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# Naturally designed for masculinity vs. femininity? Prenatal testosterone predicts male consumers' choices of gender-imaged products

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ABSTRACT

In this paper, we find that a proxy of prenatal testosterone exposure (i.e., digit ratio) is a significant predictor of preferences for products that differ in perceived masculinity vs. femininity. A more masculine (feminine) digit ratio predicts choice of products that have an increasingly masculine (feminine) image. This relationship is statistically significant for male consumers, but not for females.



## 1. Introduction

People's sex-typed, or gender-related, characteristics and behaviors are influenced by sex hormones that are present during prenatal development (for a review, see Cohen-Bendahan, van de Beek, & Berenbaum, 2005). For instance, studies in psychology and biomedicine show that prenatal testosterone exposure influences one's sexual orientation and gender identity, as well as other physical, cognitive, and personality characteristics that are gender-related (for a review, see Hines, 2010). In this paper, we replicate these studies in the marketing/consumer domain and examine the link between prenatal testosterone exposure and preferences for gender-imaged products.

In particular, we investigate the link between consumer preferences and the "2D:4D digit ratio"—which refers to the ratio of the length of the index (2D) and ring finger (4D) and which is an established biomarker indicating the level of testosterone to which individuals were exposed before birth (McIntyre, 2006). The digit ratio reliably differs by sex, with males having a lower digit ratio. Moreover, studies find that individuals with lower (vs. higher) digit ratios display more pronounced masculine and less pronounced feminine behaviors than members of their sex typically display. Most relevantly for marketing, the digit ratio has also been shown to predict visual preferences for masculine vs. feminine toys within both genders in a laboratory setting (i.e., eye fixations on masculine vs. feminine toys) (Alexander, 2006). In the present conceptual replication, we investigate whether the digit ratio predicts actual product choices (beyond eye-tracking) in a real consumption environment (beyond laboratory).

## 2. Study

### 2.1. Study design, sample, and procedure

We observed consumers' purchases and usage of gender-imaged products at a shopping mall in Helsinki, Finland. In particular, we observed consumers who purchased a product from a vending machine (selling beverages or candy). To provide a robustness check for the results, we examine two different dependent variables: (1) the purchase choice of masculine- vs. feminine-imaged products and (2) the usage of masculine vs. feminine clothing colors (i.e., the main color of shirt/top worn by the individuals purchasing from the vending machines).

For the (1) purchase dependent variable, we have 588 observations of consumers (all ethnic Finns, 245 females, 343 males, age range = 13–54) who purchased cola beverages from the vending machine during 10 weeks in June–August 2010. Observations took place on weekdays (approximately 4 h/day) between lunch and evening rush hours. We focused on consumers purchasing one of the branded cola beverages (Regular Coke, Coke Zero, Diet Coke) (a) because they represented

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**Table 1**
Beverage choice (= increasingly masculine).

| | Model with digit ratio only | | | Full model with all controls | | | Full model with all controls: winsorized[a] | | |
|---|---|---|---|---|---|---|---|---|---|
| | b | (SE) | β[b] | b | (SE) | β[b] | b | (SE) | β[b] |
| ***Panel A: males*** | | | | | | | | | |
| Intercepts | 6.86 | (2.52) | | 7.16 | (2.61)** | | 7.61 | (2.83)** | |
| | 7.60 | (2.52) | | 7.91 | (2.62)** | | 8.36 | (2.83)** | |
| Demographic controls | | | | | | | | | |
| Age | | | | −.03 | (.02)† | −.12 | −.03 | (.02) | −.13 |
| Age identity | | | | .21 | (.12)* | .15 | .20 | (.12) | .15 |
| Affluence | | | | −.02 | (.10) | −.01 | −.02 | (.10) | −.02 |
| Psychological gender identity | | | | | | | | | |
| BSRI | | | | −.01 | (.01) | −.07 | −.01 | (.01) | −.07 |
| Explicit gender identity | | | | −.02 | (.03) | −.06 | −.02 | (.03) | −.06 |
| Focal variable | | | | | | | | | |
| 2D:4D digit ratio | −6.15 | (2.62)** | −.18 | −6.53 | (2.66)** | −.20 | −7.00 | (2.88)** | −.19 |
| ***Panel B: females*** | | | | | | | | | |
| Intercepts | .03 | (2.75) | | −.49 | (2.82) | | −.57 | (3.13) | |
| | .57 | (2.75) | | .06 | (2.82) | | −.02 | (3.13) | |
| Demographic controls | | | | | | | | | |
| Age | | | | −.02 | (.03) | −.06 | −.02 | (.03) | −.06 |
| Age identity | | | | .04 | (.13) | .03 | .04 | (.13) | .03 |
| Affluence | | | | −.08 | (.11) | −.06 | −.08 | (.11) | −.07 |
| Psychological gender identity | | | | | | | | | |
| BSRI | | | | −.01 | (.01) | −.07 | −.01 | (.01) | −.07 |
| Explicit gender identity | | | | .05 | (.04)† | .13 | .05 | (.04) | .13 |
| Focal variable | | | | | | | | | |
| 2D:4D digit ratio | .67 | (2.83) | .02 | 1.56 | (2.91) | .05 | 1.64 | (3.25) | .04 |

n (males) = 343, n (females) = 245.
Occasional missing values on control variables were substituted with variable means. If the participant had a missing value on the focal variable of right-hand digit ratio (due to a missing or bandaged finger), left-hand digit ratio measure was substituted.
[a] To provide a robustness check, delimiting the effect of outliers, the digit ratio variable was winsorized by setting values below the 5th percentile to the 5th percentile, and value above the 95th percentile to the 95th percentile.
[b] The β's are estimated standardized coefficients.
** Significant at $p = .01$ level.
* Significant at $p = .05$ level.
† Marginally significant at $p = .10$ level. One-sided.

**Table 2**
Clothing color (= increasingly masculine).

| | Model with digit ratio only | | | Full model with all controls | | | Full model with all controls: winsorized[a] | | |
|---|---|---|---|---|---|---|---|---|---|
| | b | (SE) | β[b] | b | (SE) | β[b] | b | (SE) | β[b] |
| ***Panel A: males*** | | | | | | | | | |
| Intercepts | 2.86 | (1.62)* | | 2.09 | (1.68) | | 2.38 | (1.82)† | |
| | 3.46 | (1.63)* | | 2.70 | (1.68)† | | 2.98 | (1.82)† | |
| Demographic controls | | | | | | | | | |
| Age | | | | .05 | (.02)** | .18 | .04 | (.02)** | .18 |
| Age identity | | | | .01 | (.07) | .01 | .01 | (.07) | .01 |
| Affluence | | | | .02 | (.06) | .02 | .02 | (.06) | .02 |
| Psychological gender identity | | | | | | | | | |
| BSRI | | | | −.00 | (.01) | −.03 | −.00 | (.01) | −.03 |
| Explicit gender identity | | | | −.04 | (.02)* | −.09 | −.04 | (.02)* | −.09 |
| Focal variable | | | | | | | | | |
| 2D:4D digit ratio | −2.60 | (1.70)† | −.08 | −2.84 | (1.72)* | −.09 | −3.13 | (1.87)* | −.09 |
| ***Panel B: females*** | | | | | | | | | |
| Intercepts | .74 | (1.86) | | 1.16 | (1.91) | | 1.17 | (2.10) | |
| | 1.40 | (1.86) | | 1.82 | (1.92) | | 1.83 | (2.11) | |
| Demographic controls | | | | | | | | | |
| Age | | | | −.01 | (.02) | −.02 | −.01 | (.02) | −.02 |
| Age identity | | | | .07 | (.08) | .05 | .07 | (.08) | .05 |
| Affluence | | | | −.09 | (.07) | −.08 | −.09 | (.07) | −.07 |
| Psychological gender identity | | | | | | | | | |
| BSRI | | | | .00 | (.01) | .02 | .00 | (.01) | .02 |
| Explicit gender identity | | | | −.01 | (.02) | −.03 | −.01 | (.02) | −.03 |
| Focal variable | | | | | | | | | |
| 2D:4D digit ratio | −.46 | (1.92) | −.01 | −.65 | (1.94) | −.02 | −.66 | (2.14) | −.02 |

n (males) = 588, n (females) = 431.
Occasional missing values on control variables were substituted with variable means. If the participant had a missing value on the focal variable of right-hand digit ratio (due to a missing or bandaged finger), left-hand digit ratio measure was substituted.
[a] To provide a robustness check, delimiting the effect of outliers, the digit ratio variable was winsorized by setting values below the 5th percentile to the 5th percentile, and value above the 95th percentile to the 95th percentile.
[b] The β's are estimated standardized coefficients.
** Significant at $p = .01$ level.
* Significant at $p = .05$ level.
† Marginally significant at $p = .10$ level. One-sided.