The Effect of Female Social Status on Human Stature Sexual Dimorphism: Evidence of Self-Domestication?

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Presentation Overview

Domestication and self-domestication.

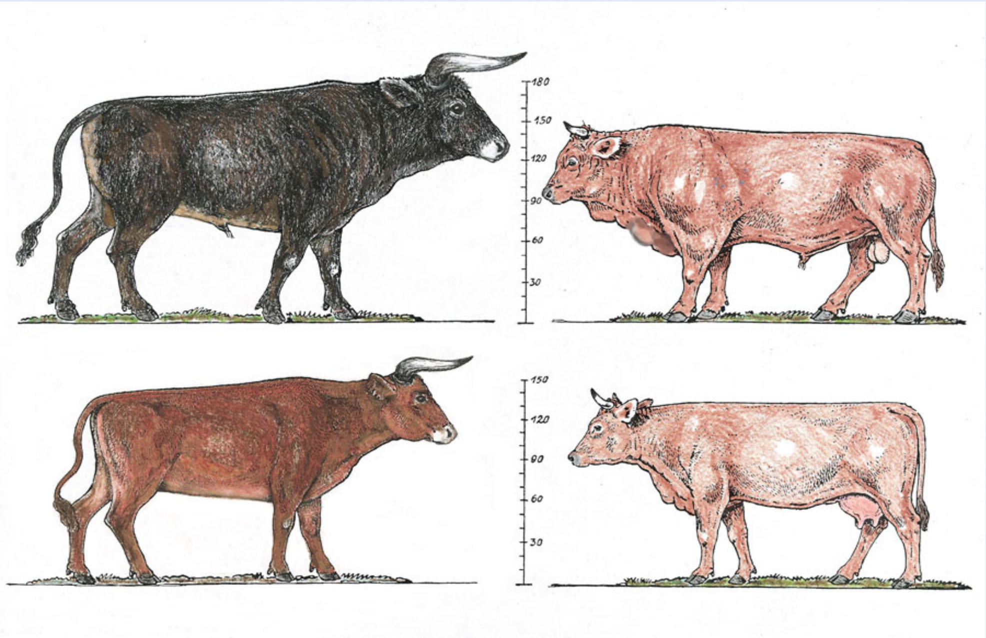
The nature of this investigation.

Interpretation of results.

Avenues for further research.

Domestication Syndrome in Mammals

Wild → Domesticated



- Smaller size
- Less size sexual dimorphism
- Smaller brains
- Shorter face/snout
- Smaller teeth
- Changes in coat pigmentation
- Paedomorphic traits
- Smaller adrenal systems

Caused by selection against aggression

Image: T. van Vuure, cited http://www.cambridgeblog.org/

Primate self-domestication

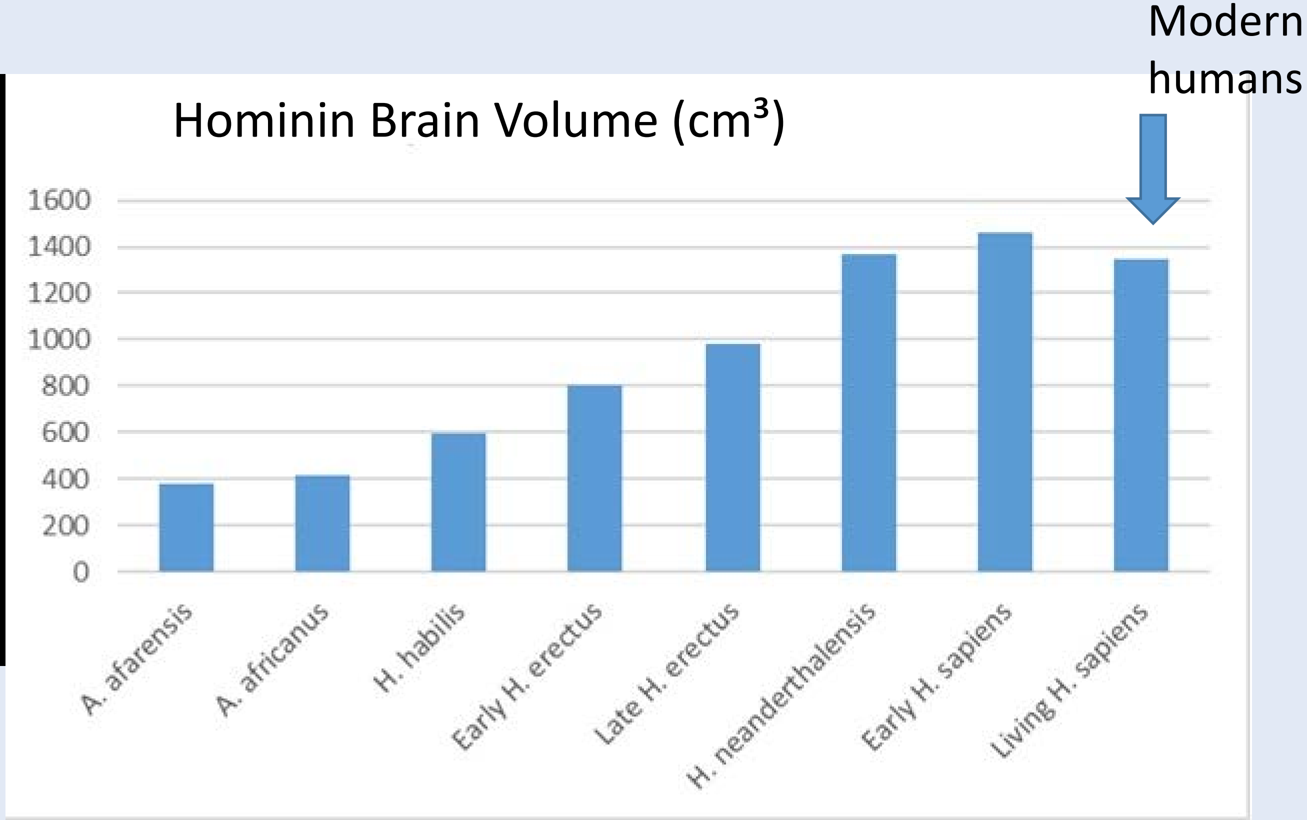
Wild bonobos are a ‘*self-domesticated*’ relative of chimpanzees (Hare et al. 2012).

Higher social status allows bonobo females to select less-aggressive male partners.

Images (LtoR): worldwildlife.org; natureworldnews.com; San Diego Zoo

Homo sapiens also show signs of self-domestication.

Skhul 5 (110-90Kya) versus recent African



This implies sustained selection against aggression in humans.

Images (LtoR): Cieri et al 2014; bar chart data from McHenry 1994.

Three proposed mechanisms for selection against human aggression

Benefits from cooperation

(Cieri et al. 2014)

Female selection against aggressive males

(Cieri et al. 2014)

Ostracism of aggressive group members

(Wrangham 2014, Pinker 2011)

Images (LtoR): www.moww.com; Robert Couse-Baker; msedna.blogspot.com.au

Self-domestication by female mate choice

Requires:

1. Female capacity to choose.
2. Female preference for less-aggressive males.

These require:

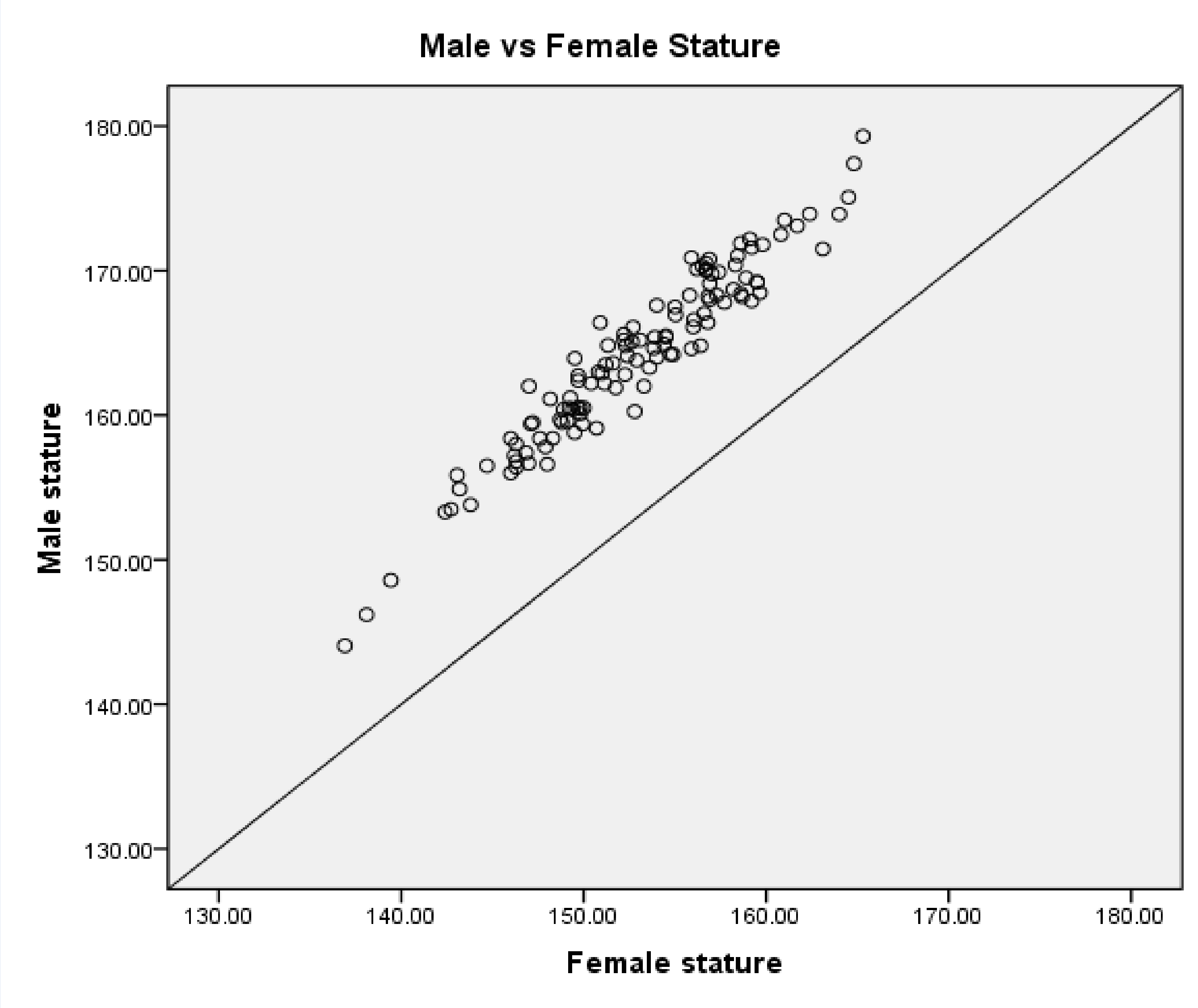
1. Elevated female social status.
2. A relatively egalitarian society (Brooks et al. 2010).

Testing the female choice hypothesis

- Cross-cultural comparison of Stature Sexual Dimorphism.
- 52 societies from the Ethnographic Atlas (Murdock 1967, Gray 1998).
- Hierarchical linear regression modelling.

Locations of the 52 societies used (map, Google 2016).

Overview of Stature Sexual Dimorphism



<u>118 societies</u>

Mean diff.: 7.4%

Std. dev.: 1%

Max: 10.3%

Min: 4.9%

Range: 5.4%

Results of Hierarchical Linear Regression

Best model included ‘latitude’, ‘Africa (y/n)’, and ‘mode of property inheritance’ (Adj.R^2=50.6, F=18.4, p<0.001).

Property inheritance increased the explanatory capacity of this model by 7% (F=7.8, p=0.007).

Change from matrilineal to patrilineal property inheritance associated with a shift of 0.95% in stature difference (p=0.007).

Interpretation

Genetic, environmental and cultural variables all affect Stature Sexual Dimorphism in human populations.

Matrilineal property inheritance shows a moderate and significant effect.

However, this is not a conclusive association between female social status and human self-domestication.

Avenues for further research

Collect further stature data for more human societies.

Utilise the Standard Cross Cultural Sample to develop more robust indicators of female social status and egalitarianism.

Incorporate other indicators of domestication syndrome.

References

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Synopsis: The Effect of Female Social Status on Human Stature Sexual Dimorphism: Evidence of Self-Domestication?

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Charles Darwin (1868) was the first to note that many domesticated mammalian species share multiple traits when compared to their wild ancestors. These traits include: smaller body size, less sexual dimorphism (size difference between males and females), smaller brains, smaller teeth, a shorter snout, changed pigmentation and smaller adrenal systems. Recent breeding experiments using silver foxes have shown that most of these characteristics predictably occur in mammals following selection for less-aggressive behaviour (Trut et al., 2006).

Interestingly, wild bonobos (*Pan paniscus*) also show domesticated traits when compared to their near relative, the chimpanzee (*Pan troglodytes*). This has led to suggestions that bonobos are a 'self-domesticated' species (Hare, Wobber, & Wrangham, 2012). High social status in female bonobos (relative to female chimpanzees) allows a greater capacity for them to select their preferred mating partners. It follows that, over time, bonobo females have preferred and selected less-aggressive males which has caused the emergence of domesticated traits throughout the species (Hare et al., 2012).

Domesticated traits are also apparent in modern human populations when compared to earlier *Homo sapiens* and this suggests humans may also have self-domesticated (Groves, 1999; Leach, 2003; Wrangham, 2014). Observations which support this possibility include: reduced prognathism in modern human faces, a reduction in cranial capacity, smaller body size, relative skeletal gracility and smaller teeth. The presence of domesticated traits suggests an evolutionary process of selection against aggression in humans which could also explain recent cooperative technological and cultural advancement in our species (Cieri, Churchill, Franciscus, Tan, & Hare, 2014).

Three primary mechanisms are proposed to explain pre-historic selection against aggression in humans. The first suggests that lower aggression is an adaptive advantage because sociable individuals are better able to share food, knowledge and technology, and so receive survival and reproductive advantages compared to more aggressive individuals (Cieri et al., 2014). The second posits that cooperative group members will often team up to expel or kill excessively aggressive and dangerous individuals (Pinker, 2011; Wrangham, 2014). This could progressively eliminate aggressive predispositions from within a population. The third proposal relies on female mate choice whereby women select less-aggressive male mating partners, leading to higher numbers of less-aggressive individuals within a group (Cieri et al., 2014). Although these selective mechanisms may have operated in isolation, or in concert together, the focus of the present investigation is to identify how much human selection against aggression has been a result of female mate choice.

For this study, I used stature sexual dimorphism data as an indicator of relative domestication in several cultural groupings and compared this with selected variables from the Ethnographic Atlas (a cross-cultural sample of 1267 societies). I used hierarchical linear regression models to determine the best combination of variables to explain observed variation in stature sexual dimorphism. Within the available sample, males were 7% taller than females on average. The largest difference was 10.3% and the smallest was 4.9%. The best available model explained approximately 50% of the variation. This took into account the effect of latitude, living in sub-Saharan Africa, and the influence of matrilineal property inheritance. Including matrilineal versus patrilineal property inheritance improved the explanatory capacity of the model by around 7% and predicted a significant change of around 1% in the difference between mean male and mean female stature.

These results indicate that multiple factors (including genetic, environmental and cultural influences), will affect the level of stature sexual dimorphism across human populations. Whilst the association between matrilineal property inheritance and lower stature sexual dimorphism may indicate a correlation between female social status and relative male and female height, there are potential explanations for why this is the case which do not involve self-domestication via female mate choice. In light of this ambiguity, I hope to improve this analysis in future by collecting stature data for more societies, and utilising the Standard Cross Cultural Sample instead of the Ethnographic Atlas. This will provide more robust cultural indicators of female social status. It will also allow for examination of other predicted symptoms of human self-domestication; including higher levels of cooperation and less inter-personal violence.