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Changing perceptions of attractiveness as observers are exposed to a different culture☆

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Abstract

It has been suggested that certain physical cues can be used to predict mate quality and that sensitivity to these cues would therefore be adaptive. From this, it follows that in environments where the optimal values for these features differ, the attractiveness preferences should also be different. In this study, we show that there are striking differences in attractiveness preferences for female bodies between United Kingdom (UK) Caucasian and South African Zulu observers. These differences can be explained by different local optima for survival and reproduction in the two environments. In the UK, a high body mass is correlated with low health and low fertility, and the converse is true in rural South Africa. We also report significant changes in the attractiveness preferences of Zulus who have moved to the UK. This suggests that these preferences are malleable and can change with exposure to different environments and conditions. Additionally, we show that Britons of African origin, who were born and who grew up in the UK, have exactly the same preferences as our UK Caucasian observers. These results suggest that humans have mechanisms for

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acquiring norms of attractiveness that are highly plastic, which allow them to track different ecological conditions through learning.

Keywords: Physical attractiveness; Body mass index; Cross-cultural

1. Introduction

It has been proposed that certain physical features honestly signal an individual's health and reproductive potential (Buss, 1994; Symons, 1995). If one were sensitive to these features, then one would be able to gauge the health and fertility of a possible partner. Certain specific values of these features could signal optimal health and fertility; thus, an individual whose features correspond to these values would be regarded as optimally attractive. From this, it follows that in environments where the optimal values for these features differ due to differences in environmental pressures, the attractiveness preferences should also be different (Anderson, Crawford, Nadeau, & Lindberg, 1992; Brown & Konner, 1987; Ember, Ember, Korotayev, & de Munck, 2005). Moreover, as observers moved from one environment to another, it would be adaptive for them to alter their attractiveness preferences to those that accurately reflected optimal health and fertility in their new environment.

In women, two potentially critical physical features are shape and weight scaled for height (in kilograms per meters squared). This latter factor is called the body mass index (BMI; Bray, 1998). For shape, research has focused on the ratio of the circumference of the waist to the circumference of the hips [the waist–hip ratio (WHR)] among women. For women in Western Europe and the USA, a low WHR (i.e., a curvaceous body) is suggested to correspond to the optimal fat distribution for high fertility (Wass, Waldenstrom, Rossner, & Hellberg, 1997; Zaadstra et al., 1995); hence, this shape should be highly attractive within these cultures. The optimal fat distribution is proposed to correspond to a ratio of 0.7, and this is suggested to be optimally attractive (Furnham, Tan, & McManus, 1997; Henss, 2000; Singh, 1993, 1994). BMI also appears to be a strong predictor of attractiveness in Western observers (Fan, Liu, Wu, & Dai, 2004; Puhl & Boland, 2001; Thornhill & Grammar, 1999; Tovée, Hancock, Mahmoodi, Singleton, & Cornelissen, 2002; Tovée, Maisey, Emery, & Cornelissen, 1999; Tovée, Reinhardt, Emery, & Cornelissen, 1998). There are also advantages to using BMI as a basis for mate selection because BMI provides a reliable cue to female health (Manson et al., 1995; Willet et al., 1995) and reproductive potential (Frisch, 1988; Lake, Power, & Cole, 1997; Reid & van Vugt, 1987; Wang, Davies, & Norman, 2000). For Caucasian women in Western Europe and the USA, Tovée et al. suggest that the balance between the optimal BMI for health and fertility is struck at around a value of 19–20 kg/m^2, which, in their studies, is also the preferred BMI for attractiveness. However, they also suggest that the ideal may vary in different racial groups and different environments (Tovée & Cornelissen, 2001), and a number of studies have suggested that resource-poorer societies prefer a heavier female body than more affluent societies (Anderson et al., 1992; Brown & Konner, 1987; Ember et al., 2005).

To test whether attractiveness preferences are adaptive and whether the preferences are different in environments where there are different local optima for survival and reproduction, we have tested the attractiveness preferences of Caucasian observers in the UK and Zulu observers in rural South Africa. Although a lower BMI and a more curvaceous body is associated with higher health and fertility in the UK, such a body is associated with low socioeconomic status (SES), poor nutrition, and disease (e.g., Clark, Niccolai, Kissinger, & Bouvier, 1999; Mvo, Dick, & Steyn, 1999) in rural South Africa. One would anticipate that a higher BMI would be preferred in this environment, which is consistent with previous studies in Tanzania using line-drawn figures (Marlowe & Wetsman, 2001; Wetsman & Marlowe, 1999). In a general population, as BMI rises, so does WHR (South African Department of Health, 1998; UK Department of Health, 2003). Hence, as a secondary effect of preferring a heavier BMI, observers may also choose a less curvaceous body. Additionally, we have tested the preferences of a cohort of Zulus who have moved to the UK to see whether their attractiveness preferences are shifting to adapt to their changed environment. We have also tested the attractiveness preferences of British people of African descent, who were born and who grew up in the UK, as a final control group.

2. Method

We recruited four groups of participants from the UK and South Africa. The first group was composed of 100 British Caucasians, equally divided between the sexes. The second group consisted of 35 South Africans (19 males, 16 females) from Mshwati-Mpolweni, in KwaZulu-Natal (Eastern Seaboard of South Africa). This group was made up of ethnic Zulus with little command of any other language and with intermittent education and was employed either as subsistence farmers or as temporary laborers and domestic workers in nearby towns like Howick. The third group was composed of 52 Zulu migrants into Britain (25 males, 27 females), all of whom were born in South Africa and moved to Britain in the 18 months before taking part in the study. The final group was made up of 66 Britons of African descent (34 males, 32 females), all of whom were born and raised in Britain. There were no significant differences in the age ranges of the different groups (see Table 1).

Participants in each group were asked to rate black-and-white images of 50 real women in front view. To generate the images, we videotaped consenting women standing in a set pose at

Table 1
Summary of the proportion of variance accounted for by BMI and WHR in the regression analysis of attractiveness judgements, plus the peak BMI for each group and the gradient of the relationship between attractiveness and WHR

Group	Age, mean (S.D.)	BMI variance	WHR variance	Peak BMI	WHR gradient
UK Caucasians	24.76 (6.96)	84.1	7.4	20.85	−6.54
SA Zulus	25.6 (4.47)	82.5	7.5	26.52	+6.18
Zulu migrants to the UK	26.56 (6.87)	86.2	1.7	23.99	−2.38
Britons of African descent	24.41 (4.53)	76.5	7.3	20.68	−8.25

a standard distance, wearing tight gray leotards and leggings in front view. Images were then frame-grabbed and stored as 24-bit images (see Tovée et al., 2002, for an example). The heads of the women in the images were obscured so that they could not be identified and so that facial attractiveness would not be a factor in subject's ratings. Although previous studies have manipulated the relative ranges of BMI and WHR to explore the relative contributions of these features to attractiveness judgements (e.g., Tovée et al., 2002, 1999), in this study, the ranges of BMI and WHR used were not constrained and represented the widest range in our image library. The ranges seem to be not inconsistent with population data reported by epidemiological studies, such as the Health Survey for England 2003 (UK Department of Health, 2003).

For this experiment, the images of women were printed on sheets of A4 paper so that each image covered the entire page. This was done so as to facilitate replication of the study in all locations. Participants were presented with a booklet to record their ratings, where the first page consisted of brief instructions and a worked example of a rating and where the final page requested participants' demographic details (age, gender, ethnicity, weight, and height). Other pages in the booklet provided a nine-point Likert scale, which appeared below the question 'How beautiful is the person in the photograph?' and on which participants were asked to record their ratings. All participants were tested individually, with the only difference in procedure between the different settings being the language used. The questionnaire was in English for all groups except for the rural South African (SA) sample, for whom the questionnaire was translated into Zulu. Within the image set, individual images were presented in a randomized order.

3. Results

3.1. Sex differences

To explore whether there were differences between the two sexes in our observer groups, we carried out a Spearman rank correlation. We found high correlations between the male and female observers in each group, suggesting that they were ranking the images in the same way (British group, r=.935, p<.001; SA Zulus, r=.781, p<.0001; Zulu migrants to Britain, r=.661, p<.0001; Britons of African origin, r=.962, p<.0001). This result is consistent with the correlations between attractiveness ratings by male and female observers found in previous studies (e.g., Tovée & Cornelissen, 2001; Tovée et al., 2002). We therefore calculated intraclass reliabilities for the male and female observer groups separately and together; then, we tested for intraclass variation. We tested intraclass variation using Winer's intraclass reliability for k means, which tests to what extent all the observers in a particular group are rating the images the same way (Winer, 1970). A score of 1.00 would mean that all the observers are giving all the images the same ratings. The measures show a very high degree of agreement between the observers' ratings in each group. Using Winer's intraclass reliability for k means, we found a high degree of agreement in all the observer groups (Caucasians, 0.99; SA Zulus, 0.96; Zulu migrants to Britain, 0.93; Britons of African origin, 0.99). This suggests that the reliability was very high and consistent across both sex groups. This is consistent with previous studies that have shown similar high levels of intraclass reliability (e.g., Swami, Antonakopoulos, Tovée, & Furnham, 2006; Swami & Tovée, 2005; Tovée et al., 2002).

3.2. Multiple regression results

A multiple polynomial regression was used to model the contributions of BMI and WHR to the attractiveness ratings. Fig. 1 shows plots of the attractiveness ratings as a function of BMI for all four groups, with all sets being significantly explained by BMI (p<.001 in all cases). Fig. 2 shows the corresponding relationship between attractiveness and WHR. None of the observer groups showed a significant correlation between attractiveness ratings and WHR (p>.05). This suggests that for this image set, WHR has only a weak effect on attractiveness ratings for the observer groups tested. As in previous studies (e.g., Tovée & Cornelissen, 2001; Tovée et al., 1999, 1998), we modeled the data using a multiple regression model (see Altman, 1991) to estimate the variance of attractiveness ratings explained by BMI and WHR. The model, run separately for the different groups, was

$$y = a + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + e,$$

where y is the attractiveness rating, a is the intercept, x_1 is the WHR, x_2 is the BMI, x_3 is the BMI^2, x_4 is the BMI^3, and e is random error.

The variance explained by BMI and WHR in the best subsets analysis from this model is shown in Table 1.

3.3. Between-group differences

There is a striking difference in the shape of the relationship between attractiveness and BMI between the four groups (Fig. 1). The UK Caucasian group shows a roughly inverted-U shape; attractiveness preferences are lower for the low and high BMI values and are higher for the middle BMI values. In contrast, the attractiveness function for the SA Zulu group is shifted toward higher BMI values and does not show the falloff in attractiveness with higher BMI values (Fig. 1A). Instead, attractiveness remains high, and the function is largely flat over the middle and high BMI values. The Zulu migrants to Britain show a function intermediate between these two patterns (i.e., the attractiveness ratings decline for the higher BMI values but not to the same extent as that seen in the Caucasian group; Fig. 1B and C). The Britons of African descent show exactly the same pattern as the Caucasians.

To determine the statistical significance of these differences, we fitted a third-order polynomial to each attractiveness and BMI function for each observer in each group, allowing the BMI at peak attractiveness to be calculated for each participant. There were significant differences between the different groups [one-way ANOVA, $F(3, 252) = 49.66$, p<.001], and a post hoc Tukey HSD showed that the SA Zulus are significantly different from the other three groups, as are the Zulus who have moved to the UK. The Caucasians and Britons of African origin are not significantly different from each other.

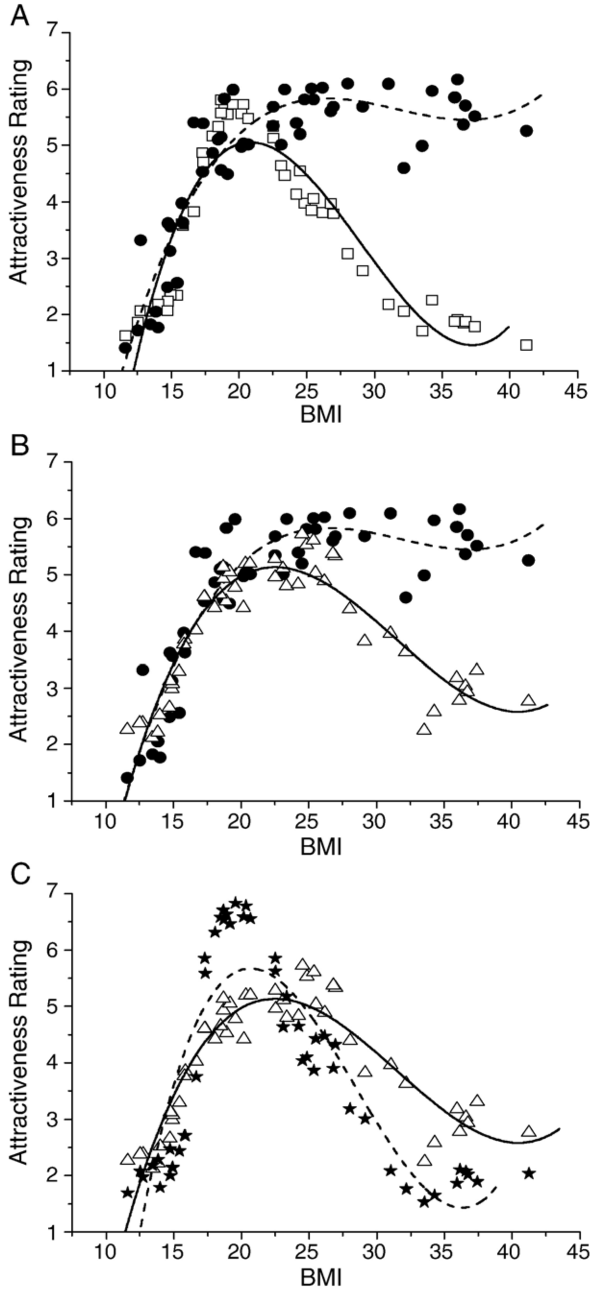

Fig. 1. Comparison plots of the attractiveness ratings by the four observer groups as functions of BMI. Each point represents the average attractiveness rating for a particular body by all the observers in one of the observer groups. Panel A illustrates a comparison of the responses of UK Caucasians (open squares and continuous line) and SA Zulus (filled circles and dashed line); Panel B illustrates that of the SA Zulus (filled circles and dashed line) and the Zulus in the UK (open triangles and continuous line); Panel C illustrates that of the Zulus in the UK (open triangles and continuous line) and Britons of African origin (filled stars and dashed line).

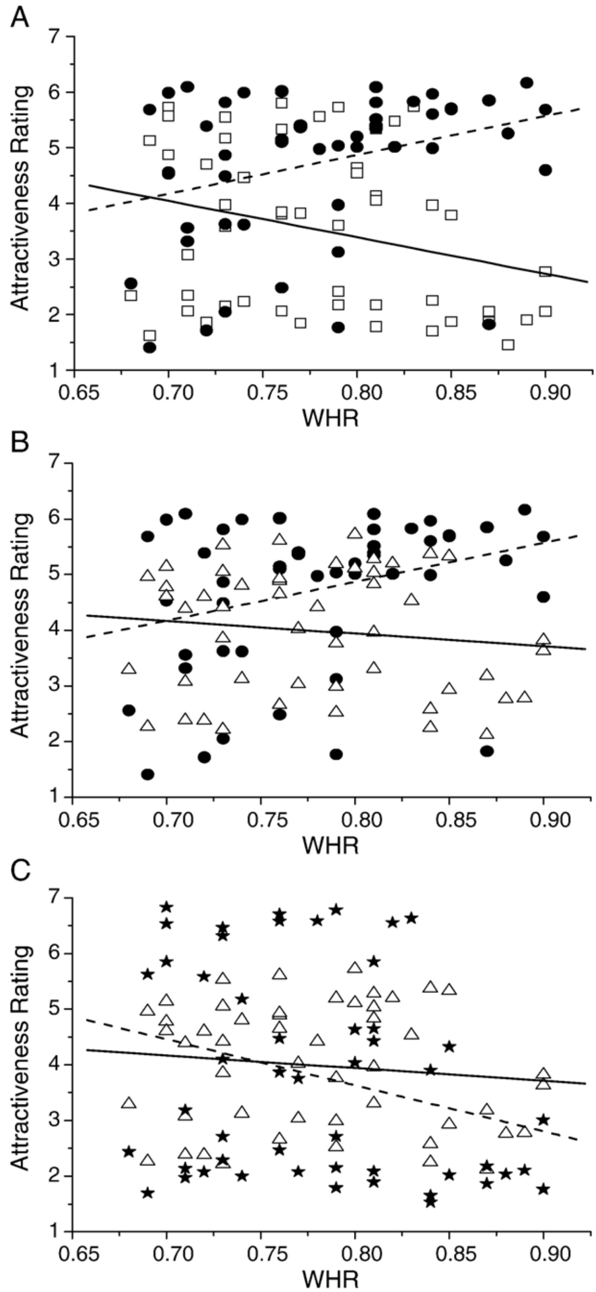

Fig. 2. Comparison plots of the attractiveness ratings by the four observer groups as functions of WHR. Each point represents the average attractiveness rating for a particular body by all the observers in one of the observer groups. Panel A illustrates a comparison of the responses of UK Caucasians (open squares and continuous line) and SA Zulus (filled circles and dashed line); Panel B illustrates that of the SA Zulus (filled circles and dashed line) and the Zulus in the UK (open triangles and continuous line); Panel C illustrates that of the Zulus in the UK (open triangles and continuous line) and Britons of African origin (filled stars and dashed line).

As a simple measure of the shape differences between the functions at the higher BMI values, we measured the attractiveness rating at BMI 35 for each observer. We then carried out a simple one-way ANOVA to determine whether the curves in each observer group were significantly different at that point. The results showed significant differences [one-way ANOVA, $F(3, 252) = 150.86$, $p<.001$], and Tukey HSD post hoc tests show that the SA Zulus are significantly different from the other three groups, as are the Zulu migrants to Britain. The Caucasians and Britons of African origin are not significantly different from each other.

There are also differences in the relationship between the attractiveness judgments and WHR (Fig. 2). The gradient of the relationship between averaged attractiveness ratings and WHR for each group seems to be similar in the Caucasians and Britons of African origin (Table 1), with increasing attractiveness as the bodies become more curvaceous (i.e., the WHR is lower). However, the gradient seems to differ for the Zulu migrants (a less steep gradient) and for the SA Zulus where the relationship is completely reversed (with a positive gradient, i.e., less curvaceous bodies, being regarded as more attractive). To explore whether this difference was statistically significant, we carried out a series of standard dummy regressions (Tukey, 1977). The SA Zulus were significantly different from all the other groups ($p<.001$). None of the other groups were significantly different.

4. Discussion

This study found substantial differences in the perception of female attractiveness in the different groups, a result consistent with some cross-cultural studies (e.g., Craig, Swinburn, Matenga-Smith, Matangi, & Vaughn, 1996; Furnham & Baguma, 1994; Marlowe & Wetsman, 2001; Wetsman & Marlowe, 1999; Yu & Shepard, 1998). There was no difference between the preferences expressed by the UK Caucasian and UK African groups. There were large differences between these two groups and the SA Zulus (Fig. 1). The peak attractiveness for the SA Zulu observers is shifted to a higher BMI, and most strikingly, the attractiveness ratings of the SA Zulus do not show a dip in attractiveness for bodies with higher BMI values (see Fig. 1A). There is also a difference in the pattern of attractiveness preferences with changing WHR. Both the UK groups show a preference for a more curvaceous figure; the opposite appears true for the SA Zulus (Fig. 2A). This latter change may be, at least, partially a result of the preference of the SA Zulus for heavier bodies, which tend to be less curvy. The preferences of the Zulus who have moved to the UK seem to be intermediate between these two positions (Figs. 1B and C and 2B and C). The fact that there are differences between the UK Caucasian and UK African groups and the SA Zulus might be explained in terms of adaptations to the different environmental pressures.

In many traditional, non-Western settings, it is argued that body fat is believed to be an indicator of wealth and prosperity (McGarvey, 1991), with obesity as a symbol of economic success, femininity, and sexual capacity (Ghannam, 1997; Nasser, 1988). In less affluent societies, there is often a positive relationship between increased SES and body weight. Only high-status individuals would have been able to put on body weight, which would explain why many of the world's cultures had or have ideals of feminine beauty that include plumpness (Anderson et al., 1992; Brown & Konner, 1987), as it would have been advantageous for women to be able to store excess food as fat in times of food surplus. Conversely, with the food abundance in many industrialized nations, fatty foods are easily available, and it is those with higher SES who are more able to keep their weight down (Furnham & Alibhai, 1983), whereas fatness became associated with poverty, poor diet, and lack of slimming activities and exercise.

People in rural South Africa are living in a low-resource, economically deprived society. Fifty-six percent report going hungry, and most households do not have electricity, running water, or significant amounts of household durable goods (which is taken as a proxy of SES; South African Department of Health, 1998). Among people living in rural South Africa, a higher female body weight is perceived to reflect affluence, high status, and good health (Clark et al., 1999; Mvo et al., 1999). It is therefore not surprising that our results suggest that a higher female BMI is regarded as attractive. These preferences may be reinforced by the current health problems prevalent in South Africa. There are long-standing problems with infectious diseases, including lower respiratory tract infections, meningitis, diarrhea, septicemia and TB, which, when combined with low levels of immunization, make potential infection a serious possibility (South African Department of Health, 1998, 2000). The health consequences linked to these serious diseases include weight loss, and this is reflected in the perception that a lower body mass may signal potential parasitic infection or disease (Clark et al., 1999; Mvo et al., 1999).

The most prevalent and the most important of the potential diseases is HIV/AIDS infection (Blacker, 2004; Bradshaw et al., 2003; Caldwell, 1997; Hosegood, Vanneste, & Timaeus, 2004). AIDS is now the single largest killer of men and women in South Africa, and this mortality rate is set to rise (Bradshaw et al., 2003; Hosegood et al., 2004). It is estimated that in 2005, 16.5% of the population of KwaZulu-Natal were HIV positive, the highest level of any province in South Africa (Shisana et al., 2005). The potential effect of AIDS on attractiveness preferences is magnified when one considers that the other important causes of illness and death (such as pulmonary or respiratory diseases) are associated with older adults, whereas the prevalence of HIV infection and the rate of AIDS deaths are highest in young and middle-aged adults (i.e., those who are most likely to be actively seeking partners; Bradshaw et al., 2003; Shisana et al., 2005). For example, it is estimated that in 2005, a quarter of 20- to 24-year-old women in South Africa were HIV positive, and a third of 25- to 29-year-old women were infected (Shisana et al., 2005). Additionally, in 2004, nearly 41% of women attending antenatal clinics in KwaZulu-Natal were HIV positive (South African Department of Health, 2005). The possibility of HIV/AIDS infection is recognized as a significant risk in partner choice by young people in KwaZulu-Natal (Bernardi, 2002; Varga, 1997), and a potential cue to HIV infection is low body weight. HIV/AIDS infection causes a characteristic loss of body mass, called wasting syndrome (Cohan, 1994; Kotler & Grunfeld, 1995). The timing of the onset of wasting can be quite variable, and if the onset occurs later in the course of the disease, it can be accompanied by other symptoms. However, moderate-to-severe weight loss can also occur before the onset of other symptoms (Polsky, Kotler, & Steinhart, 2004). Thus, a lower body weight may signal HIV infection (either on its own or in conjunction with other symptoms) and could reinforce a mate strategy that favors heavier bodies.

Additionally, a higher preconception maternal BMI is correlated with a higher birth weight for the resulting child (Baker, Michaelsen, Rasmussen, & Sorensen, 2004; Bhargava, 2000; Mohanty et al., 2006); this may convey an important advantage given that one of the most common causes of death for newborn children and for children below 1 year old is low body weight (Statistics South Africa, 1998). However, this must be balanced with the fact that a higher maternal BMI is also linked to reduced fertility and increased problems during pregnancy (e.g., Gross, Sokol, & King, 1980; Lake et al., 1997). A higher BMI is also linked to a range of health problems including diabetes, hypertension, cardiovascular disease, and stroke (Manson et al., 1995; Willet et al., 1995). However, in the conditions that prevail in KwaZulu-Natal, the positive features of a higher female BMI may outweigh the potential dangers, which may explain the pattern of attractiveness ratings by the SA Zulus.

In contrast, the situation is very different in the UK. The prevalence of HIV/AIDS is comparatively low (European Centre for Epidemiological Monitoring of AIDS, 2003; UK Collaborative Group for HIV and STI Surveillance, 2005), and the general mortality rate in young women is very low. The primary killer for this group is cancer (particularly breast cancer, as well as cervical and ovarian cancer; Brock & Griffiths, 2003; Office for National Statistics, 2003). A lower BMI is also associated with lower levels of cancer (Calle, Rodriguez, Walker-Thurmond, & Thun, 2003; Garfinkel, 1985), and a lower BMI value is also associated with general long-term female health (Manson et al., 1995; Willet et al., 1995) and reproductive potential (Frisch, 1988; Lake et al., 1997; Reid & van Vugt, 1987; Wang et al., 2000). This is true not only for the general population but also for African-Britons (Cappuccio, Cook, Atkinson, & Strazzullo, 1997; Chaturvedi, 2003). Additionally, BMI may be an indicator of SES. For a given age group, BMI is inversely proportional to nutrition and SES (i.e., a higher BMI is correlated with poorer nutrition and lower SES; Darmon, Ferguson, & Briend, 2002; James, Nelson, Ralph, & Leather, 1997; UK Department of Health, 2003). Thus, there are a number of reasons, based on health, fertility, and SES, which might influence a UK observer to favor a lower body weight.

An alternative explanation may be that the average BMI and pattern of fat distribution may differ between the populations in KwaZulu-Natal and the UK, with consequent differences in body size and shape in the two populations. Under such circumstances, it is possible that the different attractiveness preferences reflect the different ranges of BMI and WHR values found in the two environments. It might be argued that one cannot develop a preference for a particular size or shape if it is not present in the environment. For example, Sugiyama (2004) reported that Shiwiar women from Ecuador have a higher average WHR value than reported for women in the Western world and suggests that the attractiveness preferences of the Shiwiar for a higher WHR must be seen in this context. In the case of the current study, the epidemiological evidence suggests similar average female WHR values in the UK and KwaZulu-Natal populations. For example, the South Africa Demographic and Health Survey reports an average WHR of 0.83 (S.D.=0.13) for adult women from KwaZulu-Natal, and in the UK, our analysis of data from the Health Survey for England for women in the same age group shows an average WHR of 0.82 (S.D.=0.07), and specifically for African-British women, the average WHR is 0.81 (S.D.=0.17; UK Department of Health, 2003). However, this does not preclude the possibility that there are differences in body fat distribution that are not captured by WHR, which may influence attractiveness preferences. The average BMI values from the two populations are also similar [28.5 (S.D.=9.86) for Zulu women, 26.8 (S.D.=5.44) all women in the UK, and 28.8 (S.D.=9.57) for African-British women as a specific group] (South African Department of Health, 1998, 2000; UK Department of Health, 2003).

For attractiveness preferences to be adaptive, they also have to be flexible so that when conditions within an environment change or when someone moves between environments, his or her preferences should alter to reflect this change in the local optima for survival and reproduction. Hence, when someone moves from a rural SA environment (where risk factors for disease are highly correlated with low body weight) to the UK (where the opposite is the case), one would expect that his or her preferences would shift to reflect these changed priorities. Our data are consistent with this hypothesis. Eventually, over time, the preferences of the migrant population should change to become similar or identical to those of the indigenous population, which would be consistent with our data on the preferences reported by Britons of African origin.

The fact that Zulu migrants into Britain seem to have modified their preferences and the fact that the Britons of African origin have the same preferences as the UK Caucasians imply that these preferences are part of a flexible behavioral repertoire, acquired through social learning, which allows humans to adapt and respond to changing conditions within an environment or when moving between environments. In this case, the change in preferences is likely to be mediated both by social interactions and the media environment. The Western media emphasize a preference for a slim and shapely body as the female ideal, and the ubiquitous nature of this ideal in television, magazines, and advertisements is likely to accelerate the putative changes to attractiveness preferences (Barber, 1998; Silverstein, Perdue, Peterson, & Kelly, 1986; Tovée, Mason, Emery, McClusky, & Cohen-Tovée, 1997).

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