Preferred waist-to-hip ratio and ecology

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Abstract

Female waist-to-hip ratio (WHR) is widely cited by evolutionary psychologists as an example of an evolved male preference. Although many studies have found men prefer a low WHR, almost all have been conducted with college students. We tested men in a foraging society and found that they preferred high WHRs. We interpret this as a preference for heavier women, which we think should be common where there is no risk of obesity. Based on these results and others, we suggest that WHR preference varies with ecology. © 2001 Elsevier Science Ltd. All rights reserved.

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1. Introduction

What does a man find appealing in a woman? Traits that signal high potential to contribute to his reproductive success should be preferred. One such trait, according to orthodoxy in evolutionary psychology, is a low waist-to-hip ratio (WHR). The WHR of Playboy centerfolds, for example, has remained about 0.7 over time, even as weight has dropped (Singh, 1993), and several studies have found that men prefer images of women with WHRs of 0.7 to women with higher WHRs (Singh, 1993, 1994; Singh & Luis, 1995; Furnham, Tan & McManus, 1997; Henss, 1995). These data have led to the conclusion that such a preference is universal because it was an adaptive assessment of female mate value in the evolutionary past. In support of this, it has been noted that (a) females have a lower WHR than males, (b) non-pregnant, reproductive-aged females have a lower WHR than pregnant and non-reproductive-aged females, and (c) females with a lower WHR have fewer health problems, such as diabetes. Preference studies, however, have been conducted primarily on college students. If the preference for a low WHR is the result

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of a universal psychological mechanism, we certainly ought to find it among foragers, since they occupy a niche much more like that in which the preference presumably evolved. To test this, an experiment was conducted in a hunter-gatherer society. Here we present results which suggest that the preference for a low WHR may not be universal because it may have arisen only after food cultivation began.

2. Methods

The Hadza are hunter-gatherers who live in a mixed-savanna woodland habitat in Tanzania. Women dig for wild tubers and gather berries and fruit, while men collect honey and hunt game. In 1997, we asked Hadza men to rank the drawings of women used in other studies (Wetsman & Marlowe, 1999). Those drawings varied by WHR (0.7 and 0.9) and weight (underweight, normal, and overweight) (Fig. 1(a)). Unlike US men, who care about weight (preferring normal) and WHR (preferring 0.7), Hadza men cared only about weight. They preferred the heavy women to the normal women, and strongly disliked the two thin women, whom they labeled sickly.

a. 1997 and b. 1998 experiments. WHR values are shown underneath each figure.
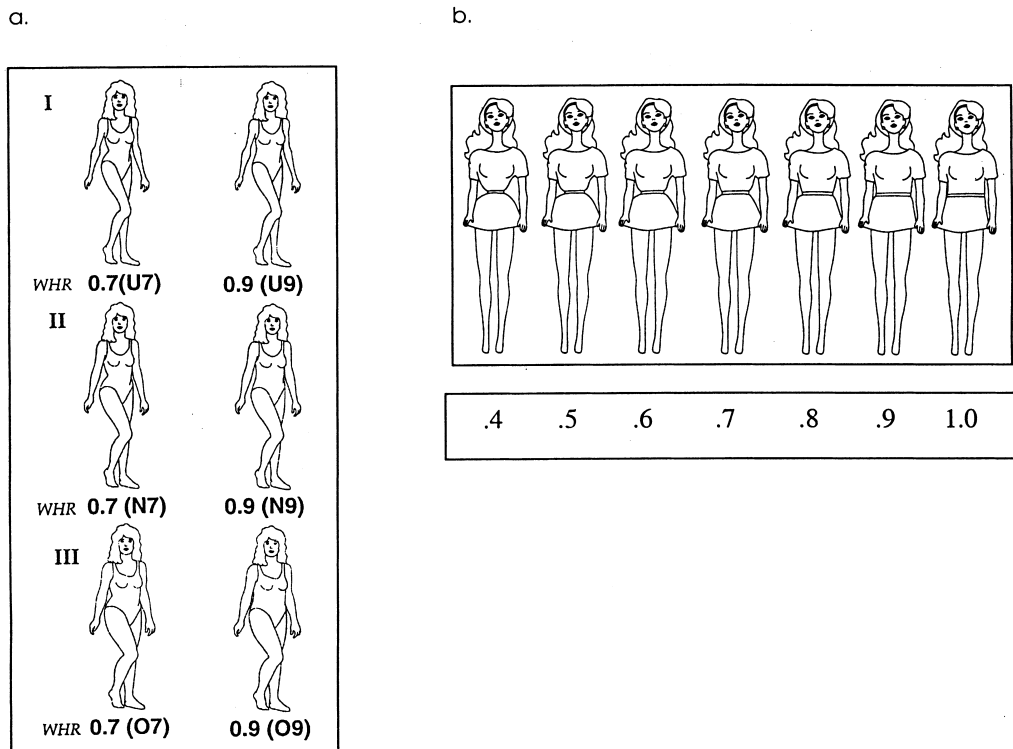

Fig. 1. (a) Waist-to-hip ratio drawings used in the 1997 Hadza experiment, and in many other studies. (b) The 0.4–1.0 waist-to-hip ratio drawings used in the 1998 Hadza vs US experiment.

To probe further, a new experiment was conducted in 1998 using different drawings in which only WHR varied. There were seven different WHRs, ranging from 0.4 to 1.0 (Fig. 1(b)). The cards (provided by Dr Singh) were presented in a horizontal line in random order. To be sure that Hadza men could detect the variation in WHR, they were asked to identify what differed from one picture to the next, before choosing which they preferred. All subjects identified the waist as the trait that varied. The men (31 subjects, age 16–69, mean age = 37.5) were then asked to rank the drawings on attractiveness, health, and desirability as a wife. As a control, we also asked US college men ($n = 16$).

3. Results

For both US and Hadza men there were significant differences in mean ranks of WHRs for attractiveness, health, and desirability as a wife (Table 1). US men disliked the high WHRs of 0.9

Table 1
Mean ranks of the 0.4–1.0 WHR preferences of US and Hadza men

US Men		Hadza Men	
WHR	Attractiveness (mean rank)	WHR	Attractiveness (mean rank)
0.4	3.19	0.4	3.06
0.5	4.63	0.5	3.26
0.6	4.94	0.6	3.23
0.7	6.25	0.7	4.32
0.8	4.63	0.8	4.61
0.9	2.94	0.9	4.90
1.0	1.44	1.0	4.61
Chi-square = 51.7, $p = 0.000$, df = 6, Kendall's W = 0.539		Chi-square = 24.6, $p = 0.000$, df = 6, Kendall's W = 0.132	
WHR	Health (mean rank)	WHR	Health (mean rank)
0.4	2.66	0.4	2.39
0.5	3.81	0.5	3.13
0.6	4.50	0.6	3.68
0.7	5.00	0.7	4.16
0.8	5.13	0.8	4.42
0.9	3.91	0.9	5.10
1.0	3.00	1.0	5.13
Chi-square = 18.4, $p = 0.005$, df = 6, Kendall's W = 0.192		Chi-square = 40.8, $p = 0.000$, df = 6, Kendall's W = 0.219	
WHR	Desirability as wife (mean rank)	WHR	Desirability as wife (mean rank)
0.4	2.56	0.4	2.81
0.5	4.19	0.5	3.39
0.6	5.38	0.6	3.48
0.7	5.44	0.7	3.81
0.8	4.81	0.8	4.90
0.9	3.63	0.9	4.71
1.0	2.00	1.0	4.90
Chi-square = 37.2, $p = 0.000$, df = 6, Kendall's W = 0.388		Chi-square = 28.2, $p = 0.000$, df = 6, Kendall's W = 0.151	

and 1.0. They also disliked the lowest WHRs of 0.4 and 0.5. As in studies using the original drawings, they chose intermediate WHRs around 0.7 (Fig. 2(a)–(c)). Hadza men, on the other hand, preferred higher WHRs. In all three categories, for example, 0.8, 0.9, and 1.0 were rated higher than 0.7 (Fig. 3(a)–(c)).

There were also differences in the degree of concordance between US and Hadza men. The highest degree of concordance for US men was for attractiveness (Kendall's W = 0.539), which was much higher than for Hadza men (Kendall's W = 0.132). Although not as pronounced as for attractiveness, the degree of concordance was also higher for desirability as a wife among US men (Kendall's W = 0.388) than among Hadza men (Kendall's W = 0.151). Interestingly, in the health category, there was greater concordance among Hadza men (Kendall's W = 0.219) than US men (Kendall's W = 0.192) (Table 1). Since Hadza men agree on health more than US men do, it is likely that the desirability as a wife category incorporates a greater interest in health than the attractiveness category. This would explain why there was greater concordance for the desirability as a wife category than for the attractiveness category among the Hadza while the reverse was true for US men.

4. Discussion

One might question the appropriateness of using drawings of European-looking women to ask Hadza men about their preferences. However, if we had used different drawings, we would not be able to rule out other effects being introduced. To test the universality of WHR, it is first necessary to use the same stimuli upon which the universal claim is being made. We used the second set of drawings because Dr Singh was concerned that the explicit weight variation in the first set had introduced a bias into Hadza preferences, which is why he gave us the second set of drawings. Although we can not demonstrate it, we believe that using these drawings did not produce results different from those we might get using drawings of Hadza women. This is suggested by several facts. US men preferred 0.7 in both sets of drawings, while Hadza men's preferences were different from US men's in both sets. Additionally, Hadza men have no difficulty rating the drawings and say they can tell which women they like, regardless of race and ethnicity, just as US men could probably rank the attractiveness of Hadza women. Finally, it may be that line drawings are poor stimuli compared with real women, who of course have three dimensions (about which we say more below), but if this is so, it only adds to our argument that it is premature to claim that a low WHR preference is universal.

In the 1997 experiment, Hadza men were indifferent to WHR but preferred heavier women; in the 1998 experiment, with no weight variation, Hadza men preferred high WHRs. We believe this is an artifact of the preference for heavier women. Tovee and Cornelissen (1999) point out that body mass index (BMI) as measured by weight/height (kg/m^2) is confounded with WHR in the original drawings. We think this applies to the new drawings as well, even though they were designed specifically to hold weight constant, while the first drawings were designed specifically to let weight vary by three categories, thin, medium, and heavy. Because height is held constant in the new drawings, as waist size increases from 0.4 to 1.0, so in a real woman would weight. In other words, females with a larger waist look heavier, so it is difficult to separate weight and WHR. We suggest that WHR preference will be found to vary cross-culturally with preference for fatness.

a. attractiveness
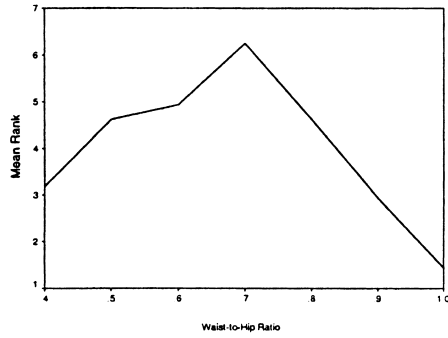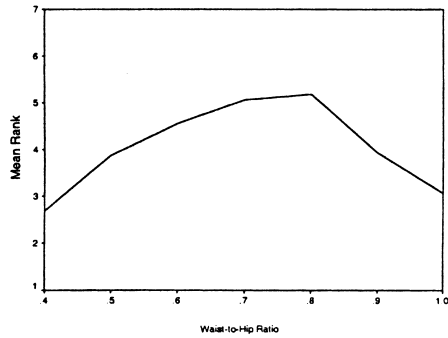
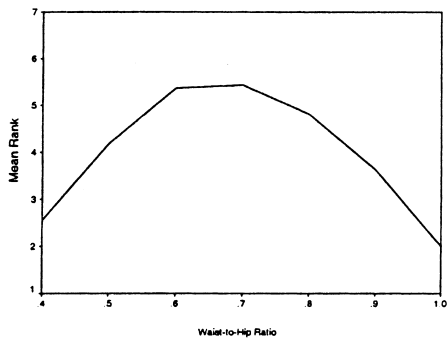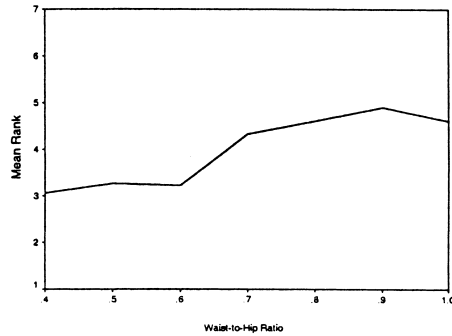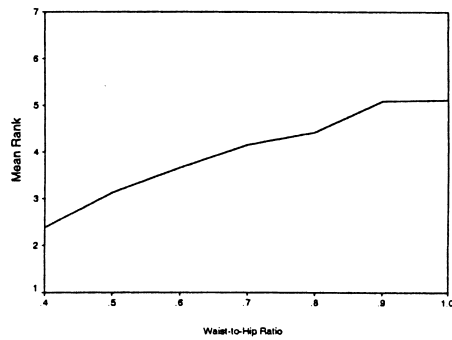## b. health

c. desirability as a wife

Fig. 2. (a) US males' rankings of female's attractiveness using the 0.4–1.0 waist-to-hip ratio drawings. (b) US males' rankings of female's health using the 0.4–1.0 waist-to-hip ratio drawings. (c) US males' rankings of female's desirability as a wife using the 0.4–1.0 waist-to-hip ratio drawings.

a. attractiveness

b. health

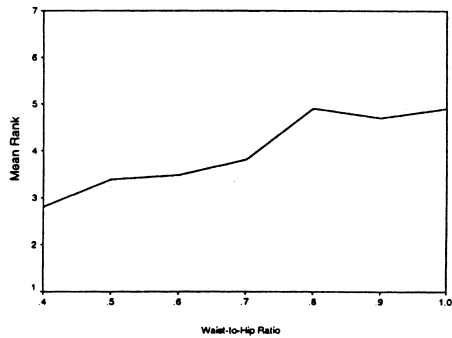### c. desirability as a wife

Fig. 3. (a) Hadza males' rankings of female's attractiveness using the 0.4–1.0 waist-to-hip ratio drawings. (b) Hadza males' rankings of female's health using the 0.4–1.0 waist-to-hip ratio drawings. (c) Hadza males' rankings of female's desirability as a wife using the 0.4–1.0 waist-to-hip ratio drawings.

A similar preference for heavy females and higher WHR was found among Matsigenka horticulturalists in Peru (Yu & Shepard, 1998). Manning, Trivers, Singh and Thornhill (1999) suggested that cultures which place exceptionally high value on sons may prefer high WHRs because high WHRs are associated with a higher likelihood of giving birth to sons. Yu and Shepard (1999) do not think such applies to the Matsigenka. Likewise, the Hadza do not place exceptionally high value on sons, which is not surprising given their tendency toward monogamy, residence with wife's kin, and sexual egalitarianism. Because the Matsigenka preference varied with degree of acculturation, Yu and Shepard suggested western media plays a role (though they do not say why westerners should prefer lower WHRs). Because exposure to western media very likely co-varies with dependence on wild vs domesticated foods, an alternative explanation of their results (and ours) is that it is dependence on wild foods that is important.

We argue that the more subsistence-oriented a society is, and the more energetically expensive women's work, the more men will find fatter women attractive. Among foragers, thinness probably indicates poorer health due to a greater incidence of tapeworms, diarrhea, or other infections. Women who are too thin and energetically stressed reach menarche later, ovulate less regularly, and have less capacity to support pregnancy and lactation (Frisch, 1987; Ellison, 1990). Given the energetic demands on Hadza women, it makes sense that Hadza men prefer women with fat to spare. Although women in many societies suffer from obesity, such a problem does not exist among the Hadza and probably rarely, if ever, existed prior to agriculture. In the past, therefore, men should have been selected to find fatter women attractive, as indeed they do in most societies (Brown & Konner, 1987), and controlling for other dimensions, fatter women will have a higher WHR.

Still, the widespread preference for a low WHR in developed nations requires an explanation. We propose that as agriculture led to a more predictable, surplus food supply (at least for some), the risk of obesity increased, and men began to prefer lower BMI's (and WHRs). We predict that the more food-rich a society, and the longer it has been food-rich, the more likely a low WHR will be preferred. However, in stratified societies such as India, a low WHR preference might begin among upper strata men and spread to lower strata men, even if lower strata women are too poor to be at risk of obesity. This could occur simply because, in other domains, it pays to imitate the rich (Boyd & Richerson, 1985).

The impetus for a low WHR preference among developed societies may also be related to pregnancy. During pregnancy, women experience a drastic increase in WHR. Pregnant women (high WHR) should be less attractive, since they are infertile while pregnant. In the US, where total fertility (TFR) is 2.0 (Zwingle, 1998), to be attracted to a woman who is already pregnant would be quite costly, since she is likely to conceive only one more child. Among the Hadza, where TFR is 6.2 (Blurton Jones, Smith, O'Connell, Hawkes & Kamuzora, 1992), a male could still sire 5.2 more children with a pregnant woman. In both populations, a pregnant woman may be less attractive than a non-pregnant woman, but the lower a society's TFR, the more it would pay a male to attend to and value signs of non-pregnancy. Among foragers, where TFR is high and there is little risk of obesity, the preference for fat may simply trump signs of non-pregnancy.

What might constitute evidence of such a tradeoff between fat and reproductive condition in men's preferences? In several studies there are slight differences in preferences between the three categories, attractiveness, health, and desirability as a wife, as there are among the Hadza (Fig. 3(a)–(c)), and our US sample (Fig. 2(a)–(c)). If such differences are robust across societies, they

may provide a clue as to how the preference for a lower WHR gets started. The most linear, positive relationship between WHR and Hadza preference is for health, which also shows the most concordance, greater even than among US men (who also found 0.8 healthier than 0.7). Hadza men often remarked on a figure's health even before being asked, and health seemed the easiest for them to judge. It is not surprising that foragers, who experience strong selection, find health the easiest trait to judge, attend more to it, and agree more about it. Attractiveness, which may in men's minds, include short-term mates, is less linearly related to WHR among the Hadza. The health of a woman would be less important than fecundity in a brief affair, so the importance of fat would drop. For a long-term mate (wife), the preference for fat (high WHR) should be stronger (since health matters more in a wife), though not as strong as when judging health directly.

A second, quite different explanation of the Hadza results is that women in many African populations might have different body shapes than the average US woman. The health risks associated with WHR (cited in Singh, 1993) are presumably correlated with 'real WHR' measured in three dimensions, not just 'frontal WHR' like that used in the drawings. Thus, we should expect men to focus on real, rather than frontal WHR. If two women have the same frontal WHR but one has more protruding buttocks, then she must have a higher real WHR. Conversely, if two women have the same real WHR the one with more protruding buttocks must have a higher frontal WHR. Hadza women may have more protruding buttocks than US women, who perhaps deposit more fat on the hips. In other words, in real (rather than frontal) WHR, Hadza men may prefer 0.7 just as much as US men do. This could be tested by measuring the real and frontal WHRs in various populations, and asking men to rate females in profile view, with WHR variation due solely to the buttocks.

5. Conclusion

The results and arguments presented here lead to the following predictions. (1) The more subsistence-oriented a society, the less is the risk of obesity and the greater is the benefit of storing fat, thus men will value fatter women more and frontal WHR less. (2) The more subsistence-oriented a society, the more health will covary with attractiveness and especially desirability as a wife, since health is more important in such societies. As a consequence, a low frontal WHR will be least preferred in the health category, then the desirability as a wife category, then the attractiveness category. (3) The lower a society's TFR, the more a low frontal WHR will be preferred. (4) If there is a health advantage to a low WHR for women, it will not be limited to the frontal WHR, thus if there is a universal male preference for low WHR it will be for the real, not just the frontal WHR. Preference for frontal WHR may map onto geographic variation in the placement of women's fat.

Evolutionary psychologists have promoted the idea that a low WHR is universally attractive. Before accepting this view, we must test a range of societies. It will not be sufficient to look across a range of complex societies, however, as they represent only a thin slice of cultural and ecological variation. In order to understand what drives preferences we must also test pastoralists, horticulturalists, and foragers. We recognize that two societies do not make a strong case, but it is at least a beginning. Several more subsistence-oriented societies should now be tested. Evolutionary

psychologists use their students as subjects and make adaptive arguments ignoring cultural variation on the grounds that, because the mind has evolved, our preferences are universal. At the same time, they note that we can expect considerable non-adaptive behavior in people living in an evolutionarily novel environment such as the US. We agree that there are important differences between evolutionarily recurrent and novel environments, i.e., that ecology is important. We think it is time to consider more thoroughly the past environments in which preferences would have been selected. It is also time to explore the effect of real vs frontal WHR, and to look at geographic variation in real body types.

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