

How universal are human mate choices? Size does not matter when Hadza foragers are choosing a mate

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It has been argued that size matters on the human mate market: both stated preferences and mate choices have been found to be non-random with respect to height and weight. But how universal are these patterns? Most of the literature on human mating patterns is based on post-industrial societies. Much less is known about mating behaviour in more traditional societies. Here we investigate mate choice by analysing whether there is any evidence for non-random mating with respect to size and strength in a forager community, the Hadza of Tanzania. We test whether couples assort for height, weight, body mass index (BMI), per cent fat and grip strength. We test whether there is a male-taller norm. Finally, we test for an association between anthropometric variables and number of marriages. Our results show no evidence for assortative mating for height, weight, BMI or per cent fat; no evidence for a male-taller norm and no evidence that number of marriages is associated with our size variables. Hadza couples may assort positively for grip strength, but grip strength does not affect the number of marriages. Overall we conclude that, in contrast to post-industrial societies, mating appears to be random with respect to size in the Hadza.

Keywords: mate choice; Hadza; height; strength; assortative mating; hunter–gatherers

1. INTRODUCTION

Choosing the right mate is an important component of fitness, particularly so in a species like our own, where long-term relationships between partners are common. There is now a large body of research investigating mating patterns within evolutionary studies of human behaviour. The great majority of this research, however, has been conducted in a single cultural setting, the post-industrial West. This narrow focus becomes problematic when researchers generalize from post-industrial populations in order to draw conclusions about the significance of particular mating patterns in our evolutionary history, since it ignores the very real possibility that mating patterns will show ecological variation.

For example, the importance of size as a cue has been emphasized in a number of recent publications. In post-industrial populations, size appears to matter for both mate preferences and mate choices. Laboratory studies of preferences suggest individuals take height into consideration when weighing up potential mates (Shepperd & Strathman 1989; Higgins *et al.* 2002). In the real world situations of mate advertising (in lonely hearts ads) and actual mate choice, height also appears to matter (Pawlowski & Koziel 2002). Similarly, weight is a factor in both stated preferences and observed choices (Silventoinen *et al.* 2003; Kurzban & Weeden 2005). Despite these relationships having been demonstrated almost entirely in post-industrial societies, they have been used to bolster stories about the evolution of sexual dimorphism (Nettle 2002) and to explain intrasexual competition (Buunk *et al.* 2008) and female character perception (Chu & Geary 2005). But if such mate preferences are contingent on ecology, they cannot explain the evolution of traits common to the entire species, nor can they be used to make generalized statements about the behaviour of all humans.

Here, we investigate mate choice in a forager society, the Hadza of Tanzania, to determine whether there is evidence that mating is non-random for anthropometric characteristics. Research in post-industrial societies suggests that positive assortative mating is common for height and weight (Silventoinen *et al.* 2003), and that there is a male-taller norm, whereby marriages in which the female partner is taller than the male are much rarer than would be expected by chance (Gillis & Avis 1980; Pierce 1996). Taller men also appear to contract more marriages (Pawlowski *et al.* 2000), though the reverse may be true for women (Nettle 2002). We investigate here whether there is any evidence for assortative mating, a male-taller norm, or that size affects the number of marriages contracted in the Hadza.

2. MATERIAL AND METHODS

(a) Population

The Hadza are hunter–gatherers who live in Tanzania in a savanna/woodland habitat. They number about 1000 and live in mobile camps that average 30 people. Women forage for plant foods and men hunt with bows and arrows. Women get married at around 17–18 years and men at age 20. There is no wedding ceremony but after a liaison a couple will begin sleeping at the same hearth and are considered married. Polyandrous marriages do not exist but about 4 per cent of men have two concurrent wives. Because divorce is common, serial monogamy is the best way to characterize the mating system. Marriage is not arranged: the Hadza are extremely egalitarian so individuals are not coerced into marriage. Female choice seems to be the main factor leading to marriage, because young single men appear willing to marry a wide range of women. Previous research on the Hadza suggests their mate preferences resemble that of Western mate preferences in some ways but not others. For example, Hadza men have significantly different preferences for women's waist-to-hip ratio compared to Western men (Marlowe *et al.* 2005) and place much more emphasis on women being hard-working and fecund (Marlowe 2004). Though preferences for size have not been systematically tested in the Hadza, when asked which characteristics are attractive in a mate, very few individuals of either sex mention size: only one woman out of 46 questioned (2%) cited 'big' as desirable; one of 46 women (2%) and one of 55 men (2%) preferred thinness; and only two men out of 55 (4%) mentioned that the woman should be shorter (Marlowe 2004).

Data have been collected on the Hadza by F. M. since 1995. Our sample is close to the entire population of the Hadza, especially all those who are full-time foragers, since all individuals in each camp were measured during anthropometric surveys.

(b) Methods

We analysed the evidence for non-random mating for the following anthropometric characteristics: height, weight, body mass index (BMI), per cent fat and handgrip strength. Height and weight indicate absolute size; BMI is a measure of weight for height; per cent fat, measured with a bioelectrical impedance scale (Tanita), is an indicator of body composition. We also examine grip strength, measured using a Smedley 3 Dynameter, as an indicator of overall strength and work capacity (Jones & Marlowe 2002). We performed the following analyses:

(i) Assortative mating

Linear regression analyses were performed to determine if there is any evidence for assortative mating for each anthropometric characteristic. The wife's characteristic was included as the dependent variable, and the husband's characteristic as an independent variable. Controls were included for age of both wife and husband and region of residence.

(ii) Male-taller norm

We investigated whether there is a male-taller norm by comparing the observed proportion of female-taller marriages (those in which the female partner is taller than the male) with the proportion of female-taller marriages expected from random mating. To determine the latter, we randomly coupled up women and men, and calculated the proportion of marriages in which the wife was taller than the husband in these randomly mated pairs. We then performed a χ^2 -test to determine whether the observed number of female-taller marriages was different from that expected from random mating.

(iii) Number of marriages

Finally, we investigated whether anthropometric status is correlated with the total number of marriages contracted for each sex (during the 6-year period covered by the anthropometry data collection). The majority of individuals only have one spouse recorded (approx. 80% of women and 70% of men), and few record more than two spouses (5% of women and 7% of men). So we performed logistic regressions to determine whether each anthropometric variable affected the probability of having multiple (>1) spouses, as opposed to one spouse. Each regression analysis controlled for the age and region of the individual; regressions were performed separately for men and women and separately for each anthropometric variable.

Given that we have performed multiple statistical tests for each sex for both assortative mating and the probability of multiple marriage (one for each anthropometric measure), for all analyses we assume a conservative alpha level of <0.01 to indicate statistical significance, based on a Bonferroni correction.

3. RESULTS**(a) Assortative mating**

Table 1 shows sample sizes and statistical output from the five linear regression models. The parameter estimates, s.e.'s and significance values shown relate to the husband's characteristic (statistical output for control variables is not shown). These regression coefficients show no evidence for assortative mating for height, weight, BMI or per cent fat. The grip strength of husbands and wives is correlated at the $p < 0.05$ level ($p = 0.024$). However, given that we are applying a correction for multiple tests, we would need a lower p -value to be convinced that this is a real effect.

(b) Male-taller norm

We also find no evidence for a male-taller norm in this society. In 8.2 per cent of all marriages the wife was taller than the husband (17 of 207 marriages). This is no different from the proportion of female-taller marriages expected by chance (8.8%: $\chi^2 = 0.089$, d.f. = 1, $p = 0.765$). Figure 1 shows the proportion of female-taller marriages in this Hadza population. R. S. has previously investigated this phenomenon in both a post-industrial society (UK) and a pre-industrial

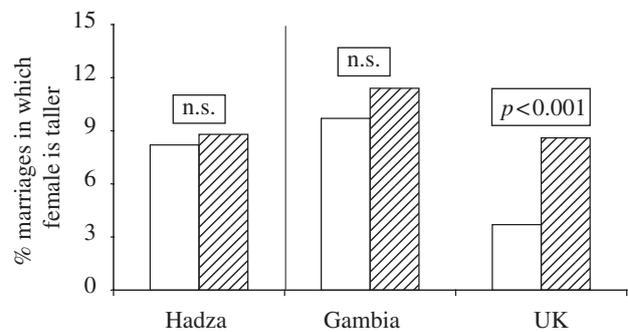


Figure 1. Observed and expected proportion of female-taller marriages in the Hadza, compared with Gambia and the UK. Empty bar, observed; striped bar, expected.

agricultural community in the Gambia, and the results of these analyses are also presented in figure 1 for comparison (Sear 2006). The proportion of female-taller marriages in the UK is significantly lower than expected by chance, but the two traditional populations show a frequency of female-taller relationships no different from that expected from mating which is random with respect to height.

(c) Number of marriages

Logistic regression analyses demonstrated no significant effect on the probability of multiple marriages for any anthropometric variable, for either sex (see table 2).

4. DISCUSSION

These results suggest that mating is random with respect to size in this population. Such a conclusion is based on accepting that our null hypotheses are correct, so in order to provide some confidence in our conclusion we determined the power of our statistical tests, using G*Power 3 (Faul *et al.* 2007). Post hoc tests suggest that the power of our tests ranges from 95–97%, assuming a medium effect size (precise power varies by test: analysis provided on request). We conclude that we would have been able to detect size-related mating patterns in the Hadza, were they similar to those in industrialized populations.

Despite the lack of evidence that size is important for mate choice, there is some weak evidence that strength may matter, given that the correlation between the strength of husbands and wives approached significance. Assortative mating may be brought about if both men and women prefer strong partners, in which case the most attractive (strongest) male is likely to end up paired with the most attractive (strongest) female, leading to a positive correlation for strength. Strength has been shown to correlate with work capacity in this population (Jones & Marlowe 2002), so couples may be positively assorting on productivity. An alternative possibility is that couples converge for strength after they marry. But men and women forage separately and largely for different food items in this population, so shared work patterns seem unlikely to lead to a convergence in strength.

Table 1. Descriptive data and statistical output for assortative mating analysis.

	mean (s.d.) for wives	mean (s.d.) for husbands	parameter estimate (s.e.)	<i>p</i>	<i>N</i> couples
age (years)	37.88 (15.80)	41.89 (14.86)	0.839 (0.033)	<0.001	224
height (cm)	149.66 (6.27)	162.24 (6.76)	0.103 (0.068)	>0.05	206
weight (kg)	45.51 (7.05)	53.20 (5.93)	0.138 (0.094)	>0.05	206
BMI	20.25 (2.51)	20.14 (1.64)	-0.027 (0.112)	>0.05	206
per cent fat	18.99 (6.79)	11.17 (3.28)	0.143 (0.133)	>0.05	192
grip strength (kg)	19.92 (6.10)	31.69 (8.03)	0.137 (0.061)	0.024	185

Table 2. Results of logistic regression analyses on probability of multiple marriages.

	men				women			
	parameter estimate	s.e.	<i>p</i>	<i>N</i>	parameter estimate	s.e.	<i>p</i>	<i>N</i>
height (cm)	0.011	0.026	> 0.05	167	0.021	0.029	> 0.05	236
weight (kg)	0.036	0.032	> 0.05	167	-0.018	0.026	> 0.05	236
BMI	0.080	0.105	> 0.05	167	-0.096	0.072	> 0.05	236
per cent fat	-0.012	0.054	> 0.05	158	-0.021	0.027	> 0.05	222
grip strength (kg)	0.007	0.026	> 0.05	158	-0.004	0.033	> 0.05	219

Overall, however, our analysis suggests size and strength are not greatly important when Hadza are choosing a mate. This lack of size-related mating patterns might appear surprising, since size is usually assumed to be an indicator of health, productivity and overall quality. But health and productivity may be signalled in alternative ways in the Hadza, who are a small, relatively homogeneous population. An individual's health history may be more important than size, for example, and this may be relatively well known in a small, mobile population. Additionally, there may be some disadvantages to large size in food-limited societies, where the costs of maintaining large size during periods of food shortage may be high. Such disadvantages will not be seen in food-abundant societies, so that large size may be a better indicator of quality in post-industrial populations. Finally, research on another African forager population found that height is *negatively* correlated with hunting returns (Lee 1979), suggesting that tall height may not be an indicator of productivity in such economies.

It is also important to note that we have not systematically tested mate preferences in this population, only mate choice. The distinction between mate preferences and mate choice is important. While mate preferences can give useful information about which traits are valued in a prospective mate, observed mate choices are arguably more informative about the evolutionary implications of mating behaviour. Mate choice takes into account the costs and constraints involved in acquiring a partner, and results from a combination of mate preferences (which may span a number of domains, not just physical cues), mate availability and one's own value on the mate market. These factors may assume different importance in different environments, just as mate preferences may differ between environments. We suggest that neither human mate

preferences nor mate choices are likely to be identical across all populations, and that efforts should be made to test the universality of both preferences and choices before speculation is made on their evolutionary implications. With more data from a diverse array of populations we can begin to test hypotheses about why mating patterns should vary between environments and why some patterns might indeed be universal. It is time to expand our horizon to a truly cross-cultural view and begin to sort between highly variable and truly universal mate patterns.

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