



## HANDEDNESS AND FOOTEDNESS IN FOOTBALLERS IN JOS, NIGERIA

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### ABSTRACT

*This study was carried out to compare handedness and footedness in a sample of 50 footballers in Jos, Nigeria and also to determine if any significant relationship exists between handedness of the footballers and that of their first degree relatives. 25 self-professed right handed and 25 self-professed left handed were randomly selected from various teams in Jos and compared on preference measures. Their ages range between 18 -35 years. All information was obtained using a standard questionnaire and the data generated analyzed using ANOVA. The results showed that 84% of right handed footballers were also right footed, 4% were left footed, and 12% were mixed footed with no particular foot preference. Of the 25 left handed footballers, 28% were right footed while 72% were left footed. This shows that the left handed footballers were significantly less lateralized than the right handed footballers. Statistical analysis showed that the observed difference between the two groups was not significant ( $P > 0.05$ ). The results showed that the incidence of left handedness was significantly higher among the male siblings of the left handed footballers. This study also showed that lateral preference between right handedness and left handedness is not significant and there was possibility of genetic factor involvement in the occurrence of left handedness among males.*

**Keywords:** Handedness, footedness, footballers, Jos

### INTRODUCTION

The cerebral hemispheres are very similar in appearance, but they differ significantly in their structures and functions. One of the best known differences between the two structures is motor control; the right hemisphere controls the left half of the body and the left hemisphere controls the right half of the body. These motor control differences were discovered mainly through the examination of paralysis caused by cerebrovascular accidents or other damage to a specific hemisphere (Ball, 2008). In 1861, the theory of lateralization of function was expanded with the discovery by P. Broca of the structure in the right hemisphere that controlled speech, this structure is now known as Broca's area. Like many other advances in neurosciences this discovery was made possible by an unfortunate stroke victim, who in this case lost his ability to speak. After his death, Broca examined his brain and discovered damage in the right hemisphere at this now famous location (Kolb and Whishaw, 2003).

This finding was followed soon after by the discovery of an area, also in the right hemisphere, responsible for understanding of written words, this area became known as Wernicke's area named after the man who discovered it by "studying patients with select comprehension deficits" and comparing these deficits with damages to the brain (Smith, 2000).

Even though the two hemispheres have different functions they do not work independently of each other. They communicate back and forth across the corpus callosum, this is not an equal partnership however, and one hemisphere usually dominates over

the other, an effect best illustrated by the fact that most people are only good with either their right or left hand. In most cases the left hemisphere is believed to be the dominant hemisphere (Piethish, 2003).

A striking feature of the organization of the human brain is that the two hemispheres of the human brain are anatomically and functionally asymmetrical. The asymmetries in structure are visible not only in an overall view but also at the level of the morphology of the individual neuron, and the asymmetries in function exist not only in neurological patients but also in the normal brain (Kolb and Whishaw, 2003). In 90% of the population, the left cerebral hemisphere dominates the ability to speak, write and understand spoken and written words. In the other 10%, either the right hemisphere dominates or both hemispheres equal dominance. The right cerebral hemisphere is mostly non-verbal and is more involved in spatial and holistic thinking, in many aspects of music and in some emotions, including locomotion control. It is worthy to note that the baby girls firstly develop the left hemisphere, while the baby boys the right one. Thus, there is prevalence of left handed boys. Similarly the baby girl starts speaking earlier. The baby boy starts stepping earlier (Tor *et al.*, 2003).

The left hemisphere prevails for verbal and linguistic functions, for mathematical skills and analytical thinking while the right hemisphere is concern with imagination, spatial skill art and left hand control (Mosby, 2003).

It remains true that no qualitative differences in structure, connectivity or neuronal physiology between the hemispheres have been found but there have been reports of minor differences in asymmetry of the cerebral cortex. Anatomically men show greater temporal cortex asymmetry (Good *et al.*, 2001).

Handedness is referred to as chirality or laterality as an attribute of humans defined by their unequal distribution of fine motor skills between the left and right hands (Wikipedia, 2011). There are four main types of handedness; Right-handedness left-handedness, mixed-handedness and ambidexterity

Right handedness is most common. Right-handed people are more dexterous with their right hand when performing a task. Some studies suggest that 70-90% of world population is right-handed rather than left-handed or any other form of handedness (Holder, 1997).

Left-handedness is less common than right-handedness. Left-handed people are more dexterous with their left hands when performing a task. A variety of studies suggests that 8-15% of world populations are left-handed (Hardyek and Petrinovich, 1997).

Mixed-handedness, also known as cross-dominance, is being able to do different tasks better with different hands. Ambidextrous is exceptionally rare, although it can be learned. A true ambidextrous person is able to do any task equally well with either hand. Those who learn it still tend to sway towards their originally dominant hand (Wikipedia, 2011).

Footedness is a term used to describe the willed or unwilled preference for the use of either right or left leg in the performance of activities like skateboarding (Mosby, 2003). Footedness like handedness is said to be a good predictor of language laterality (Watson *et al.*, 1998). Footedness has been found to be a better predictor of emotional lateralization than handedness (Elias *et al.*, 1998). There are three main types of footedness: Right Footedness, left footedness and mixed footedness

Right footedness occurs when the individual expresses a willed or unwilled preference for the use of his/her right leg in the performance of activities such as kicking or pedaling. Left footedness occurs when the individual expresses a willed or unwilled preference for the use of his/her left leg in the performance of activities such as skateboarding, mountain boarding and other related activities. Mixed footedness occurs when the individual is adapting with each leg equally or approximately equally in the performance of activities stated above (Mosby, 2003).

## **MATERIALS AND METHODS**

This research is a descriptive type, which has both qualitative and quantitative components. Fifty footballers in Jos, Plateau state, Nigeria were selected for the study

The data was collected from the subjects using the structured interview method and questionnaires, which were administered to the respondents (self administered). For those footballers who were educated enough and had the

understanding of what was required of them. However, for those that were not educated enough to understand what was required of them; the questionnaires were administered by an interviewer.

The study population consisted footballers in Plateau state i.e. they were drawn randomly from different football teams scattered across the capital city of Jos. All the subjects studied were males.

Handedness being the independent variable was studied under two major categories (right and left handedness).i.e. the footballers studied were in two categories; right handed footballers and left handed footballers. For the right handed footballers, the method of sampling used was cluster sampling from the various teams where right handed players were selected randomly from the sampling frame of the football teams/clubs in Jos.

For the relationships between handedness and their first degree relatives, the method of sampling used was also cluster sampling. However, for the left handed footballers the method of sampling used was chain referral sampling, which is used for a small group of people with special characteristics. This involved some already identified left handed footballers assisting in identifying other footballers like them, who when identified in turn helped in identifying others in a chain like fashion until the target size of left handed footballers was obtained. In all, 50 questionnaires were administered. We used one way analysis of variance (ANOVA) to analyse the data obtained, and the level of significance for the two categories of footballers determined for comparison.

## **RESULTS**

Tables 1 and 2 show data on handedness and footedness and crossed lateral preferences among the subjects. It is shown that some of the left handed footballers were not consistently left footed. Specifically there were about 28% of them that is 7 out of the 25 footballers who demonstrated preference for the opposite foot were right footed while the remaining 72% (18 footballers) demonstrated left footed preference (uncrossed lateral preference).

The right handed footballers also showed similar results where 16% i.e. 4 footballers demonstrated crossed lateral preference, while the remaining 84% (i.e. 21 footballers) demonstrated uncrossed lateral preference. Despite the similarity in the result obtained between the two groups of footballers (right and left handed) some peculiarities were noticed among the category of the right handed that demonstrated crossed lateral preference. Of the 16% with crossed lateral preference, only 4% (which is just 1 of the 25 right handed footballers) were solely left footed, the other 12% (3 footballers) were mixed footed.

The statistical analysis of this result using ANOVA proved that the observed differences in the degree of crossed lateral preference demonstrated by the two categories of footballers was not statistically significant with the p-value of 0.817.

Tables 3 and 4 compare handedness of the subjects with those of their first degree relatives (i.e., their parents and siblings). There is no significant correlation between the handedness of the subjects and that of their first degree relatives especially among female gender where the percentages of left-handed female siblings for the right and left handed footballers were 12.5% and 12.9% respectively- a difference, which is not significant. However table 4 shows that there is a relationship between the left

handed footballers and their male siblings. Specifically the percentage of the left handed male siblings among the left handed footballers was 46.7% (i.e. 42 out of 90 male siblings) while the percentage among the right handed was 6.71% (i.e. 6 out of 89 male siblings) a difference which was statistically significant at ( $p = 0.01$ ). Table 5 shows that the degree of crossed lateral preference demonstrated by the two categories was not statistically significant.

**Table 1: Handedness and footedness of 50 Male Footballers**

Handedness/Footedness	Right footed	Left footed	Both	Total
Right handed RH	21	1	3	25
Left handed LH	7	18	0	25
Total	28	19	0	50

**Table 2: Showing number of subjects and crossed lateral preference**

Handedness	Crossed preference	lateral	Uncrossed preference	lateral	Total
Right handed	4		21		25
Left handed	7		18		25
Total	11		39		50

**Table 3: showing number of handedness of subjects and handedness of parents**

Subject/parent	Father HR	LH	Both	Mother	LH	Both	Total
Right handed (RH)	24	-	1	23	2	-	50
Left handed (LH)	23	2	-	22	2	1	50
Total	47	2	1	45	4	1	100

**Table 4: Showing number of handedness of subject and handedness of siblings**

Subject/siblings	Male RH	LH	Both	Total	Females RH	LH	Both	Total
Right Handed RH	81	6	2	89	49	7	-	56
Left LH	46	42	2	90	47	7	-	54
Total	127	48	4	179	96	14	-	110

**Table 5: ANOVA test showing differences between crossed lateral preference of siblings and parents**

		Sum Squares	of	DF	Mean Squares	of	F	P
Age of respondent	Between groups	180.5	1	180.5	6.888	0.012		
	Within groups	1257.92	48	26.207				
	Total	1438.42	49					
Footedness of respondent	Between groups	0.08	1	0.08	0.054	0.817		
	Within groups	70.8	48	1.475				
	Total	70.88	49					
Right handed siblings	Between groups	27.38	1	27.38	7.027	0.011		
	Within groups	187.04	48	3.897				
	Total	214.42	49					
Left handed siblings	Between groups	25.92	1	25.92	16.545	0		
	Within groups	75.2	48	1.567				
	Total	101.12	49					
Ambidextrous siblings	Between groups	0	1	0	0	1		
	Within groups	5.68	48	0.118				
	Total	5.68	49					
Left handed parent	Between groups	0.08	1	0.008	0.533	0.469		
	Within groups	7.2	48	0.15				
	Total	7.28	49					
Right handed parent	Between groups	0.08	1	0.08	0.444	0.508		
	Within groups	8.64	48	0.18				
	Total	8.72	49					
Ambidextrous parents	Between groups	0	1	0	0	1		
	Within groups	1.92	48	0.04				
	Total	1.92	49					

## DISCUSSION

The result of the study showed that the left handed footballers were not consistently left footed. They were about 28% of them who demonstrated preference for the opposite foot (i.e. they were right footed) while the remaining 72% demonstrated left footed preference (uncrossed lateral preference). This phenomenon expressed among the left handed footballers is referred to as crossed lateral preference (Kang and Harris, 2000).

The right handed footballers also showed similar results. Some of them demonstrated crossed lateral preference, (16%) while the remaining 84% demonstrated uncrossed lateral preference, despite the similarity in this result, the two groups of footballers (right and left handed), some peculiarities among the category of the right handed that demonstrated crossed lateral preference have been noticed; of the 16% with crossed lateral preference only 4% (which is just 1 of 25 right handed footballers (were solely left footed, the other 12% were mixed footed. The reason for this may be that the footballers in an attempt to be more versatile in the game decided to train themselves to use their left feet thereby becoming mixed footed. A research carried out by Adeyemi and Doro in 2003 also made reference to culture and myths having effect on right hand dominance on learning (Adeyemi-Doro, 1993).

The statistical analysis of this result using ANOVA proved that the observed differences in the degree of crossed lateral preference demonstrated by the two categories of footballers were not statistically significant ( $P > 0.05$ )

The result of this study is at variance with the work of Kang and Harris in 2000. This also agrees with Borod *et al.* (1984), who observed that the left handed were significantly less lateralized with respect to performance and preference measure of handedness and footedness (Borod *et al.* 1984; Kang and Harris, 2000). The reason for the higher level of crossed lateral preference in the left handed may be due to the general tendency towards the characteristics of the majority of the population which is right preference.

This study has also showed that generally left lateralization was more common in footedness than in handedness. In other words, it is easier to find a left footed individual than to find left handed person. The incidence of left footedness according to this study is 38% while that of left handedness according to Reiss and Reiss, (1997) is less than 10% (Reiss and Reiss, 1997). This agrees with the other studies (Dittmar,

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2002; Reiss and Reiss, 1997) who showed the prevalence of right footedness to be 77.1% and 74% respectively, meaning that about 23.9% and 26% were non right footed respectively. This also agrees with the findings of Adeyemi-Doro (2003) that showed prevalence of right handed to be 93.7% and 96.1% respectively and 6.3% and 3.9% for non-right handed respectively.

Lastly, this work has demonstrated an association between left handed footballers and left handedness among their first degree relatives (i.e. particularly the male siblings). The left handed footballers had more left handed male siblings than right handed footballers, the percentage of left handed male siblings among the left handed footballers was 46.7% while the percentage among the right handed was 6.71% and which was statistically significant at ( $P = 0.01$ )

The result suggests that the pattern of genetic inheritance displayed in handedness favours a prevalence of left handedness among the first degree relatives of males who are left handed. This agrees with Ookis (2005) who suggested that handedness has genetic basis only among the left handed males.

## CONCLUSION

There is no significant difference in the degree of crossed lateral preference demonstrated by the left handed or right handed footballers and left handedness is significantly higher among the male siblings of the left handed footballers. Although non-right handedness is associated with many unpleasant things, it has some advantages. Being right-handedness or non-right handed should not be considered as good or bad, but rather simply different (Geschwind and Galaburda, 1985).

## RECOMMENDATIONS

We recommend that further work should be carried out to find answers to the following:

- Does the dominant hemisphere exert direct control on both sides of the body during function?  
And/or does the non dominant hemisphere express some degree of dominance on individuals with respect to handedness and footedness?

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