

HANDEDNESS AND SIDEDNESS IN HUMANS

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ABSTRACT

The present study was carried out in a group of 300 adults to study the correlations between functional lateral preferences-handedness, footedness, eyedness, earedness & preferred chewing side & postural lateral preferences – arm folding, hand clasping, leg crossing & side preference while lying. 90% were right handed & 10% were left handed. Significant association was present between functional lateral preference for right handedness with footedness, eyedness, earedness, preferred chewing side & postural lateral preference- arm folding & hand clasping; for left handedness with footedness, eyedness, hand clasping, leg crossing & side preference while lying. Significant correlation was found between right leg crossing & footedness, eyedness, earedness, hand clasping, arm folding & between left leg crossing with earedness & hand clasping. Right side preference while lying was positively associated with hand clasping & leg crossing.

Significant cross laterality was observed between left handedness earedness, preferred chewing side & arm folding; left arm folding & hand clasping; left leg crossing & footedness, eyedness & arm folding; left side preference while lying & arm folding, hand clasping & leg crossing; right side preference while lying & arm folding.

Keywords: Laterality, Cross laterality

INTRODUCTION

Because of brain organization, expression of lateral preference – the preferential use of one of a pair of bilaterally symmetrical organs – have long been of interest to neurophysiologists & neuropsychologists. There has been overwhelming evidence of Left- Right differences in neuroanatomy and neural processing across vertebrate and even some invertebrate species. How anatomical asymmetry is imposed on a seemingly bilaterally symmetric structure is unknown.[1]

Handedness as it is usually defined as the consistent use of one hand in unimanual task, is most obvious lateral preference, & has been most extensively studied. Handedness also determines the postural preferences.[2]

In most of these studies, the hand used by the individuals in writing has been used as the most reliable index of handedness. There is an argument against such a single criterion approach since writing is a learned behavior on which, teaching the skill can have an influential effect.[3]

Recent advancements utilizing genetic, anatomical and behavioral specializations of the brains of model research animals have refocused attention on the evolution and advantage of brain laterality. Thus research is needed in which a multiple of tasks are chosen as indicators of handedness.

OBJECTIVE

To investigate the association of handedness with other lateral preferences in adults

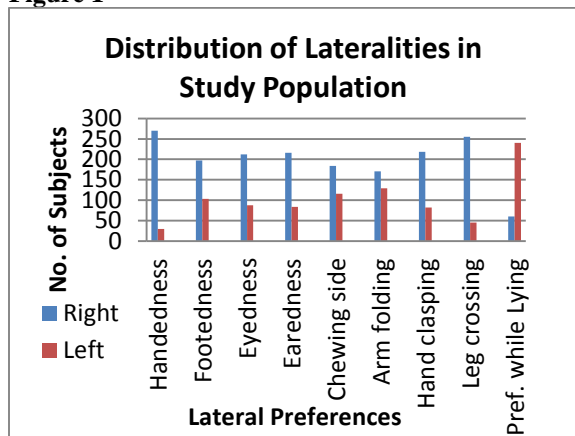
MATERIAL AND METHODS

The present study was carried out in the Department of Physiology, R.D. Gardi Medical College, Ujjain. The study was conducted on MBBS students (Ist IInd and IIIrd Prof), teaching and non-teaching faculty in various departments of the medical college to study the correlation between functional lateral preferences – handedness, footedness, eyedness, earedness & preferred chewing side & postural lateral preferences – arm folding, hand clasping, leg crossing & side preference while lying.

The questionnaire proposed by Old field & Porac was used. [4],[5]. This type of questionnaire is both reliable & valid.[6] An informed consent was obtained from the subjects. The study was approved by the Ethical Committee of R. D. Gardi Medical College, Ujjain.

RESULTS

Figure 1



The present study included 300 adults, out of these 270 (90%) were right handed & 30 (10%) were left handed. Right handedness showed correlation with footedness (72.9%), eyedness (78.5%), earedness (80 %), chewing side (68.1%). Correlation of right handedness with arm folding, hand clasping & leg crossing was – 63.3%, 80.7 % & 94.4%. On the contrary right handedness showed association with left side preference while lying & was 88.8 %.

Left handedness showed preference to left footedness (55%) & eyedness (70%) but there was correlation of left handedness with right earedness & right side chewing preference as 60% for the both. Association of left handedness & right arm folding was 60% & left handedness & left hand clasping 90%, left handedness & left leg crossing 66% & left side preference while lying 65%.

Table 1: Chi Square Test for Association between Handedness and different lateralities

| Parameters | Handedness | | Chi-Square | P |
|------------------------|------------|------|------------|-------|
| | Right | Left | | |
| Footedness | Right | 184 | 7.374** | 0.007 |
| | Left | 86 | | |
| Eyedness | Right | 203 | 26.594** | 0.000 |
| | Left | 67 | | |
| Earedness | Right | 198 | 2.381 | 0.094 |
| | Left | 72 | | |
| Chewingside | Right | 166 | 0.025 | 0.511 |
| | Left | 104 | | |
| Arm folding | Right | 153 | 0.122 | 0.441 |
| | Left | 117 | | |
| Hand clasping | Right | 215 | 65.906** | 0.000 |
| | Left | 55 | | |
| Leg crossing | Right | 235 | 8.787** | 0.006 |
| | Left | 35 | | |
| Preference while lying | Right | 50 | 3.704 | 0.051 |
| | Left | 220 | | |

**significant at 1% level of significance, *significant at 5% level of significance

On applying Chi Square test, the results indicated that there was significant association between handedness and footedness ($p < 0.01$), eyedness ($p < 0.01$), hand clasping ($p < 0.01$) and leg crossing ($p < 0.01$).

There was no significant association between earedness ($p > 0.01$), chewing side ($p > 0.01$), arm folding ($p > 0.01$) and preference while lying ($p > 0.01$).

Table 2: McNemar test for difference of proportions between handedness and different lateralities

| Parameters | Handedness | | P |
|------------------------|------------|------|-------|
| | Right | Left | |
| Footedness | Right | 184 | 0.000 |
| | Left | 86 | |
| Eyedness | Right | 203 | 0.000 |
| | Left | 67 | |
| Earedness | Right | 198 | 0.000 |
| | Left | 72 | |
| Chewingside | Right | 166 | 0.000 |
| | Left | 104 | |
| Arm folding | Right | 153 | 0.000 |
| | Left | 117 | |
| Hand clasping | Right | 215 | 0.000 |
| | Left | 55 | |
| Leg crossing | Right | 235 | 0.000 |
| | Left | 35 | |
| Preference while lying | Right | 50 | 0.000 |
| | Left | 220 | |

On applying McNemar Chi Square test for difference between two paired proportions, there was significant difference between handedness and all the parameters: footedness, eyedness, earedness, chewing side, arm folding, hand clasping, leg crossing and preference while lying ($p < 0.0001$)

DISCUSSION

The purpose of this study is the quantitative evaluation of correlations between functional & postural lateralities. We reported positive correlations between right handedness & right footedness, eyedness, earedness & side chewing preference but Porac et al (5) & Gabbard & Hart (12) found association between right handedness & left footedness & eyedness. Positive association was observed between left handedness & left footedness & eyedness. Cross laterality existed between left handedness & earedness & preferred chewing side.

Right handedness showed positive association with right arm folding but Reiss (13) reported no relation. Strong positive association was present between right handedness & right hand clasping but no association was reported by Reiss (13) Bryden (6) and Neuman et al (14)

In the present study we reported cross laterality between left handedness & arm folding but

Bryden (3) reported positive association. Strong positive correlation was observed between left handedness & hand clasping, contrary to cross laterality.

Positive laterality was seen between left handedness & leg crossing. Strong positive cross laterality was present between left arm folding & hand clasping but McManus et al (4) & Neuman (14) reported lack of association between arm folding & hand clasping.

We reported positive association between right leg crossing & footedness, eyedness earedness hand clasping & arm folding. Cross laterality was reported between left leg crossing & footedness, eyedness & arm folding but association between left leg crossing & left earedness & hand clasping.

In the present study we reported association between left handedness & left side preference while lying but no association between right handedness & side preference while lying

Cross laterality was present between left side preferences while lying & arm folding, hand clasping & leg crossing; right side preference while lying & arm folding but association between right side preference while lying & hand clasping & leg crossing.

CONCLUSION

Observed relationships among lateralities support the hypotheses that earedness, chewing side, arm folding and preference while lying might be aspects of a larger phenotype that is independent of footedness, eyedness, hand clasping and leg crossing. There is confusion in the previous studies about the interassociation of handedness and correlation of various lateralities by chance even if there is no correlation between the lateralities measures.

This study investigated the consistency of right and left handed individuals in preferring the same side for functional lateral preferences – handedness, footedness, eyedness, earedness & preferred chewing side & postural lateral preferences – arm folding, hand clasping, leg crossing & side preference while lying.

The results agree with the hypothesis that the left handed may have reduced rather than reversed asymmetry.

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