2D:4D RATIO
INVESTIGATION OF A SEXUALLY DIMORPHIC TRAIT IN THE HUMAN SKELETON

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INTRODUCTION

- The ratio between the 2nd digit (index finger) and 4th digit (ring finger) length (2D:4D) is a sexually dimorphic trait.
- Males tend to have a lower 2D:4D ratio because the 2nd digit is usually shorter than the 4th digit. Females tend to have a higher 2D:4D ratio because the 2nd and 4th digits are approximately of equal length. (Fig. 1)
- The 2D:4D ratio is established by the 14th week of gestation. The higher the fetal testosterone levels, the lower the 2D:4D ratio.
- Homeobox genes Hoxa and Hoxd control development of both genitals and digits.
- Variations in 2D:4D ratios have been correlated with certain diseases, athletic ability, mental skills, and career choices.
- Students can easily measure digit length directly or from photocopies using a metric ruler or digital calipers.
- This exercise brings an investigative approach to the study of the human skeleton and introduces provocative discussions about development.

RESULTS

- No significant differences were found in measuring finger length directly or from photocopies with either a ruler or digital calipers (Table 1).
- Mean right 2D:4D ratio for female students (0.98) was significantly different from mean right ratio for male students (0.94). Left 2D:4D ratios for female (0.98) students were slightly higher than male (0.97) students (Table 2). In the general population males have a mean 2D:4D of 0.98 and women a mean 2D:4D of 1.0.
- Mean right (0.98) and left (0.96) 2D:4D ratios for the women’s soccer team were slightly lower from the mean 2D:4D ratios (0.99 and 0.97 respectively) for college female students (Table 3). Previous studies of women professional teams had shown 2D:4D ratios approaching the masculine digit ratio. Females tend to have a higher 2D:4D ratio because the 2nd digit is longer than the 4th digit. Females tend to have a higher 2D:4D ratio because the 2nd digit is longer than the 4th digit.

DISCUSSION & FUTURE WORK

- 2D and 4D lengths are easily measured directly or from photocopies by either ruler or digital calipers.
- Mean 2D:4D ratios for college males were < 1:2:4D ratios for college females were higher and approached 1.
- Mean 2D:4D ratios for women soccer players were slightly lower than college females from the general population.
- Mean 2D:4D ratios for college-age males and females did not differ significantly from those of older college faculty and staff.
- The 2D:4D ratio will be used to investigate fluctuating asymmetry during 2009 – 2010.

MATERIALS & METHODS

- Metric rulers (150 mm) preferably transparent vinyl
- Digital calipers, resolution of 0.01 mm (optional)
- Photocopies of hands (optional)
- Measurements of finger length (in mm) of the 2nd (index finger) and 4th (ring finger) digits of each hand (palm side) from the basal crease (metacarpophalangeal joint) to the tip of the distal phalanx (Fig. 2).
- Calculate the right and left 2D:4D ratio.
- Compare 2D:4D ratio means in populations – males vs. females, athletes vs. non-athletes, older faculty/staff vs. college-age students, etc.

REFERENCES


SUPPLIES & SOURCES

- Rulers, transparent vinyl (110 mm) $0.53 – 0.75 each
- Digital calipers (0.01 mm resolution) $70 – $100
- Carolina Biological Supply Company www.carolina.com
- Edmund Scientific www.edmund.com

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