Title:

PREFERENCES FOR SYMMETRY IN HUMAN FACES IN TWO CULTURES:
DATA FROM THE UK AND THE HADZA, AN ISOLATED GROUP OF
HUNTER/GATHERERS

Running head:

Cross-cultural preferences for symmetry

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Abstract

Many studies show agreement within and between cultures for general judgements of facial attractiveness. Few studies, however, have examined the attractiveness of specific traits and few have examined preferences in hunter-gathers. The current study examined preferences for symmetry in both the UK and in a hunter/gather society, the Hadza of Tanzania. We found that symmetry was more attractive than asymmetry across both cultures and was more strongly preferred by the Hadza than in the UK. The different ecological conditions may play a role in generating this difference. Such variation in preference may be adaptive if it reflects adaptation to local conditions. Symmetry is thought to indicate genetic quality, which may be more important among the Hadza with much higher mortality rates from birth onward. Hadza men who were more often named as good hunters were also deemed more attractive by Hadza women. These men placed greater value on symmetry in female faces. These results suggest high quality Hadza men are more discriminating in their choice of faces. Hadza women had increased preferences for symmetry in men's faces when they were pregnant or nursing, perhaps due to their increased discrimination and sensitivity to foods and disease harmful to a fetus or nursing infant. These results imply that symmetry is an evolutionarily relevant trait and that variation in symmetry preference appears strategic both between cultures and within individuals of a single culture.

Key words: Facial attractiveness, asymmetry, culture, environment, agreement, variation, Hadza.

PREFERENCES FOR SYMMETRY IN HUMAN FACES IN TWO CULTURES: DATA FROM THE UK AND THE HADZA, AN ISOLATED GROUP OF HUNTER/GATHERERS

An evolutionary view of human facial attractiveness posits that certain traits are indicators of mate value – the degree to which an individual could enhance the fitness of their partner. These traits may indicate good health, fertility, physical and/or behavioural dominance, even pro-social investment. It might then be expected that if some cues are reliably associated with mate value that there would be agreement amongst humans on which faces are attractive and unattractive and, indeed, across many studies considerable agreement is found within a particular culture, as well as across different cultures (e.g., Cunningham et al. 1995) (see Langlois et al. 2000, for a meta-analytic review). Such studies have generally only examined agreement on global attractiveness (i.e., is one face more attractive than another face) and such studies have usually examined urban university-based populations.

While there is much agreement on which faces are attractive and unattractive it has also become apparent that there are predictable individual differences in preferences for some facial traits (Little et al. 2001; Little et al. 2002). If there are differences between individuals of the same culture there may also be differences between cultures. Darwin (1871) was struck by cultural differences in attractiveness criteria, such as preferences for skin colour, body hair, body fat, and practices such as lip ornamentation and teeth filing. Such convictions were supported by early cross-cultural work by Ford and Beach (1951) who catalogued differences between cultures in preferences for various aspects of female physique.

In the current study we examine preferences for facial symmetry as this trait is potentially linked to evolutionarily relevant aspects of mate value. Fluctuating asymmetry (FA, Valen 1962) is thought to reflect an individual's ability to maintain the stable development of their morphology under the prevailing environmental conditions. In urban Western samples, studies of real (Penton-Voak et al. 2001; Scheib et al. 1999) and manipulated faces (Little & Jones 2003; Perrett et al. 1999) show that symmetry is found attractive. While the issue is controversial, many studies do show links between symmetry and quality including factors such as growth rate, fecundity and survivability (Møller 1990; Møller 1997), and one study has shown that more asymmetrical men and women reported more health problems (Thornhill & Gangestad 2006).

These data may imply all individuals should prefer symmetry. However, such a preference could also carry a cost, which may then change its value according to circumstance. It has been argued that humans have variable mating strategies, with preferences changing in response to environmental and life history factors (Gangestad & Simpson 2000). One aspect of this argument is that high quality males should be less willing to provide paternal investment than males who are less preferred by women. In terms of symmetry preference we might then expect that individuals relatively more interested in high quality offspring (genetically) would have stronger preferences for symmetry than for help in provisioning. Symmetry preferences may then vary between cultures where parental investment is more important and those where resistance to disease is more important.

Two studies have examined symmetry preferences across cultures using manipulated faces. Kowner (1996) examined the attractiveness of manipulated symmetry in Japanese participants, demonstrating that Japanese participants preferred the unmanipulated, slightly asymmetric versions (although symmetry was preferred in elderly faces). The manipulation used by Kowner, reflecting the face along the vertical midline, is known to create unusual but symmetric faces, with for example, any incorrect placing of the midline creating large or small noses in the resulting symmetric images (see Perrett et al. 1999).

A more recent and more technically sophisticated study (manipulating symmetry by blending each face with its mirror image) has shown that symmetry of faces is found attractive in Japanese faces in Japan (Rhodes et al. 2001). Thus, while compatible with the view that there is cross-cultural agreement, the current data on cross-cultural preferences for symmetry are few and limited to affluent societies. The explanations put forward by Rhodes et al. (2001) to explain similarity in preference are that similar visual experience between cultures could explain agreement or else a similar pressure to choose symmetric partners has led to preferences in both cultures.

Rationale

Previous studies of cross-cultural preferences for symmetry have been limited to urban societies with exposure to modern media. We examined preferences for symmetry in opposite-sex faces in the Hadza, a hunter/gatherer society from northern Tanzania in East Africa and from UK participants. The Hadza

live under conditions very different from those generally assessed. The Hadza have very limited exposure to modern media and, as foragers depend on acquiring wild foods, they live under radically different circumstances to people in Western cultures. The Hadza live under potentially more challenging ecological conditions (Gray & Marlowe 2002). For example, they sleep outside on the ground, have greater daily physical exertion, and have limited access to medical care. Living outside in the tropics where pathogens are more prevalent (Low 1990) means they are exposed to more pathogens. There are also potential differences in investment in partners between the two cultures. Any or all of these differences are variables that could generate differences in facial preferences. If symmetry is an important, sexually selected trait we should expect it to be preferred across cultures.

We were also interested in variability in symmetry preferences amongst the Hadza. Preferences for symmetry have been found to vary according to the attractiveness of the perceiver, with women who think they are attractive preferring more symmetric male faces (Little et al. 2001). Here we collected data on perceptions of male quality by the Hadza with the prediction that those men who were seen as attractive would be relatively more choosy about symmetry in faces. Limited data were collected on Hadza women but data were available on whether women were pregnant and/or nursing. Given that previous studies have found pregnancy increases preferences for healthy appearing faces and decreases preferences for masculinity (Jones et al. 2005) we examined this variable in relation to symmetry preference.

Methods

Participants

The Hadza are mobile hunter-gathers who number about 1000. They live in a savannah-woodland habitat in Northern Tanzania and have camps that average about 30 individuals. Camp membership continually changes as people move in and out. Camps generally move to different locations about once every 1-2 months. Women dig for wild tubers, gather berries and collect baobab fruit while men hunt prey and collect honey. Most Hadza are monogamous, though about 4% of men have two wives.

Hadza participants, were recruited from three separate camps, and were interviewed in private by one of the authors, Apicella. The Hadza are fluent in Swahili and the interviews were conducted in Swahili. European participants were recruited over the Internet via a mailing list. All European participants reported being heterosexual and were volunteers.

Seventy-eight European participants from the UK (39 males, 39 females, aged 18-44, mean age = 24.4, SD = 5.6) and 42 Hadza participants from Tanzania (21 males, 21 females, aged 20-56, mean age = 33.6, SD = 9.6) took part in the study.

Stimuli

Five original male and five original female face images were selected for each race from the set of photographs described above. Images were selected for the faces to be looking directly at the camera to minimise asymmetries due to head tilt. The test was made up of a pair of images, one original and one symmetric. All images were manipulated to match the position of the left and right eyes by standardising inter-pupillery distance. To generate the symmetric images, original images were morphed so that the position of the features on

either side of the face was symmetrical. Images maintained original textural

cues and were symmetric in shape alone. See Perrett et al. (1999) for

technical details. An example of an original and symmetrical Hadza face can

be seen in Figure 1.

We measured horizontal and vertical asymmetry from the

unmanipulated images using established measurement techniques (for details

see Penton-Voak et al. 2001). Univariate ANOVA's were conducted with race

of face and sex of face as fixed factors which revealed no significant effects of

either variable for horizontal symmetry (all $F_{1,16} < 0.23$, $p > .64$) or vertical

symmetry (all $F_{1,16} < 1.68$, $p > .21$) suggesting starting asymmetry was

equivalent for all types of face.

Figure 1 around here

Procedure

All participants were presented with face pairs of the opposite-sex. European

and Hadza individuals participated in different ways though the instructions

and images were equivalent. The Europeans had the faces presented

electronically on computer screen and the test was self-administered. The

Hadza had the test administered to them on photographic quality printed

cards. Both Europeans and Hadza had unlimited time to complete their

judgements. The face pairs were presented in random order with participants

being asked to choose from the pair "which face is most attractive?". For each

trial presentation of symmetric/asymmetric on left or right was randomised.

Age, sex and sexuality were recorded in a short questionnaire for the

European participants and the experimenter noted sex and age for the Hadza.

Randomisation for the Europeans was done using computer generated random numbers, whereas for the Hadza this was done via the experimenter shuffling the image pairs and dealing left and right images at random.

Additional data were collected on Hadza women's perceptions of the male judges. Pictures of all possible pairs of men within a given camp were shown to all women living within the same camp in order to get within-camp ranks of all men. Women were asked to make forced choice decisions about the men based on best hunter, most attractive in appearance, best father, most healthy and who spends the most time with their children. The pictures were displayed on a computer and both the pairing order, as well as the presentation of the actual pictures (e.g. whether they were displayed on the left or right side of the computer screen) was randomized. One set of rankings for a particular measure was collected before moving on to a new set. For instance, women were first asked to make a forced choice for "best hunter" for all possible pairs of men in each camp before being asked to choose the most attractive man from each pair. This methodology helps ensure some independence between the questions. Ranks were averaged across all women in a camp and since some camps were bigger than others, men's within-camp ranks were standardised by transforming them to z-scores to allow for comparisons across camps. Cronbach's Alpha was calculated suggesting that agreement was high for ranking of all traits. Alpha ranged from .686-.969 (mean = .873) for the 3 camps. The 3rd camp was the smallest and we did not compute agreement for best father or time spent with children because of the small sample size of men with children (n=3). Data are missing for four men because they were tested outside the 3 main camps and no

ranking data was collected. Data are missing for an extra four men for best

father and time spent with children due to these men not having children.

Results

We computed symmetry preference as the number of symmetric faces chosen

converted to a percentage score (100% = all symmetric faces chosen). This

was computed separately for European and Hadza faces. A repeated

measures ANOVA was conducted with 'face-race' (European/Hadza) as a

within participant factor and 'rater-race' (European/Hadza) and 'rater-sex'

(male/female) as between participant factors. This revealed a significant main

effect of rater-race ($F_{1,116} = 4.05$, $p = .046$). No other effects of interactions

were significant (all $F_{1,116} < 0.46$, $p > .498$). From Figure 2 it can be seen that

Hadza judges had stronger preferences for symmetry than European judges.

One sample t-tests comparing preferences for symmetry, collapsing across

both sex of judge and race of faces, against chance (50%) revealed significant

preferences for symmetry in both the UK (Mean = 56.5, SD = 12.8, $t_{77} = 4.52$,

$p < .001$, Cohen's D = 1.03) and Hadza (Mean = 61.9, SD = 15.7, $t_{41} = 4.93$, p

$< .001$, Cohen's D = 1.54) samples.

Figure 2 around here

To examine variability in preference, a composite symmetry preference score

was calculated by taking the average score for both European and Hadza

faces. Note that sample size differs in these calculations as complete data

were unable to be collected for all participants, Pearson product moment

correlations were performed for several traits relevant to male quality and

symmetry preferences. These correlations revealed a significant positive correlation between a man's perceived hunting ability (N = 17, r = .544, p = .024) and their preferences for symmetry in female faces and a close to significant correlation between perceived attractiveness (N = 17, r = .466, p = .096) and preference for symmetry. Correlations did not reach significance between health (N = 17, r = .041, p = .877), good father (N = 13, r = .290, p = .336), and time spent with children (N = 13, r = .284, p = .346) and preferences for symmetry. We found no significant correlations between symmetry preference and male age (N = 21, r = -.274, p = .277).

For female Hadza participants we examined relationships relevant to reproduction. With a composite symmetry preference score we found no significant correlations between symmetry preference and female age (r = .159, p = .492). We selected Hadza women below 41 years of age to restrict the sample to reproductively active women. Small sample sizes meant we did not calculate statistics comparing married to unmarried (N=2) women. Three women reported to be pregnant and 6 six women were nursing and so we compared the preferences of those pregnant/nursing (N=9) with those who were not either (N=9) in a repeated measures ANOVA with race of face (European/Hadza) as a within-participant variable and pregnant/nursing (yes/no) as a between participant variable. There was a close to significant interaction between pregnant/nursing and race of faces so that those women who were pregnant/nursing preferred symmetry more than those who were not when judging Hadza faces ($F_{1,17}$ = 4.34, p = .053). No other effects or interactions were close to significance ($F_{1,17}$ < 0.45, p > .510). Independent samples t-tests revealed that preferences were close to being significantly

higher for those who were pregnant/nursing than those who were not for Hadza faces (yes mean = 68.9, SD = 10.5, no mean = 54.0, SD = 21.2, t_{17} = -1.90, p = .074, Cohen's D = 0.90) but not for European faces (yes mean = 60.0.0, SD = 17.3, no mean = 68.0, SD = 14.0, t_{17} = 1.11, p = .281, Cohen's D = 0.52).

Discussion

The current study demonstrates both similarities and differences in face preferences between Hadza and UK judges. Men and women judged opposite-sex faces, and symmetry was preferred to asymmetry in all faces across male and female faces and across UK and Hadza faces. Our study is the first to show that facial symmetry is attractive in a relatively isolated hunter/gatherer population. There was also a significant difference between UK and Hadza judges in terms of overall preference with Hadza judges more strongly preferring symmetry in the faces. The methods did differ in assessing preferences between the two groups with one group taking the test face to face and the other group taking the test on computer screen. There is, however, no strong reason to believe that participant's choices or motivations would differ based on the manner in which the test was carried out.

Both cultures preferred symmetry indicating cross-cultural agreement that symmetry is attractive as has been seen in prior studies in a Japanese sample (Rhodes et al. 2001). Such data are important as they suggest that preferences for symmetry are not arbitrary across cultures, which further highlights the importance of symmetrical appearance as an attractive trait in humans, just as it is in other species (Møller 1992; Waitt & Little 2006).

Symmetry has been proposed to be attractive because of experience with faces (Enquist & Arak 1994). The Hadza, however, showed no difference in their preference between European and Hadza faces even though they have limited experience with European faces. We have previously found that Hadza judges do not prefer more average European faces but do prefer more average Hadza faces (Apicella et al. In Press). If limited visual experience leads to a lack of preference for averageness in European faces then comparison to an average is unlikely to account for preferences for symmetry in European faces amongst the Hadza. Such logic also suggests that different visual experience does not account for the increased preferences for symmetry in the Hadza.

Differences in preferences may instead reflect an adaptive response to particular environmental or cultural variables. Given symmetry is proposed to advertise immunocompetence in both males and females (Thornhill & Gangestad 1999) the pathogen prevalence explanation is plausible to explain the increased preference for symmetry in the Hadza judges. Penton-Voak, Jacobson, and Trivers (Penton-Voak et al. 2004) found stronger preferences for masculinity in Jamaicans than in the UK and Japan and suggested that a higher pathogen prevalence may result in increased preferences for masculinity in male faces as it has been shown that pathogen load is positively related to the importance of facial attractiveness in mate choice across different cultures (Gangestad & Buss 1993) and that masculinity is more preferred under conditions where women may acquire genetic benefits to offspring (Little et al. 2002; Penton-Voak et al. 1999). As individuals close to the equator have higher pathogen loads (Low 1990) and outdoor living may

increase exposure to pathogens, a difference in pathogen load between our samples may also explain increased preferences for symmetry in the Hadza. Penton-Voak, Jacobson, and Trivers (2004) also suggest differences in culture could also lead to adaptive preferences. For example, societal tendencies towards relatively low paternal investment or emphasis on physical quality may increase the importance of proposed signs of immunocompetence such as symmetry. More data examining symmetry preferences across culture will be important to determine the exact conditions under which symmetry is more or less preferred.

As well as variability between cultures, we also assessed variability in symmetry preferences amongst the Hadza. We found that men who were perceived as better hunters and as more attractive showed the strongest preferences for symmetry in female faces. This finding is analogous to findings that women who think they are attractive are choosier about face traits (Little et al. 2001; Little & Mannion 2006) and findings in other species whereby high quality males are also choosier in their partner preferences . We note that the Hadza women knew the men that they were rating and so attractiveness, while focused on physical traits, may reflect a general attraction.

Jones et al. (2005) have shown that women who are pregnant have higher preferences for health in faces and decreased preferences for masculinity. While we examined preferences for Hadza women who were pregnant and/or nursing, the logic remains similar though potentially the hormonal profiles differ. Women who are pregnant/nursing have the greatest need of investment in their offspring and a greater motivation to avoid

disease. That those pregnant or nursing had strongest preferences for symmetry (though only when judging Hadza faces) fits well with the later proposal if symmetric men are more resistant to disease. Alternatively, if more symmetrical men tend to be better hunters, women could be attracted to them for their provisioning potential. Provisioning is important among foragers as male contribution to diet is positively correlated with female reproductive success (Marlowe 2001). The individual differences shown here then are in line with the pattern seen in Western cultures for facial masculinity preferences. Such differences highlight strategic elements of symmetry preferences but we note that the small sample sizes here limit the conclusions that can be drawn.

In summary, the current study demonstrates that symmetry is more strongly preferred in a hunter/gatherer society than in the UK, though symmetry was found attractive in both cultures. The different ecological conditions and cultures may play a role in generating such differences. In the same way that some individual differences in preferences have been theorised to be adaptive, so cultural variation in preference should be adaptive if it reflects adaptation to local conditions. Symmetry can be seen as an attractive trait across cultures, but cultures, and individuals within those cultures, may also vary in their symmetry preference in an adaptive fashion. In this way individual and cultural differences in preferences can themselves be the outcome of a universal adaptation.

Acknowledgements:

References

Apicella, C. L., Little, A. C. & Marlowe, F. W. In Press Facial averageness and attractiveness in an isolated population of hunter-gatherers. *Perception*.

Cunningham, M. R., Roberts, A. R., Barbee, A. P. & Druen, P. B. 1995 "Their ideas of beauty are, on the whole, the same as ours": Consistency and variability in the cross-cultural perception of female attractiveness. *Journal of Personality and Social Psychology* **68**, 261-279.

Enquist, M. & Arak, A. 1994 Symmetry, Beauty and evolution. *Nature* **372**, 169-172.

Ford, C. S. & Beach, F. A. 1951 *Patterns of Sexual Behaviour*. New York: Harper & Row.

Gangestad, S. W. & Buss, D. M. 1993 Pathogen prevalence and human mate preferences. *Ethology and Sociobiology* **14**, 89-96.

Gangestad, S. W. & Simpson, J. A. 2000 The evolution of human mating: trade-offs and strategic pluralism. *Behavioural and Brain Sciences* **23**, 573-644.

Gray, P. B. & Marlowe, F. 2002 Fluctuating asymmetry of a foraging population: the Hadza of Tanzania. *Annals of Human Biology* **29**, 495-501.

Jones, B. C., Perrett, D. I., Little, A. C., Boothroyd, L., Cornwell, R. E., Feinberg, D. R., Tiddeman, B. P., Whiten, S., Pitman, R. M., Hillier, S. G., Burt, D. M., Stirrat, M. R., Smith, M. J. L. & Moore, F. R. 2005 Menstrual cycle, pregnancy and oral contraceptive use alter attraction to apparent health in faces. *Proceedings of the Royal Society B-Biological Sciences* **272**, 347-354.

Kowner, R. 1996 Facial asymmetry and attractiveness judgment in developmental perspective. *Journal of Experimental Psychology: Human Perception and Performance.* **22**, 662-675.

Langlois, J. H., Kalakanis, L., Rubenstein, A. J., Larson, A., Hallamm, M. & Smoot, M. 2000 Maxims or myths of beauty? A meta-analytic and theoretical review. *Psychological Bulletin* **126**, 390-423.

Little, A. C., Burt, D. M., Penton-Voak, I. S. & Perrett, D. I. 2001 Self-perceived attractiveness influences human female preferences for sexual dimorphism and symmetry in male faces. *Proceedings of the Royal Society of London, B* **268**, 39-44.

Little, A. C. & Jones, B. C. 2003 Evidence against perceptual bias views for symmetry preferences in human faces. *Proceedings of the Royal Society of London Series B-Biological Sciences* **270**, 1759-1763.

Little, A. C., Jones, B. C., Penton-Voak, I. S., Burt, D. M. & Perrett, D. I. 2002 Partnership status and the temporal context of relationships influence human female preferences for sexual dimorphism in male face shape. *Proceedings of the Royal Society of London, B* **269**, 1095-1100.

Little, A. C. & Mannion, H. 2006 Viewing attractive or unattractive same-sex individuals changes self-rated attractiveness and face preferences in women. *Animal Behaviour* **72**, 981-987.

Low, B. S. 1990 Marriage systems and pathogen stress in human societies. *American Zoologist* **30**, 325-339.

Marlowe, F. 2001 Male contribution to diet and female reproductive success among foragers. *Current Anthropology* **42**, 755-760.

Møller, A. P. 1990 Fluctuating asymmetry in male sexual ornaments may reliably reveal male quality. *Animal Behaviour* **40**, 1185-1187.

Møller, A. P. 1992 Female swallow preference for symmetrical male sexual ornaments. *Nature* **357**, 238- 240.

Møller, A. P. 1997 Developmental stability and fitness: A review. *American Naturalist* **149**, 916-942.

Penton-Voak, I. S., Jacobson, A. & Trivers, R. 2004 Populational differences in attractiveness judgements of male and female faces: Comparing British and Jamaican samples. *Evolution and Human Behavior* **25**, 355-370.

Penton-Voak, I. S., Jones, B. C., Little, A. C., Baker, S., Tiddeman, B., Burt, D. M. & Perrett, D. I. 2001 Symmetry, sexual dimorphism in facial proportions, and male facial attractiveness. *Proceedings of the Royal Society of London, B* **268**, 1617-1623.

Penton-Voak, I. S., Perrett, D. I., Castles, D. L., Kobayashi, T., Burt, D. M., Murray, L. K. & Minamisawa, R. 1999 Menstrual cycle alters face preference. *Nature* **399**, 741-742.

Perrett, D. I., Burt, D. M., Penton-Voak, I. S., Lee, K. J., Rowland, D. A. & Edwards, R. 1999 Symmetry and human facial attractiveness. *Evolution and Human Behavior* **20**, 295-307.

Rhodes, G., Yoshikawa, S., Clark, A., Lee, K., McKay, R. & Akamatsu, S. 2001 Attractiveness of facial averageness and symmetry in non-Western populations: In search of biologically based standards of beauty. *Perception* **30**, 611-625.

Scheib, J. E., Gangestad, S. W. & Thornhill, R. 1999 Facial attractiveness, symmetry, and cues to good genes. *Proceedings of the Royal Society of London, B* **266**, 1913-1917.

Thornhill, R. & Gangestad, S. W. 1999 Facial attractiveness. *Trends in Cognitive Sciences* **3**, 452-460.

Thornhill, R. & Gangestad, S. W. 2006 Facial sexual dimorphism, developmental stability, and susceptibility to disease in men and women. *Evolution and Human Behavior* **27**, 131-144.

Valen, L. V. 1962 A study of fluctuating asymmetry. *Evolution* **16**, 125-142.

Waitt, C. & Little, A. C. 2006 Preferences for symmetry in conspecific facial shape among Macaca mulatta. *International Journal of Primatology* **27**, 133-145.

Figure 1: Examples of symmetrised (left) and original (right) male and female Hadza faces.

Figure 2: % Preferences for symmetry (+/- 1SE of mean) in opposite-sex faces split by European (N = 78) and Hadza (N = 42) judges.