

## **Research Article**

### **Association between Tongue Rolling and Tongue Folding in Osogbo, Southwestern Nigeria**

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**Abstract:** The rolling and folding of tongues in man have attracted the interest of many researchers elsewhere but there is dearth of information on these two peculiar traits in Southwestern Nigeria. This present study was carried out among 144 individuals ( $\geq 18$  years) from the Yoruba tribe of Southwestern Nigeria in order to estimate the frequency of occurrence of tongue rollers and folders and to determine if there was any association between them. Participants were examined for the ability to roll and/or fold their tongues using standard methods. Of the 144 participants, the incidence of tongue rollers and tongue folders were 59.7% and 79.2% respectively. Tongue rolling was higher in females than male but the difference was not significant ( $\chi^2 = 1.039$ ,  $df = 1$ ,  $p = 0.308$ ). Tongue folding was significantly higher in females than males ( $\chi^2 = 4.211$ ,  $df = 1$ ,  $p = 0.04$ ). Of the 144 participants, 76 (52.8%) were tongue rollers and folders, 10 (6.9%) were rollers and non-folders, 38 (26.4%) were non-rollers and folders and 20 (13.9%) were non-rollers and non-folders. These classes did not vary significantly with sex ( $\chi^2 = 5.895$ ,  $df = 3$ ,  $p = 0.117$ ) but there was a significant association between the ability to roll the tongue and the ability to fold the tongue ( $\chi^2 = 10.97$ ,  $df = 1$ ,  $p < 0.001$ ). This study shows that tongue rollers are associated with tongue folders.

**Keywords:** Association, traits, tongue roller, tongue folders, Osogbo, Nigeria.

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#### **INTRODUCTION**

The rolling and folding of tongues in man have attracted the interest of many researchers because of their peculiarities. Some people can roll their tongues while others cannot. Similarly some people can fold their tongues while others cannot. Hsu [1] described the ability to roll the tongue as dominant; the gene regarded as a simple two allele character, with the allele for rolling being dominant over the allele for non-rolling. Liu and Hsu [2] described the ability to fold up the tip of the tongue as recessive. Liu and Hsu [2] demonstrated the independence of tongue rolling and tongue folding.

However, there are contradictory reports on these two traits. Some researchers are of the view that these traits are more than just simple genetics and that the characters are connected to habits developed early in life [3-5]. For instance, there are reports of some parents who cannot roll their tongues but have children with the ability and identical twins do not necessarily share an ability to roll the tongue [6, 5]. Nevertheless, these traits are given attention to because they are of great value in studying human diversity and population variations [7, 8].

In Nigeria, studies on these characters are rare. We are aware of only one study carried out in Southsouth Nigeria by Odokuma *et al.* [8] which focused on the incidence of these traits with respect to sex. The aim of the study was to determine the frequency distribution of tongue rollers and tongue folders among the Yoruba tribe of Southwestern Nigeria with a view to determining if there was any association between the ability to roll and fold the tongue.

#### **SUBJECTS AND METHODS**

This study was carried out in Osogbo, Southwestern Nigeria. A total of 144 unrelated volunteered (72 males and 72 females) students of Ladoke Akintola University of Technology, Osogbo, Nigeria who were all of Yoruba tribe participated in the study. Ethical approval for this study was obtained from the Ethical Committee of Ladoke Akintola University Teaching Hospital, Osogbo, Nigeria. Standard methods were employed in recording the ability to roll and fold the tongue [9].

Each participant was asked to roll and fold their tongue without using their teeth. One of the authors who could both roll and fold his tongue was

readily available to demonstrate to the participants. Those who could roll their tongues were regarded as tongue rollers (R+) while those who could not were called tongue non-rollers (R-). Similarly, participants who could fold their tongues were known as tongue folders (F+) while those who could not were called non-folders (F-). Also recorded were participants who could roll and fold their tongues (R+F+), those who could roll but not fold their tongues (R+F-), those who could not roll but fold their tongues (R-F+) and those who could neither roll nor fold their tongues (R-F-). Data were analysed using percentages and proportions and their differences were examined using Chi-square ( $\chi^2$ ) test. A  $p < 0.05$  was considered statistically significant.

**RESULTS**

The mean age of the 144 participants was 25.85 years (range 19-40). The frequency distribution of tongue rollers and non-rollers together with tongue folders and non-folders among the study population in relation to sex is given in Table 1. Of the 144 participants, 86 (59.7%) comprising 40 (55.6%) of the 72 males and 46 (63.9%) of the 72 females were tongue rollers while 58 (40.3%) comprising 32 (44.4%) of the 72 males and 26 (36.1%) of the 72 females were tongue non-rollers. There were more female tongue rollers than

male tongue rollers but the difference was not statistically significant ( $\chi^2 = 1.039$ ,  $df = 1$ ,  $p = 0.308$ ). Also Table 1 shows that of the 144 participants, 114 (79.2%) comprising 52 (72.2%) of the 72 males and 62 (86.1%) of the 72 females were tongue folders while 30 (20.8%) comprising 20 (27.8%) of the 72 males and 10 (13.9%) of the 72 females were tongue non-folders. There were more female tongue folders than male tongue folders and the difference was statistically significant ( $\chi^2 = 4.211$ ,  $df = 1$ ,  $p = 0.04$ ).

The two traits, tongue rolling and folding, were considered together and the frequency distributions with respect to sex are given in Table 2. There were four combinations observed: rollers and folders (R+F+), rollers and non-folders (R+F-), non-rollers and folders (R-F+), non-rollers and non-folders (R-F-). Of the 144 participants, 76 (52.8%) were tongue rollers and folders, 10 (6.9%) were rollers and non-folders, 38 (26.4%) were non-rollers and folders and 20 (13.9%) were non-rollers and non-folders. These combined traits did not vary significantly with respect to sex ( $\chi^2 = 5.895$ ,  $df = 3$ ,  $p = 0.117$ ). However, there was a significant association between the ability to roll the tongue and the ability to fold the tongue ( $\chi^2 = 10.97$ ,  $df = 1$ ,  $p < 0.001$ ).

**Table-1: Distribution of Tongue Rolling and Folding by Sex among the Study Population in Osogbo, Southwestern Nigeria**

Character	All Subjects (%)	Male (%)	Female (%)
<b>Tongue rolling</b>			
Rollers	86 (59.7)	40 (55.6)	46 (63.9)
Non-rollers	58 (40.3)	32 (44.4)	26 (36.1)
Total	144 (100.0)	72 (50.0)	72 (50.0)
<b>Tongue folding</b>			
Folders	114 (79.2)	52 (72.2)	62 (86.1)
Non-folders	30 (20.8)	20 (27.8)	10 (13.9)
Total	144 (100.0)	72 (50.0)	72 (50.0)

**Table-2: Distribution of Combination of Tongue Rolling and Folding by Sex among the Study Population in Osogbo, Southwestern Nigeria**

Character (%) combination	All Subjects	Male (%)	Female
R+F+	76 (52.8)	35 (48.6)	41 (56.9)
R+F-	10 (6.9)	5 (6.9)	5 (6.9)
R-F+	38 (26.4)	17 (23.6)	21 (29.2)
R-F-	20 (13.9)	15 (20.8)	5 (6.9)
Total	144 (100.0)	72 (50.0)	72 (50.0)

**DISCUSSION**

This study reported a higher incidence of tongue rollers (59.7%) than non-rollers. This is similar to the observation of Odokuma *et al.* [8] who reported an incidence of 60.8% rollers in Southsouth Nigeria. Elsewhere, studies had shown that the frequencies of tongue rollers vary significantly from one population to

another. For instance, in India, researchers had reported a range from 28.5% to 97.7% incidence of rollers [10, 11, 12, 4]. Similarly, in this study, the incidence of tongue folders (79.2%) was higher than that of non-folders. This is in line with the report of Odokuma *et al.* [8] in Southsouth Nigeria who reported an incidence of 83.9%. As with rollers, a wide range from 7.1% to

84.9% of folders had been reported in previous studies elsewhere [4].

In this study, the frequency of tongue rollers was higher in females than in males but the difference was not significant. This is in line with the findings of Bulliyya [4] and Odokuma *et al.* [8] who reported no significant difference in tongue rolling with respect to sex. This implied that the ability to roll the tongue is independent on sex. However, the tongue folders were significantly higher in females than in males in this study. This is in line with the report of Bhattacharya [13] while some other studies had reported non-statistically significant higher tongue folding in females compared to males [4, 9].

This study favours the suggestion that both traits exhibit dominance; the ability to roll the tongue being dominant just as the ability to fold the tongue. The result of this study is at variance with the report of Hsu [1] and Singh [9] who opined that the ability to fold the tongue was recessive while the ability to roll the tongue was dominant.

This study showed that there was a significant association between the ability to roll the tongue and the ability to fold the tongue. Individuals who were tongue rollers and folders were considerably much more than any other combinations. Rollers and folders (R+F+) were the highest while rollers and non-folders (R+F-) were the least in this study population. In his study, Singh [9] reported that rollers and non-folders (R+F-) had the highest frequency and non-rollers and folders (R-F+) had the least but found no association between tongue rolling and tongue folding. On the other hand, Bulliyya [4] reported that non-rollers and non-folders had the highest frequency and rollers and folders had the least while his data showed a significant association between tongue non-rollers and non-folders.

These variations in the expression of both the rolling and folding traits as dominant or as recessive show that the inheritance of each of these traits is more than simple Mendelian genetics. The dominance demonstrated in tongue folding or tongue rolling cannot be as described as a simple one gene, two allele genetic character with the rolling allele completely dominant over non-rolling and the folding allele completely dominant over non-folding. The deviations observed could be attributed to the involvement of multiple genes or some environmental influence. The results of this present study support the views of some researchers that these traits are more than just simple genetics [3-5]

## CONCLUSION

This study shows that both tongue folding and rolling traits are two distinct traits with folding and rolling dominant to non-folding and non-rolling respectively. There is an association between tongue rollers and tongue folders. Tongue rollers are more

likely to be tongue folders. The marked variation in the expression of these traits from one population to another is a pointer to the fact that they are influenced by both genetics and environment.

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