



Patterns of Handedness and Socio-cultural Influences on Dextrality Amongst University of Nigeria Medical Students

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Abstract

There are three types of handedness with different prevalence rates reported from various parts of the world including Nigeria. The aim of the study was to establish the prevalence of handedness using the students of the College of Medicine, University of Nigeria Enugu Campus as the study group. A modified Edinburgh Inventory was applied to 1200 students. Of the questionnaires returned, only those that were correctly filled, were analyzed. Of the 1200 questionnaires, 880 (73.33%) were analyzed. Three hundred and seventy six (42.7%) were females and 504 (57.3%) males. The ages of the subjects ranged from 18 to 28 with a mean age of 22.13 (\pm 2.236) years. Eight hundred and twenty nine (94.2%) of the respondents were Igbos and 99.5% Christians. Overall, 3.94% were left handed, 8.43% mixed handed and 87.63% were right handed. More males were left handed than females. More than 10% of the respondents were forced to switch from left hand to right hand in their formative years. A higher percentage of females were affected by the forced hand switch, and the success rate was higher with females. The prevalence of left handedness compared favourably with reports from Nigeria, and other African and Europeans countries. Forced hand switch or forced dextrality probably plays a significant role in keeping the prevalence of left handedness low in our country, and may be partly responsible for the higher prevalence of left handedness in males than in females.

Key words: Handedness, Patterns, Medical students, Nigeria

Handedness is the preference to use one hand for tasks requiring precise coordination, exact calibration of forces and accurate timing (Siebner et al 2002). It is the consistent preference for one hand in skilled manipulative tasks (Uloneme and Okoro 2006) or, as Annett and Kilshaw (1983) put it, the hand that performs faster or more precisely on manual tasks. Other definitions include the hand one uses for writing (Benoitz 1996) and the hand one prefers to use regardless of performance (Silverstein and Silverstein 1977). These definitions define three types of handedness namely, left-handedness (sinistrality), mixed-handedness (ambidextrous) and right-handedness (dextrality).

Studies have shown that primates tend to exhibit different degrees of handedness and that in humans, those exhibiting right-handedness predominate (Hopkins et al 1977). Hand preference distributions result from several factors including genetic factors, early hemispheric lesions, cultural demands, parental pressure and others (Coren and Porac 1977).

Cultural and environmental factors could change "natural" hand preferences either by changing the hand used for some unimanual activities, by reducing the degree of hand preference to all hand actions or by changing the overall hand preferred (De Agostini et al 1997).

Several prevalence rates have been reported for hand preferences. Tan (1988) reported prevalence rates of 3.4%, 30.5% and 66.1%, for left, mixed and right-handedness respectively from Turkey in Europe and Zverev (2004) reported 3.9%, 5.7% and 90.4% from Malawi. In a study on 759 undergraduates aged 18 to 33 years, De Agostini et al (1997) observed a frequency of left manual preference of 5%. In a study of Igbos of Southeastern Nigeria, Uloneme and Okoro (2006) found the prevalence of left-handedness to be 4.72% in the general population and 2.23% in the 18 to 28 years age group.

Though some authors have reported significant differences in hand preference rates between the male and female gender ((Uloneme

and Okoro 2006), others did not notice any significant association between handedness and gender (Zverev 2004). Elevated levels of testosterone in the males were thought to be responsible for the higher prevalence of left hand preference reported in men (Geschwing and Galaburda 1987).

These figures, however, highlight the predominance of dextrality. Thus, our world is dextrally biased (Ellis et al 1998). Therefore most designs are made for right handed persons while “natural” left handers are either forced to become right handed during their formative years or subjected to doing things with the right hand even as adults. This situation is referred to as forced dextrality. In Nigeria and most African countries, there is strong pressure against left hand activities because the left hand is thought to be associated with ill-fortune. It is therefore considered improper to carry out certain unilateral activities with the left hand, especially tasks related to eating, writing, shaking hands or giving something to someone. The left hand tended to be reserved for activities considered to be “unclean”, like blowing one's nose or wiping oneself after defaecation. Most of these taboos encourage forced use of the right hand by “natural” left handers. Hence, the incidence of right-handedness tended to be higher in cultures that strongly discourage the use of left hand than in cultures that are more tolerant (Coren and Porac 1977).

Some of these taboos appear to have relaxed to some extent in some countries with concomitant report of generation effects. Hatta et al (1995) demonstrated an increase in the preference of left-handedness among Japanese students when compared with a similar study done twenty years earlier. Similarly, Smart et al (1980) in their study on three generations of British subjects noted that the preference of left-handedness increased from 6.2% in the first generation to 17.5% in the third. Tambs et al (1987) showed a similar increase in Norwegians with the preference of left-handedness increasing from 1.2% to 8.7% in a period of three generations. In all these studies, the

increase in left hand preference was more marked in females.

The aims of this study were to establish the prevalence of left handedness and identify the role played by forced hand switch (forced dextrality) in determining the prevalence of left handedness amongst our undergraduates, using the students of the College of Medicine of University of Nigeria Enugu Campus (UNEC) as the study population. The results obtained were compared with those from other studies. Other possible areas for further research were discussed.

MATERIALS AND METHODS.

The sample population was drawn by simple random sampling from the students of the University of Nigeria College of Medicine (UNEC). Those eligible for inclusion in the study were students aged 18 to 28 years, who did not have any visible deformity or infirmity. This age range was chosen because it was representative of the ages of the students in the College.

This was a questionnaire-based, cohort study. Modified Edinburgh Inventory was the instrument for data collection. The questionnaire was initially pre-tested on 20 medical students of Enugu State University and then modified for clarity. Subsequently, 1,200 questionnaires were applied to the eligible medical students after informing them of the study and their consent sought and obtained.

Respondents were considered left handed for a particular task if they entered + (weak left handedness) or ++ (strong left handedness) in the appropriate space and did not fill the other space. The same conditions applied to respondents who were recorded as right handed. Respondents were considered mixed handed if they entered + in the left and right spaces. The questions on forced hand change were ticked or filled as appropriate. Only the questionnaires that were correctly filled by the respondents who met the age criteria were analyzed. Analysis was done using SPSS 15 Evaluation version.

The study protocol was reviewed and approved by the Ethical Committee of Department of Anatomy, UNEC, before the study was commenced.

RESULTS

Of the 1200 questionnaires, 880 or 73.33% fulfilled the required criteria and were analyzed. Five hundred and four (57.3%) of these were males and the rest (376 or 42.7%) females. Their ages ranged from 18 to 28 years. Their mean age and standard deviation were 22.13 ± 2.236 years. The mean age of the males was $22.31 (\pm 2.248)$ years and that of the females $21.88 (\pm 2.198)$ years. Eight hundred and twenty nine or 94.2% were Igbos and the remaining 51 (5.8%) were from nineteen other Nigerian tribes. Eight hundred and seventy six (99.5%) were Christians.

Table 1 shows hand preferences for each of the ten unimanual tasks. Respondents exhibited the lowest left hand preference (3.0% or below) for writing, drawing, holding scissors and eating with hand and the highest left hand preference (4.0% or above) for throwing an object, hitting an object and sweeping with broom. When all the 10 tasks were combined the hand preferences were 3.49%, 8.43% and 88.08% for left, mixed and right handedness respectively. After excluding writing and drawing, the hand preferences for the other 8 tasks combined were 3.65% for left handedness, 10.38% for mixed handedness and 85.95% for right handedness.

The results of gender-related hand preferences for each of the ten tasks are shown in Table 2. Males exhibited higher left-hand preferences than females in all the ten tasks. When the ten tasks were combined, the prevalence of left handedness was 3.86% for males and 2.92% for females. This gave a male to female ratio for lefties of 1.3:1. When writing and drawing were excluded, the prevalence rates for left-handedness increased to 4.08% for males and 2.98% for females, and the male to female ratio increased to 1.4:1. When the values for left hand preferences for

Table 1: Number (n) and percentage (%) of students who responded positive to hand preferences for each of the 10 unimanual tasks, overall hand preference for 10 tasks and the hand preference for 8 tasks, after excluding writing and drawing.s

Tasks	left handed n (%)	Mixed handed n (%)	Right handed n (%)
Writing	26(3.0)	5(0.6)	849(96.4)
Drawing	24(2.7)	6(0.7)	850(96.6)
Through an object	35(4.0)	96(10.9)	749(85.1)
Hitting and object	39(4.4)	124(14.1)	717(81.5)
Holding scissors	26(2.9)	42(4.8)	812(92.3)
Holding toothbrush	28(3.2)	61(6.9)	719(89.9)
Eating with spoon	33(3.7)	71(8.1)	776(88.2)
Eating with hand	25(2.8)	70(8.0)	785(89.2)
Sweeping with broom	41(4.7)	177(20.1)	662(75.2)
cutting grass	30(3.4)	90(10.2)	760(86.4)
Ten tasks	30.7(3.49)	74.2(8.43)	775.1(88.08)
Eight tasks	32.1(3.65)	91.4(10.38)	756.5(85.97)

Table 2: Percentage (%) of left-, mixed- and right-hand preferences in males and females for each of the ten unimanual tasks, the combined percent for ten tasks and that for eight after excluding writing and drawing

Tasks	Handedness in Male(%)				Handedness in Female (5)			
	Left	mixed	right	total	Left	mixed	right	total
Writing	3.2	0.6	96.2	100	2.7	0.5	96.8	100
Drawing	2.8	0.2	97.0	100	2.7	1.3	96.0	100
Through an object	4.6	10.1	85.3	100	3.2	12.0	84.4	100
Hitting and object	5.4	16.3	78.4	100	3.2	11.2	85.6	100
Holding scissors	3.6	4.4	92.1	100	2.1	5.3	92.6	100
Holding toothbrush	4.2	6.3	89.5	100	1.9	7.7	90.4	100
Eating with spoon	3.8	8.1	88.1	100	3.7	8.0	88.3	100
Eating with hand	3.0	8.1	88.9	100	2.7	7.7	89.6	100
Sweeping with broom	5.0	23.4	71.6	100	4.3	15.7	80.1	100
cutting grass	3.0	12.3	83.7	100	2.7	7.4	89.9	100
Ten tasks	3.86	8.98	87.16	100	2.92	7.68	89.4	100
Eight tasks	4.08	11.13	84.79	100	2.98	9.38	87.64	100

Ratio of Male to female left-handedness = 1.3: 1 for ten tasks and 1.4:1 for eight tasks. P values were at less 0.05 at 95% Confidence Interval (C.I.) for both ten tasks and eight tasks, showing statistical significance.

Table3:Comparison of gender involvement in forced hand switch

Gender	total	Forced hand switch(%)	Success of forced hand switch		
			Full(%)	partial(%)	none(%)
Male	504	50(9.92)	19(38.0)	21(42.0)	10(20.0)
Female	880	40(10.64)	28(70.0)	9(22.5)	3(7.7)
Total	880	90(10.23)	47(52.22)	30(33.33)	13(14.45)

males were compared by Paired Samples T-tests at 95% Confidence Interval (CI) with those for females, P values were found to be statistically significant ($P < 0.005$) at 0.007 for all the ten tasks and 0.009 for the other eight tasks, after excluding writing and drawing.

Table 3 shows the number of respondents who had forced hand change, their ages when they had the forced hand change and the gender involvement in the forced hand change. Ninety (90) respondents or 10.2% of the 880 respondents had forced hand switch. The direction of hand switch was from left hand to right hand in all the cases. The forced hand switch occurred at ages that ranged from 1 to 14 years, with a mean age and standard deviation of 7.22 ± 3.26 years. Forty seven of these respondents or 52.22% agreed that the forced hand switch was successful, 33.33% indicated that it was partially successful and the rest claimed that it did not succeed. Fifty of these respondents or 55.6% were males (this amounted to 9.92% of all the male respondents in the study) and 40 of them or 44.4% were females (i.e. 10.64% of all the female respondents). When the males and females affected by forced hand switch were compared, it was noted that a greater percentage of females (10.64% of female to 9.92% of male) was involved. Also, the success rate for full hand switch from left handedness to right handedness was almost twice as high in females as in males (70.0% in females to 38.0% in males).

DISCUSSION

The prevalence of left handedness varied for the individual tasks. Writing, drawing, holding scissors and eating with hand had the lowest prevalence rates. This is probably so because these tasks need more skilled manipulations and therefore require precise coordination, exact calibration of forces and accurate timing (Siebner, 2002; Uloneme and Okoro, 2006). It may also be as a result of the effect of taboo, especially with respect to eating and writing, which helps keep left hand use to the barest minimum. Other tasks had left hand prevalence rates higher than 3%.

The prevalence of left-handedness of 3.49% obtained for the ten tasks differed marginally from 3.65% obtained for eight, after excluding writing and drawing. These two rates were found to be higher than the 2.23% left hand prevalence rate reported for this age group by Uloneme and Okoro (2006) in their work on Igbos of Southeastern Nigeria. This is not surprising, because while the study by Uloneme and Okoro (2006) involved the general population, our study involved a group that is more likely to have suffered westernization. This notwithstanding, these results suggest that the prevalence of left-handedness in Igbos of this age group hovers between 2 and 4%.

The prevalence rates for left handedness, mixed handedness and right handedness for the ten tasks of 3.49%, 8.43% and 88.08% differed significantly from that reported from Turkey (Tan 1988) on the prevalence of mixed and right handedness. The report by Zverev (2004) on Malawian school children had a higher prevalence of lefties (3.9%). This observation may be due to the fact that the study involved a younger age group (17 years and below).

The prevalence of left-handedness for ten unimanual tasks in the male and female students studied were 3.86% and 2.92% respectively, and for eight tasks, 4.08% and 2.98%. When subjected to Paired Samples T-tests, the values for male lefties was found to be statistically different from that for female lefties, with P values less than 0.005 at 95% CI. Also, the ratios of male lefties to female lefties for the ten tasks was 1.3:1 and for eight, 1.4:1. These findings agree with the study by Uloneme and Okoro (2006) which reported a significantly higher prevalence of lefties in males than in females, but not so with the report from Malawi where no significant association was found between gender and handedness (Zverev 2004). Though the male to female ratio of lefties appeared to approximate in this study, the positive statistical significance test suggests the fact that more males are lefties than females.

The gender differences in lefties are thought to result from the higher levels of

testosterone elaborated in the male gender (Geschwing and Galaburda 1987). However, this may not be the sole cause. In most traditional Nigerian cultures, and even with the advent of Christianity, the left hand is associated with evil and ill-fortune. Therefore, pressures are usually mounted on children who showed signs of left-handedness early in life, with the intention of changing their hand preferences to right (forced hand switch). Although hand preference is usually not evident until children are 4-6 years old (Annet 1964), from our study forced hand switch was noted to have commenced earlier in some instances, with a mean age of commencement of 7.22 ± 3.26 years. Also, in the traditional Igbo setting, the girl child has to be well behaved to be marriageable. Hence, forced hand switch affects more females than males, more females suffer the parental and societal pressures associated with forced hand switch, and the outcome is more likely to be better in females. Our study revealed that more females had forced hand switch and that the positive response for females was almost twice as much as that for males. These findings support the fact that nurture plays a significant role, not only in keeping the prevalence of left-handedness very low in the general population, but in causing the differences in the prevalence of left handedness between male and female gender.

In conclusion, the prevalence of left handedness varies a great deal for different unimanual tasks. The prevalence of left handedness in this study compared favourably with that in some of the studies reviewed. More males than females are left handers. Forced dexterity played a significant role in keeping the prevalence of left handedness at its current level and in making the prevalence of left handedness lower for females than for males.

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