

STUDY OF HANDEDNESS AND FACIAL ASYMMETRY IN TEENAGERS.

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ABSTRACT: Aim of this study was to investigate the distribution and frequencies of facial asymmetry, handedness, arm folding, and digital interlocking. It was also intended to study the correlation between the different functional traits. 200 healthy co-operative volunteers between the age group of 13 & 15 years were selected for the study. Subjects with any deformity of upper limbs & those with the history of injury to vii cranial nerve were excluded from the study. Personal data was collected from the subjects, by providing them a questionnaire, in which they also mentioned whether any of the family members was left handed, if so, their relation to the student. Various tests were conducted to determine handedness & the asymmetry in the face, arm folding, & digital interlocking. Data collected was subjected to tabulation & was subjected to statistical analysis & tested for statistical significance. Chi square test was used with paired T test. Male subjects exhibit a highly significant correlation between handedness and digital interlocking ($P<0.01$). Female subjects show a highly significant correlation between handedness and digital interlocking ($P<0.005$). Highly significant correlation exists between digital interlocking and arm folding in both sexes ($P<0.0001$). Both males and females, exhibit a significant correlation between handedness and vertical wrinkling of the forehead ($P<0.05$), as well as functional preference of other groups of facial musculatures i.e. winking ($P<0.05$), and lateral movement of angle of mouth ($P<0.01$). No significant correlation was seen between facial musculature and sex of the individual.

Females showed higher preponderance of left handedness. Significant correlation exists between handedness and the following parameters; digital interlocking, and facial asymmetry.

Key words: Asymmetry, Handedness, Facial asymmetry, Cerebral dominance

INTRODUCTION

Laterality has been studied throughout the last century. Some workers say that it is the parental influence which determines the handedness (Friere-Maia and Friere-Maia1961). Some attribute lateral dominance to habitual practice, environmental factors or chance phenomena. Infants are more frequently left handed, but subsequent educational methods make most of them right handed (Hardyck et al., 1975). It was indicated that these functional characteristics may differ on the basis of sex, age and race (Chris et al., 1984). Handedness, sex and familial handedness, may be related to sight dominance in complex and unexpected way (Berkitt 1979). According to some workers, there is an ipsilateral relation between the facial dominance and handedness (Inaho and Potturi1989) Left handedness and non right handedness is associated with sudden cardiac death (Lane et al 1994) A link between inflammatory bowel diseases and left handedness was also suggested (Morris et al., 2000). Recent studies have shown that handedness is associated with the asymmetry of thyroid size (Michael Ying, Dennis M.C.Yung)

MATERIALS AND METHODS

The total number of subjects included in the study was 200. Healthy and co-operative subjects who were mentally and physically fit were selected. Those with any deformity of the upper and lower limbs and those with the history of injury to facial nerve (vii cranial), were excluded from the study. Finally, 112 male subjects and 88 female subjects between the ages of 13 to 15 years were selected.

The subjects were asked to answer a questionnaire in writing. They answered simple questions like their name, age, sex etc. They were also requested to mention, whether any member in the family is left-handed, and their relation to the subject. The hand used by each student to pick up and answer the questionnaire was noted. Each subject was interviewed and during the conversation, the dominant side of the spontaneous smile was noted. Various tests were conducted to see the functional asymmetry of the face, handedness, arm folding and digital interlocking. Observations were recorded.

A. TESTS FOR FUNCTION OF FACIAL MUSCULATURE

The following tests were conducted to determine the facial muscular dominance.

Vertical wrinkling of the forehead

The subject was requested to vertically wrinkle the forehead and maintain the wrinkled forehead in position. The number of folds and degree of inward pull of the brows were observed and noted. The number of folds on either side of the forehead were counted and recorded. A score of 5 (five) was assigned to side with more degree of inward pull of the brow and score less than 5 (five) to the one with less degree of inward pull of the brow. The side with a higher score was determined as the dominant side of the forehead.

In the next series of exercises in relation to facial function, the subject was first demonstrated what he/she has to do. Later he/she was requested to mimic the exercise 10(ten) times. The subject was asked to do the exercise first on one side continuously for 10(ten) times, and then repeat on the other side, for 10(ten) times. The subject was observed and the side of the face with which he begins to do the exercise was noted. He/she was given rest between exercises for 1 (one) minute, after which the subject was asked to repeat the exercise.

This time, he/she was asked to begin on the side of the face, on which he/she last completed the exercise. At the end of each exercise, the subject was asked as to which side he/she felt comfortable in performing the exercise. The reply was noted. The subject was requested to repeat the exercise after 5(five) minutes of rest. In most of the subjects the first and second results, were same. The subjects with difference in first and second results were asked to repeat the exercises after 30 minutes of rest. After observing them again, an ultimate decision was made. Those, in whom perfect distinction was not seen, were classified as “Ambilateral”. The various other exercises were:

- 2- Winking,
- 3- Lateral movement of angle of mouth,
- 4- Raising and everting the upper lip with dilatation of nostrils and
- 5- Contraction of platysma

All the exercises were tested alternately on both sides. Care was taken to see that the movements were fine and regular during rapid performance. Squeezing, twisting and extortions were avoided. The judgement of dominant side of the face was based on the performance with convenience and uniform rapidity of movements. Equal performances on both sides of face, after repeated testing, were recorded as “Ambilateral”. Inability of the subjects to perform certain exercises was considered as a failure.

B. TESTS FOR HANDEDNESS

The following tests were conducted to see the functional dominance of hands.

- a) Picking up the pins and pinning them on the cushion,
- b) Cutting the paper with scissors,
- c) Hammering on a nail,
- d) Handwriting,
- e) Personal impression of one's own handedness.

The pins, cushions, paper, scissors, hammer and nails etc. were placed on the table. They were placed in a neutral position, so as to not favour any particular hand to pick up the things. The hand used by the subject to pick up the things and the way they were held in each hand was noted down. The subjects were asked to perform each exercise using both hands separately. The movement of the non-dominant side would include clumsy handwriting and the subject would take longer time to write. The subject was not comfortable while using the non-dominant hand for pinning the cushion, hammering on a nail and other exercises. A score of one (1) was assigned to each of the exercise. The maximum score obtained by a particular hand was designated as the dominant one. Armfolding and Digital interlocking were demonstrated to the subject, which he/she performed. The arm or digit which was on top was considered as the dominant one.

OBSERVATIONS AND RESULTS

TABLE 1: Frequencies of Male subjects with distribution of lateral dominance for each of the parameters studied.

	Functions	No. Tested	No.RD	%RD	No.LD	%LD	No.AL	%AL
1	Vertical wrinkling of forehead	112	52	46.42	1	0.9	59	52.68
2	Winking	112	79	70.54	7	6.25	26	23.21
3	Lateral movement of angle of mouth	112	86	76.78	1	0.9	18	16.1
4	Raising and everting the upperlip with dilatation of nostrils.	112	30	26.27	-	-	56	50
5	Platysma contraction	112	8	7.14	-	-	79	70.5
6	Handedness	112	108	96.45	4	3.55	-	-
7	Arm folding	112	85	75.90	27	24.10	-	-
8	Digital interlocking	112	98	87.50	14	12.50	-	-

TABLE 2: Frequencies of Female subjects with distribution of lateral dominance For each of the parameters studied.

	Function	No. Tested	No.RD	%RD	No.LD	%LD	No.AL	%AL
1	Vertical wrinkling of forehead	88	27	30.68	3	3.40	56	62.5
2	Winking	88	62	70.45	13	14.77	9	11.36
3	Lateral movement of angle of mouth	88	72	81.81	3	3.40	8	10.22
4	Raising and everting the upper lip with dilatation of nostrils.	88	13	14.77	1	1.13	42	48.86
5	Platysma contraction	88	6	6.81	1	1.13	51	57.95
6	Handedness	88	83	94.30	5	5.70	-	-
7	Arm folding	88	62	69.30	27	30.70	-	-
8	Digital interlocking	88	71	80.70	17	19.30	-	-

TABLE 3: Correlation between the handedness and facial exercises

Exercise	Handedness		Facial Dominance					
			Right		Left		Ambilateral	
			No	%	No	%	No	%
1 Vertical wrinkling of forehead	RD	191	76	39.79	1	0.52	111	58.11
	LD	9	3	33.33	4	44.44	1	11.11
2 Winking	RD	191	139	72.773	13	6.80	33	17.27
	LD	9	3	3.33	5	55.55	1	11.11
3 Lateral movement of angle of mouth	RD	191	156	81.672	2	1.04	22	11.51
	LD	9	2	2.22	2	22.22	2	22.22
4 Raising and everting the upper lip with dilatation of nostrils.	RD	191	43	22.51	0	0	91	47.64
	LD	9	0	0	1	11.11	7	77.77
5 Platysma contraction	RD	191	14	7.32	0	0	123	64.39
	LD	9	0	0	1	11.11	7	77.77

A person who was right faced had 96.2% of chance of being right handed. A right handed person had 98.7% chance of being right faced. A left handed person had 57.14% chance of being left faced. A person who was left faced had 20% chances of being right handed. Significant correlation existed between the handedness and vertical wrinkling of the forehead $P < 0.05$. There was significant correlation between the sidedness of the hand and winking exercise in both sexes $P < 0.05$. Significant correlation was seen between handedness and lateral movement of angle of mouth $P < 0.01$. In contrast, exercises for the lower part of the face i.e. Raising and everting the upper lip with dilatation of nostrils and Platysma contraction, had no significant relation with handedness $P > 0.05$.

TABLE 4: Comparison of Handedness and its paired distribution with the other variables studied.

		Males				Females			
		RD	%	LD	%	RD	%	LD	%
Digital interlocking	RD	97	86.7	1	0.8	70	79.5	1	1.2
	LD	11	9.9	3	2.6	13	14.8	4	4.5
Arm folding	RD	83	74.1	2	1.8	59	67.0	3	3.5
	LD	25	22.3	2	1.8	24	27.3	2	2.3

These two parameters showed a highly significant correlation in both the sexes $P < 0.0001$. However no significant correlation was seen between handedness and Arm folding in both the sexes $P > 0.1$. Both males and females showed a highly significant correlation between handedness and digital interlocking $P < 0.01$ & $P < 0.005$ respectively.

TABLE 5: Comparison of Digital interlocking and its paired distribution with other variables studied

		Males				Females			
		RD	%	LD	%	RD	%	LD	%
Hand	RD	97	86.6	1	0.9	70	79.5	1	1.1
	LD	11	9.8	3	2.7	13	14.8	4	3.6
Arm folding	RD	81	72.4	4	3.5	55	62.5	5	5.7
	LD	17	15.2	10	8.9	16	18.2	12	13.6

TABLE 6: Comparison of Arm folding and its paired distribution with other variables.

	Males				Females				
		RD	%	LD	%	RD	%	LD	%
Hand	RD	83	74.1	25	22.3	59	67	24	27.3
	LD	2	1.8	2	1.8	3	3.4	2	2.3
Digital interlocking	RD	81	72.3	17	15.2	55	62.5	16	18.2
	LD	4	3.6	10	8.9	5	5.7	12	13.6

CONCLUSION

Male subjects exhibit a highly significant correlation between handedness and digital interlocking ($P < 0.01$)

Female subjects show a highly significant correlation between handedness and digital interlocking ($P < 0.005$)

Highly significant correlation exists between digital interlocking and arm folding in both sexes ($P < 0.0001$).

Both males and females, exhibit a significant correlation between handedness and vertical wrinkling of the forehead ($P < 0.05$), as well as functional preference of other groups of facial musculatures i.e. winking ($P < 0.05$), and lateral movement of angle of mouth ($P < 0.01$).

No significant correlation was seen between facial musculature and sex of the individual.

Females showed higher preponderance of left handedness. Significant correlation exists between handedness and the following parameters namely; digital interlocking, vertical wrinkling of the forehead, winking and lateral movement of the angle of the mouth.

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