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Personality and Social Sciences

Perceptions of female body weight and shape among indigenous and urban Europeans

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Two important cues to female physical attractiveness are body mass index (BMI) and body shape as measured by the waist-to-hip ratio (WHR). This study examined the relative contribution of both cues in three culturally distinct populations. A total of 119 Finnish, Sámi and British male observers rated a set of un-edited photographs of women with known BMI and WHR. The results showed that there were significant differences in preferences for physical attractiveness, with the indigenous Sámi preferring figures with larger BMIs and more tolerant of heavy-weight figures than either Finnish participants in Helsinki or Britons in London, who were indistinguishable in their preferences for slim figures. The findings are discussed in terms of evolutionary psychological explanations of mate selection, and sociocultural theories which emphasizes the learning of preferences for body sizes in social and cultural contexts.

Key words: Female physical attractiveness, body mass index, waist-to-hip ratio, Sámi.

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INTRODUCTION

Some evolutionary psychologists have argued for the existence of universally shared criteria of attractiveness, which are potent cues to a person's potential reproductive success (Buss, 1994, 1999; Buss & Schmitt, 1993; Symons, 1995). Within this paradigm, males and females are believed to select partners that will enhance their reproductive success, and there has been a concurrent emphasis on the attractiveness of salient morphological features. The latter are said to honestly signal that one individual is more "desirable" than another (Buss, 1994, 1999). In women, two potentially critical cues are body shape and weight scaled for height, or the body mass index (BMI).

For shape in women, research has focused on the ratio of the width of the waist to the width of the hips (the waist-hip ratio, or WHR). A low WHR (i.e. a curvaceous body) is suggested to correspond to the optimal fat distribution for health and high fertility (Wass, Waldenstrom, Rossner & Hellberg, 1997; Zaadstra, Seidell, Van Noord *et al.*, 1993), and so this shape should be highly attractive. This suggestion is supported by studies that have asked subjects to rate for attractiveness a set of line-drawn figures of women's bodies (Singh, 1993a, b, 1994a, b, 1995; Furnham, Tan & McManus, 1997). This led Singh (1993a: 304) to argue that the WHR acts as a "wide first-pass filter, which would automatically exclude women who are unhealthy or who have low reproductive capacity." It is only after this "culturally invariant" filter is passed that other features such as the face, skin or weight (which may vary between cultures) become utilized in final mate selection.

However, the WHR in these line drawings is varied by altering the torso width around the waist, but this not only alters the WHR, but also the apparent BMI. As the value of the WHR rises, so does that of the apparent BMI, and so it is not possible to say whether changes in attractiveness ratings are made on the basis of WHR or BMI, or both (Tovée & Cornelissen, 1999; Tovée, Maisey, Emery & Cornelissen, 1999). This problem is also found in studies using edited photographic images of women, where their WHR has been artificially altered by thickening or narrowing their torsos (e.g., Henss, 2000). Altering the torso width also altered apparent body mass, and so once again, the WHR and BMI were co-varied.

When digital photographs of real women (Tovée *et al.*, 1998, 1999, 2002), computer-generated photographs (Puhl & Boland, 2001) and three-dimensional images (Fan, Liu, Wu & Dai, 2004) are used, BMI seems to be the most important predictor to judgments of attractiveness, with WHR serving as one of a number of secondary cues to attractiveness. It is not simply that this paradigm is insensitive to shape cues, as when women are asked to rate male images in the same format and under the same experimental conditions, the primary determinant of male attractiveness is upper body shape – specifically the waist-chest ratio (Maisey, Vale, Cornelissen & Tovée, 1999; Swami & Tovée, 2005a). The finding that BMI may be the primary determinant of female attractiveness is consistent with the fact that successful female fashion and glamour models all fall within a narrow BMI range (Tovée, Mason, Emery, McCluskey & Cohen-Tovée, 1997).

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It is well established that changes in BMI also have a strong impact on health (Manson *et al*., 1995; Willet *et al*., 1995) and reproductive potential (Frisch, 1988; Lake, Power & Cole, 1997; Reid & Van Vugt, 1987), and so a mate choice strategy based on BMI also favours reproductive success.

If judgments of attractiveness are an innate preference, then it might be expected that these preferences should be consistent across cultures. Many studies using observers from industrialized societies show similarities in their preferences, especially with regard to a low WHR (Furnham, McClelland & Omer, 2003; Furnham, Moutafi & Baguma, 2002; Henss, 2000; Markey, Tinsley, Ericksen, Ozer & Markey, 2002; Singh, 2000, 2001, 2002; Singh & Luis, 1995; Singh & Young, 1995). However, other cross-cultural studies, particularly those that have included observers from rural or non-industrialized cultures, have shown apparent differences in the preferences expressed by people in different cultures across the world (e.g., Furnham & Alibhai, 1983; Furnham & Baguma, 1994; Furnham, Moutafi & Baguma, 2002; Marlowe & Wetsman, 2001; Wetsman & Marlowe, 1999; Yu & Shepard, 1998). Swami & Tovée (2005b), for example, showed that preferences for different body weights in Malaysia and Britain varied with socio-economic status, and that body shape played a relatively minor role.

However, these differences are not necessarily inconsistent with an evolutionary explanation, as it might be argued that they represent adaptations to local environmental conditions, rather than arising through different cultures (Sugiyama, 2004; Tovée & Cornelissen, 1999, 2001). To clarify this ambiguity, it is important to explore the attractiveness preferences of observers from different cultural surroundings. Recent studies using photographic stimuli (e.g., Swami & Tovée, 2005b; Swami, Caprario, Tovée & Furnham, 2006; Tovée, Swami, Furnham & Mangalparsad, 2006) have examined preferences of attractiveness in Asia and Africa, but fewer studies have looked at similar preferences among different cultural groups within Europe.

To correct this paucity of research, the current study examined the physical attractiveness preferences of a group of Sámi, the indigenous people of northern Scandinavia (Näyhä, 1989). Insofar as the Sámi have their own language, culture and way of life, as well as maintain distinct socio-economic and political institutions, they present a natural sample among which to examine physical attractiveness preferences for the female body. To compare this unique group of indigenous Europeans, we elicited similar preferences from ethnic Finns in Helsinki and Britons in London, both of whom represent a relatively urbanized cultural milieu.

METHOD

Participants

The Finnish Sámi sample consisted of 27 male participants from the three northernmost local government districts of Finland (Enontekiö, Inari and Utsjoki), which are officially termed the "Sámi district". The Sámi of Finland (now approximately 6,000 in number) are almost entirely concentrated in the Sámi district, although even here the Finns have constituted the main population since the turn of the century (with the exception of Utsjoki). Biologically, the Sámi are a distinct European indigenous population, with their own history and culture based on the sustainable use of territory to fulfill basic needs. There is evidence, for example, to show that the Sámi of Finland suffer from exceptionally low mortality from heart diseases when compared with Finns in neighboring districts (Näyhä, 1997), suggesting a biological break from other Finnish populations. Up to the present day, Sámi life has been marked by traditional occupations such as reindeer herding and fishing (although two-thirds of the population are now engaged in sales, services and industry, and only 15 per cent in the primary sector; Statistics Finland, 1993). The Sámi also maintain distinct linguistic rights, with several Sámi languages currently in use. Of these, North (or Mountain) Sámi is the most widely used in northern Finland. To reduce systematic biases, only participants who considered themselves Sámi and who could speak North Sámi were invited to take part in this study.

The second group consisted of 42 male participants of Finnish ethnicity recruited from the urban center of Helsinki, in southern Finland. Although there has been some mixing of the main population for centuries, especially in the north (Eriksson, 1973), the region around Helsinki is emphatically Finnish, as is borne out by its history of settlement, its "Finnish" occupational, lifestyle and dietary patterns, and by everyday experience. Thus, the measurement of ethnicity on the Sámi–Finnish axis may be regarded as valid for the present purpose. Regarded as Finland's cultural and economic hub, the Helsinki region serves as an important trade and business center in Finland, with a GDP almost 50% higher than the European Union average and roughly the same percentage figure above the GDP of Finland as a whole (Statistics Finland, 2002). The municipality of Helsinki has a population of some 560,000, of whom over 90% are Finnish-speaking and about 5% Swedish-speaking. Only Finnish-speaking participants were invited to take part in the present study.

The final group consisted of 50 British males who were born and raised in urban Britain, and were used as a comparison sample. The age ranges and means of the different groups are summarized in Table 1. There were significant differences in the mean ages of the groups (one-way ANOVA, $F_{(2, 118)} = 21.64$, $p < 0.05$), with the Sámi group being older than the Helsinki and British groups, who were not significantly different from each other. However, a previous study on British observers has shown that age appears to have no significant impact on the attractiveness judgments of observers (George, Cornelissen & Tovée, 2004). There were, however, no significant differences in the body mass indices of the different groups (one-way ANOVA, $F_{(2, 118)} = 0.002$, $p > 0.05$; see Table 1).

Materials

Participants in each group were asked to rate images of 50 real women in front view. To generate the images, consenting women were videoed standing in a set pose at a standard distance, wearing tight grey 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 use of high-resolution photographic images is more realistic than the line drawings used to date, but it should be noted that a two-dimensional image might not capture all the visual cues available from a three-dimensional image seen from the same viewing point (DeSoto & Kopp, 2003). However, a recent study that compared the ratings of two-dimensional photographs with ratings of movie clips of the same bodies rotated through 360° found no

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Table 1. *Age and BMI ranges, means and standard deviations*

	Age			BMI		
Group	Range	Mean	Standard deviation	Range	Mean	Standard deviation
Sámi	20–53	35.15	8.38	17.71–30.44	23.43	3.32
Helsinki	18–43	24.90	6.39	18.73–31.96	23.42	2.89
Britain	19–44	24.66	6.10	17.65–29.97	23.46	2.60

differences (Smith, Cornelissen & Tovée, in press), suggesting that two-dimensional photographs can capture much of the visual information available in three-dimensional images.

Every effort was taken to ensure that ethnicity would not be a factor in the images. To this end, 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 subjects' ratings. The images were also presented in black-and-white to minimize the impact of skin color. For the stimulus set of this experiment, ten images of women were drawn from each of the five BMI categories (Bray, 1998): emaciated (below 15 kg/m^2), underweight (15–18.5 kg/m^2), normal (18.5–24.9 kg/m^2), overweight (25.0–29.9 kg/m^2) and obese (over 30 kg/m^2). The women in this study varied in waist-to-hip ratio (WHR) from 0.68 and 0.98, with the ranges of BMI and WHR values representing the widest range available in the researchers' library. In a previous study, Tovée *et al.* (1999) examined the effect of varying the relative ranges of BMI and WHR for images in front view, and found that BMI remained the primary predictor even when the range of BMI was very narrow relative to the WHR range.

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 physically attractive is the person in the photograph?" and on which participants were asked to record their ratings.

Procedure

All participants in Britain and Helsinki were tested individually, while Sámi participants were tested in a group setting. To avoid social contagion effects that the close proximity of the latter setting may induce, participants were requested not to cross-refer their ratings with those of other participants. The questionnaire was similar for all groups, with the only difference being the language used. While the questionnaire was in English for the British group, instructions were translated into Finnish for the Helsinki group and North Sámi for the Sámi group. A back translation of the instructions by an independent translator certified the validity of the questionnaire across conditions.

Any questions were answered by the experimenters before the procedure began. Within the image set, individual images were presented in a randomized order, and subjects were presented with the entire set twice. In the first run through, participants were asked to verbally state if the woman depicted was pregnant or not. This was done to make participants aware of the range of variability of body features represented in the images, and to encourage participants to use the whole set of attractiveness ratings from 1 (least attractive) to 9 (most attractive). Participants were only asked to rate the images according to the leading question on the second run through. The entire procedure took approximately 40 mins to complete for each participant. This procedure is identical to that used in previous cross-cultural studies (e.g., Swami & Tovée, 2005b; Swami, Antonakopoulos, Tovée & Furnham, 2006).

RESULTS

Intra-class reliabilities

To check that the observers in each group were rating the images in the same way, we carried out an intra-class reliability measure on each group. Intra-class reliability measures show a very high degree of agreement between the observers' ratings. Using the Shrout-Fleiss intra-class reliability for k means, we found a high degree of agreement in all three observer groups (Shrout & Fleiss, 1979): for the Sámi observers it was 0.93; for the Helsinki observers it was 0.98; and for the British observers it was 0.99.

Multiple regression results

A multiple polynomial regression was used to model the contributions of BMI and WHR to the attractiveness ratings. Figure 1 shows plots of attractiveness ratings as a function of BMI, with all sets being significantly explained by BMI ($p < 0.001$ in both cases). It is clear from these figures that the relationship between BMI and attractiveness is non-linear. That is, increases or decreases in BMI either side of the peak of the curve reduces the attractiveness rating. Figure 2 shows the corresponding relationship between attractiveness and WHR, with only the Helsinki set being explained by WHR ($p < 0.05$), although this only just reaches significance. By contrast, there was no significant effect of WHR on the attractiveness ratings of Sámi or British participants ($p > 0.05$). This suggests that the WHR does have a slight effect on the attractiveness ratings of the Helsinki observers, but not of the Sámi and Britons.

There are a large number of non-linear functions that could be used to model these data. Following Tovée *et al.* (1999), we chose the simplest approach possible, which was to include second- and third-order terms in a multiple regression model (see Altman, 1991), to estimate the variance of attractiveness ratings explained by BMI and WHR.

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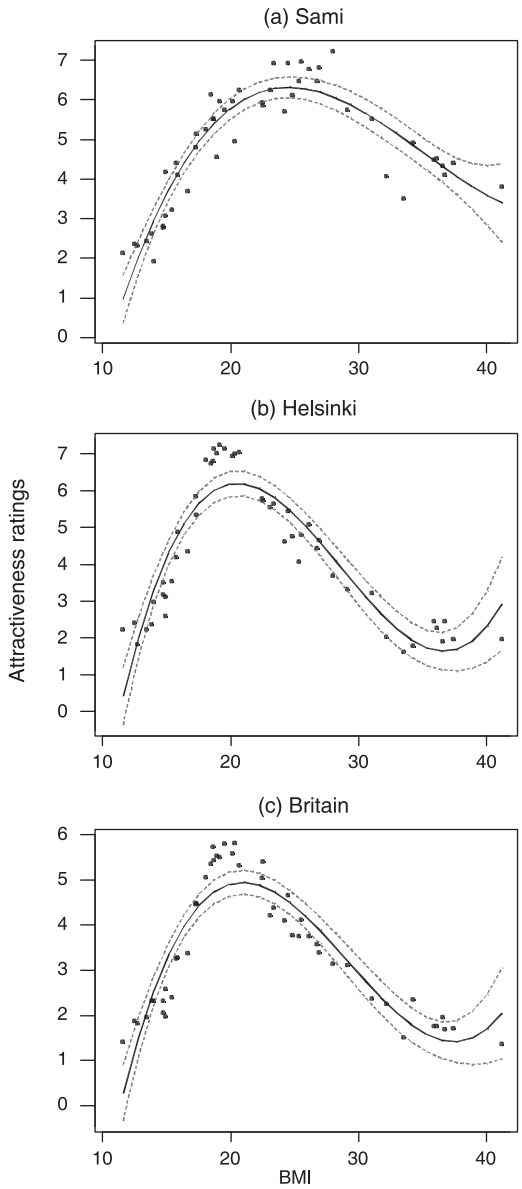

Fig. 1. Plots of attractiveness as functions of BMI.
Notes: Each point represents the 50 attractiveness judgments made by participants. Regression lines (solid lines) and their 95% confidence levels (dotted lines) are superimposed.

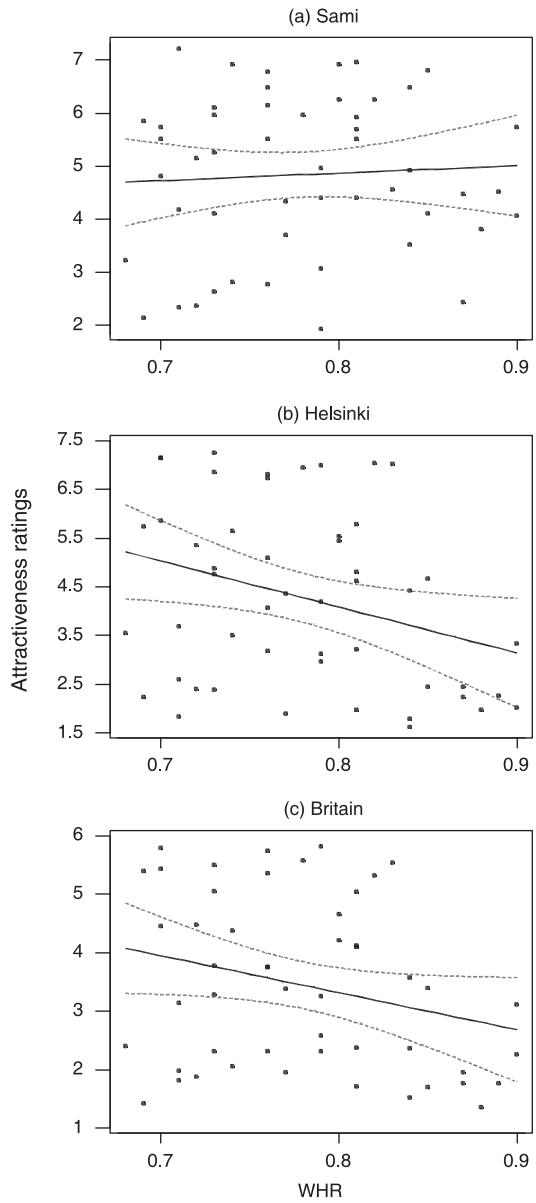

Fig. 2. Plots of attractiveness as functions of WHR.
Notes: Each point represents the 50 attractiveness judgments made by participants. Regression lines (solid lines) and their 95% confidence levels (dotted lines) are superimposed.

There appears little justification in the psychological literature for fitting a more complex function. 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 total variance explained by this model for the relationship between BMI and attractiveness ratings was over 80% for all three groups: 84.6% for the Sámi; 83.6% for the Helsinki observers; and 83.3% for the Britons. The variance explained by WHR and attractiveness ratings was 0.3% for the Sámi, 9.8% for the Helsinki group, and 7.1% for the Britons.

Between group differences

There is a striking difference in the shape of the relationship between attractiveness and BMI between the different groups (Fig. 1). The British and Helsinki groups show a roughly inverted-U shape; attractiveness preferences are lower for the low and high BMI values, and higher for the middle BMI values. In contrast, the attractiveness function for the Sámi group is shifted towards higher BMI values,

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and does not show the fall-off in attractiveness with higher BMI values. Instead, attractiveness ratings decline for the higher BMI values, but not to the same extent as that seen in the other observer groups.

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. For the Sámi group, this peak was 20.59 kg/m^2; for the Helsinki group, it was 25.10 kg/m^2; and for the British group it was 20.85 kg/m^2. There were significant differences between the different groups (one-way ANOVA, $F(2, 118) = 44.90$, $p < 0.001$), and a post-hoc Tukey HSD test showed that the Sámi group was significantly different from the Helsinki and British groups, who were not significantly different from each other.

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, $F(2, 118) = 78.59$, $p < 0.001$), and Tukey HSD post-hoc tests show that the Sámi observers are significantly different from the other two groups.

The multiple regressions also suggest that the importance of WHR in attractiveness judgments differs between groups. Attractiveness and WHR is significantly correlated in the Helsinki group ($r = 0.31$, $p < 0.05$), but not in the Sámi ($r = 0.06$, $p > 0.05$) or British ($r = 0.27$, $p > 0.05$) groups, although the latter just fails to reach significance. The gradient of this relationship for the British is –6.34, for the Helsinki observers is –9.45, and for the Sámi is +1.41. This suggests a much steeper gradient in the two urban groups. A dummy regression (Tukey, 1977) shows that there is a significant difference between the gradients for the Sámi and the two other groups ($p < 0.05$).

DISCUSSION

We found significant differences in attractiveness judgments between the Sámi observers and their counterparts in Helsinki and Britain. This finding is particularly important, as this is the first study of its kind to elicit data from an indigenous European sample. When compared with participants in Britain and Helsinki, the Sámi participants in this study selected a body size that was significantly larger in terms of BMI as their most preferred, and in addition were more tolerant of heavier figures. This is further combined with a reduced preference for a more curvaceous body shape among the Sámi, that is, changing body has less of an effect on attractiveness in the Sámi group, and a less curvaceous shape is regarded as relatively more attractive in this group than in the other observer groups. This finding is generally consistent with a number of other studies using photographic stimuli (e.g., Swami & Tovée, 2005b) and line drawings (Marlowe & Wetsman, 2001; Wetsman & Marlowe, 1999; Yu & Shepard, 1998) with observers from non-industrialized societies showing that heavier and less curvaceous figures may be more preferred.

Tovée and Cornelissen (2001) have suggested that BMI may be used as an indicator of health, and consequently that differences in preferences for body weight in different cultures may be based on different optimal BMI for different racial groups and environments. On the basis of epidemiological evidence that suggests that different ethnic populations may have differing levels of risk for negative health consequences with changing BMI (Kopelman, 2000; Shetty & James, 1994; Stevens *et al.*, 1992), the authors suggest that there may be a different optimal BMI for health and longevity in different racial groups. As a consequence, there will be a preferred optimal BMI for each group, which will balance environmental and health factors, but this optimal BMI may differ between groups and environments.

What is the evidence for this? Tovée *et al.* (1999) have suggested that the balance between the optimal BMI for health and fertility, for (typically British) Caucasians, is struck around a value of 20kg/m^2, which, in this study, is also the preferred BMI for attractiveness among Britons. There seems little reason why similar definitions of BMI should not be used for Finns (Lahti-Koski, Vartiainen, Männisto & Pietinen, 2000), which would tend to support this explanation for the data from Helsinki. However, comparable data is lacking for the Scandinavian Sámi, which makes the testing of this hypothesis problematic. Nevertheless, it is clear that there is an association between morbidity and obesity among the Sámi, making body weight an important determinant of disease among certain circumpolar populations (e.g., Jørgensen, Bjerregaard & Borch-Johnsen, 2002; Naylor, *et al.*, 2004; Young, 1996). In addition, there is evidence that BMI guidelines on Caucasian populations do not readily apply to other circumpolar populations, who in general have different body builds from that of Caucasians (larger torsos and shorter limbs; Becker-Christensen, 2003). A recent study, for example, has shown that traditional definitions of obesity do not apply to the Inuit of Greenland (Andersen, Mulvad, Pedersen & Laurberg, 2004), with whom the Sámi show some similarity in terms of epidemiology (Näyhä, 1997). Finally, there is also evidence that the Sámi have different epidemiological correlates from Finns. For example, serum cholesterol, which is related to a fatty diet and obesity, is higher in the Sámi than in Finns (Björkstén *et al.*, 1975).

In the absence of definitive guidelines as to optimal BMIs for health for the Scandinavian Sámi, authoritative conclusions are clearly difficult. Two further pieces of evidence, which suggest that the conclusions reached by Tovée and Cornelissen (2001) may not be entirely accurate, should be considered. First, it seems intuitive that the Sámi should be genetically prone to develop obesity (see Hegele *et al.*, 1999,

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2001, for comparable data among the Inuit) because survival may have been higher among individuals with a high capacity for energy storage, building up fat deposits (e.g., Furnham & Baguma, 1994). However, recent cross-sectional studies among circumpolar populations have described decreasing overweight and an increased number of slim women (Andersen *et al.*, 2004; Bjerregaard, Jørgensen, Andersen, Mulvad & Borch-Johnsen, 2002), which would suggest that male preferences for attractiveness should follow this pattern if it were an evolutionary adaptation.

Secondly, the evidence from other studies does not support this hypothesis. For example, Malays, Chinese and Indians in Southeast Asia are known to have different optimal BMIs for health and mortality, which would suggest that members of each ethnic group should have different preferences for body weight. However, this is not the case: when preferences were elicited using the same stimuli and procedure reported in this study, Malays, Chinese and Indians in Malaysia were all found to have a similar preference for slender figures (Swami & Tovée, 2005b). For these authors, differences in preference for body weight may be linked more with socio-economic status (or resource availability), with rural participants in general preferring heavier figures than participants in urban or modernized settings.

Nelson and Morrison (2005; see also Swami & Tovée, 2006) have proposed an implicit psychological mechanism based on the situational influence of environmental conditions to explain the gradient of preferences for body weight. They argue that the consequence of collective resource scarcity is that individual members of a society in which resources are scarce are likely to lack resources themselves. They further argue that the affective and physiological states associated with individual-level resource availability provide implicit information about collective resource availability, and that this then plays a role in the construction of preferences. Thus, for example, financially dissatisfied and hungry men tend to prefer a heavier mate than do financially satisfied or satiated men respectively (Nelson & Morrison, 2005). This explanation is also relevant to the present study: the Sámi may prefer heavier body weights because of their relative experience of resource scarcity when compared with observers in Helsinki or Britain.

There a number of limitations to this study which must be acknowledged. First, although the utilization of photographic images was a substantial improvement upon artificial line-drawn stimuli in previous studies, the ability to select a single model and manipulate her WHR and body weight would allow full control of any extraneous factors contributing to judgments of physical attractiveness. For example, although every effort was made in these experiments to ensure that information about skin color was minimized, there were slight differences between the different models. In this case, differences in skin color were not expected to have any influence on ratings as the difference was not detectable in the photographs and because the images were presented in black-and-white. However, potential problems like these could be avoided by making computer-generated manipulations on a single model (e.g. Smith *et al.*, in press). Sampling is also notoriously difficult in cross-cultural studies, and the present example was no exception. For instance, the Sámi participants in this study were significantly older than either the Finnish or British participants. Although participant age does not appear to be a mediating factor in preferences for BMI (George *et al.*, 2004), there may have been generational differences for the Sámi since they are at a different stage in the process of societal development. Future studies may therefore wish to examine the effect of age on body weight preferences across societies. In addition, future research should also consider the effect of other possible mediators of body weight preferences, such as whether participants are looking for short- or long-term partners and integration into mainstream cultures (for instance, Sámi in urban Scandinavia).

These limitations notwithstanding, the present study indicates that indigenous European populations may have divergent expectations of physical attractiveness from more dominant, mainstream cultures. This has implications for the treatment and prevention of eating disorders in societies that have experienced rapid modernization. Inasmuch as the rapid modernization that has occurred in southern Finland fosters risk factors for slim bodily ideals and disordered eating, it can be predicted that fat-concern, dieting and ultimately eating disorders will become increasingly common experiences for Finnish, but not Sámi, women.

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