2016, 1986, 1985, 1987a, 1987b).

Physiological correlates of extreme intellectual, biological correlates and gender differences in precocious mathematical reasoning ability agreed as not illusory, not easily explained (Benbow, 1986, 1987, 1988). Left handed children have been reported as extremely high in mathematical reasoning (Benbow 1986, Benbow and Benbow, 1984; Annett and Kilshaw, 1982, Peterson, 1979, Peters, 1991) and Left-handers are excellent architects (Peterson and Lansky, 1974; Shettel, Neurber and Doreilly 1983). The greater incidence of sinistrality among feeble minded, epileptics, alcoholics, and persons suffering from various types of psychosis has been remarked upon by numerous authors. These studies have shown a relationship of handedness or as such laterality among the humans is directly concerned to almost all areas of personality characters, cognitive abilities, physical attributes and other distinguishable characteristics (Rani, 2005; Rani and Singh, 2012, 2023).

Studies have shown the evidence for and against an association between handedness and allergic disorders. Such as Geschwind and Galaburda (1987) theory of cerebral dominance in relation to auto immune disorder (c.f. Gaschwind and Behan, 1982, 1984) which had led Smith (1987) to examine allergen related immune disorders such as eczema, urticaria (rashes), rhinitis (hay fever) and asthma. Results of study of patients attending an allergy clinic showed that compared with a controlled group matched for age and sex 89% left handed. There was a significantly greater proportion of left handed patients in groups selected on the basis of immunoglobulin E (Ig-E) mediated immune disorder having symptoms of eczema (28.1%), urticaria (36.4%) or rhinitis (15.9%) compared with

the control group there were also proportionally more left handed patients in the Ig-E mediated group of pooled eczema, rhinitis, and asthma sufferers (16.5%) and the group of patients who responded positively to skin tests (17.9%) for one or more allergies (atrophic). There were significantly more left handed females in the patient group than in the female control group but no difference in the males (Smith 1987). Our studies have also reported similar result of mental rotation test and its effect on handedness and gender differences (Singh and Rani, 2003, 2004; Rani, 2005; Rani and Singh, 2012, 2023).

Present Study: Material and Method

It was conducted on right and left handed men and women and what is the relationship with their respective talents and disorder. The following tests were used to determine the relationship between the talents and disorders with following tests: i. Mental Rotation Test (MRT) (Vandenberg and Kuse, 1978), ii. Words and Spelling Test (WST), iii. Health Related Questionnaire (HRQ) and iv. Hand Preference Questionnaire (HPQ)

Problem: To observe the extent of talents and frequencies of various neurological & physical disorders among right and left handed male and female subjects.

Specification: Whether is there any relationship between birth order, age of mother and Hand preference? Is there any relationship between incidence of disorders & hand preference? And, to discuss various disease which are more common among right & left hand men and women?

Hypothesis: Higher birth order is related to left handedness. Higher incidence of behavioral disorders is expected among left hander.

Variable: Independent variables are Sex- male and female and Handedness: right and left handedness whereas the dependent variables are the Score obtained for each subject for health questionnaire & different task of spatial & verbal abilities are the dependent variables.

II. MATERNAL AND METHOD

20 boys and 20 girls were selected between 10 to 30 years for talents and disorder testing. They were further grouped as 10 left hand boys & girls and 10 right handed boys & girls. All subjects have examined for physical, psychological disorder and allergies. But none of them have any known mental & neurological disorder. Following material used- Health questionnaire, Mental Rotation test (for spatial Ability) and Word & Spelling Task (Verbal) and Hand preference questionnaires (to determine right & left handedness). Each subject was given a task at a time and asked to complete the health questionnaire as well as the hand preference questionnaire.



III. PROCEDURE:

- I) Vandenberg Mental Rotation Test: In this subject is required to rotate mentally a three dimensional target shape in order to judge which of four alternatives a rotated version of the target items. The test consists of 20 items. This test was chosen to test the spatial ability of the subject. If the subject correctly identifies the two rotated version of the target items among the distraction alternatives, 2 points were awarded. If one was wrong then subject was awarded as zero, but if one item was correct then subjects were given 1 point. Its score may range from 0 to 40. In the present study the main score was 82.4.
- II) Spelling & Word Test: Each subject was given dictations of 2 words of our 10 fill in the missing words. This test was chosen for testing the Verbal ability of each subject. Each subject could score from 1 to 25 with one point. Each subject could score from 1 to 25 with one point for each word correctly spelled on the spelling test, and zero was awarded for the incorrectly spelled word. The mean score for spelling test was 49.9 in the present study.

- III) Hand preference questionnaire: Each subject was asked to mark him or himself as right hander or left handed for various daily routine task i.e. writing, throwing, cuttings, beating etc. They have to express the handedness whether it is right or left or mixed for the listed task.
- IV) Health questionnaire. Six disordered viz. Learning disorder, Allergies, physical disorder, psychological disorders and accident were mentioned in the health questionnaire. Subjects were given 1 point for each. Learning disorder -3, Allergies-5, physical disorder-13, psychological disorders-3 and Accident-1.

In following we present results for separate disorder with relationship to hand preference.

IV. RESULTS

Figure-1 exhibits mean Vandenberg Mental Rotation(VMR) scores as a function of sex, handedness from 0 to 40. Mean score for right handed males was 23.50, whereas mean score for left handed male observed as 19.90. Mean score for right handed female was 20.80 and mean score for left handed female was 18.20.



Fig-1: Mean Vandenberg Mental Rotation (VMR) scores a function of Sex and Handedness (left handed and right handed)

Table-1 shows the Analysis of variance (Anova) for factors Hand (right-left), and sex (Male, Female) performed on Vandenberg Mental rotation (VMR) scores. As the table

shows that effect of sex and hand was not significant. Interaction effect among sex and handedness was also not significant.



Table –1: Anova of Vandenberg Mental rotation (VMR) score.

Source	SS	df	MS	F	P
Sex	48.400	1	48.400	1.528	0.224
Handedness	96.100	1	96.100	3.033	0.090
2-Way interaction	2.500	1	2.500	0.079	0.078
Residual	1140.60	36	31.683		
Total	1287.600	39	33.015		

Fig.- 2 shows mean spellings scores as a function of sex and handedness varies from 10.60 to 14.50. Further graph shows the mean score for right handed males is 12.10.

Whereas the mean score for right handed female is 14.50 followed 10.60 as the mean score for left handed females.

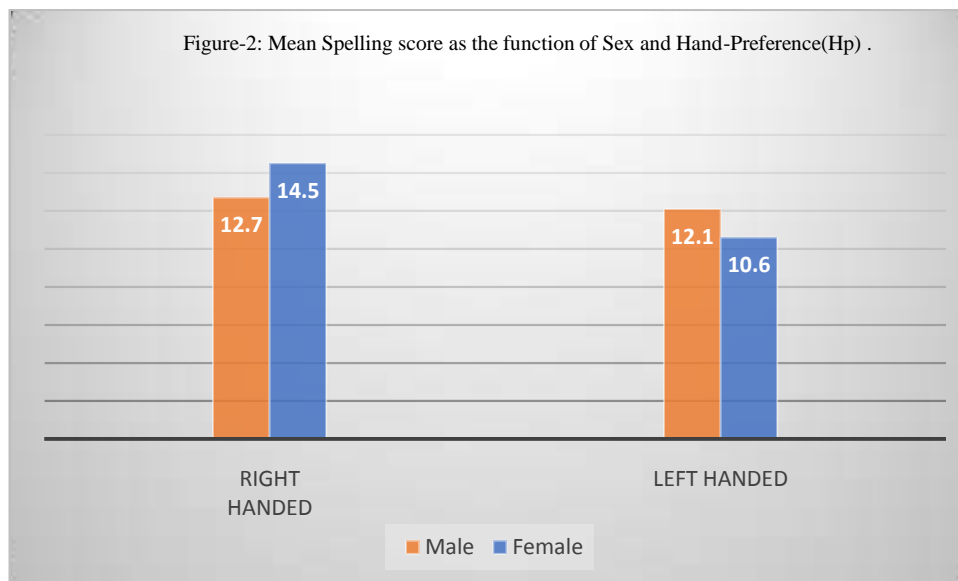


Figure-2: Mean Spellings Scores as a function of Sex and Handedness

Source	SS	DF	MS	F	P
Sex	0.225	1	0.225	0.009	0.926
Handedness	50.625	1	50.625	1.943	0.172
2-Way interaction	27.225	1	27.225	1.045	0.313
Residual	937.900	36	26.051		
Total	1015.975	39			

Table –2: Anova of Spellings Score as a function of Sex and Handedness

Table- 2 shows the Analysis of various for factors hand (right and left) and sex (Male, Female) performed on spellings scores. As the table shows that there is no main effect of sex and hand, and so it is not significant, interaction effect between sex and handedness is also not significant.

Table-3 shows the relationship between composite hand preference score and incidence of physical disorders. Curve

estimation of the relationship shows significant linear and cubic trends, but the curve estimation does not show significant in Quadratic trend. The Graph shows composite hand preference scores and the incidence of the occurrence of various physical disorders.

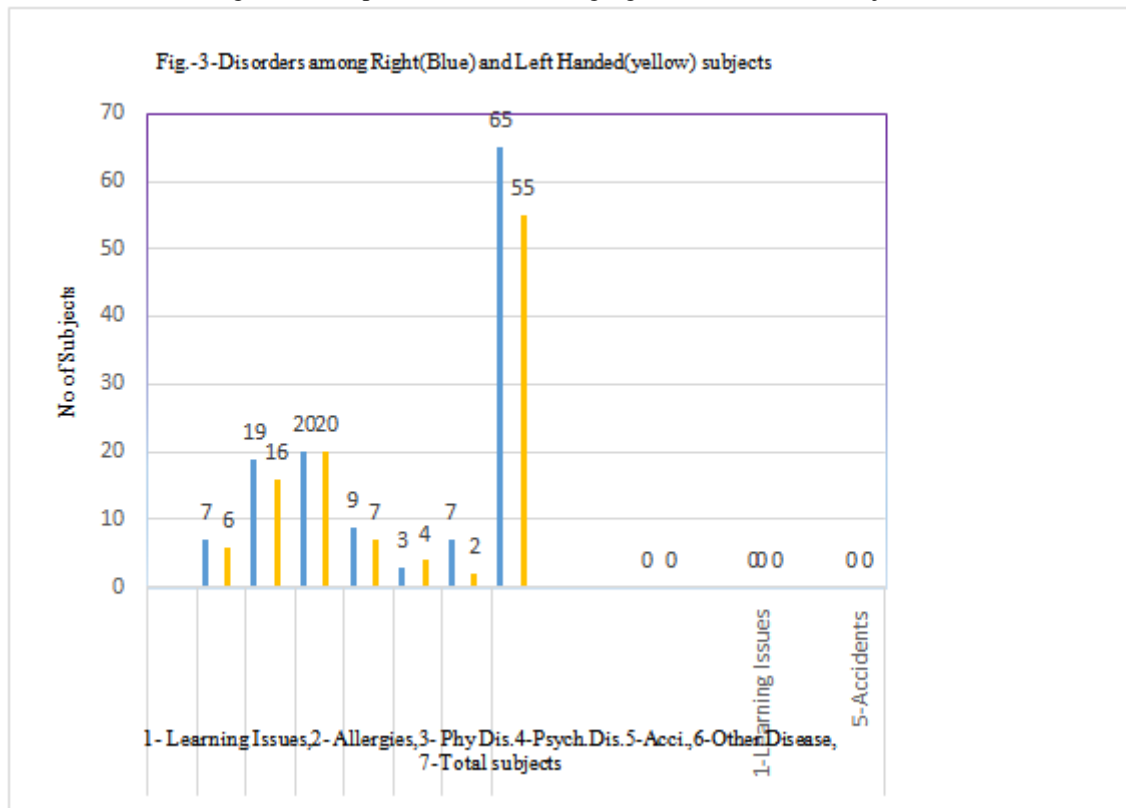
Fig.3 reveals the relationship between composite hand preference score and incidence of allergies. Curve estimation of the relationship shows significant linear,



Quadratic and Cubic trends. The Graph shows complex pattern of relationship between composite hand preference

scores and the incidence of the occurrence of various allergies.

Figure -3: Graph of disorders among right and left handed subjects



Sl. No	Disorders	Hand Preferences(Hp)	
		Right-Handed	Left-Handed
1	Learning problems	7	6
2	Allergies	20	16
3	Physical disorders	19	20
4	Psychological	9	7
5	Accidentals	3	4
6	Other diseases	7	2
7	Total	65	55

Table-3: Incidence of disorders among right and left handed subjects

V. DISCUSSION AND CONCLUSION

The result of present study shows that the left handers revealed no elevated spatial ability and no elevated incidence of learning problems, allergies, psychological, accidental and other diseases, but it had more physical disorder than the right handers. However, they did show

verbal problems. Further, earlier studies have maintained that left-handers will be more likely to develop autoimmune disorders in childhood (e.g. Geschwind and Galaburda, 1987). In present study the left-handers showed neither a tendency towards psychological disorders, learning problems, allergies, accident nor for other disease, but they



had more physical disorders than right-handers. The left-handers made more spelling errors than the right-handers. Their theory predicts that the incidence of spatial gifts, verbal deficits and immune disorders should be even more elevated among left handed males than among left hander as a group, or among males as a group (Ibid). However, in the present study left handed males show neither many spatial skills, verbal deficits, nor a high incidence of learning problems, allergies, physical disorders, psychological, accidental and other diseases.

Present results indicate a relationship, to some extent, between Hp and sex with talents and disorders. Whereas the results of sex and Hp in spatial and verbal ability do not support for the effect. Male did not report any particular disorders. Moreover, a complex relationship seems to exist between Hp and Allergic and physical disorders among the right and left-handers. Further the study could not indicate much difference in talents and disorders among right and left-handers as, we feel, that sample being of a small size which directs to work on a larger sample as well as well design tests further to precise the effect between spatial, verbal and disorders among hand preferences (Hp).

Acknowledgement

We also express the gratitude for the guidance of Dr Maharaj Singh, Professor (Associ), Marquette University, USA, Ex-Reader, Department of Psychology, CCS Uni., Meerut. We are thankful to the all students of main campus of CCS University, Meerut, UP where the second author had primarily collected the data.

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