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Height in women predicts maternal tendencies and career orientation

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Abstract

Previous research has shown that variation in sex-specific personality traits in women can be predicted by measures of physical masculinisation (second to fourth digit ratio and circulating testosterone). This study aimed to test the hypothesis that certain sex-specific traits in women (maternal tendencies and career orientation) could be predicted by one index of masculinisation, height. Data was collected via online questionnaires. In pre-reproductive women (aged 20–29, $n = 679$), increasing height related to decreasing maternal personality (lower importance of having children, lower maternal/broodiness) and decreasing reproductive ambition (fewer ideal number of children, older ideal own age to have first child). Increasing height also related to increasing career orientation (higher importance of having a career, and higher career competitiveness). In post-reproductive women (aged over 45, $n = 541$), increasing height related to decreased reproductive events (fewer children, had first child at older age) and increased career orientation. Results provide further support for previous studies that show physical masculinisation is associated with psychological masculinisation.

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1. Introduction

This study looks at how sex-specific personality traits in women relate to a measure of physical masculinisation, height. Height is a universally sexually dimorphic trait, with adult males being taller than their female counterparts in all human cultures. Pre-pubescent girls and boys are anatomically similar, with the sexual dimorphism in height only emerging at puberty under the influence of androgens on the human skeleton (Vanderschueren & Bouillon, 1995). In vivo animal studies have shown that androgens promote the growth of long bones (Orwoll, 1996). The effects of androgens on bone size are demonstrated with male animals having both larger bones and thicker cortices than their female counterparts (Kasra & Grynepas, 1995).

Personality research has shown that there are reliable sex differences in certain personality traits. While men generally exhibit more assertive and competitive personalities, women possess more caring attitudes and sociability (for review see Collaer & Hines, 1995). There is also evidence that *within* women, sex-specific personality dimensions are associated with physical masculinisation. Second to fourth digit ratio (2D:4D) is proposed to be a marker of prenatal gonadal hormones (see Manning, 2002). Csatho et al. (2003) showed that women with a more masculine (low) 2D:4D ratio had more masculine personality traits as measured by the Bem Sex Role Inventory. Wilson (1983) also found that women with low 2D:4D ratios were more likely to describe themselves as assertive and competitive than those with high 2D:4D.

Waist-to-hip ratio (WHR) is another sexually dimorphic trait, with women possessing lower WHRs than men due to their tendency to store body fat on their hips and buttocks rather than their waists and stomachs; whereas the opposite is true for men (Leibel, Edens, & Fried, 1989). WHR has also been shown to be a marker of physical masculinisation and testosterone levels *within* women (DeRidder et al., 1990; Evans, Hoffmann, Kalkhoff, & Kissebah, 1983). Cashdan (2000) found that female students with higher WHRs report more competitive feelings and more displays of aggression. A direct role for testosterone and masculinisation of personality has also been demonstrated. In many studies, women with higher testosterone report possessing more masculine personality traits (Al-Ayadhi, 2004; Baucom, Besch, & Callahan, 1985; Grant & France, 2001; Udry & Talbert, 1988). There are no studies to our knowledge linking sex-specific personality traits with height in women. A recent study has shown that height of women influences *perception* of their character (Chu & Geary, 2005). Taller women are rated as more intelligent, assertive and ambitious than shorter women. Only men also rated shorter woman as more considerate, nurturing and homely. Our study aims to test whether women's height is associated with their *actual* personality characteristics.

One key aspect of sex-specific personality traits are parental or maternal tendencies. Sex differences in parental responsiveness present themselves very early in life with females typically spending more time involved in care giving and nurturing activities (Berman, 1991). There are no studies to our knowledge linking any kind of physical masculinisation with maternal personality in healthy adult females. However, there are studies using females with congenital adrenal hyperplasia (CAH), a condition which results in hypersecretion of adrenal androgens (New & Levine, 1984). In addition to physical masculinisation, females with CAH are less interested in infants (Dittmann et al., 1990; Leveroni & Berenbaum, 1998), score lower on measures of parental or nurturant tendencies (Helleday, Edman, Ritzen, & Siwers, 1993) and show less parenting 'rehearsal' behaviors such as doll play or infant care compared with control females (Ehrhardt

& Meyer-Bahlburg, 1981). CAH women also show a masculine bias on different personality inventories (Collaer & Hines, 1995). Although these studies use a clinical sample, they do serve to demonstrate a link between maternal behaviors and physical masculinisation, both of which are postulated to be due to underlying androgen exposure during development.

The reviewed studies suggest that sex-specific personality traits are associated with physical masculinisation within females. Therefore, alongside the evidence that height is under the control of androgens, sex-specific personality traits might be predicted to be linked to the physical measure of height. Studies have also shown that more physically masculine women have fewer reproductive events. Kaye, Folsom, Prineas, Potter, and Gapstur (1990) found married women with higher WHRs report having their first births at a later age than those with lower WHRs. Nettle (2002) used data from the UK National Child Development Study to show that women of mean height and above (excluding the extremes) had fewer children. The greatest number of children were had by women 0.7–1.7 SD below the mean. Lycett, Manning, and Barrett (submitted for publication) also found in a sample of British women that women taller than average had fewer reproductive events. The interpretation given by Kaye et al. (1990) is that women with higher WHRs are less fecund. Indeed, there is evidence that women with higher WHR (with polycystic ovaries) have more trouble conceiving (Zaadstra et al., 1993). However, an alternative explanation is that women with higher WHRs are actively *choosing* to have fewer children and at a later age as they are less maternally driven and perhaps more career orientated. Nettle (2002) explained the association of low fertility with increasing height with the theory that women who are taller are less able to find a partner to have children with. However, Lycett et al. (submitted for publication) found that taller women had fewer children, even when marital status was controlled for. So a similar interpretation could be implied; taller women may be *choosing* to have fewer children, and this might be due to a lower maternal drive alongside an increased career drive.

The present study attempts to test the hypothesis that taller women are less maternally driven and more career orientated. For women who are not likely to have started having children (in our sample those aged 20–29, named ‘pre-reproductive’) it is predicted that taller women will have lower ‘maternal personality’ as measured by lower rated importance of having children and lower self-rated broodiness (maternal feelings). Taller women are also predicted to have lower ‘reproductive ambition’ as measured by fewer ideal number of children and older ideal own age at time of having first child. Taller women are predicted to have higher ‘career orientation’ as measured by higher rated importance of having a career and increased career competitiveness. In an attempt to replicate the Nettle (2002) and Lycett et al. (submitted for publication) findings, in ‘post-reproductive’ females (in our sample those aged over 45) it is predicted that taller women will have had less reproductive output, as indexed by having had fewer children and having had their first child at an older age. They might also be expected to still be more career orientated and have lower maternal personality. The internet was used in order to gather a large sample of women of all age ranges. Therefore, self-report height was collected. This was not deemed to be a source of confound as studies have shown self-reported height is highly correlated with measured height, with correlation coefficients of above 0.8 (Himes & Roche, 1982). For people younger than 50 and older than 15 the correlation is very high, at over 0.9 (Himes & Faricy, 2001). Many studies have utilised the internet for data collection alongside data obtained in traditional lab settings, and have demonstrated comparable findings (e.g., Jones et al., 2005).

2. Methods

2.1. Participants

Pre-reproductive sample consisted of 679 heterosexual white women aged 20–29 (mean age = 23.6, SD = 2.9). Mean height = 166.0, SD = 6.8.

Post-reproductive sample consisted of 541 white women aged 45 and over (mean age = 49.3 SD = 4.2, range = 45–69). Mean height = 164.1, SD = 7.1.

Only White women from UK, US, Canada and Australia were used (93% of total participants) as racial and geographical height and body shape differences have been documented, and the number of non-white participants were too small to allow adequate comparisons. Only self-reported heterosexuals (scoring 7) were included as some weak relationships between sexuality and height have been reported in women (e.g., Bogaert, 1998).

The age constraint for the pre-reproductive women was selected as 20–29. Twenty was chosen as the lower limit as females below this age may still be in puberty and may not be at an age where they have even considered having children. Twenty-nine was chosen as the upper limit, as beyond 30 most women will be looking to have children very soon (88% of US women have had children by age 35 (United Nations Population Statistics, 2004, <http://esa.un.org/unpp>)), therefore you may expect more biased answers. Between 20 and 29 women may have contemplated having children, yet not be feeling under pressure to have them quickly, therefore they might be expected to show the most variance in maternal tendencies due to personality rather than circumstances. Post-reproductive women were chosen as those over the age of 45 as most women have finished having their children by this age. UN population statistics show that less than 0.08% of births are from women over the age of 45 (<http://esa.un.org/unpp>).

2.2. Materials

2.2.1. Measurement of maternal tendencies

- ‘How broody/maternal do you feel compared to others of your age?’ Responses were along the seven point scale (1 = not at all broody/maternal, 7 = very broody/maternal).
- ‘How important to you is having children?’ Responses were along the seven point scale (1 = not at all important, 7 = very important).
- ‘Ideally, how many children would you like to have?’
- ‘Ideally, at what age would you like to have your first child?’
- ‘How many children do you have?’
- ‘At what age did you have your first child?’

2.2.2. Measurement of career orientation

- ‘How important to you is having a career?’ Responses were along the seven point scale (1 = not at all important, 7 = very important).

- ‘How competitive are you in your career?’ Responses were along the seven point scale (1 = not at all competitive, 7 = very competitive).

2.2.3. Measurement of height

- Self-report height (options were given to answer in cm or foot/inches).

2.2.4. General demographic questions

- age,
- ethnicity,
- nationality,
- sexual orientation (on 1–7 scale, 1 = homosexual, 7 = heterosexual).

As there are well documented nutritional effects on height during development, the following measure of socio-economic status (SES) were measured to control for any confounding effects due to SES on reproductive ambition and career orientation.

- Parental income whilst growing up (five categories: highest 20%, lowest 20%, etc.).

2.3. Procedure

The questionnaires were completed online by participants via the internet. Links to the experimental website were placed on multiple sites for online experiments (e.g., <http://psych.hanover.edu/Research/exponnet.html>). Informed consent was given by clicking on button to enter the experimental website. Participants were informed that the experiment was looking at personality characteristics. After completion participants were informed that the specific aim of the experiment was to investigate maternal and competitive tendencies and physical characteristics such as height. An e-mail address was provided if participants wished to gain further information or ask any questions. Before analysis, potential repeat participants were removed by excluding duplicate IP addresses ($n = 13$) (see Kraut et al., 2004).

3. Results

3.1. Pre-reproductive women (age 20–29)

Normality of distribution of all the variables was tested for using Kolmogorov–Smirnov test. None of the variables were normally distributed (all z s > 2.7 , all p s $< .001$). Therefore, the non-parametric statistic, Spearman’s rank correlation was used to analyse the height and personality relationships.

As age was not correlated with height ($r = -.002, p = .96, n = 678$), it did not need to be controlled for in the following analyses. As parental income whilst growing up was not correlated with height ($r = .04, p = .26, n = 671$) it also did not need to be controlled for in the following analyses.

Height was significantly negatively correlated with importance of having children ($r = -.24, p < .001, n = 678$) and self-rated broodiness ($r = -.22, p < .001, n = 678$). Height was significantly positively correlated with importance of having a career ($r = .11, p = .005, n = 678$) and career competitiveness ($r = .12, p = .003, n = 668$). Height was significantly negatively correlated with ideal number of children ($r = -.14, p < .001, n = 672$) and positively correlated with ideal own age at time of having first child ($r = .11, p = .004, n = 636$).

The maternal tendencies questions are highly interrelated (e.g., child importance and ideal number of children, $r = .52$; child importance and broodiness $r = .57$; all $ps < .001, n = 673$). The two career questions are also significantly correlated (importance of having career and career competitiveness, $r = .51, p < .001, n = 669$). Therefore all the dependent variables were entered into a Principal Components Analysis. Two factors with Eigenvalues greater than 1 were extracted (Factor 1: Eigenvalue = 2.2, accounting for 36.1% of the variance; Factor 2: Eigenvalue = 1.6, accounting for 26.2% of variance). Correlation coefficients less than ± 0.4 were not considered to load highly on a given factor (Comrey & Lee, 1992). Variables that loaded highly on factor 1 were importance of having children ($r = .81$), ideal number of children ($r = .71$), ideal own age to have first child ($r = -.56$), and self-rated broodiness ($r = .81$). Variables that loaded highly on factor 2 were importance of having a career ($r = .87$) and competitiveness in career ($r = .87$). Factor 1 was interpreted as 'maternal tendencies' and Factor 2 was interpreted as 'career orientation'. The two factors were independent ($r = .03, p = .50, n = 624$). Factor scores were computed using the regression method.

Factor 1, 'maternal tendencies' was significantly negatively correlated with height ($r = -.26, p < .001, n = 623$). Factor 2, 'career orientation' was significantly positively correlated with height ($r = .10, p = .017, n = 623$).

3.2. Post-reproductive women (age 45+)

Parental income whilst growing up was significantly positively correlated with height ($r = .29, p < .001, n = 536$). Age was also significantly negatively correlated with height ($r = -.09, p = .033, n = 536$). Therefore, age and parental income were controlled for using partial correlations in the following analyses. As none of the variables were normally distributed (all $z_s < 2.5$, all $ps < .001$) using parametric partial correlations represents a less conservative measure of analysis. However, using non-parametric correlations and not controlling for age or parental income whilst growing up did not produce any additional qualifications to the following results.

Controlling for own age and parental income, height was significantly negatively correlated with number of children ($r = -.31, p < .001, n = 315$) and significantly positively correlated with own age at time of having first child ($r = .36, p < .001, n = 315$). Height was significantly positively related to importance of having a career ($r = .18, p = .001, n = 315$), but not with competitiveness in career ($r = .04, p = .45, n = 315$). Height was not correlated with importance of having children ($r = -.02, p = .68, n = 315$) or self-rated broodiness ($r = -.02, p = .74, n = 315$).

4. Discussion

Height was found to relate to maternal personality traits, reproductive ambition, and career orientation in pre-reproductive women. Taller women were found to be consistently less maternal and more career orientated. A factor analysis revealed that all of the questions relating to maternal personality and reproductive ambition loaded highly on one factor, interpreted as ‘maternal tendencies’. Our two questions relating to interest in a career loaded highly on a second, independent factor, interpreted as ‘career orientation’. Age was not correlated with height therefore these effects cannot be due to the effect of age on changing priorities with regards to having children and a career. Parental income was also not correlated with height, therefore these effects cannot be interpreted as due to the effects of socio-economic status on lifestyle priorities or opportunities. These results support the idea that in pre-reproductive women, physical masculinisation, as indexed by height, is associated with psychological masculinisation, as indexed by both maternal tendencies and career orientation.

In post-reproductive women, height was associated with measures of reproductive output. Taller women had fewer children and had their first child at a later age. The first result directly supports findings by [Nettle \(2002\)](#) and [Lycett et al. \(submitted for publication\)](#) who found that shorter women have fewer children. There was also some evidence that height was associated with career orientation. Taller women placed more importance on having a career than shorter women. As age was controlled for in all the analyses, these results cannot be due to cohort effects of older women (who are shorter due to secular trend or shrinkage) having had different priorities due to socio-cultural pressures. As parental income was also controlled for, these results cannot be a result of shorter women (shorter as a product of nutritional effects) having different priorities due to socio-economic constraints on lifestyle choices. There was no association with any of the measures of maternal personality. This might be expected, as post-reproductive women will already have had children thus their psychological priorities may be expected to have changed; and consequentially all women might be expected to rate these questions about their children similarly.

The associations of height with reproductive ambition, maternal personality and career orientation in pre-reproductive women may have implications for studies which have shown that in post-reproductive women taller women have fewer children (e.g., [Nettle, 2002](#)). Our results suggest that the reasons for this documented pattern might not necessarily be due to inability to find a partner (due to their lower mate value) or their lower fecundity, but possibly that taller women have different personality characteristics relating to maternal drive and career drive. This might be considered a better interpretation, especially in Western society ([Nettle, 2002](#) sample is from UK) as women have more easily been able to control their fertility via contraception and typically have far fewer children than physiologically possible; therefore any differences in number of children may be more likely due to choice as opposed to fecundity constraints or opportunity.

Masculinisation of both physical features and the psychological traits of maternal tendencies and career orientation may possibly be manifestations of underlying androgens. Future studies should aim to test this prediction directly using measures of prenatal testosterone (second to fourth digit ratio) and circulating testosterone. As these are the first reported findings using our measures of reproductive ambition, maternal personality, and career orientation, future

studies should also seek to test the measures for reliability and validity, ultimately for construction of a questionnaire scale of maternal tendencies.

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