Male Medical Students Have Lower Second-To-Fourth Digit Length Ratio than Non-Medical Students But Not the Females

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Abstract—The length ratio of the index finger (2D) to the ring finger (4D) has been the subject of much recent research, although the sexually dimorphic nature of this ratio has been reported for over 50 years. The 2D:4D ratio is a likely biomarker for the organizational (permanent) effects of prenatal androgens on the human brain and body, and seems that the ratio is stable during life. Coco et al. recently reported that male medical students have lower 2D:4D than male non-medical students. In this study, we attempted to replicate their finding with 140 medical students (97 male, 43 female) and 150 individuals who did not pass the medical school admission test (non-medical students)(99 male, 51 female) [1]. The results showed that average right 2D:4D of male is lower in medical students than in non-medical students as reported by Coco et al. [1]. However, no difference exists in female.

Keywords— digit ratio, finger, medical students, prenatal androgens.

I. INTRODUCTION

The length ratio of the index finger (2D) to the ring finger (4D) is a widely studied putative indicator for prenatal androgen effects. The individual differences in 2D:4D emerge in uterus at the end of the first trimester [2], [3]. Longitudinal studies show that values of 2D:4D seem relatively stable during postnatal life [4]. Coco et al. recently reported that male medical students have lower 2D:4D than male non-medical students, and concluded that higher prenatal testosterone increase performance in situations that require prompt decision-making and the ability to take risks [1]. If lower digit ratios are associated with medical students, then an association between the two should be apparent in females well as male, since the association between prenatal testosterone and digit ratios is at least as well substantiated in male as it is in female. To test this, we examined data collected from Taipei Medical University, Taiwan.

II. METHODS

A. Participants

The participants in the study were 140 medical students (97 male, 43 female) and 150 individuals who did not pass the medical school admission test (non-medical students) (99 male, 51 female). All the participants are freshmen. The study was approved by the Ethics Committee of the Taipei Medical University, Taiwan.

B. Assessment of 2D:4D

Images of hands were collected from participants using a BENQ scanner 5550T computer scanner. Hands were placed lightly on the surface of the plate. Image analysis was performed using Image-Pro Plus 5.0 software (Media Cybernetics, USA). Every digit was measured twice and the average was taken. Feature points were marked at the tip of the finger and at the center of the proximal crease on the second and fourth digits. Actual measurement was carried out automatically, 2D:4D was calculated by dividing 2nd by 4th digit length. The Pearson’s product moment correlation between the first and second measurements of the length of the second and fourth digits was high for the right and left hands (all r > 0.95). It suggests that our measurements have a high degree of repeatability.

C. Statistical analysis

We used independent t-test to compare the variables between medical students and non-medical students within a sex. The variables includes age, height, weight, the second digit length (2D), fourth digit length (4D), and 2D:4D ratios. We also calculated effect sizes [5], using the standard consensus that d = 0.2 is small, d = 0.5 is medium, and d = 0.8 is large.

III. RESULTS

The results are summarized in Table 1. In female, no difference existed in 2D, 4D, and 2D:4D ratios between medical students and non-medical students. In male, the right 2D:4D in medical students was lower than those in non-medical students (p = 0.028; Cohen’s d = 0.31), and the left
2D:4D had no difference between groups.

### Table I

<table>
<thead>
<tr>
<th>Variable</th>
<th>Male</th>
<th>Female</th>
<th>P value</th>
<th>Male</th>
<th>Female</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>19.2±1.7</td>
<td>19.0±1.9</td>
<td>.527</td>
<td>19.0±1.3</td>
<td>18.3±1.5</td>
<td>.431</td>
</tr>
<tr>
<td>Height</td>
<td>173.8±6.1</td>
<td>173.0±6.0</td>
<td>.383</td>
<td>159.4±5.0</td>
<td>159.0±5.3</td>
<td>.684</td>
</tr>
<tr>
<td>Weight</td>
<td>69.0±11.7</td>
<td>67.1±11.4</td>
<td>.237</td>
<td>51.2±7.9</td>
<td>50.3±5.0</td>
<td>.323</td>
</tr>
<tr>
<td>L4D</td>
<td>74.49±4.89</td>
<td>74.49±4.89</td>
<td>.458</td>
<td>68.76±3.57</td>
<td>68.29±4.29</td>
<td>.573</td>
</tr>
<tr>
<td>R2D</td>
<td>71.51±4.03</td>
<td>71.83±4.03</td>
<td>.587</td>
<td>67.17±4.12</td>
<td>66.13±4.20</td>
<td>.230</td>
</tr>
<tr>
<td>R4D</td>
<td>75.40±4.98</td>
<td>74.70±3.96</td>
<td>.279</td>
<td>68.75±3.58</td>
<td>68.32±4.59</td>
<td>.621</td>
</tr>
<tr>
<td>L2D4D</td>
<td>0.962±0.057</td>
<td>0.958±0.034</td>
<td>.542</td>
<td>0.979±0.030</td>
<td>0.972±0.031</td>
<td>.285</td>
</tr>
<tr>
<td>R2D4D</td>
<td>0.950±0.040</td>
<td>0.962±0.037</td>
<td>.028</td>
<td>0.978±0.043</td>
<td>0.969±0.039</td>
<td>.310</td>
</tr>
</tbody>
</table>

### IV. Conclusion

The 2D:4D as a proxy measure of prenatal testosterone exposure. Intelligence or learning-ability skills might be influence by prenatal testosterone. Analysis of the data from our sample revealed that male medical students have lower second-to-fourth digit length ratio than non-medical students, these findings are consistent with those from another study for male medical students [1]. However, the 2D:4D ratios of female medical students are equivalent to non-medical students. We conclude that prenatal testosterone exposure do not relate to intelligence or learning-ability skills in female.

### References


