2nd to 4th digit ratios and handedness in UM BMS1 students

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Introduction

Right-handed people comprise between the 80% and 90% of the Anglo-Saxon population, as has been studied via the use of questionnaires, without any significant variation in this metric between genders (1). Handedness seems to appear early on in a person's life, with the first indications of their handedness bias recently in the post-natal period. One example of such behaviour is newborns preferring to lie with their head turned to a specific side after being held in a midline position, which was strongly related to the hand which most frequently contacted the mouth (2). This, along with other evidence, suggests that handedness is mediated by an epigenetic marker.

Some evidence seems to point towards the ratio of prenatal testosterone to prenatal oestrogen as being an important factor in the development of extragenital sexual dimorphisms, of which the differentiation of the nervous system is a part of. Said differentiation may include the expression of laterality preferences. This is hypothesized to be due to testosterone slowing down growth within some areas of the left hemisphere, while promoting growth of certain others in the right hemisphere (3). Another extragenital sexual dimorphism related to prenatal testosterone levels has been observed to be the 2nd to 4th digit ratios, with a negative correlation between it and the fetal testosterone to fetal oestradiol ratio (4). The 2D:4D theory has caused controversy in the scientific community due to producing irreproducible or contradictory results, as well as an exaggeration of its usefulness and applications in medicine. The psychologist Martin Voracek has compared the study of this ratio to phrenology (5). Its relationship with handedness is also under a fair amount of criticism, as there are two main neurological development models that seem to contradict each other (the Geschwind-Behan-Galaburda model and the sexual differentiation model predict the opposite of the callosal hypothesis) (6). The purpose of this work was to examine the association between the 2D-4D ratio and handedness.

Materials and methods

Only first-year biomedical students were recruited to participate in this study. There were no exclusion criteria, and participation was voluntary, though highly encouraged. The subjects were instructed, during an informative session in which the project was discussed and explained, how to properly measure their own finger lengths. These measures had to be taken with a ruler, from the middle of the bottom-most crease to the tip of each of the studied fingers, and they had to be written down in the provided data collection spreadsheet in millimetres. The 2D:4D ratio of each hand had to be calculated and registered in the spreadsheet.

The data was collected anonymously via each student's project mentor, compiled into a single common database, and shared for analysis. Alongside 2D and 4D lengths of both hands, participants were also asked to note down their age and handedness. The influence of gender in handedness or digit ratio was not of interest in this study.

After the data collection, a descriptive statistical analysis and data graphing were performed using IBM SPSS.

Results

The results of a descriptive statistical analysis, seem to show that left-handed people (*Table 1*) have, in average, a higher 2D:4D ratio than right-handed people (*Table 2*). Left-handed people also have a higher ratio when compared to the mean from all the studied subjects (*Table 3*). The standard deviation is very similar in both groups when compared between each other or against the general population, which indicates a similar spread of the datapoints.

Table 1: *Descriptive statistical analysis of the results from left-handed subjects*

	L Hand	R Hand
Subjects	19	19
Mean	1,005	0,988
Median	1,013	0,986
Standard Deviation	0,044	0,055

Table 2: *Descriptive statistical analysis of the results from right-handed subjects*

	L Hand	R Hand
Subjects	138	138
Mean	0,982	0,985
Median	0,974	0,974
Standard Deviation	0,045	0,043

Table 3: *Descriptive statistical analysis of the results from all subjects*

	L Hand	R Hand
Subjects	157	157
Mean	0,985	0,985
Median	0,985	0,974
Standard Deviation	0,045	0,045

Three outlying values can be observed when looking at the average (between left and right) 2D:4D ratios in each subject (*Figure 1*).

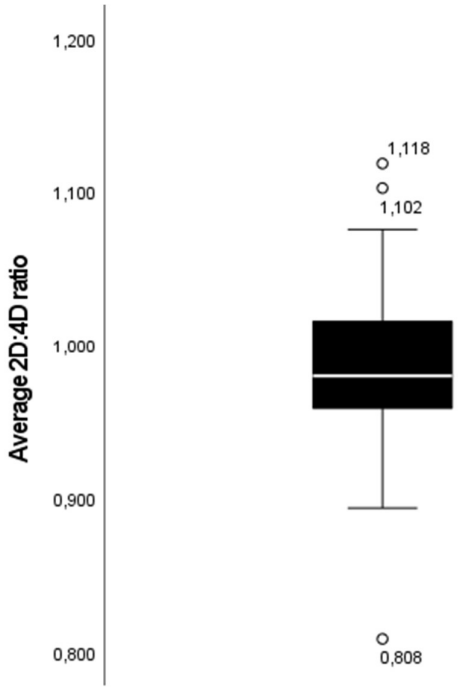

Figure 1: *Box-and-whiskers graph of the 2D:4D ratios of all participants*

Conclusion

PLACEHOLDER

Discussion

One problem with study: measure-taker may have been influenced to modify data slightly to fit in with ratio according to gender.

References

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