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Hormones and Behavior 49 (2006) 150 – 156

Hormones and Behavior

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# A longitudinal study of digit ratio (2D:4D) and other finger ratios in Jamaican children

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Received 25 January 2005; revised 25 May 2005; accepted 26 May 2005
Available online 22 July 2005

**Abstract**

It has been hypothesised that the ratio between the length of the 2nd and 4th digits (2D:4D) is a correlate of prenatal sex steroids, and this relationship is strongest for the right hand. Furthermore, it has been suggested that 2D:4D is sexually dimorphic, the dimorphism is determined early, and 2D:4D among children is stable with growth. Here, we present the first longitudinal study of right and left hand 2D:4D. Our sample was 108 (54 males) Jamaican children. The first measurements were made in 1998 when mean age was 9.68 ± 1.39 years, and a second set of measurements were made in 2002. We found that: (i) there was a small increase in 2D:4D with age which was lowest in the right hand; (ii) 2D:4D was sexually dimorphic, the means for males and females differed in the same direction in the 1998 and 2002 samples, and the sex difference was significant in the 1998 but not in the 2002 sample; (iii) the correlation between the 1998 and 2002 measurements of 2D:4D was high, indicating that rank order of the ratio was stable across year groups; and (iv) the rate of change in 2D:4D did not differ significantly across year groups. We conclude that 2D:4D increases slightly with age in children with the effect less marked for the right hand (i.e. the hand which is likely to show the strongest association with prenatal steroids), 2D:4D is sexually dimorphic from an early age, and the rank order of 2D:4D is stable in children. We discuss the implications of our findings for the status of 2D:4D as a correlate of prenatal sex steroids. The patterns of change in other finger ratios are also considered.


*Keywords:* Digit ratio; 2D:4D; Longitudinal change

## Introduction

It is thought that prenatal sex steroids such as testosterone and oestrogen have substantial organising effects on the foetal brain and other organs (Migeon and Wisniewski, 1998). However, these effects are difficult to study in humans for ethical and practical reasons. Recently, it has become apparent that patterns of finger length may contain information concerning exposure to prenatal sex hormone.

### *2D:4D ratios*

Manning et al. (1998) have suggested that the ratio between the lengths of the 2nd (index) and 4th (ring) fingers (the 2D:4D ratio), a sexually dimorphic trait with lower mean 2D:4D in males compared to females, is negatively related to prenatal testosterone and positively related to oestrogen. The Manning et al. (1998) study reported cross-sectional evidence that 2D:4D was determined early and was correlated with adult concentrations of sex steroids. Such associations may arise as a result of similarities between levels of prenatal and adult hormones. However, prenatal/adult correlations of sex hormones are probably quite weak (Manning et al., 2004a), and more convincing evidence for a link between 2D:4D and prenatal sex steroids is necessary. Thus, in support of prenatal effects of testosterone and oestrogen on finger ratio, the 2D:4D in children has been reported to be negatively related to the testosterone and oestrogen-dependent waist-to-hip ratio of their mothers (Manning et al., 1999) and to radioimmunoassays of foetal testosterone and oestrogen obtained from

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doi:10.1016/j.yhbeh.2005.05.023

routine amniocentesis (Lutchmaya et al., 2004). In addition, there is evidence from studies of congenital adrenal hyperplasia (CAH) and the structure of the androgen receptor gene (AR) that prenatal testosterone reduces values of 2D:4D. The 2D:4D ratio is lower in children with CAH, a condition associated with high in utero androgen concentrations, compared to healthy controls (Brown et al., 2002a,b; Okten et al., 2002, but see Buck et al., 2003). Allelic variation in the AR influences sensitivity to testosterone, such that individuals with AR alleles containing small numbers of CAG triplets have higher sensitivity than individuals with AR variants containing high numbers of such repeats. The 2D:4D ratio is lower in men with low numbers of CAG repeats compared to men with high numbers of CAG triplets (Manning et al., 2003).

If 2D:4D in adults is a correlate of prenatal sex steroids, we should expect it to be sexually dimorphic, the dimorphism should be present in very young children, the rank order of 2D:4D among individuals should not change with growth, and 2D:4D should show little absolute change with growth in children (Manning et al., 1998). There is some support for these suggestions from cross-sectional studies of children in various ethnic groups. Thus, in a sample of Caucasians from the Liverpool area of the United Kingdom, Manning et al. (1998) examined the relationship between age and 2D:4D in the right and left hands of 800 participants aged from 2 years to 25 years. They found no significant relationships. Similarly, 798 children aged from 5 to 14 years drawn from Caucasian populations (Berbers of North Africa, $n$ = 90, Uygurs of East Asia, $n$ = 438), Orientals (Han of China, $n$ = 118), and Afro-Caribbean populations (Jamaicans, $n$ = 152) showed no overall significant association of right or left 2D:4D regressed on age (Manning et al., 2004b). However, two smaller samples have shown some evidence of a weak tendency for 2D:4D to increase with age in children. In a sample of 130 Jamaican children aged 5 to 11 years, the left hand 2D:4D but not the right was positively and significantly correlated with age (Manning et al., 2000). Similarly, a sample of Caucasian pre-school children (aged 2 to 5 years) from the Aberdeen area of Scotland showed a slight increase of 2D:4D with age at a rate of 0.0008/year on the left and 0.012/year on the right (Williams et al., 2003).

### *Other finger ratios*

Links between the developmental control of the urinogenital system and patterns of finger growth may influence digits other than 2D and 4D (see Manning et al., 1998 and Manning, 2002 for discussion). In addition to 2D:4D, there are five possible finger ratios: 2D:3D, 2D:5D, 3D:4D, 3D:5D, and 4D:5D (we have excluded the 1st digit or 'thumb' because reliable measurement landmarks are difficult to establish). In humans, sexual dimorphism has been reported for 2D:5D and 3D:4D (McFadden and Shubel, 2002), and for 2D:3D and 2D:5D (Manning et al., 2003). In mice, there is evidence that 2D:3D is dimorphic (Manning et al., 2003). This may mean that a number of the finger ratios could be correlates of sex-dependent traits such as developmental disorders and susceptibility to disease (e.g. 2D:3D, 2D:4D, and 2D:5D for myocardial infarction: Manning et al., 2003). The stability of these ratios in rapidly growing children is therefore of interest.

Cross-sectional studies are useful indicators of possible longitudinal changes in 2D:4D and other ratios. However, in order to be sure of the pattern of right and left hand finger ratios with age in children, we need longitudinal studies. Here, we report data from the first such study in Afro-Caribbean children from Jamaica.

## Material and methods

### *Participants*

We recruited 108 (54 males) Afro-Caribbean children from the Southfield district of the parish of St. Elizabeth in Jamaica. This sample comprised part of the 'Jamaican Symmetry Project', which is a long-term study of fluctuating asymmetry in rural Jamaican children (Trivers et al., 1999).

### *Procedure*

The ventral surface of the right and left hands of the participants was photocopied in July 1998. At this time, the mean age of the participants was 9.68 ± 1.39 years with a range from 7 to 13 years. The hands of the participants were photocopied again 4 years later in July 2002.

All measurements of the fingers (2D, 3D, 4D, and 5D) were made from the photocopies. The lengths of the fingers were measured from the ventral crease to the tip of the finger (see Manning, 1995, for reliability of measurements made directly from the fingers, and Manning (2002) and Manning et al. (2004b), for reliability of finger measurements and 2D:4D from photocopies). When the finger had multiple creases, as is often the case for the 3rd and the 4th, the crease proximal to the palm was measured. All measurements were made with steel callipers recording to 0.01 mm. In order that the reliability of measurements could be assessed, all fingers were measured twice, at least 24 h elapsed between the 1st and 2nd measurement, and the 2nd measurement was made blind to the first. The photocopies from 1998 were measured first, and measurements from the 2002 sample were made blind to measurements from the 1998 sample.

## Results

### *2D:4D ratios*

We found high intra-class correlation coefficients ($r_1$) for 2nd and 4th finger length from both the 1998 and 2002

photocopies (Table 1). The $r_1$ values for finger length measurements varied from $r_1$ = 0.995 to $r_1$ = 0.998. As expected, those for 2D:4D were slightly lower at $r_1$ = 0.940 to $r_1$ = 0.977. Repeated measures ANOVA analyses showed between-individual differences in finger length greater than error differences (from $F$[1,107] = 388.05 to $F$[1,107] = 880.79, $P$ = 0.0001). Lower but nevertheless highly significant $F$ values were found for 2D:4D ranging from $F$[1,107] = 32.38 to $F$[1,107] = 85.15. We concluded that our measurements reflected real differences in finger length and 2D:4D between participants. Mean finger lengths and 2D:4D were calculated from the first and second measurements and used in subsequent analyses.

As expected, we found that fingers were longer in the 2002 sample compared to the 1998 sample. The means for the left hand were: 2D 1998 60.29 ± 5.53 mm, 2002 69.90 ± 4.90 mm, paired $t$ test $t$ = 21.53, $P$ = 0.0001, 4D 1998 64.79 ± 5.57, 2002 73.73 ± 5.58, $t$ = 19.89, $P$ = 0.0001. The means for the right hand were: 2D 1998 60.60 ± 5.23, 2002 69.68 ± 4.86, $t$ = 21.82, $P$ = 0.0001, 4D 1998 64.66 ± 5.53, 2002 73.60, $t$ = 8.94, $P$ = 0.0001.

Our main concern here is with 2D:4D ratios, not finger lengths. We ask 'does mean 2D:4D change across time?' In the total sample, there were lower mean values of 2D:4D in 1998 (right 2D:4D 0.938 ± 0.032, left 0.931 ± 0.036) compared to 2002 (right 2D:4D 0.947 ± 0.034, left 0.949 ± 0.035), and these changes in 2D:4D across time were significant (paired $t$ tests; right $t$ = 4.63, $P$ = 0.0001, $d$ = 0.27, left $t$ = 8.134, $P$ = 0.0001, $d$ = 0.51: note that we have used Cohen's $d$ as a measure of effect size). This meant that mean 2D:4D increased with growth in this sample. With regard to sex ratio, an inspection of the sex difference in the 1998 sample showed that it was significant for the right and left hand with small effect size (right hand; males 0.932 ± 0.033, females 0.944 ± 0.033, $t$ = 2.05, $P$ = 0.04, $d$ = 0.38: left hand; males 0.924 ± 0.038, females 0.938 ± 0.033, $t$ = 2.04, $P$ = 0.04, $d$ = 0.39). There were no significant sex differences in 2D:4D in the 2002 sample, but, in common with the 1998 sample, male ratios were lower than female (right hand; males 0.944 ± 0.036, females 0.951 ± 0.031, $t$ = 1.12, $P$ = 0.27, $d$ = 0.21: left hand; males 0.943 ± 0.037, females 0.955 ± 0.032, $t$ = 1.80, $P$ = 0.08, $d$ = 0.35). In order to consider changes across time and sex differences in digit ratio, we performed a 2-factor ANOVA on 2D:4D with Factors for (A) Sex (male and female) and (B) Year of Measurement (1998 and 2002). There were significant main effects for Sex and Year of Measurement (right hand; A = $F$[1,212] = 4.78, $P$ = 0.03, B = $F$[1,212] = 4.67, $P$ = 0.03: left hand; A = $F$[1,212] = 7.55, $P$ = 0.007, B = $F$[1,212] = 14.54, $P$ = 0.0002). This confirmed a significant sex difference in 2D:4D and that 2D:4D differed between the years of measurement. There were no significant interaction effects (right hand AB = $F$[1,212] = 0.37, $P$ = 0.55; left hand AB = $F$[1,212] = 0.04, $P$ = 0.85: the interaction plots are shown in Fig. 1). The lack of an interaction effect for either hand showed that the means for males and females differed in the same direction in 1998 and 2002.

The 1998 and 2002 values of 2D:4D were strongly correlated with one another (right hand $r$ = 0.78, Fig. 2; left hand $r$ = 0.79). An inspection of Fig. 2 shows some changes in 2D:4D. For example, one participant went from 0.93 to 0.88 and another from 0.88 to 0.95. Nevertheless, the 1998 2D:4D ratios explained more than 60% of the variance of the ratios measured in 2002 (adjusted $r^2$, right hand $r^2$ = 0.61, left hand $r^2$ = 0.62). With regard to stability of rank order of 2D:4D across time, Spearman rank correlation coefficients were high for both the right ($r_s$ = 0.77, $Z$ = 7.98, $P$ = 0.0001) and the left hand ($r_s$ = 0.75, $Z$ = 7.80, $P$ = 0.0001). This showed that the rank order of 2D:4D among the children had changed little over 4 years of growth.

Correlation analysis does not reveal whether directional changes in 2D:4D have occurred with growth. As stated, there was evidence that 2D:4D was higher in the 2002 sample compared to that of 1998 and that the effect size was higher for the left hand ($d$ = 0.51) compared to the right ($d$ = 0.27). The mean increase in 2D:4D for the right hand was 0.01 ± 0.02 with a rate of change of 0.0025 per year, and for the left hand, it was 0.018 with a change of 0.0036 per year. A 2-factor ANOVA on change in 2D:4D with Factors for (A) Sex (male and female) and (B) Hand (right and left) showed a non-significant effect for Sex (A = $F$[1,212] = 1.22, $P$ = 0.27) and a significant effect for Hand (B = $F$[1,212] = 7.76, $P$ = 0.006) with a non-significant interaction factor (AB = $F$[1,212] = 0.31, $P$ = 0.58). This confirmed that 2D:4D changes from 1998 to 2002 were greater in the left hand compared to right but showed that the magnitude of the change in 2D:4D between hands was similar in males and females.

Table 1
Intra-class correlation coefficients ($r_1$) for finger length measurements and 2D:4D values in 108 Jamaican children

| | $r_1$ | $F$(1,107) | $P$ |
|---|---|---|---|
| *1998 sample* | | | |
| 2D left | 0.995 | 388.05 | 0.0001 |
| 4D left | 0.955 | 418.56 | 0.0001 |
| 2D right | 0.995 | 427.55 | 0.0001 |
| 4D right | 0.996 | 494.28 | 0.0001 |
| 2D:4D left | 0.951 | 39.52 | 0.0001 |
| 2D:4D right | 0.940 | 32.38 | 0.0001 |
| *2002 sample* | | | |
| 2D left | 0.996 | 524.59 | 0.0001 |
| 4D left | 0.998 | 880.79 | 0.0001 |
| 2D right | 0.996 | 463.34 | 0.0001 |
| 4D right | 0.997 | 753.01 | 0.0001 |
| 2D:4D left | 0.977 | 85.15 | 0.0001 |
| 2D:4D right | 0.972 | 71.18 | 0.0001 |

Each child's 2D:4D was measured from photocopies taken in 1998 and again in 2002. The $F$ values were obtained from repeated measures ANOVA tests and are the ratios of between-individual differences (representing real differences) and measurement error. In all measurements, the differences between participants were much greater than the measurement error. The 1998 sample was taken when the mean age of the children was 9.68 ± 1.39 years.

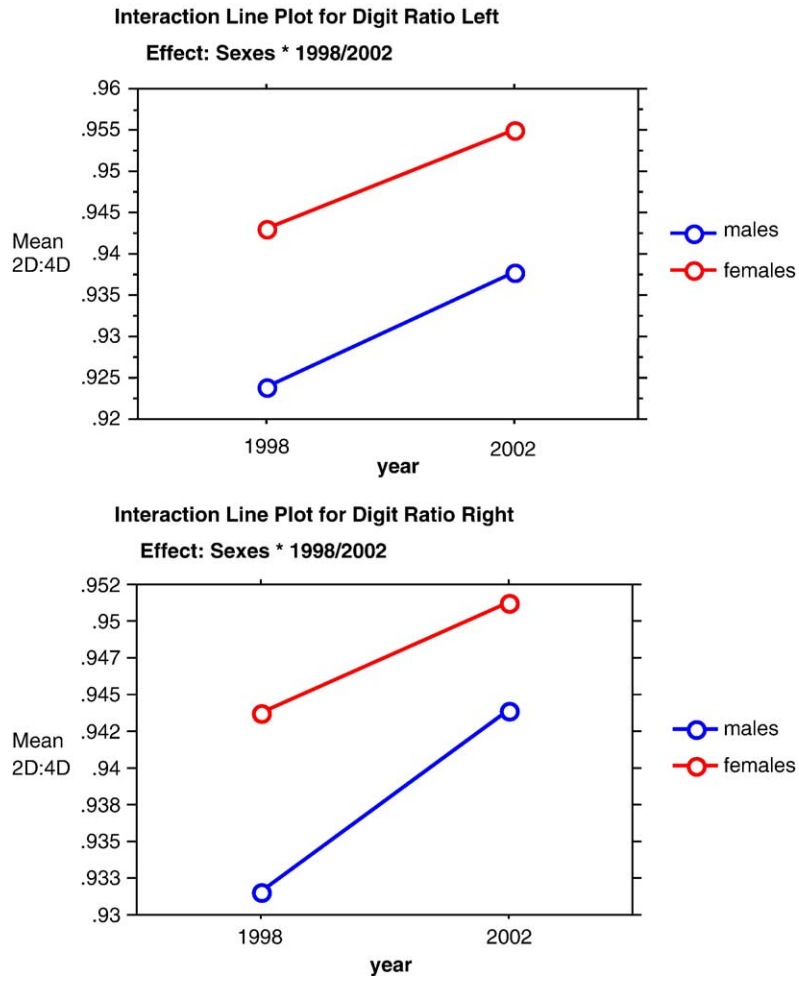


Fig. 1. Interaction plots show changes in mean 2D:4D from 1998 to 2002 in 54 boys and 54 girls from Jamaica. Note that a 2-factor ANOVA showed that a mean digit ratio increased significantly from 1998 to 2002 and that there was a significant sex difference in 2D:4D such that mean 2D:4D is lower in males than in females. There was no significant interaction between year of measurement (1998 or 2002) and sex (male or female), showing that the direction of change in 2D:4D from 1998 to 2002 was similar in males and females.

In order to examine further the rate of change across age groups, we considered the male and female samples separately. There were seven age groups which included participants showing growth from as young as 7 years in 1998 to 11 years in 2002 and as old as 13 years in 1998 to 17 years in 2002. Details of the numbers of males and females in each age group were as follows: 7 years to 11 years (1 male and 2 females), 8 years to 12 years (11 males and 9 females), 9 years to 13 years (13 males and 15 females), 10 years to 14 years (11 males and 9 females), 11 years to 15 years (15 males and 11 females), 12 years to 16 years (2 males and 5 females), and 13 years to 17 years (1 male and 2 females). We found no significant differences in the rate of change of 2D:4D across these age groups in either males or females (ANOVA: right hand; males $F[6]53 = 0.0003$, $P = 0.80$, females $F[6]53 = 0.00004$, $P = 0.48$: left hand; males $F[6]53 = 0.0005$, $P = 0.82$, females $F[6] = 0.001$, $P = 0.053$). This result indicates that the small increases in 2D:4D with age were constant across age groups for both sexes.

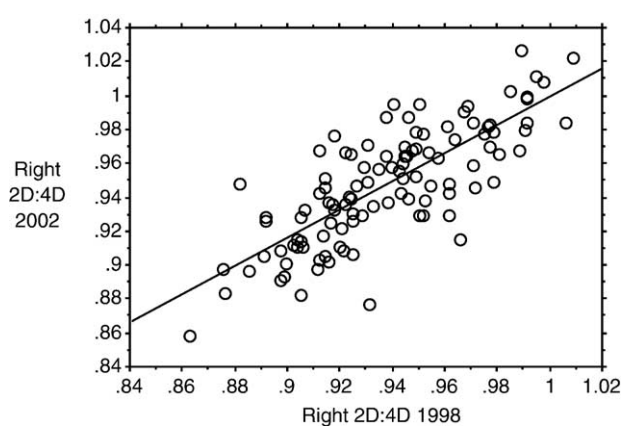


Fig. 2. The relationship between right hand 2D:4D in Jamaican children measured in 1998 and again in 2002.

*Other finger ratios*

The 2D:4D ratio and its possible changes with growth are the main focus of this paper. Here, we deal briefly with the remaining finger ratios.

Table 2
Intra-class correlation coefficients ($r_1$) for the right and left finger ratios of 108 Jamaican children

| | $r_1$ | $F(1,107)$ | $P$ |
|---|---|---|---|
| *1998 sample* | | | |
| 2D:3D left | 0.940 | 32.55 | 0.0001 |
| 2D:3D right | 0.955 | 43.71 | 0.0001 |
| 2D:5D left | 0.982 | 109.11 | 0.0001 |
| 2D:5D right | 0.986 | 138.68 | 0.0001 |
| 3D:4D left | 0.933 | 28.67 | 0.0001 |
| 3D:4D right | 0.937 | 30.56 | 0.0001 |
| 3D:5D left | 0.989 | 175.39 | 0.0001 |
| 3D:5D right | 0.988 | 166.03 | 0.0001 |
| 4D:5D left | 0.967 | 59.05 | 0.0001 |
| 4D:5D right | 0.967 | 58.80 | 0.0001 |
| *2002 sample* | | | |
| 2D:3D left | 0.978 | 90.73 | 0.0001 |
| 2D:3D right | 0.963 | 53.35 | 0.0001 |
| 2D:5D left | 0.984 | 122.74 | 0.0001 |
| 2D:5D right | 0.984 | 122.21 | 0.0001 |
| 3D:4D left | 0.953 | 41.80 | 0.0001 |
| 3D:4D right | 0.961 | 50.36 | 0.0001 |
| 3D:5D left | 0.984 | 175.39 | 0.0001 |
| 3D:5D right | 0.986 | 138.00 | 0.0001 |
| 4D:5D left | 0.977 | 86.02 | 0.0001 |
| 4D:5D right | 0.984 | 125.42 | 0.0001 |

Each child's fingers were measured from photocopies taken in 1998 and again in 2002. There are five possible ratios (excluding 2D:4D). The $F$ values were obtained from repeated measures ANOVA tests and are the ratios of between-individual differences (representing real differences) and measurement error. In all measurements, the differences between participants were much greater than the measurement error.

In Table 2, we show $r_1$ values for five finger ratios (for brevity, we do not show repeatability values for finger length measurements). All $r_1$ values were high ranging from 0.933 for the left hand 3D:4D ratio in the 1998 sample to 0.989 for the left hand 3D:5D also in the 1998 sample. Repeated measures ANOVA tests showed that differences in finger ratios between participants were much higher than measurement errors ($P < 0.0001$). Therefore, we calculated the means of the ratios and used these in all subsequent tests.

Table 3
The effect sizes for sex differences in finger ratios across all five possible ratios (excluding 2D:4D) measured from the photocopies taken in 1998 and 2002

| Finger ratio | Right hand | Left hand |
|---|---|---|
| *1998* | | |
| 2D:3D | 0.04 | 0.90**** |
| 2D:5D | 0.30 | 0.56** |
| 3D:4D | 0.51** | 0.35 |
| 3D:5D | 0.32 | −0.07 |
| 4D:5D | 0.06 | −0.21 |
| *2002* | | |
| 2D:3D | 0.04 | 0.30 |
| 2D:5D | 0.08 | 0.42* |
| 3D:4D | 0.30 | 0.16 |
| 3D:5D | 0.05 | 0.30 |
| 4D:5D | −0.09 | 0.21 |

Each effect size represents the female mean ratio minus the male mean ratio divided by the square root of the weighted means of the variances of the two samples. Positive effect sizes indicate the female mean ratio was higher than that of the male. The $P$ values of the sex differences in finger ratios are from two-tailed $t$ tests (*<0.05, **<0.01, ****<0.0001) and are not corrected for multiple tests.

Table 4
Product moment correlation coefficients and adjusted $r^2$ values for the relationships between finger ratios (five ratios excluding 2D:4D) calculated from photocopies made in 1998 and finger ratios from photocopies of the hands of the same children in 2002

| Finger ratio | Right hand $r$ | Right hand adjusted $r^2$ | Left hand $r$ | Left hand adjusted $r^2$ |
|---|---|---|---|---|
| 2D:3D | 0.82 | 0.66 | 0.50 | 0.24 |
| 2D:5D | 0.77 | 0.59 | 0.81 | 0.66 |
| 3D:4D | 0.78 | 0.61 | 0.93 | 0.86 |
| 3D:5D | 0.79 | 0.62 | 0.60 | 0.36 |
| 4D:5D | 0.76 | 0.57 | 0.57 | 0.32 |

All correlations had $P$ values of <0.0001. The subjects were 108 Jamaican children.

There was a tendency for sex differences in the finger ratios such that for most ratios females had higher values than males (for effect sizes of the sex differences, see Table 3). Significant sex differences were found for 2D:3D (left hand, 1998), 2D:5D (left hand 1998 and 2002), and 3D:5D (right hand, 1998). Bonferroni correction for multiple tests across the whole of Table 3 left only 2D:3D significant.

The relationships between 1998 and 2002 ratios were all significant, showing some stability of individual rank order of finger ratios. For the right hand, the 1998 ratios explained between 0.57 (4D:5D) to 0.66 (2D:3D) of the variance of the 2002 ratios, and the strength of these correlations compared well with those for 2D:4D ($r^2 = 0.61$). For the left hand, there was more variation in the stability of the ratio from 1998 to 2002, with values of $r^2$ varying from 0.24 (2D:3D) to 0.86 (3D:4D; Table 4).

Despite this evidence for stability in the participant's rank order of finger ratios, there were significant directional changes with growth in most ratios. Fig. 3 shows these changes in ratios and clearly indicates that in most

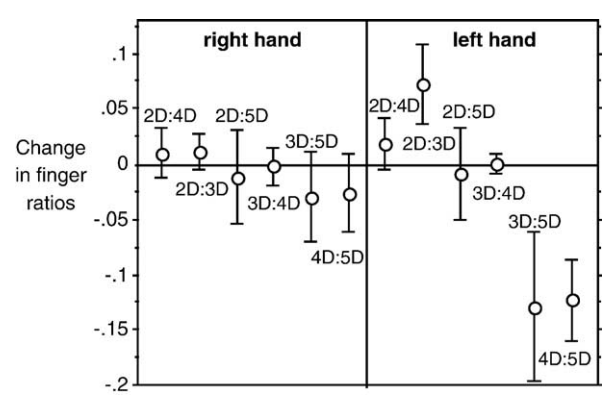


Fig. 3. The changes in right and left hand finger ratios with age in 108 Jamaican children (ratios 2002 – ratios 1998). For comparison purposes, 2D:4D ratios are shown in addition to the five other finger ratios. Positive values indicate that mean ratios have increased with growth, while negative values show that mean ratios have decreased.

cases directional change is greatest in the left hand. In common with 2D:4D, the mean 2D:3D increases with growth with medium to high effect sizes (right $d = 0.43$; left $d = 2.11$). The 3D:4D ratio shows no appreciable change (right $d = -0.11$; left $d = 0.04$), and the 2D:5D ratio shows a small reduction with weak effect size (right $d = -0.19$; left $d = -0.14$). The remaining ratios show reductions in ratios with growth with medium to large effect sizes (3D:5D, right $d = -0.48$; left $d = 1.73$: 4D:5D, right $d = -0.48$; left $d = -1.89$).

## Discussion

With regard to 2D:4D, we have the following results: (i) mean 2D:4D did show differences in 1998 and 2002 such that 2D:4D was higher in 2002 compared to 1998. This finding indicated that 2D:4D was age-dependent in children and that the effect was strongest in the left hand. (ii) A two-factor ANOVA with Time and Sex as factors showed significant changes in 2D:4D with time and significant sex differences, but the lack of a significant interaction effect indicated that the means for males and females increased in the same direction. There was a significant sex difference in 2D:4D in 1998 but not in 2002. (iii) Despite the increase in 2D:4D from 1998 to 2002, there were little in the way of rank order changes in 2D:4D, with a correlation between 2D:4D at time one and time two of $r = 0.78$ for the right and $r = 0.79$ for the left hand. (iv) The rate of increase in 2D:4D with age in children did not show significant differences among the seven age groups (i.e. growth from 7 years to 11 years... and from 13 years to 17 years).

Overall, our results suggest that 2D:4D is sexually dimorphic, and the magnitude of the sex difference is determined early. There is a weak increase in 2D:4D with growth, but the increase is not associated with marked changes in rank order of 2D:4D nor is it stronger in one sex compared to another.

However, there is some evidence that the rate of change in the left hand 2D:4D is greater than that in the right hand. The relative stability of right 2D:4D with age is further evidence for lateralised effects on 2D:4D. The 2D:4D has often been shown to be more sexually dimorphic on the right compared to the left, and this observation applies to human hands (Manning et al., 1998; for review, see Manning, 2002), the feet of mice (Brown et al., 2002a,b), and zebra finches (Burley and Foster, 2004). In addition, relationships between 2D:4D and index traits tend to be stronger for the right hand compared to left. This latter observation applies to foetal sex hormones obtained from amniocentesis (Lutchmaya et al., 2004), AR structure (Manning et al., 2003), and a number of sex-dependent psychological factors such as sex role identity (Csatho et al., 2003a), navigation (Csatho et al., 2003b), and physical aggression (Bailey and Hurd, 2005).

The 2D:4D ratio has attracted increasing attention in the last few years. The reason for this lies in the suggestion that it is a correlate of prenatal sex steroids (Manning et al., 1998; Manning, 2002). Of course, we do not report measures of sex steroids in this paper. However, it is valid to ask whether the patterns of 2D:4D we report in this study are consistent with the status of 2D:4D as a prenatal correlate of sex hormones. We have found that in children mean 2D:4D increases with growth. However, as the ratio increases, there is no evidence that the rank order of 2D:4D shows substantial change, and the rate of change across year groups does not show significant differences in either males or females. If 2D:4D ratios are formed as a response to prenatal sex steroids, their pattern of subsequent growth in children suggests that within year groups the 2D:4D ratio, particularly the right hand ratio, could be used as a putative measure of early sex steroid exposure. However, we suggest one note of caution. Comparisons of 2D:4D between year groups of children should only be made if appropriate measures are taken to control for age-dependent changes in 2D:4D. Some other finger ratios showed sexual dimorphism and changes with growth in our data. In common with 2D:4D, the stability of the right hand ratios tended to be greater than that of the left hand. In children, comparisons using these ratios could be valuable if confined within year groups or if age effects are controlled.

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