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*Original Research Article*

# Stature and Sexual Stature Dimorphism in Sweden, from the 10th to the End of the 20th Century

ANDERS GUSTAFSSON,[1*] LARS WERDELIN,[2] BIRGITTA S. TULLBERG,[1] AND PATRIK LINDENFORS[1]
[1]*Department of Zoology, Stockholm University, S-106 91 Stockholm, Sweden*
[2]*Department of Palaeozoology, Swedish Museum of Natural History, S-104 05 Stockholm, Sweden*

*ABSTRACT* Mean stature in a population has been observed to vary with living conditions. If, and how, this affects sexual dimorphism in stature is not fully understood. We analyzed stature data from Swedish populations from the 10th to the end of the 20th century to investigate if male stature is more plastic than female stature in response to environmental changes. Further, we examined if there, as a consequence of this, exists an allometric relationship between male and female stature that is not caused by genetic factors, coupling greater stature with greater dimorphism. We found no significant change in stature from the 10th century to the 17th century, but a clear increase in both male and female stature during the 20th century, most likely because of improved living conditions. Regression analyses revealed no consistent change in sexual stature dimorphism over time for any of the time periods, including the 20th century. Further, we found no significant allometric relationship between male and female stature, and could consequently not identify any significant relationship between stature and stature dimorphism. Thus, contrary to previous suggestions, the regressions did not provide support for the assertion that male stature is more sensitive to environmental changes than female stature, nor that stature dimorphism increases with increasing stature. Am. J. Hum. Biol. 19:861–870, 2007. 

Stature has been observed to vary considerably within, as well as between, human populations (Eveleth and Tanner, 1990). As with almost all other morphological variables, there is evidence supporting the notion that this variation is influenced by both genetic and environmental factors.

It is known from numerous family and twin studies that stature has a high heritability, ranging from 0.75 to above 0.90 (Liu et al., 2004). It is therefore generally assumed that some of the differences in stature between human societies have a genetic basis (e.g., Alexander et al., 1979; Holden and Mace, 1999). On the other hand, environmental effects on stature can be substantial, as evidenced by increased stature in populations where the standard of living has increased. For example, in Europe an average increase in mean height of about 1 cm/decade took place from 1880 to 1980 (Eveleth and Tanner, 1990). Also, lowered nutritional standards and healthcare conditions can cause the mean stature of a population to decrease (e.g., Eveleth and Tanner, 1990; Komlos, 1998; Steckel, 1983).

Much of our knowledge about how stature has varied before the 20th century comes from measurements of male conscripts. For Sweden, these data indicate that male mean stature was relatively low during the 18th century. Then, beginning in mid-19th century and continuing into the late 20th century, stature has increased, possibly leveling out in the last decades of the 20th century (Fig. 1; c.f. Cavelaars et al., 2000; Lindgren, 1998; Sandberg and Steckel, 1980). The increase in stature during the last centuries in industrialized countries has mainly been explained by increased standards of living, particularly through improved nutrition and health care (e.g., Eveleth and Tanner, 1990; Steckel, 1983). Another source of knowledge is height estimations based on archaeological data. In an analysis of skeletal remains from Sweden, Werdelin et al. (2002) found that male heights varied around a mean of ~172–173 cm during

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*Correspondence to: Anders Gustafsson, Department of Zoology, Stockholm University, S-106 91 Stockholm, Sweden. E-mail: anders.gustafsson@zoologi.su.se

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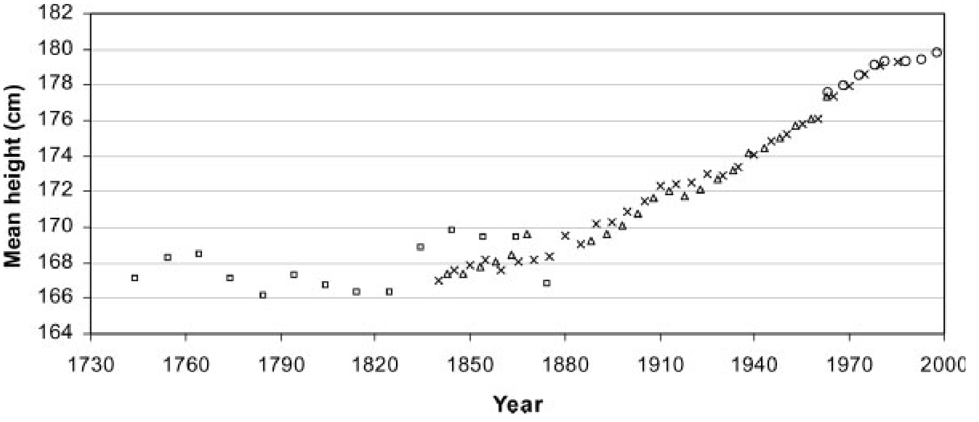


Fig. 1. Mean stature of Swedish male conscripts. Data was compiled from four sources: Squares represent means for 10-year intervals from the period 1720–1859 (Sandberg and Steckel, 1987), and crosses 5-year intervals from 1820 to 1965 (Sandberg and Steckel, 1997). Data from both these sources were based on year of birth. Year 1841–1965 (SCB, 1969; triangles) and year 1962–2000 (Pliktverket, 2006; circles) represent predominantly 5-year intervals based on year of enlistment. For the last period, 1966–2000, the means for the 5-year intervals were calculated from yearly data for the presentation in this figure. For every interval, from any of the four sources, a mean year was calculated for the interval to represent that period. Please note that all data for year of birth (squares and crosses) have been shifted 20 years later (i.e. to the right in the graph), as a crude approximation of year of measurement, for ease of visual inspection.

the Middle Ages. Archaeological data from northern Europe also confirms a low mean stature around the 18th century (Steckel, 2004).

Humans are sexually dimorphic in numerous traits, among them stature. This is evident from the fact that men are on average taller than women in all observed human populations (Eveleth, 1975). Sexual stature dimorphism, henceforth termed SSD, can be measured as the male to female stature ratio. Cross-cultural studies indicate that this ratio varies around a mean of 1.07 (Gaulin and Boster, 1985; Gustafsson and Lindenfors, 2004).

Though the SSD has been observed to differ between populations (Wolfe and Gray, 1982), differences in SSD between human populations are relatively small, leading Gaulin and Boster (1985) to propose that deviations from the mean are mainly an artifact of small sample sizes. However, their conclusion has later been questioned by Gustafsson and Lindenfors (2004), who noted that variation exists even between populations with larger sample sizes.

What governs this inter-population variation in SSD is presently not fully understood, but since both genetic and environmental factors probably influence stature, both have been suggested to be of importance also for stature dimorphism (e.g. Holden and Mace, 1999). Of the environmental factors, a common hypothesis is that male stature is more sensitive than female stature to changes in standards of living, i.e. that female growth is more buffered against hardship, such as, e.g. nutritional deficits (e.g., Bielicki and Charzewski, 1977; Greulich, 1951; Stini, 1969; Tobias, 1970). Several studies have found support for this hypothesis (e.g., Bielicki and Charzewski, 1977; Hall, 1978; Hewitt et al., 1955; Kuh et al., 1991; Tobias, 1975), though there are also studies that have not found such support, or that have come to contradictory conclusions (e.g. Brundtland et al., 1980; Greulich, 1976).

A possible solution to the ambiguous results in different studies is given by Stini (1972), who suggests that male growth is not only more severely affected by unfavorable circumstances, but that poor living conditions also may lead to a longer growth period in males, thus in effect possibly leading to similar adult SSD under both good and bad conditions.

Archaeological studies of human remains have also been used to test the hypothesis that male stature is more sensitive to environmental variation. Werdelin (1985) examined a sample of medieval remains of human long bones and proposed that greater male plasticity in stature in response to environmental fluctuations could explain the patterns he observed. However, support for that explana-

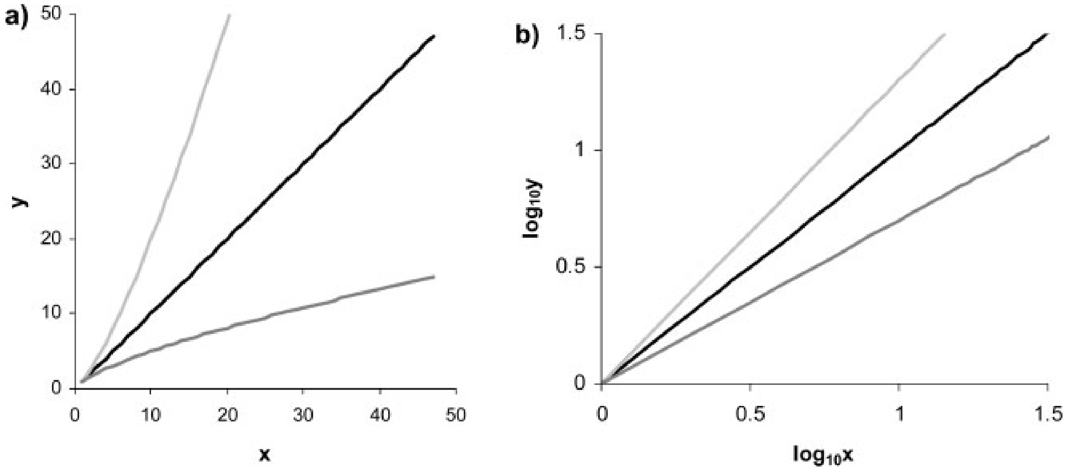


Fig. 2. Isometric and allometric curves. Figure **2a** shows different curves for the equation $y = bx^a$, and **2b** shows curves for a $\log_{10}$-transformed version of the equation. The constant, $b$, is in all cases equal to 1.0, while the index, $a$, takes three different values; $a = 1.0$ (black lines), $a = 0.7$ (dark gray lines), and $a = 1.3$ (light gray lines). The black line gives example of an isometric relationship, while the gray lines exemplify allometric (exponential) relationships. If the slope in a log-log graph deviates from 1.0 (as do the gray lines in 2b), it is an indication of an allometric relationship.

tion disappeared when a larger sample was examined using a different analytical approach (Werdelin et al., 2002).

If male stature is more sensitive or more plastic, populations with a lower standard of living would be expected to have comparatively shorter males. Accordingly, the male to female stature ratio should increase as mean stature increases in a population. If SSD changes in this way as mean stature changes in a population because of environmental conditions, this would be indicated by an allometric rather than isometric relationship when samples of male stature are plotted against corresponding samples of female stature.

Power functions between two variables, where the index [$a$ in Eq. (1)] is different from 1, are often referred to as allometric.

$$y = bx^a \tag{1}$$

Allometry implies that the relationship between the two variables either increases or decreases in a systematic way throughout the range of variation as expressed by Eq. (1). If the relationship does not change, but remains constant, corresponding to $a = 1$ in Eq. (1), the relationship is called isometric and may be expressed as a straight line (Fig. 2a).

To detect an allometric relationship between two variables one can log-transform (i.e. with $\log_{10}$) the data on both axes (or use log–log scale). This is equivalent to taking the logarithm of both sides in Eq. (1), which then becomes Eq. (2).

$$\log y = \log b + a \log x \tag{2}$$

In Eq. (2) the slope will be determined by $a$. Hence, a slope deviating from 1 in Eq. (2) will indicate an allometric relationship in Eq. (1) (Abouheif and Fairbairn, 1997) (Fig. 2b).

A positive allometric relationship between male and female size is often found when comparing different animal species within a clade, a pattern referred to as Rensch's rule (Fairbairn, 1997; Abouheif and Fairbairn, 1997) after the discoverer (Rensch, 1950, 1959). When males are the larger sex the rule states that sexual size dimorphism increases with increasing body size, within clades. Rensch's rule could potentially also apply to similar patterns among populations within species. This has been tested on human populations by Wolfe and Gray (1982) who found support for an allometric relationship between male and female stature, and by Gustafsson and Lindenfors (2004), who did not.

If male and female stature are influenced differently by varying environmental conditions, this may have implications for studies of the evolution of human sexual stature dimorphism. If it could be shown that SSD increases with increasing general stature because of environmental causes, it would be necessary to take this into consideration as a possible explanation for discovered allometric relationships between males and females in cross-cultural studies. Furthermore, a relationship where male stature is positively allometrically related to female stature can also be indicative of greater phenotypic plasticity in male than in female stature.

In this study we aim to investigate the following questions:

- Does change in mean stature over time in a population affect SSD, and if so, how?
- Is male stature more sensitive than female to changes in environmental conditions?
- Is there an allometric relationship between male and female stature that is not caused by a genetic change?

One way to address these questions is to study a population whose genetic composition has not changed significantly over time, with regard to genes relevant to stature. We here present an overview of how stature and SSD have changed in Sweden from the 10th century until present, and try to answer the afore-mentioned questions. Special focus is directed towards the 20th century, during which our data show that stature of both men and women increased. We work under the assumption that genetic change during the period has been negligible, i.e. that stature change has mainly been because of environmental changes, such as nutrition and health.

## METHODS

Self-reported standing height (stature) and in vivo measurements of stature, as well as femur lengths (archaeological data), were compiled from a variety of published sources, and one unpublished source (Sjøgren; Appendix 1). Data on standing height was also recorded from Swedish passport applications for the years 1940/1941, 1955, and 1970. For more information on the included populations and references see Appendix 1. All data come from populations within the current borders of Sweden, except for a Swedish population on Runö (Ruhnu Island, located in the Gulf of Riga; Hildén, 1926), which was also included.

Subjects were in all cases assumed to have reached mature height. In the data obtained from passport applications all subjects were 20 years or above. However, the data from SCB (2006) did contain one cohort with subjects aged 16–24, though this cohort was very similar in stature to the cohort aged 25–34. Therefore, it was deemed unlikely to affect the results and was hence included in the study.

For the archaeological data, the method developed by Sjøvold (1990) was used to estimate standing height from femur length (M1 of Martin and Saller, 1957). Only populations with at least 10 individuals of each sex were included in the study. For further information on the archaeological material, see Werdelin et al. (2002) and the original sources (Appendix 1).

Unfortunately, we lack data for female stature for the period 1700–1920, and could therefore not include this period in our analyses of SSD. Because of this gap, the data are more or less clustered into two periods; 900–1700 and 1920–2000. Previous studies of the period 900–2000 indicate no directional change during the Medieval period (Werdelin et al., 2002), lower means around the $18^{th}$ century (Sandberg and Steckel, 1987; Steckel, 2004), and a clear increase in stature during the 20th century (Sandberg and Steckel, 1980). Therefore, analyzing the data using a single least squares regression analysis is probably not a valid approach. The pre-1700 data and the 20th century data also differ in another way, namely that mean standing height was arrived at by direct measurements in the latter time-period, but based on estimations from skeletal remains in the former. For these reasons we choose to analyze the two periods in separate regression analyses, while the two periods are compared with each other through the use of analyses of variance.

For the analyses where “Year” was used as the independent variable, normal least-squares regressions were used. However, since the requirements for parametric tests were not met in all cases, we double-checked all results from analyses including “Year” using nonparametric Spearman rank correlations. The results of the parametric and nonparametric tests are presented in parallel. For the tests of a possible allometric relationship between male and female stature we followed the approach of Abouheif and Fairbairn (1997) and conducted regressions on male and female stature, testing if the resulting slopes differed significantly from 1.0, which would have indicated an allometric relationship. Major axis (Model II) regressions were used rather than regular least-squares regressions since there is no a-priori reason to assign either males

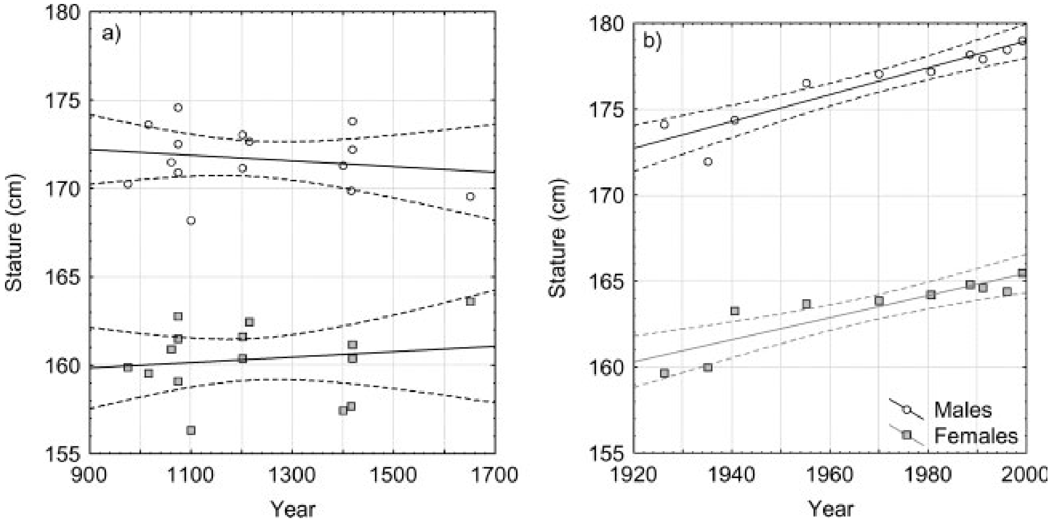


Fig. 3. Least squares regression lines for mean male and female stature, including 95% confidence intervals (dotted lines), in various Swedish populations. Neither male nor female stature showed any significant association with time from the 10th to and including the 17th century (**a**). Both male and female stature increased during the 20th century (**b**).

or females as the dependent or independent variable. A major axis regression functions byplacing the regression line where the sum of the squared distances perpendicular from each data point to the regression line are minimized (Quinn and Keough, 2002). For these tests, the data was log-10 transformed. In all other analyses data remained untransformed.

## RESULTS

Stature data from the 10th to and including the 17th century showed that neither male (regression $b = -0.002$, $R^2$adj $= -0.043$, $F_{1,13} = 0.430$, $P = 0.524$; Spearman $t_{13} = -0.42$, $P = 0.679$) nor female stature (regression $b = 1.529{*}10^{-3}$, $R^2$adj $= -0.054$, $F_{1,13} = 0.284$, $P = 0.603$; Spearman $t_{13} = 0.66$, $P = 0.522$) showed a significant change with time during the period (Fig. 3a).

Analyses on data from the 20th century showed that both male and female stature increased significantly with time during the period (Males: regression $b = 0.078$, $R^2$adj $= 0.855$, $F_{1,8} = 54.02$, $P < 0.001$; Spearman $t_8 = 12.61$, $P < 0.001$. Females: regression $b = 0.064$, $R^2$adj $= 0.757$, $F_{1,8} = 28.99$, $P < 0.001$; Spearman $t_8 = 8.75$, $P < 0.001$; Fig. 3b).

When stature during the 20th century was pooled and compared with the pooled stature of the pre-18th century populations, both male (ANOVA $F_{1,22} = 183391.5$, $P < 0.001$) and female stature (ANOVA $F_{1,22} = 163117.4$, $P < 0.001$; Fig. 4a) were significantly greater during the 20th century.

The unweighted mean SSD for all populations in this study was 1.075. Among the populations, Runö had the highest SSD (1.090), and the St. Petri chapel population has the lowest SSD (1.036).

Neither the regression on male to female stature ratio (SSD) from the 10th up to and including the 17th century (regression $b = 0.00002$, $R^2$adj $= 0.031$, $P = 0.249$, $F_{1,13} = 1.451$), nor the Spearman rank correlation (Spearman $t_{13} = 0.299$, $P = 0.770$) (Fig. 5a) revealed any relationship between stature and time during the period.

When data on SSD from the 20th century was analyzed, neither of the tests showed that SSD was changing with time during the period (regression $b = 5.486{*}10^{-5}$, $R^2$adj $= -0.054$, $P = 0.484$, $F_{1,8} = 0.538$; Spearman $t_8 = 1.26$, $P = 0.244$; Fig. 5b).

The SSD was significantly greater in the 20th-century populations (ANOVA $F_{1,23} = 4.9$, $P = 0.037$) than in the pre-18th century sample, however. Since the St Petri population was a possible outlier the test was also repeated without this population, with similar result (ANOVA $F_{1,22} = 5.3$, $P = 0.031$; Fig. 6).

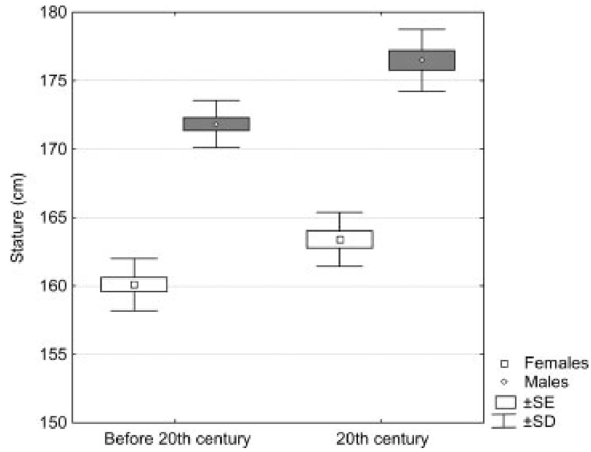


Fig. 4. Male and female stature compared between the period from the 10th to the end of the 17th century, and the 20th century. Both male and female stature are significantly greater during the 20th century.

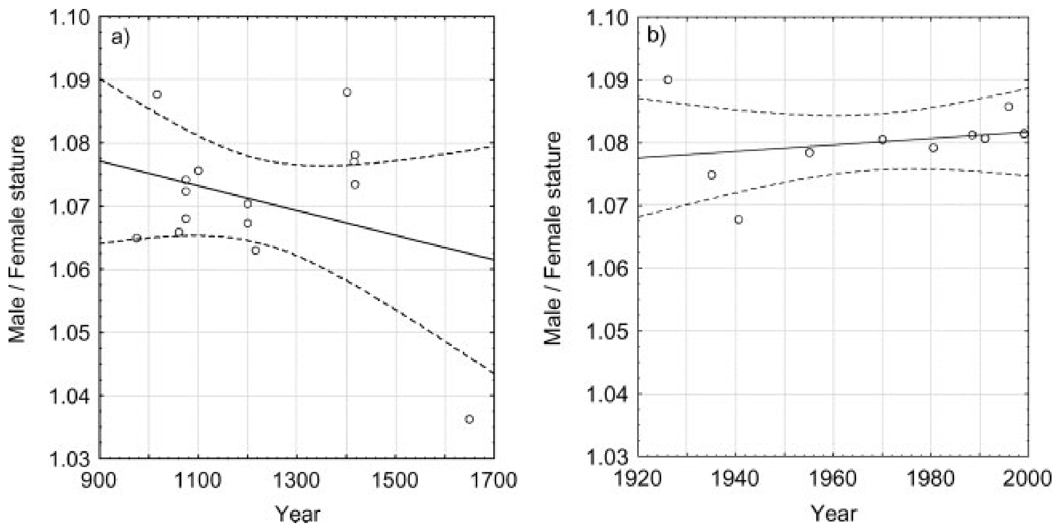


Fig. 5. Male to female stature ratio (SSD), including 95% confidence intervals (dotted lines), in various Swedish populations **a**) from the 10th to and including the 17th century, and, **b**) during the 20th century. SSD did not show any significant association with time during any of the two periods.

A major axis regression on male and female stature based on $\log_{10}$-transformed data (Fig. 7a) showed that male and female stature were significantly associated ($b = 1.141$, $R^2 = 0.667$, $n = 25$, $P < 0.001$), and that the slope of the regression line did not deviate significantly from a slope of 1 ($P = 0.314$). Similar results were recorded when only populations from the 20th century were included ($b = 1.064$, $R^2 = 0.820$, $n = 10$, $P < 0.001$; Fig. 7b). The slope of this regression line did not deviate significantly from a slope of 1.0 either ($P = 0.699$).

## DISCUSSION

The analyses in this study did not show any significant consistent changes in stature or stature dimorphism during the period from the 10th to the 17th century. During the 20th century; however, stature increased signifi-

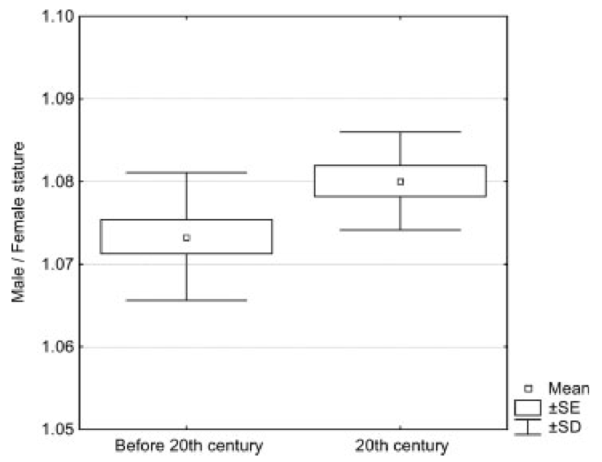


Fig. 6. Sexual stature dimorphism compared between the period from the 10th to the end of the 17th century, and the 20th century. Stature dimorphism is significantly greater during the 20th century.

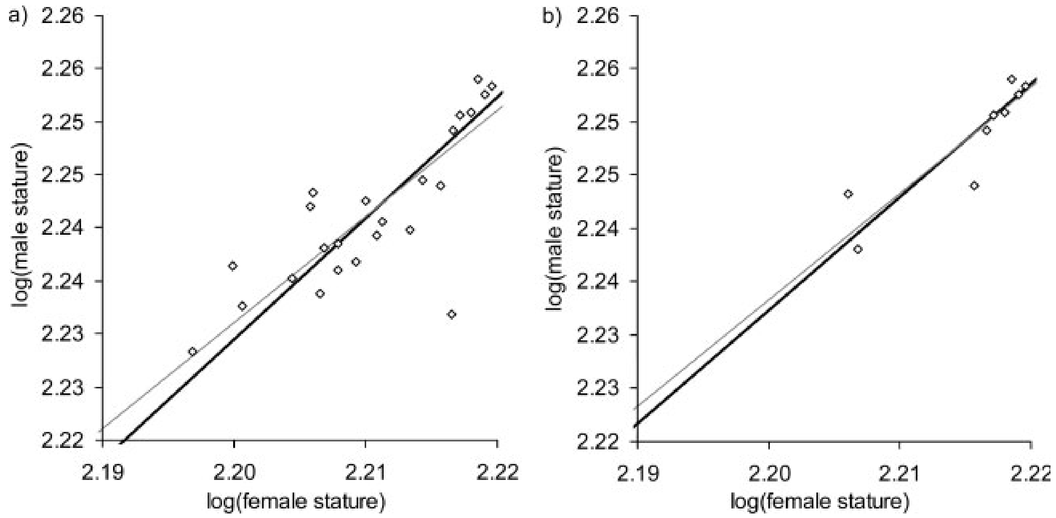


Fig. 7. Major axis regression lines (thick black lines) on male and female stature for Swedish populations (**a**) from the 10th century until present, and (**b**) for populations from the 20th century. The slopes are not significantly different from slopes of 1 (thin gray lines). Thus, the relationship between male and female stature does not deviate significantly from isometry.

cantly, but this change was not coupled with a similar change in SSD. In line with this, analyses of the relationship between male and female stature revealed no general increase of SSD with stature in our sample. Interestingly however, we found a significant difference in stature dimorphism between the pre-20th century populations and the samples from the 20th century.

In our study we have assumed that no substantial genetic change in genes related to stature took place during the period. This assumption is based in part on the assumption that during most of this time, immigration mostly was from neighboring countries. Further, according to Cavalli-Sforza et al. (1994), Europeans have relatively small genetic differences. It is possible, however, that an increased amount of genetic outbreeding has occurred during the last decades, something that might create heterosis (hybrid vigor), and thereby contribute to the increased mean stature. This explanation has received some support (e.g. Schreider, 1967), even though studies among migrant groups have indicated that mean stature has increased regardless of rates of outbreeding (Hulse, 1957).

According to a mathematical model of Rogers and Mukherjee (1992) it takes more than 60 times longer for SSD to evolve than for an increase, or decrease, in mean stature to occur in both sexes. Since stature probably has changed little because of genetic changes since the 10th century, it can be assumed that any possible changes in SSD with time are most probably because of changes in standard of living.

The mean SSD for the whole period was 1.075, thus very close to the means obtained in cross-cultural analyses (1.073: Gaulin and Boster, 1985; 1.072 and 1.069: Gustafsson and Lindenfors, 2004). The lowest SSD in the sample, St Petri, could most likely be explained by sampling error due to small sample size ($n_{\mathrm{males}} = 15$, $n_{\mathrm{females}} = 11$).

Stature did not change significantly from the 10th to the end of the 17th century (Fig. 3a), a result in accordance with that of Werdelin et al. (2002). As was expected from earlier observations, both male and female stature increased during the 20th century (Fig. 3b). These trends can most probably be explained by a general increase in the standard of living during the 20th century (Steckel, 1983).

There was, however, no significant support for an increase in SSD during the 20th century (Fig. 5b), as would have been expected if male stature increased faster than female stature in response to improved conditions. Thus, in this test, we could find no support for the assertion that male stature is more sensitive to environmental conditions than female stature (e.g. Tobias, 1970).

The relationship between male and female stature did not deviate significantly from isometry, neither for the whole period, nor for the 20th century only (Fig. 7a, b), thus lending no support to the idea that there is an allometric relationship between male and female mean stature in a population changing over time. Since we expect almost all of our variation in the current study to be because of environmental factors, this does not make it implausible to find allometric patterns among populations that differ genetically. As was the case in the study of how SSD changed during the 20th century, the test of an allometric relationship between male and female stature did not support the hypothesis that male stature is more plastic than female stature.

When all pre-18th century populations were pooled and tested with an ANOVA against the populations from the 20th century, SSD during the 20th century was, however, significantly higher (Fig. 6). The corresponding tests for male and female stature separately (see Fig. 4) showed that both male and female mean stature during the 20th century were greater than during the pre-18th century period. From this one might suspect a direct relationship between stature and SSD, but our other results indicate that this is not the case. Even though stature and SSD both differ between pre-20th century and 20th century data, this simultaneous difference appears not to be functionally related.

So, why was the SSD higher during the 20th century than before the 18th century? Our regression analyses indicate that it probably has nothing to do with a general increase in stature, and does consequently not appear to be connected to the increased standard of living during the 20th century. Instead, a possible explanation is that the difference is related to methodological biases between the recordings of in vivo standing height, and the stature estimations based on archaeological remains. For example, if the equation suggested by Sjøvold (1990) gives a consistent unidirectional error when estimating either male or female height from femur lengths, this will affect the SSD in all archaeological populations in the material. Another, perhaps less plausible, possibility is that there was a consistent bias in the height of the men and the women included in the archaeological sample, so that the SSD of the people buried at a particular location was not representative of the whole population.

Overall, the results of the present study imply that variation in adult SSD in the population is not functionally related to the environmentally caused variation in mean stature. This may have implications for cross-cultural studies of SSD, and, more generally, studies of the evolution of SSD in humans. For example, since it seems that SSD does not increase with increasing general stature because of environmental causes, it might not be necessary to take this into consideration as a possible explanation of allometric relationships between male and female stature in cross-cultural studies.

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# APPENDIX 1

*Mean stature for Swedish populations at different time periods*

| Population[a] | Period/Year[b] | Mean year[c] | Male height[d] | $n^e$ | Female height[d] | $n^f$ | SSD[g] | References |
|---|---|---|---|---|---|---|---|---|
| Archaeological data | | | | | | | | |
| Fjälkinge | 900–1050 | 975 | 170.3 | 22 | 159.9 | 20 | 1.065 | Arcini, 1999 |
| Trinitatis, Lund T1 | 990–1020/30 | 1015 | 173.6 | 48 | 159.6 | 30 | 1.088 | Arcini, 1999 |
| Trianits, Lund T2-3 | 1020/30–1100 | 1060 | 171.5 | 91 | 160.9 | 76 | 1.066 | Arcini, 1999 |
| St. Andreas Church, Lund | 1050–1100 | 1075 | 170.9 | 80 | 159.1 | 55 | 1.074 | Arcini, 1999 |
| Trinitatis, K3 | 1050–1100 | 1075 | 172.5 | 50 | 161.5 | 22 | 1.068 | Arcini, 1999 |
| Trinitatis, D3 | 1050–1100 | 1075 | 174.6 | 11 | 162.8 | 12 | 1.072 | Arcini, 1999 |
| Löddeköpinge | 1050–1150 | 1100 | 168.2 | 180 | 156.4 | 129 | 1.076 | Persson and Persson, 1981 |
| Westerhus, Frösö parish | 1050–1350 | 1200 | 173.0 | 62 | 161.7 | 72 | 1.070 | Gejvall, 1960 |
| Trinitatis, Lund T4 | 1100–1300 | 1200 | 171.2 | 110 | 160.4 | 83 | 1.067 | Arcini, 1999 |
| Leksand church | 1030–1400 | 1215 | 172.7 | 11 | 162.5 | 35 | 1.063 | Holm, 1996 |
| Kv. Kroken, Uppsala | 1300–1500 | 1400 | 171.3 | 19 | 157.5 | 16 | 1.088 | Sigvallius, 1989 |
| Helgeandsholmen, Stockholm | 1300–1530 | 1415 | 169.9 | 176 | 157.7 | 112 | 1.077 | Sjøgren, 1979–1982 |
| Trinitatis, Lund T5 | 1300–1536 | 1418 | 172.2 | 161 | 160.4 | 124 | 1.074 | Arcini, 1999 |
| Trinitatis, Lund T | 1300–1536 | 1418 | 173.8 | 28 | 161.2 | 16 | 1.078 | Arcini, 1999 |
| St. Petri chapel, Leksand | 17th century | 1650 | 169.6 | 15 | 163.6 | 11 | 1.036 | Holm, 1996 |
| Standing height | | | | | | | | |
| Runö-Swedes | 1926 | 1926 | 174.1 | 77 | 159.7 | 75 | 1.090 | Hildén, 1926 |
| Dalarna | 1932–1938 | 1935 | 172.0 | 5431 | 160.0 | 3398 | 1.075 | Lundman, 1945 |
| Sweden | 1940–1941 | 1940.5 | 174.4 | 426 | 163.3 | 426 | 1.068 | Passports[h] |
| Sweden | 1955 | 1955 | 176.5 | 407 | 163.7 | 407 | 1.078 | Passports[h] |
| Sweden | 1970 | 1970 | 177.1 | 443 | 163.9 | 443 | 1.081 | Passports[h] |
| Sweden | 1980–1981 | 1980.5 | 177.2 | 7265 | 164.2 | 7699 | 1.079 | SCB, 2006 |
| Sweden | 1988–1989 | 1988.5 | 178.2 | 6211 | 164.8 | 6506 | 1.081 | SCB, 2006 |
| Sweden | 1991 | 1991 | 177.9 | 2961[i] | 164.6 | 3058[i] | 1.081 | Cavelaars et al., 2000 |
| Sweden | 1996 | 1996 | 178.5 | 2846[i] | 164.4 | 3004[i] | 1.086 | SCB, 2006 |
| Sweden | 1998–2000 | 1999 | 179.0 | 8437[i] | 165.5 | 9526[i] | 1.082 | SCB, 2006 |

[a]Population, referring to the location where data was collected.
[b]Period, or year, when the subjects were measured in vivo, or referring to the year of death for measurements of skeletal remains.
[c]The average, or middle year, of the period.
[d]Mean height (cm). For the archaeological data, standing height was estimated from femur lengths (see texts).
[e]Sample size, males.
[f]Sample size, females.
[g]Sexual dimorphism in stature, displayed as a ratio where male stature is divided by female stature.
[h]Data on self-reported and in vivo measurements of stature was recorded from Swedish passport applications.
1940/1941: Riksarkivet. Statens kriminaltekniska anstalt. Pass, FIII aa, vol. 1, 2 and 3
1955: Riksarkivet. Statens kriminaltekniska anstalt. Pass, FIII ab, vol. 642 and 643.
1970: Riksarkivet. Rikspolisstyrelsen, Passansökningar KI, vol. 2718 and 2719.
[i]Approximate sample size, based on information from SCB (2006).