USE OF AN "ONLINE RULER" TO SELF-MEASURE DIGIT RATIO

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The ratio between 2nd (index) and 4th (ring) finger lengths (2D:4D) has been proposed to be negatively correlated to prenatal testosterone exposure in humans (Manning, 2002). Evidence for this phenomenon has come from findings of differences between males and females, masculinized 2D:4D in individuals with congenital adrenal hyperplasia (a condition which produces elevated prenatal testosterone), experimental manipulations with animals, 2D:4D being related to receptivity to testosterone (androgen receptors), masculinized 2D:4D in females with male co-twins, and an association between 2D:4D and hormone levels taken from prenatal fluid (see Manning, Churchill, & Peters, 2007 for a review).

Initial studies that assessed 2D:4D used photocopies of the hand that were subsequently measured by researchers. More recently, attention has been given to participant self-reported 2D:4D. Caswell and Manning (in press) found moderate correlations between participant self-reported and experimenter measured 2D:4D from photocopies when outlier self-reported values were excluded. From a large Internet study using self-reported 2D:4D, Manning et al. (2007) also found significant effects with lower effect sizes in sex differences than in previous studies. These studies show that self-reported ratios are an acceptable measure of 2D:4D when large samples are used to compensate for the increased error resulting from using non-trained measurers. Furthermore, Manning et al. concluded that direct measurement of finger length is preferable to using photocopies which may not approximate actual 2D:4D as well as first thought.

In designing an online questionnaire that assessed 2D:4D as well as a number of other gender- and sexuality-related variables I was aware that many participants would not have access to a ruler, so I decided to trial giving them the option of using an "online ruler" which is simply the image of a ruler in a pop-up browser window. This ruler can not accurately measure finger lengths because the size of the picture, and thus the scale of the ruler varies depending on the screen resolution settings of the computer. However, provided both fingers

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are measured on the same ruler, I hypothesized that 2D-4D – a ratio between two measurements – could be measured accurately.

METHOD

Participants were recruited for an online questionnaire using Internet advertising and posting to mailing lists that were relevant to the topics of gender and sexuality. The questionnaire consisted of a total of approximately 150 mostly multiple-choice items. For the purposes of this analysis, participants were classified as transsexual, other gender-variant (e.g. cross-dressers, transgender, genderqueer), homosexual/bisexual, or heterosexual based on their self-reported identity because of the possibility that these groups experience differing prenatal testosterone levels, and thus differing 2D:4D.

Participants were asked to report finger-lengths for their right hand using the same instructions and response options given by Manning et al. (2007). In addition, participants were informed that if they don't have a "physical" ruler or a tape measure, they could use an online ruler, with the proviso that "This online ruler is more difficult to use, and not as accurate, so it is preferable for you to use a physical ruler if you can." Participants were also asked to report whether they used an online or a physical ruler. A total of 811 participants responded to these questions and were used in this analysis.

RESULTS

Initial analysis sought to determine whether participants using the online ruler were more likely to report an outlier 2D:4D. Caswell and Manning (in press) and Manning et al. (2007) excluded 2D:4Ds less than 0.8 or greater than 1.2 as outliers. Of 317 participants using an online ruler, 4 (1.2%) reported an outlier 2D:4D, and of 494 participants using a physical ruler, 2 (0.4%) reported an outlier 2D:4D; this difference was not statistically significant ($\chi^2 = 1.90$, $p = 0.17$). These six participants were excluded from the remaining analysis.

Also for the remaining analysis, only the 739 participants who identified their ethnicity as "White/Caucasian/European" were included because of previous findings that 2D:4D is related to ethnicity (Loehlin, McFadden, Medland, & Martin, 2006; Manning et al., 2007). Participant group average 2D:4Ds are outlined in Table 1. A two-way ANOVA using the variables in Table 1 found a significant main effect for participant group ($F[7, 723] = 2.82$, $p = .01$), no significant main effect for type of measurement ruler used ($F[1, 723] = 0.06$, $p =$

.80), and no significant group X ruler type interaction effect (F[7, 723] = 0.56, p = .80). A Levene's Test found that the standard deviation for the online ruler group (.065) was significantly higher than for the physical ruler group (.048; F = 32.89, p < .001).

Table 1. *Mean and confidence intervals of 2D:4D for participants using an online or physical ruler grouped by gender identity/sexual orientation type.*

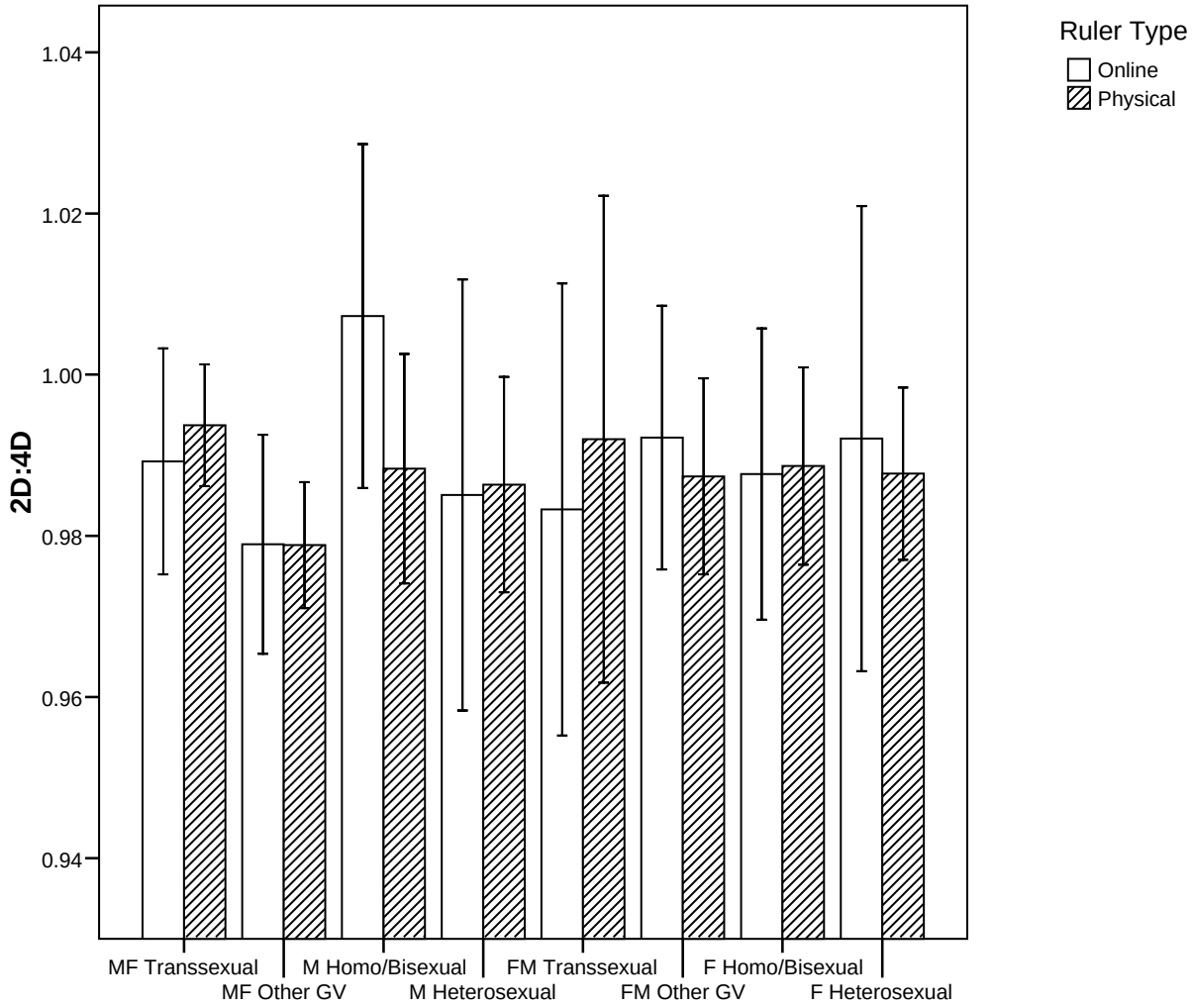
Group	Online ruler			Physical ruler		
	n	2D:4D	95% Confidence intervals	*N*	2D:4D	95% Confidence intervals
Male-to-female transsexual	73	.992	.979-1.005	113	.998	.988-1.008
Other gender-variant, birth-assigned male	73	.972	.959-.984	129	.978	.968-.988
Male homosexual or bisexual	18	1.004	.979-1.030	41	.998	.981-1.015
Male heterosexual	5	.996	.948-1.045	15	.999	.971-1.027
Female-to-male transsexual	20	.982	.957-1.006	15	.989	.961-1.017
Other gender-variant, birth-assigned female	48	.994	.978-1.010	66	.985	.972-.999
Female homosexual or bisexual	36	1.001	.983-1.019	51	.988	.973-1.004
Female heterosexual	12	.966	.935-.998	24	.984	.962-1.006
Total	285	.988	.979-.998	454	.990	.983-.997

DISCUSSION

Although there was an increase in the percentage of participants reporting an outlier 2D:4D using an online ruler (1.2% versus 0.4%) this difference was not statistically significant, and the 1.2% of outliers in this research is comparable to Manning et al.'s (2007) level of 1%. In addition, once the outliers were removed, 2D:4D did not differ significantly between participants who used an online ruler and those who used a physical ruler, and the 2D:4D patterns were similar across a variety of participant groups. Therefore, I conclude that an online ruler is an acceptable alternative to a physical ruler in 2D:4D measurement, and giving participants the option of using an online ruler is likely to increase response rates by

allowing participants who do not have access to a physical ruler the ability to respond. However, while the standard deviation of the 2D:4D for participants using a physical ruler was similar to that reported by Manning et al., the standard deviation for participants using an online ruler was significantly higher indicating a larger amount of measurement error using this method.

Figure 1. *Mean and 95% confidence intervals of 2D:4D for participants using an online or physical ruler grouped by gender identity/sexual orientation type.*



M = Male, F = Female, GV = Gender-variant

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