

## 2D:4D Is Negatively Associated to Aggressive Dominance in Men: A Response to Voracek (2013)

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We do not agree with the interpretation and evaluation of our article by Voracek. We feel that our results and our interpretation of the results are supported by our data analyses and do add to the current understanding of the relationship between 2D:4D and personality. We feel confident we can address many, if not all, of Voracek's criticisms. However, we fully agree that 2D:4D research would benefit from more replication and from the use of larger sample sizes. *Aggr. Behav.* 39:88–89, 2013.

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### DATA-ANALYTIC AND STATISTICAL POWER ISSUES

1. Voracek states that he could not reproduce our exact *P* values. However, this is probably due to rounding off. Our correlations up until the third decimal are: Aggressive dominance and 2D:4D:  $r_{79} = -0.226$ ,  $P = 0.046$ , and for sociable dominance and 2D:4D:  $r_{79} = -0.087$ ,  $P = 0.446$ . These *P* values are correct for the correlation coefficient and sample size.
2. Voracek correctly states that the correlations between Aggressive dominance—D2:4D and sociable dominance—2D:4D were not significantly different. Although a significant difference between the correlations would certainly have strengthened our conclusions, not finding a significant difference may in this case be not that problematic as both concepts of dominance are theoretically different; aggressive dominant men use more Machiavellian tactics whereas sociable dominant men use more reasoning strategies.
3. The post hoc power calculations done by Voracek provide no new information as *P* values and observed power have a one-to-one relationship (Hoenig & Heisey, 2001). Furthermore, there is a clear theoretical difference between our measurements of dominance and others' measurements of direct aggression This

makes comparisons between our effect size and those from papers estimating effect sizes of aggression on 2D:4D inappropriate.

### CONCEPTUAL AND STUDY DESIGN ISSUES

1. Great care went into translating the items into Spanish, but of course slight translational differences could have arisen. However, we do not feel that this has caused important differences in the construction of our scales, since we found a similar factor structure as in the original article (Kalma, Visser, & Peeters, 1993).
2. Additionally, there is no convincing argument for the suggestion that we used the scale incorrectly. For the construction of the scales, Kalma et al. (1993) actually used undergraduates who fell within a similar age

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range as in our sample. Kalma et al. did not construct the scale based on assessments; instead they merely suggested its usefulness for personnel selection. Furthermore, infrequent use of a scale is not necessarily a sign of lower quality.

3. Our factor structure is indeed slightly different than the original factor structure. However, this is not uncommon when administrating a scale in a different sample. Nonetheless, the differences were minimal (see Table 1 of the article). Furthermore, the results were virtually the same when using the exact same items as in the original scales (Aggressive dominance and 2D:4D:  $r_{79} = -0.222$ ,  $P = 0.049$ ; Sociable dominance and 2D:4D:  $r_{79} = -0.082$ ,  $P = 0.470$ ).
4. Voracek incorrectly suggests that Kalma et al. (1993) found a slightly higher score on the aggressive dominance scale for women than for men. Actually, Kalma et al. found that women scored slightly lower on the aggressive dominance scale than men (see page 50), although the Kalma et al. attributed this difference to social desirability.

### 2D:4D MEASUREMENT AND RELIABILITY ISSUES

1. In contrast to the opinion of Voracek, 96 dpi is not a problematic image size as long as the greases can clearly be spotted. Clear visibility of the greaves is reflected in our high inter observer reliability ratings for each finger and when comparing ratios per observer (ICC Left hand: 0.96; ICC Right hand; 0.94). Furthermore, 2D:4D means and standard deviations fell within the normal population range (mean  $\pm$  standard deviation: Left 2D:4D =  $0.97 \pm 0.03$ ; Right 2D:4D =  $0.96 \pm 0.03$ ).

### ISSUES OF PRESENTING RESEARCH EVIDENCE

1. We do not believe we falsely created the impression of solid evidence for 2D:4D and its relationship to personality. We pointed out several times in the manuscript (see introduction and discussion) that findings regarding 2D:4D are inconsistent and complex (see also Putz, Gaulin, Sporter, & McBurney, 2004).
2. We agree that the inclusion of the suggested references by Voracek would have increased the quality of our article. However, the article was written in a short report format, and thus had limited space for many other references.

### CONCLUSION

Further replication of our findings would certainly bolster our conclusions. However, we do not think that this makes our article any less valuable. We think that we have provided initial evidence that differences in 2D:4D are especially associated with a more aggressive dominant strategy. This is in line with the interpretation that men high on aggressive dominance may have been exposed more to prenatal androgens.

### REFERENCES

- Hoenig, J. M., & Heisey, D. M. (2001). The abuse of power. *American Statistician*, 19–24.
- Kalma, A. P., Visser, L., & Peeters, A. (1993). Sociable and aggressive dominance: Personality differences in leadership style? *Leadership Quarterly*, 4, 45–64.
- Putz, D. A., Gaulin, S. J. C., Sporter, R. J., & McBurney, D. H. (2004). Sex hormones and finger length: What does 2D:4D indicate? *Evolution and Human Behavior*, 25, 182–199.
- Voracek M. (2011). Special issue preamble: Digit ratio (2D:4D) and individual differences research. *Personality and Individual Differences*, 51, 367–370.