

## Correlation of Handedness with Hand Length in Right Hander and Left Hander Medical Students in Bangladesh

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### Abstract

A cross-sectional, analytical type study was performed in the Department of Anatomy, Dhaka Medical College, Bangladesh, from July 2016 to June 2017, to analyze the differences between right and left hand length and its correlation with handedness score in right hander and left hander medical students of Bangladesh. A total of 178 (52 right hander male, 52 left hander female, 40 left hander male and 34 left hander female) medical students participated in this study. Sample collection was done by convenient purposive sampling technique. History of any injury of upper limb was excluded to construct standard measurement. Handedness of each medical student was determined by the Edinburgh handedness inventory. Hand length was measured with the help of vernier calipers. Significant difference was observed between right and left hand lengths of the right hander ( $181.58 \pm 9.51$  mm vs.  $183.67 \pm 9.21$  mm;  $P < 0.001$ ) as well as left hander male medical students ( $182.78 \pm 8.10$  mm vs.  $181.45 \pm 8.96$  mm;  $P < 0.05$ ). Similarly, significant difference was observed between right and left hand lengths of the right hander ( $165.71 \pm 8.37$  mm vs.  $167.77 \pm 8.14$  mm;  $P < 0.001$ ) as well as left hander female medical students ( $168.82 \pm 6.66$  mm vs.  $167.35 \pm 6.54$  mm;  $P < 0.001$ ). However, handedness score showed non-significant negative correlation with right hand length ( $r = -0.178$ ,  $P > 0.05$ ) and left hand length ( $r = -0.192$ ,  $P > 0.05$ ) in right hander male. Similarly, in right hander female, non-significant negative correlation was found with right hand length ( $r = -0.034$ ,  $P > 0.05$ ) and left hand length ( $r = -0.025$ ,  $P > 0.05$ ). In left hander male, non-significant positive correlation was found with right hand length ( $r = +0.067$ ,  $P > 0.05$ ) and left hand length ( $r = +0.107$ ,  $P > 0.05$ ). In left hander female, non-significant positive correlation was found with right hand length ( $r = +0.234$ ,  $P > 0.05$ ) and left hand length ( $r = +0.169$ ,  $P > 0.05$ ).

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### Introduction

Hand preference is perhaps the most blatant behavioral asymmetry observed in human and is manifested by the preferential use of one limb more than the other for manual activities. Although hand preference is often used to subtype individuals into groups to investigate lateralized behaviors, our understanding remains limited with respect to the critical neural systems that mediate hand preference and the specific behavioral measures that discriminate right and left handers.<sup>1</sup> Handedness, in most individual is controlled by dominant hemisphere.<sup>2</sup> The hand used by the individuals in writing has been used as the most reliable index of handedness. Writing is a learned behavior on which, skill have an influential effect.<sup>3</sup> Handedness has been measured by questionnaires developed by several authors. Among them Edinburgh handedness inventory is most recognized. There are several

version of Edinburgh Handedness Inventory based on 4 items, 7 items and 10 items questionnaire. The 4-items inventory measures a single handedness factor and has a brief and simple instructions and a small number of items.<sup>4</sup> Most of the surgical instruments and apparatuses are designed for right hander medical personnel. There is a growing perception that the left handed (LH) medical students are facing difficulties while performing the clinical tasks that

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involve psychomotor skill, although the evidence is very limited and diverse.<sup>5</sup> The significant difference is present between right and left hand of male and female, between left hander and right hander and these differences has some impact on ergonomic field. So the study was done to find out if there is any correlation present between handedness and hand length of right hander and left hander medical college students of Bangladesh.

## Methods

This cross-sectional, analytical of study was conducted in Department of Anatomy of Dhaka Medical College, Dhaka, Bangladesh, from July 2016 to June 2017. A total of 178 (52 right hander male, 52 left hander female, 40 left hander male and 34 left hander female) medical students participated in this study. Sample collection was done by convenient purposive sampling technique. They were selected from different government (Dhaka Medical College, Sir Salimullah Medical College, Mymensingh Medical College, Shaheed Taj Uddin Ahmad Medical College) and non-government (Popular Medical College, Dhaka Central International Medical College, Tairunnesa Memorial Medical College and City Medical College) medical colleges of Bangladesh. Their ages were confirmed by the national ID cards (aged between 20 and 25 years). The heights of male and female medical students were between 162 cm (5 feet 6 inch) and 172cm (5 feet 9 inch) and between 142 cm (4 feet 9 inch) and 167 cm (5 feet 7 inch) respectively. Prior to this, permission from the head of the respective medical colleges was taken to carry out the study procedure. Handedness of each medical college student was determined by “*Edinburgh Handedness Inventory – Short Form*”.<sup>4</sup> The participant of this study was asked to indicate their preferences in the use of hands in the following

activities/ holding items:

Activities/ holding items	Always right	Usually right	Both equally	Usually left	Always left
Writing					
Throwing					
Toothbrush					
Spoon					

For each item there is a score. Always right = 100; usually right = 50; both equally = 0; usually left = –50; Always left = –100. For each activities/holding objects participants was given score. Then the score for the above four items were added. To obtain handedness score the sum of the score was divided by four. Then the handedness of participant was determined according to the following scores: If any participant got score between –100 to –61, then he or she was considered as left-hander; if any participant got score between –60 to 60, then he or she was considered as mixed-hander, whereas any participant got score between 61 to 100, then he or she was considered as right-hander.

For measurement of hand length, the subject was requested to put his or her palm extended and facing up with digits in extended and adducted position.



**Fig. 1:** Photograph showing the measurement of hand length (right hand).

Hand length was measured from the midpoint of the distal transverse wrist crease to the midpoint of the tip of the middle finger along the long axis of the hand.<sup>6</sup> The length was measured in mm, using vernier caliper. Fixed jaw of the caliper was placed on the midpoint of the distal transverse wrist crease and the sliding jaw of the caliper was placed on the midpoint of the tip of the middle finger. This reading was recorded as hand length.

Data was collected, scrutinized and compiled. All statistical analyses were performed using Statistical Package for Social Sciences (SPSS) version 23.0 for windows. Continuous variables were presented as mean $\pm$ SD for normally distributed data. Comparison was done using Paired Student's 't' test. P value <0.05 was considered statistically significant.

The study was approved by the Ethical Review Committee (ERC) of Dhaka Medical College, Dhaka, Bangladesh.

## Results

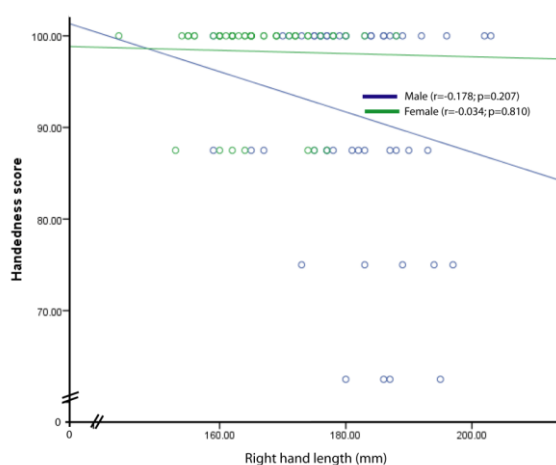
In this study, statistically significant difference was observed between right and left hand lengths of the right hander male medical students (181.58 $\pm$ 9.51 mm vs. 183.67 $\pm$ 9.21 mm;  $P<0.001$ ) as well as left hander male students (182.78 $\pm$ 8.10 mm vs. 181.45 $\pm$ 8.96 mm;  $P<0.05$ ). Similarly, statistically significant difference was observed between right and left hand lengths of the right hander female medical students (165.71 $\pm$ 8.37 mm vs. 167.77 $\pm$ 8.14 mm;  $P<0.001$ ) as well as left hander female students (168.82 $\pm$ 6.66 mm vs. 167.35 $\pm$ 6.54 mm;  $P<0.001$ ) (Table-I). However, handedness score showed non-significant negative correlation with right hand length ( $r=-0.178$ ,  $P>0.05$ ) and left hand length ( $r=-0.192$ ,  $P>0.05$ ) in right hander male. Similarly, in right hander female, non-

significant negative correlation was found with right hand length ( $r=-0.034$ ,  $P>0.05$ ) and left hand length ( $r=-0.025$ ,  $P>0.05$ ). In left hander male, non-significant positive correlation was found with right hand length ( $r=+0.067$ ,  $P>0.05$ ) and left hand length ( $r=+0.107$ ,  $P>0.05$ ). In left hander female, non-significant positive correlation was found with right hand length ( $r=+0.234$ ,  $P>0.05$ ) and left hand length ( $r=+0.169$ ,  $P>0.05$ ) (Fig. 2-5).

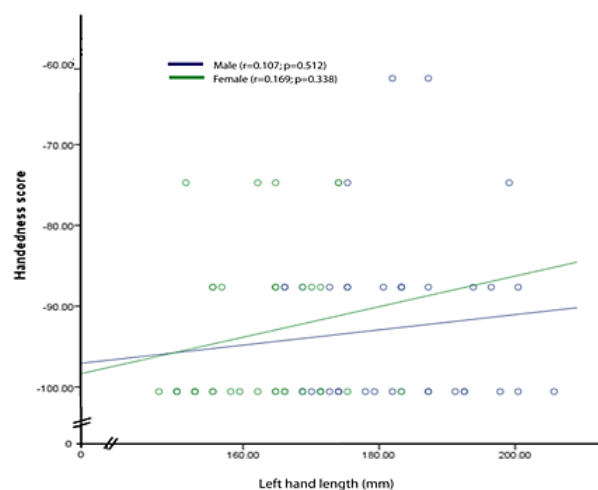
**Table-I:** Comparison between right and left hand length of right hander and left hander male and female medical students

Group	Hand length in mm		
	Right (Mean $\pm$ SD)	Left (Mean $\pm$ SD)	P Value
<b>Male</b>			
Right hander (n=52)	181.58 $\pm$ 9.51 (159.0–203.0)	183.67 $\pm$ 9.21 (161.0–207.0)	<0.001 <sup>s</sup>
Left hander (n=40)	182.78 $\pm$ 8.10 (159.0–200.0)	181.45 $\pm$ 8.96 (158.0–200.0)	<0.05 <sup>s</sup>
<b>Female</b>			
Right hander (n=52)	165.71 $\pm$ 8.37 (144.0–188.0)	167.77 $\pm$ 8.14 (146.0–188.0)	<0.001 <sup>s</sup>
Left hander (n=34)	168.82 $\pm$ 6.66 (158.0–186.0)	167.35 $\pm$ 6.54 (156.0–183.0)	<0.001 <sup>s</sup>

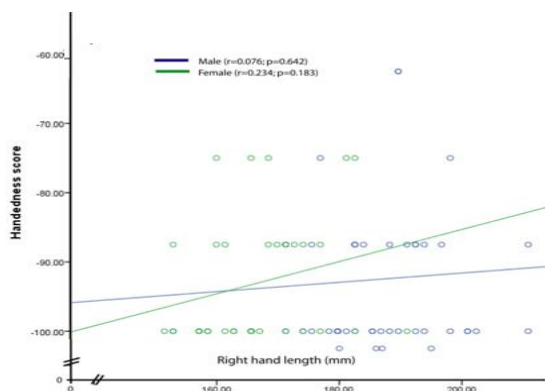
Figures in parentheses indicate range. SD = Standard Deviation. Comparison between values of right and left hand of same group was done by Paired Student's 't' test; s= significant.



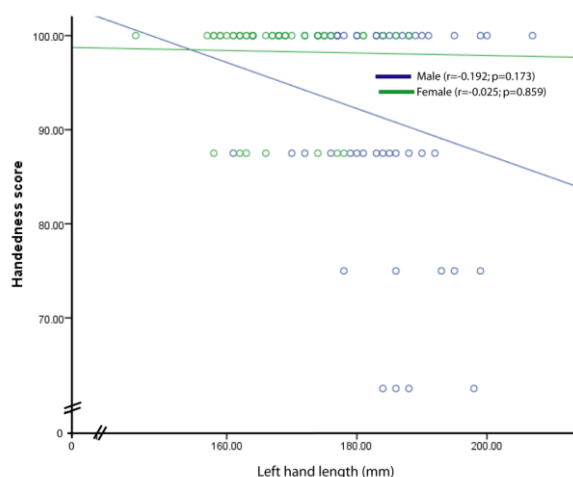
**Fig. 2:** Correlation of handedness score with right hand length of right hander male and female



**Fig. 5:** Correlation of handedness score with left hand length of left hander male and female



**Fig. 3:** Correlation of handedness score with right hand length of left hander male and female



**Fig. 4:** Correlation of handedness score with left hand length of right hander male and female

## Discussion

The findings of the present study showed dissimilarities with some finding of the studies carried out by Swami, Kumar and Sharma<sup>1,7</sup>; Kulaksiz and Gozil.<sup>8</sup> Swami, Kumar and Sharma<sup>1</sup> carried out a study on 6 left hander (1 male and 5 female) Haryanvi Brahmins of age 18 years and above. Swami, Kumar and Sharma<sup>1</sup> showed non-significant positive correlation between handedness score and right hand length ( $r = +0.015$ ,  $P > 0.05$ ), left hand length ( $r = +0.017$ ,  $P > 0.05$ ) in right hander and left hander Haryanvi Brahmins.

Swami, Kumar and Sharma<sup>7</sup> also carried out a study on 7 left hander (5 male and 2 female) Kashmiri pandit of age 18 years and above. They recorded non-significant positive correlation between handedness score and right hand length ( $r = +0.074$ ,  $P > 0.05$ ), left hand length ( $r = +0.075$ ,  $P > 0.05$ ) in Kashmiri pandits.

Kulaksiz and Gozil<sup>8</sup> carried out study on 14 left hander (08 male and 06 female) university students of Turkey. Kulaksiz and Gozil<sup>8</sup> recorded non-significant positive correlation between handedness

score and right hand length ( $r = +0.0435$ ,  $P > 0.05$ ) and non-significant positive correlation between handedness score and left hand length ( $r = +0.0640$ ,  $P > 0.05$ ) in Turkish students.

In the present study handedness score showed non-significant negative correlation with right hand length ( $r = -0.178$ ,  $P > 0.05$ ) and left hand length ( $r = -0.192$ ,  $P > 0.05$ ) in right hander male. In right hander female handedness score showed non-significant negative correlation with right hand length ( $r = -0.034$ ,  $P > 0.05$ ) and left hand length ( $r = -0.025$ ,  $P > 0.05$ ).

In left hander male handedness score showed non-significant positive correlation with right hand length ( $r = +0.067$ ,  $P > 0.05$ ) and left hand length ( $r = +0.107$ ,  $P > 0.05$ ). In left hander female handedness score showed non-significant positive correlation with right hand length ( $r = +0.234$ ,  $P > 0.05$ ) and left hand length ( $r = +0.169$ ,  $P > 0.05$ ).

Swami, Kumar and Sharma<sup>1,7</sup>, Kulaksiz and Gozil<sup>8</sup> conducted study on right hander and left hander but they did not show separate data for male and female but in the present study the data was collected separately from both right hander male and right hander female, left hander male and left hander female. This could be the cause of such dissimilarity.

## Conclusion

Handedness score showed non-significant negative correlation with right hand length and left hand length in right hander male and right hander female. Handedness score showed non-significant positive correlation with right hand length and left hand length in left hander male and left hander female.

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