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Handedness: The Inter-relationship of Inheritance Pattern and Self-reported Talent among Medical Students at the University of Lagos, Nigeria

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Abstract: Approximately 10% of the population seems to be left-handed. It is however unclear whether human hand preference is innate and genetically determined. The objective of this study is to determine the inter-relationship of handedness with inheritance pattern and self-reported talent among medical students at the University of Lagos. The survey was carried out among 512 medical and dental students of the University of Lagos through a self-administered questionnaire which was distributed to them through their classes. Names were not required to be written on the questionnaire to ensure confidentiality and to prevent likely bias in their response to the questions. The males were twice likely to use their left hand to perform various activities with their left hand than females. 100% of the respondents who were 2.5 kg at birth were right handed with 0% being left handed. 18% of those who were born at term were left handed while 82% were right handed; also, 27.3% of those born pre-term were left handed while 72.7% were right handed. The percentage of left handed students was highest among those who identified their mother as being left handed (54.5%), followed by father (48.1%), sister (45.8%) and then brother (34.3%). Left-handed respondents were more talented in all the activities than the right handed ones. There were more left handed students found to be talented in music, followed by chess, drawing and painting; then interior decoration while the least was fashion designing. There is a relationship between handedness and sex, talent, genetic inheritance but none found in relation to birth factors.

Key words: Left handedness · Students · Talent

INTRODUCTION

Handedness has been extensively studied in the past century, but its exact cause remains debatable [1]. Individuals are considered right-handed if they prefer to use the right hand to throw a ball, use a spoon, saw, sew, shoot marbles, bowl, cut with a knife, cut with scissors, hammer and write. If they routinely use the left hand or either hand for any number of these 10 tasks, they are designated non-right-handed [2]. Thus, both left-handed and ambidextrous individuals are pooled as non-right-handed.

Such preference is stronger in activities, which are more socially controlled like eating or writing and is weaker in activities like carrying a bag or opening a bottle. Thus, questionnaires often show that writing is one of the activities, which are most often performed with the right hand [3]. In some societies almost everyone has a right hand preference, at least for activities like writing. For example, in a study in Taiwan [4] only 0.7% of 4,143 participants were left hand writers.

From an analysis in Katanga, Congo it is reported that 0.5% of 1,047 children were left-handed but no child was writing with the left hand [5]. This would make nearly 50% of the population in both societies shifted in hand preference, especially in writing.

The prevalence of left handedness in other studies varies from 9 to 11% [6]. Researchers often consider handedness to be a classic "complex trait" that is specified by a combination of genetics and environmental causes. Indeed, more recent studies on the subject also conclude that genes do not play a significant role in handedness [1, 7, 8].

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Searleman, Porac and Coren [9] conducted a review and meta-analysis of the literature that had been published since 1971 and found that birth stress and birth risk factors were associated with an elevated percentage of left-handedness and more recent findings tend to confirm this [10].

In Nigeria, some typical problems are associated with left-handedness. Because most people in the society do not know that left-handedness is genetically determined, they tend to view left-handedness as at worst a manifestation of evil, or at best a hopefully curable misfortune. Consequently, most parents embark on some undesirable medical and/or psychological actions of forcing a naturally left-handed child to do things with the right hand, especially for writing and eating. In some parts of Nigeria, left-handed children are regarded as abnormal [11].

One striking feature of left-handed people is that they are generally less "lateralized" than right-handed people. This means that there is less distinct specialization in the two sides of the brain [12].

As handedness is biologically and genetically linked, so it has various effects on one's behaviour and abilities. Consistent is the evidence that left-handed people may have better spatial abilities [13]. This finding has been used to explain the elevated incidence of left-handed chess masters and mathematicians, science students. There are also reports of an increased proportion of left-handed artists and architects, although not all studies have replicated this association. Neuropsychological explanations of the advantage of being left-handed in some spatial, or putatively spatially related, abilities are still fairly speculative.

This survey was therefore conducted to assess the relationship between handedness and family history, gestational stage, birth weight and talent.

MATERIALS AND METHODS

Study Population: The survey was carried out in June, 2010 among 512 medical (MBBS) and dental (BDS) students of the University of Lagos.

Survey Instrument: The questionnaire sought information on their socio-demographic characteristics, hand preference for different activities, family relationship, birth weight, gestational stage and talent.

This was done in the form of a self-administered questionnaire which was distributed to them through their classes. Names were not required to be written on the questionnaire to ensure confidentiality and to prevent likely bias in their response to the questions.

Determination of Handedness: The activities used to determine handedness was adapted from Oldfield [14]: "The assessment and analysis of handedness: the Edinburgh inventory". Each activity was designed to assess the hand preference of each student by using every day activities.

Statistical Analysis: Questionnaires were coded and statistical analysis was done using Statistical Package for Social

Sciences software programme (SPSS) Version 10 to calculate frequencies and chi-square analysis to test for associations between categorical variables.

RESULT

Socio-demographic Characteristics: A total of 512 students participated in this survey, 290 males and 222 females. Both medical and dental students from 200 to 600 levels participated. Their ages ranged from 17 to over 27 years.

Table 1 shows the frequency in which each sex performed the various activities with their left hand. This was seen to be higher in males than in females.

From the odd ratio, the males were twice likely to use their left hand in writing, throwing which is significant; using toothbrush and striking match than the females. The males were also more likely, though by a smaller percentage, to use their left hand in drawing, using toothbrush, knife and broom, opening box, holding mouse, using key, holding hammer, brush/ comb and cup.

The females were however, more likely to use their left hand to use a spoon than males.

According to figure 1, 100% of the respondents who were 2.5 kg at birth were right handed with 0% as left handed. 24% of those who weighed 2.5-3.5 kg at birth were left handed while 76% were right handed. Those weighing about = 4.0 kg were 35% left handed and 65% right handed. The percentage of left handed students was highest in those who weighed = 4.0 kg (35%) at birth, followed by those who weighed 2.5-3.5 kg (24%), with none born weighing 2.5 kg (0%).

81% of the respondents however, did not know their birth weight.

Table 1: Prevalence of left handedness for various activities according to sex

	Frequency (%)				95% CI	
Activities	Male (n = 290)	Female (n = 222)	Total (n = 512)	Odd ratio	Lower	Upper
Writing	23 (7.9)	9 (4.1)	32 (6.3)	2.04	0.08	4.86
Drawing	21 (7.2)	9 (4.1)	30 (5.6)	1.85	0.79	4.45
Throwing	30 (10.3)	11 (5.0)	41 (8.0)	2.21*	1.04	4.82
Using scissors	23 (7.9)	9 (4.1)	32 (6.3)	2.04	0.88	4.86
sing tooth brush	27 (9.3)	12 (5.4)	39 (7.6)	1.80	0.85	3.86
Using knife	28 (7.9)	15 (6.8)	43 (8.4)	1.47	0.74	2.98
Using spoon	10 (10.3)	11 (5.0)	41 (8.0)	0.69	0.26	1.77
Using broom	31 (10.7)	17 (7.7)	48 (9.4)	1.44	0.75	2.81
Striking match	28 (9.7)	11 (5.0)	39 (7.6)	2.05	0.95	4.49
Opening box	30 (10.3)	18 (8.1)	48 (9.4)	1.31	0.68	2.52
Holding mouse	20 (6.9)	13 (5.9)	33 (6.4)	1.19	0.55	2.60
Using key	27 (9.8)	12 (5.4)	39 (7.6)	1.80	0.85	3.86
Holding hammer	25 (8.6)	11 (5.0)	36 (7.0)	1.81	0.83	4.02
Holding brush/comb	32 (11.0)	13 (5.9)	45 (8.8)	1.99	0.98	4.12
Holding cup	34 (11.7)	18 (8.1)	52 (10.2)	1.51	0.80	2.87

*Significant

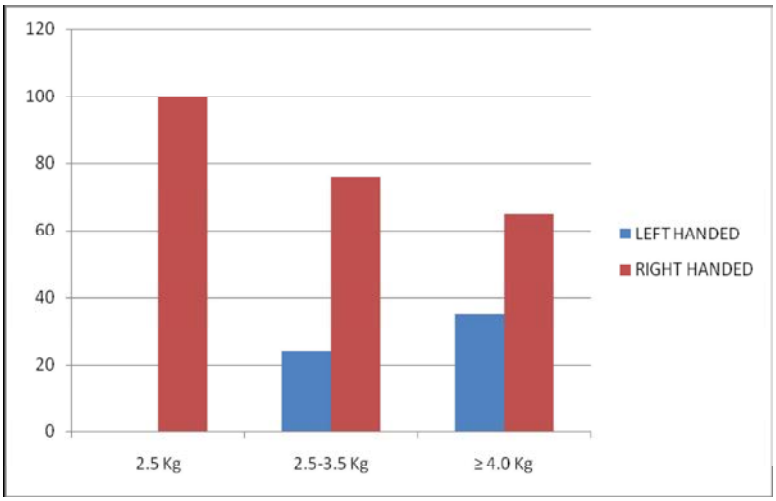

Fig. 1: Percentage of Handedness in Relation to Birth Weight

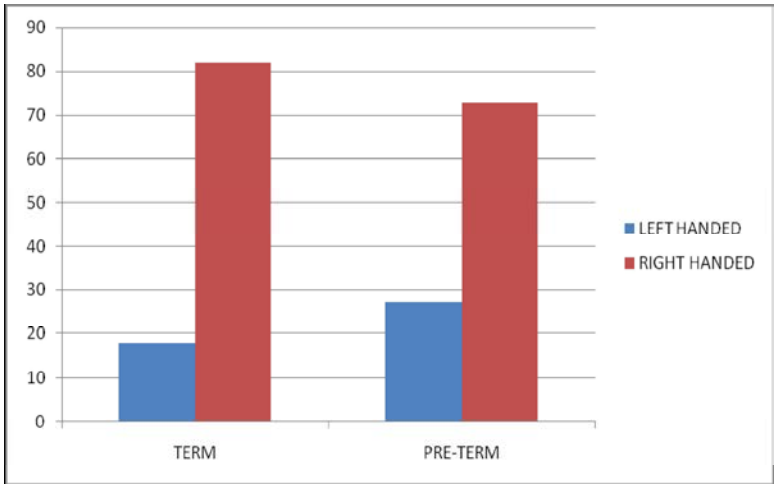

Fig. 2: Percentage of Handedness in Relation to Gestational Stage

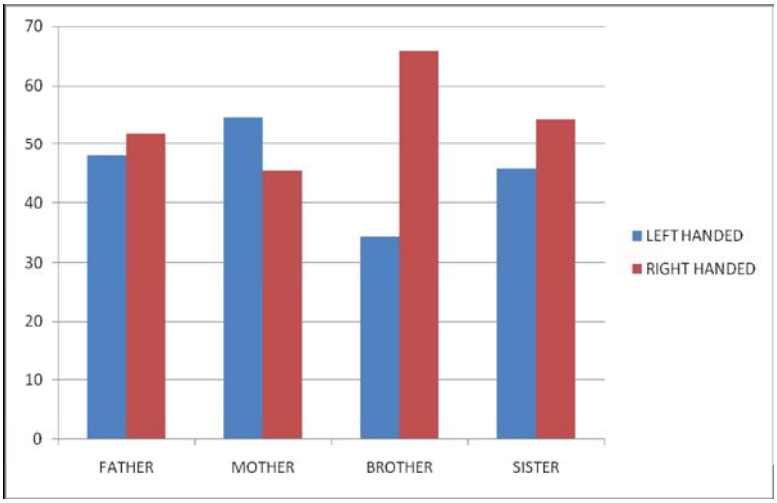

Fig. 3: Percentage of Left Handed Family Members in Relation to Respondents' Handedness

The right handed students however, had a higher percentage among those who weighed 2.5 kg (100%), followed by 2.5-3.5 kg (76%) and least was found in those whose birth weight was = 4.0 kg (65%).

According to figure 2, 18% of those who were born at term were left handed while 82% were right handed; also, 27.3% of those born pre-term were left handed while 72.7% were right handed.

The percentage of left handed students born at pre-term (27.3%) was higher than those born at term (18%). The right handed students had a higher percentage born at term (82%) than pre-term (72.7%). There was no response however, from 23% of the respondents to this question.

In figure 3, 48.1% of the left handed students and 51.9% of the right handed ones identified their fathers as being left handed. 54.5% of the left handed students and 45.5% of the right handed ones ticked their mother as being left handed. 34.3% of the left handed students and 65.7% of the right handed ones ticked their brother as being left handed; while 45.8% of the left handed students and 54.2% of the right handed ones identified their sister as being left handed.

The percentage of left handed students was highest among those who identified their mother as being left handed (54.5%), followed by father (48.1%), sister (45.8%) and then brother (34.3%).

There were a higher percentage of right handed students who identified their brother as being left handed (65.6%), followed by sister (54.2%), father (51.9%) and then mother (45.5%).

The distribution of talents of the male students in relation to handedness is shown in Table 2A. It shows the percentage of left handed students being more talented in all the activities than the right handed ones. In drawing and painting, there were 46.2% left handed students compared to 41.8% of the right handed students. In fashion designing, 23.1% left handed students were found talented compared to 17.8% right handed ones. Also, 38.5% left handed students were found to be talented in interior decoration compared to 30.2% right handlers. In music, the left handed students found talented were 56.9% while 52.0% were right handed; and in chess, 46.2% of the left handed students were talented while 30.7% were right handed.

The highest percentage of male left handed students were found to be talented in music, followed by chess, drawing and painting; then interior decoration while the least was fashion designing.

The percentage of male right handed students were however found to be more talented in music, followed by drawing and painting, then chess, interior decoration and the least also being fashion designing.

The odd ratio also shows that the left handed males are more likely to be more talented in all the activities than the right handed ones, with the talent in chess being significant.

The distribution of talents of the female students in relation to handedness is shown in Table 2B. Here, the percentage of left handed students talented is higher in all the activities except in chess.

Table 2a: Distribution of Activities the Male Respondents Are Talented in by Whether They Are Left Handed

	Handedness (%)				95% Ci	
Talent	Left Handed	Right Handed	Total	Odd Ratio	Lower	Upper
Drawing and Painting	30 (46.2)	94 (41.8)	124 (42.8)	1.99	0.66	2.16
Fashion Designing	15 (23.1)	40 (17.8)	55 (19.0)	1.39	0.65	2.84
Interior Decoration	25 (38.5)	68 (30.2)	93 (32.9)	1.44	0.78	2.66
Music	37 (56.9)	117 (52.0)	154 (53.1)	1.22	0.65	2.21
Chess	30 (46.2)	69 (30.7)	99 (34.1)	1.94*	1.06	3.54

*Significant

Table 2b: Distribution of Activities the Female Respondents Are Talented in by Whether They Are Left Handed

	Handedness (%)				95% Ci	
Talent	Left Handed	Right Handed	Total	Odd Ratio	Lower	Upper
Drawing and Painting	18 (45.0)	72 (39.6)	90 (40.5)	1.25	0.59	2.63
Fashion Designing	23 (57.5)	78 (42.9)	101 (45.5)	1.80	0.86	3.82
Interior Decoration	25 (62.5)	102 (56.0)	127 (57.5)	1.31	0.61	2.80
Music	27 (67.5)	106 (58.2)	133 (59.9)	1.49	0.68	3.28
Chess	5 (12.5)	30 (16.5)	35 (15.8)	0.72	0.23	2.14

There were 45.0% left handed students talented in drawing and painting compared to 39.6% right handed ones; in fashion designing, 57.5% left handed students were found more talented than 42.9% right handed students. In interior decoration, 62.5% left handed students were seen compared to 56.0% right handed students. 67.5% left handed students were found to be more talented in music compared to 58.2% right handed students. In chess, 16.5% right handed students were found to be talented compared to 12.5% left handed students.

The highest percentage of left handed female students were talented in music, followed by interior decoration, then fashion designing, drawing and painting, the least was chess.

The right handed female students had a higher percentage talented also in music, followed by interior decoration, then fashion designing, drawing and painting; the least also being chess.

The odd ratio also shows that the left handed females are more likely to be more talented in all the activities than the right handed ones, except in chess where the right handed ones seem to be more talented.

DISCUSSION

The result of this study showed a higher percentage of left handed students born pre-term compared to those born at term. The right handed students, on the other hand, had a higher percentage of those born at term than pre-term (Fig 2).

This is in correlation with the various environmental factors believed to provide structural brain substrate for left-handedness such as birth difficulties, prenatal ultrasound [15], maternal smoking during pregnancy, low birth weight, diffuse brain damage and testosterone level during early development.

The left handed students had a higher percentage of those with higher birth weight than the right handed students (Fig 1). This is not in line with the study by Powls *et al.* [16] which suggests that birth weight influences handedness though a high percentage of respondents did not know their birth weight. The clearest evidence for a link between left-handedness and peri-natal condition comes from studies of infants of extremely low birth weight; we however, did not have such cases. It was also proposed that birth weight and its consequences may be the unifying causal factor of "pathological left handedness" [10].

Table 2A and 2B shows a higher percentage of talented activities in the left handed students compared to the right handed ones. Various studies have shown that left handedness is associated with enhanced abilities. Left-handedness is also more common among musicians, mathematician, professional baseball and cricket players, architects and artists (Ghayas and Adil, 2007).

The brains of left-handers are found to exhibit lower rates of brain hemisphere specialization in general, meaning that left-handers more commonly use both sides of the brain for a given task. The main connection between the two hemispheres of the brain is a thick band called corpus callosum which contains millions of nerves and acts as a data-wire that allows the two hemispheres to "speak" to each other. Left-handers have a thicker corpus callosum, which results in an increased capacity for communication between the two hemispheres and implies that the brains of left-handers are better integrated in processing information [17]. Left-handers therefore perform better at activities that require rapid transfer of information and creativity [18]. Coren [19], for instance, finds creativity to be positively correlated with left-handedness in men only. This study, however found a high level of creativity in both the male and female left-handed students.

A higher percentage of the left handed respondents identifying their mother as being a left hander, followed by their father, sister and then brother. The percentage of right handed students who identified their brother as being left handed was higher, followed by sister, father and then mother (Fig. 3). This shows some sort of relationship between handedness and genetics.

The contribution of genetics in handedness has been supported by studies of families of concordant twins and adopted individuals [6]. However, because the Mendelian mode of inheritance has not been demonstrated for handedness, psychologists have not accepted the purely genetic mechanism. Rather, a major school of thought proposes that handedness is primarily, or at least partially, a learned behaviour [6].

These findings point to the potential use of handedness as an instrumental variable in empirical applications.

Conflicts of Interest: The authors have declared that no conflict of interest exists.

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