

# Women's preferences for sexual dimorphism in height depend on menstrual cycle phase and expected duration of relationship

Boguslaw Pawlowski<sup>a,\*</sup>, Grazyna Jasienska<sup>b</sup>

<sup>a</sup>Department of Anthropology, University of Wrocław, ul. Kuźnicza 35, Wrocław 50-138, Poland

<sup>b</sup>Department of Epidemiology and Population Studies Jagiellonian University, Collegium Medicum, Grzegorzewska 20, Kraków 31-531, Poland

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## Abstract

Human mate preferences are related to many morphological traits, such as female waist-to-hip ratio (WHR), body mass index (BMI), male height or facial symmetry. People also vary in preferences for sexual dimorphism in stature (SDS = male height/female height) between themselves and a potential partner. Here, we demonstrate that women adjust their preference for SDS not only in relation to their own height but also in relation to (1) the phase of menstrual cycle during which their preferences were studied and (2) the sexual strategy (short- versus long-term) they were asked to choose. Taller males (larger SDS) were preferred more often when women were in the follicular (i.e. fertile) phase of their menstrual cycle and when the partners were chosen for short-term relationships. These effects were independent of woman's height. The results show that women in a potentially fertile phase of their menstrual cycle and when choosing a partner who might be less likely to invest in children select genes of taller males.

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## 1. Introduction

Human mate preferences are known to rely on morphological traits of a potential partner (Barber, 1995). Probably the most important male morphological trait on the mate market is stature (Lynn and Shurgot, 1984; Pawlowski and Koziel, 2002; Pierce, 1996). Taller men are preferred by females and, not surprisingly, they also have higher reproductive success (Mueller and Mazur, 2001; Nettle, 2002; Pawlowski et al., 2000).

A new method of studying preferences for the height of a potential partner was proposed by Pawlowski (2003): preferences for sexual dimorphism in stature (SDS = male height/female height) between a subject and his/her partner may be tested by using drawings of six pairs with different SDS. A woman's preference for SDS depended on her own height and taller women preferred relatively lower SDS than

shorter ones (Pawlowski, 2003). Preferences for different morphological traits may also depend on the phase of a woman's menstrual cycle (e.g. Johnston et al., 2001; Penton-Voak and Perrett, 2000; Penton-Voak et al., 1999; Thornhill and Gangestad, 1999b) and on the sexual strategy she may follow (Gangestad and Simpson, 2000; Regan et al., 2001). Women in the fertile phase and when choosing a partner for a short-term relationship are prone to choose more masculine male faces (Johnston et al., 2001; Penton-Voak and Perrett, 2000; Perrett et al., 1998; Thornhill and Gangestad, 1999b). Masculinity may be a good indicator of genetic quality because androgens are known to negatively affect immunocompetence, and therefore only men with "good genes" could afford higher level of such hormones. Moreover, as results obtained by Hume and Montgomerie (2001) and Gangestad and Thornhill (2003) indicate, men's facial masculinity also partly advertises the underlying developmental stability. In the short-term mating context, women prefer men displaying direct intrasexual competitiveness (Gangestad et al., 2004). The function of this mating strategy could be obtaining "good genes" (as an opposite to the

\* Corresponding author. Tel.: +48 713752774; fax: +48 713752697.

E-mail addresses: [bogus@antropo.uni.wroc.pl](mailto:bogus@antropo.uni.wroc.pl) (B. Pawlowski), [jasienska@post.harvard.edu](mailto:jasienska@post.harvard.edu) (G. Jasienska).

strategy for securing a “good provider” and “good father”) (Gangestad and Simpson, 2000; Scheib, 2001). Male stature was found to be negatively related with an index of fluctuating asymmetry (FA) (Manning, 1995). FA is a small non-directional deviation from perfect bilateral symmetry, and it “represents imprecise expression of underlying developmental design due to developmental perturbations” (Gangestad and Thornhill, 1997). Consequently, if height can be an indicator of good genes and if women select good genes more often when they are fertile or when choosing a short-term partner, one should expect that women should also adjust their preference for SDS in relation to these two conditions.

There are, however, some costs associated with choosing such a partner for long-term relationship. Male height (e.g. Heald et al., 2003) and strength (Roy et al., 2002) are related to higher levels of testosterone (T), and high levels of T are associated with elevated reactive aggression (Benderlioglu et al., 2004). Since masculinity increases perceived dominance and aggressiveness (Perrett et al., 1998) it may negatively affect paternal investment. This is why one should expect that in less fertile phase of menstrual cycle or when choosing a long-term partner women might prefer men with less masculine features (Burnham et al., 2003; Gray et al., 2002; Perrett et al., 1998).

Here we hypothesize that women who are in their fertile part of menstrual cycle or when choosing a short-term partner, will be more prone to choose taller men (larger SDS) than those women who are in the non-fertile (luteal) part of the cycle or choosing a partner for a long-term relationship.

## 2. Material and methods

Women participating in this study were subjects in the larger project on lifestyle variation and reproductive function conducted in Poland from 2001 to 2003 (Jasienska et al., 2004). Women were recruited for the study by advertisements posted in newspapers and television programs. Women were selected for participation in the study if they met the following criteria: between 24 and 36 years of age, regular menstrual cycles and no fertility problems, not taking any hormonal medication or using hormonal contraception, and not being pregnant or lactating during the last 6 months before the recruitment. Women kept daily logs where they recorded precise dates of the beginning of menstrual cycles and duration of menstrual flow. Subjects' body weight (measured by the electronic scale to the nearest 0.1 kg), body fat percentage (measured by bioimpedance to the nearest 0.1%), body height and circumferences (measured to the nearest millimeter) of waist and hips were measured before and after the menstrual cycle during which questionnaires were distributed. Measurements were taken randomly with respect to the phase of the menstrual cycle. Arithmetic means of two measurements, taken for each

variable before and after the cycle of saliva collection, were used in analyses. Waist-to-hip ratio (WHR) was assessed by the circumference of waist divided by the circumference of hips. In order to avoid an inter-observer error, all measurements (including height and body mass) were taken by one professional anthropologist. Neither subjects nor investigators distributing the questionnaires were informed about the predictions of this study.

Subjects completed a questionnaire which included frontal-view outlines of six male/female pairs with different degrees of SDS ( $A = 1.19$ ,  $B = 1.14$ ,  $C = 1.09$ ,  $D = 1.04$ ,  $E = 1.0$ ,  $F = 0.96$ ; Fig. 1; after Pawlowski (2003)). The subjects were asked to indicate which one of the six pairs was in their judgement the best matched one and to rank the remaining pairs from the 2nd up to the 6th (the least preferred) “choice”. The mean SDS for the Polish population is between 1.08 and 1.09 (Guegan et al., 2000) and therefore the pair “C” represents the mean SDS in the Polish population, while “A” and “B” represent SDS higher than the mean (i.e. more pronounced sexual dimorphism), and “D”, “E” and “F” represent SDS lower than the mean.

One hundred forty four women out of 151, who were given the questionnaire, indicated the first best pair they preferred and these 144 women were included in further analyses. Six women were indiscriminate (i.e. replied that they would accept all) and one woman accepted all but “F”. The mean height for the women included in further analysis was 163.2 cm (S.D. 6.4), and the mean BMI was 23.3 kg/m<sup>2</sup> (S.D. 3.76). Since only two women chose “A”, five chose “E” and no one chose “F” we have decided to categorize this choice for three groups: women choosing SDS higher ( $A$  and  $B$ ) than the population average SDS which is close to “C” ( $N = 29$ ), those who chose SDS = “C” ( $N = 66$ ) and those who chose low SDS ( $D$  and  $E$ ) ( $N = 49$ ). Women were also asked (1) in which of these six pairs they would like to be a female partner for short-term relationship and (2) in which they would like to be for long-term relationship (e.g. marriage).

All women who were measured and answered the questionnaire and about whom we had precise information on the dates of their cycles ( $N = 110$ ) were divided into two groups. Those who answered the questionnaire during the second part of their menstrual cycle (in the 14 days before the onset of menstruation; luteal phase, “L” ( $N = 70$ )) were classified as not being in the fertile period and those who filled the questionnaire before that period (i.e. in the first part of the cycle; follicular phase, “F” ( $N = 40$ )) were classified as being in the fertile part of the cycle. Descriptive statistics for all women as well as the differences between groups of women who were in the follicular phase and women who were in the luteal phase of their cycles are presented in Table 1. We classified the entire follicular phase as the fertile period, since the probability of conception is much higher during the follicular phase of the menstrual cycle than during the luteal phase. Slightly more than 50% of women reach the

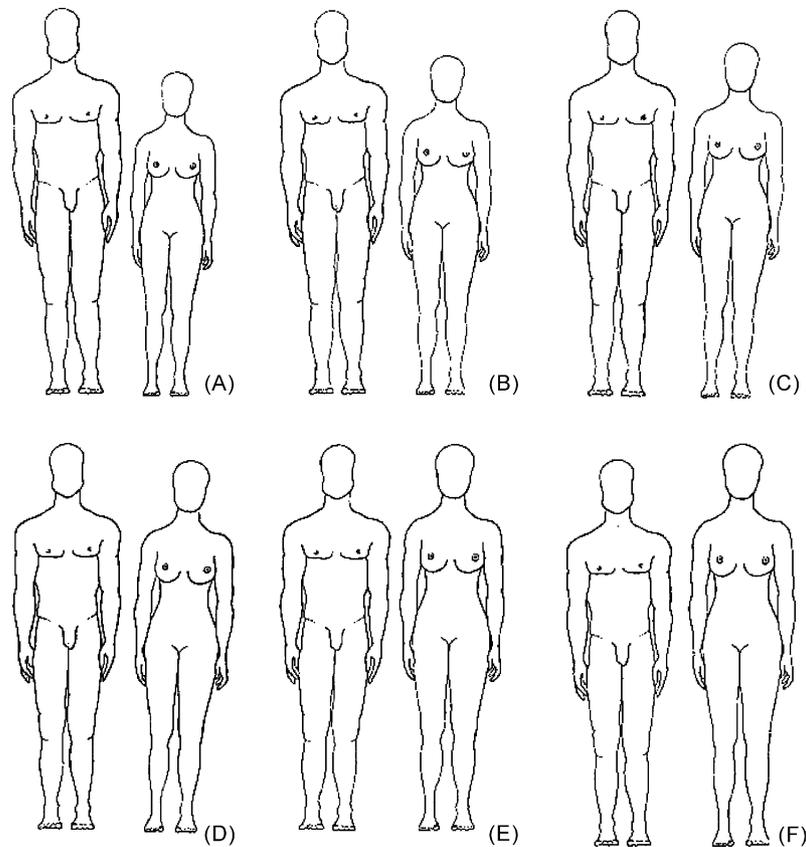


Fig. 1. Six pairs of human outlines with different levels of sexual dimorphism in size ( $A = 1.19$ ,  $B = 1.14$ ,  $C = 1.09$ ,  $D = 1.04$ ,  $E = 1.0$ ,  $F = 0.96$ ) (after Pawlowski, 2003).

peak of fertility around days 12 and 13 of the menstrual cycle, and some women are in their fertile window as early as the fourth day of their cycle (Wilcox et al., 2000). To check whether the choice of SDS differed in relation to a woman's height we carried out an ANOVA analysis. Analysis of the relationship between preferences for SDS and two phases of menstrual cycle were carried out with Pearson's  $\chi^2$  and to analyze the differences in height between the "L" and "F" women, Student's *t*-test was used. All analyses were carried out using STATISTICA 5.5 A PL (StatSoft, 2000).

### 3. Results

First we tested whether women's preferences were related to their height, body mass and BMI. We found a similar relationship as Pawlowski (2003), who used only self-reported height (ANOVA,  $F(2,140) = 5.49$ ,  $p < 0.005$ , height for one person was missing). Women who chose the high SDS were shorter, on average, than women who chose low SDS (160.8 cm, S.D. = 4.7 and 165.4 cm (S.D. = 6.3, respectively;  $p < 0.05$ ) and women who chose the average SDS (162.7 cm, S.D. = 6.7) were shorter than those women

Table 1

Characteristics of the study subjects. Differences between groups of women who were in the follicular phase of their cycles and women who were in the luteal phase were tested by two-tailed *t*-tests

	All women ( $N = 110$ )	Women in follicular phase ( $N = 40$ )	Women in luteal phase ( $N = 70$ )	<i>t</i> (or $\chi^2$ , for the last)	<i>p</i>
Age (years) <sup>a</sup>	29.9 (3.41)	29.3 (3.47)	30.2 (3.36)	-1.33	0.18
Number of children	0.97 (1.29)	0.75 (1.13)	1.11 (1.37)	-1.52	0.13
Height (cm)	163.47 (6.74)	163.08 (5.77)	163.7 (7.26)	-0.47	0.64
Body weight (kg)	62.15 (10.10)	62.37 (9.44)	62.03 (10.53)	0.17	0.87
Body mass index (kg/m <sup>2</sup> )	23.22 (3.79)	23.45 (3.50)	23.09 (3.96)	0.64	0.64
Body fat (%)	27.37 (7.20)	27.73 (6.42)	27.16 (7.65)	0.40	0.69
Waist-hip ratio	0.726 (0.05)	0.721 (0.05)	0.730 (0.05)	-0.89	0.37
Length of menstrual cycle (days)	28.39 (3.53)	29.32 (3.63)	27.86 (3.39)	2.13	0.04
Having sexual partner (yes/no)	93/17	32/8	61/9	$\chi^2 = 0.99$	0.32

<sup>a</sup> Mean (S.D.).

who chose the low SDS ( $p < 0.054$ ). There was no significant difference among SDS groups with respect to either body mass or BMI.

Although close to significance ( $p < 0.068$ ), there was no significant difference between “F” and “L” women with respect to their SDS preference ( $\chi^2 = 5.39$ , d.f. = 2). However, when comparing only those who chose the high SDS ( $N = 24$ ) with those who chose the low SDS ( $N = 33$ ) we found a significant difference ( $\chi^2 = 5.35$ , d.f. = 1,  $p < 0.02$ ). This means that women who were more prone to choose high SDS were relatively more often in their potentially fertile cycle phase (13 versus 11) than those who chose low SDS (8 versus 25). Our results were confirmed by repeating the previous analysis after dividing women in relation to “the conception risk across the cycle”. Such division was used by Gangestad and Thornhill (2003), who suggested that only the late follicular and ovulatory phase should be considered as a fertile period ( $\chi^2 = 4.05$ , d.f. = 1,  $p < 0.05$ ). This effect cannot be attributed to the biased height distribution in the groups of women in two phases of their cycle (mean height for “F” was 163.1 cm, S.D. 5.8 and for “L” 163.7 cm, S.D. 7.3;  $t = -0.47$ , d.f. = 108,  $p < 0.65$ ). Since there was a significant difference in the cycle length between “F” and “L” women (see Table 1) we have also tested whether SDS preferences depend on cycle length and found no significant difference ( $F(2, 107) = 1.66$ ,  $p < 0.2$ , the mean cycle length for those who chose high, mean and low SDS are 28.6; 27.8 and 29.2, respectively).

In the next step we tested whether women adjust their choices to sexual strategy. Out of 133 women who indicated their SDS preference for the long (LTR) and short term relationship (STR), 71 chose the same SDS for LTR and STR, 20 chose lower SDS for STR and 42 chose higher SDS for STR. When compared to the expected equal division (31:31) this difference is statistically significant ( $\chi^2 = 7.8$ ,  $p < 0.01$ ). The mean heights did not differ significantly in the three groups of women (d.f. = 2,  $F = 0.61$ ,  $p < 0.56$ ).

There was no significant relationship between phase of menstrual cycle (“F” and “L”) and choosing higher or lower SDS for short-term relationship ( $\chi^2 = 1.5$ , d.f. = 1,  $p < 0.22$ ).

#### 4. Discussion

We confirmed the results obtained by Pawlowski (2003) for women using measured (and not self-reported) height. As well as adjusting the preferences for SDS in relation to their own height, we found that females also adjust their preferences for the difference in height between partners in relation to both the phase of their menstrual cycle and to their sexual strategy (short- versus long-term).

The analysis of the relationship between the chosen SDS and the phase of the menstrual cycle was based on the question about “the best matched pair” and not about the pair in which “you would like to be one of the partners”.

We did not ask about a preference towards a particular SDS because by the subsequent questions we intended to inquire more specifically about preferences for SDS in short- and long-term relationships. However, our data suggest that by indicating “the best matched pair”, our subjects in fact indicated their own personal preference. This conclusion is supported by a very high concordance between the responses to the “the best matched pair” question and to the question about the pair in which “you would like to be in long-term relationship”. Out of 141 women who answered both questions, 118 women selected pairs with the same SDS for both (that is 83.7% concordance) and additional 16 women selected the closest possible SDSs for both questions. The remaining seven women selected different SDSs.

Our results confirm that when women are potentially fertile or seeking a partner for a short-term relationship they more often choose larger men. Despite the fact that the question about “being in short-term relationship” preceded the question about “being in long-term relationship”, the women’s choices of SDS for STR and LTR could not be the effect of some sort of “demand” for alteration of response. There are two reasons. Firstly, there is much higher concordance in response to “the best matched pair” with LTR (83.7%) than with STR (59.3%). And secondly, more than 50% of women did not alter their response and chose the same SDS for STR and LTR. Our results support the hypothesis that women follow that strategy which increases the chances for acquiring better genes for their offspring (Thornhill and Gangestad, 1999a, 1999b). A man’s height may indicate his high quality genotype. First, men who were able to invest in body size are also likely to have high levels of androgens, and since the androgens negatively affect immunocompetence, only men with good quality genes could afford such a trait. Second, bigger men have lower fluctuating asymmetry (FA), which is a trait indicating lower susceptibility to factors that could disrupt developmental stability (Hume and Montgomerie, 2001; Manning, 1995). In the STR strategy (as in extra-pair mateships) it is attractiveness which is more important to the detriment of good character (Scheib, 2001). Having an affair with a man taller than her LTR partner gives woman a chance of having a male offspring with better genetic quality (e.g. Gangestad and Simpson, 2000; Scheib, 2001).

There is a question why women do not always prefer the tallest possible man and why in the nonfertile phase of menstrual cycle they tend to prefer lower SDS. Firstly, men who are excessively tall may be unhealthy (Giovannucci et al., 1997; Okasha et al., 2002; Samaras and Storms, 1992) and therefore, in non-adaptive condition. This means that one should not expect any unrestricted preference for tallness. Secondly, there are also other costs of choosing an extremely tall man. As for masculine faces (Perrett et al., 1998), more negative personality traits can be attributed to the bigger male size. Since these traits may potentially lead to lower paternal investment and/or

higher risk of abandoning a female and therefore possibly also ceasing any paternal investment, non fertile females should choose males of intermediate size and choose lower SDS. Furthermore, there may exist some preference toward being in a relationship with the SDS which is close to the mean SDS in a given population (Pawlowski, 2003). One should therefore, not expect that women always will prefer the tallest possible male. All of this suggests that the strategy of choosing a bigger man for “good genes” has limitations.

It is worth pointing out why for studying the preferences for height we chose the method of using pictures representing few couples with different SDS. In our opinion this method is a better way to check the preferences for a partner's height than asking about preferred height in centimeters (or inches) or showing only men silhouettes. Our method allows to detect different ranges of preferred height, even though we had no information about the subjects' knowledge concerning the variation of men height in a population. In other methods, having no reference (in our method this reference is a subject's own height), women could have chosen simply the biggest male. In order to have a possibility to compare our results to the previous research we have used the same stimuli which were used by Pawlowski (2003). We do not think that if we had used stimuli with the same female size and with different male sizes our results would have been different, because our subjects perceived the females in the pictures as themselves and therefore had a good reference point to assess to what extent a male is bigger.

Our results indicate that for short-term relationships women tended to prefer higher SDS and, therefore, taller partners than for the long-term relationship. However, it is interesting that more than 50% of women chose the same SDS for both STR and LTR. Together with additional 10 women who chose only their LTR partner, this constitutes substantial fraction of women who either do not have a STR strategy or do not differentiate their preferences for STR and LTR partners. This suggests that in studies on STR and LTR strategies, researchers should include also the point of view of many women who show the same preference for a potential partner in relation to both short- and long-term relationship. These results were obtained in a study applying the between-subjects design (i.e., different subjects were studied in the fertile and non-fertile phase) and it would be interesting to confirm them by using within group analysis (i.e. comparing the preferences of the same women in two different phases).

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