

Men's Preferences for Women's Breast Morphology in New Zealand, Samoa, and Papua New Guinea

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Abstract Sexual selection via mate choice may have influenced the evolution of women's breast morphology. We conducted an image-based questionnaire quantifying and comparing the preferences of men from Papua New Guinea (PNG), Samoa, and New Zealand (NZ) for images of women's breast size, breast symmetry, areola size, and areolar pigmentation. Results showed that men from PNG preferred larger breasts to a greater extent than men from Samoa and NZ, providing some support for the hypothesis that men from subsistence living cultures have a greater preference for morphological cues indicative of caloric reserves. Symmetrical breasts were most attractive to men in each culture. However, preferences were highest among NZ men, followed by men from Samoa, and were lowest among men from PNG. These results did not support the hypothesis that people living in higher pathogen environments have a greater preference for traits indicative of pathogen resistance and developmental stability. Large areolae were preferred among men from PNG, and to a lesser extent in Samoa, while in NZ men preferred medium-sized areolae. Thus, men's preferences for women's areolar size appear to be

highly culturally specific. Darkly pigmented areolae were most attractive to men from Samoa and PNG, whereas men from NZ preferred areolae with medium pigmentation. These findings suggest that areolar pigmentation indicative of sexual maturity is preferred by men rather than lighter pigmentation, which may signal that a woman is in the early years of reproductive maturity. This study highlights the importance of cross-cultural research when testing the role of morphological cues in mate choice.

Keywords Attractiveness · Female breasts · Sexual selection · Cross-cultural research

Introduction

Uniquely among the primates, adult female human beings have large stores of body fat in their thighs, hips, and buttocks (the gluteal/femoral region) and breasts (Dufour & Slather, 2002; Pond, 1997). Body composition is sexually dimorphic (Carter & Heath, 1990); women may have up to 43.6% of their physique comprised of fat in comparison to 28.4% in men (Clarys, Martin, & Drinkwater, 1984). Sexual dimorphism in body composition results in marked sexual dimorphism in body shape (Wells, 2007). Women typically have a narrower waist in relation to wider hips, as reflected in their lower waist-to-hip ratios (WHR) compared to men. The physiological demands of pregnancy and lactation are such that natural selection has likely been the primary evolutionary cause for sexual dimorphism in body fat and body shape (Cant, 1981; Jasienska, 2009). The evolution of bipedal locomotion also places biomechanical constraints on women, as they must remain mobile during gestation (Pawlowski, 2001). This may have favored a lower center of body mass in women, which correlates with low WHR (Pawlowski & Grabarczyk, 2003). In addition to natural

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selection, sexual selection may have affected body shape and the distribution of body fat in women. Thus, a gynoid fat distribution and an “hourglass” body shape may be honest signals of female health and reproductive potential (Barber, 1995; Singh, 2002; Singh & Young, 1995; Thornhill & Grammer, 1999).

In contrast to female nonhuman primates, where breast enlargement only occurs during lactation (Short, 1980), women’s breasts enlarge at puberty due to increased deposition of adipose and stromal tissue (Vandeweyer & Hertens, 2002). The social and evolutionary significance of breast enlargement prior to pregnancy and lactation in women has been a subject of much debate (Caro, 1987; Jesser, 1971). Some authors have argued that as humans evolved hairlessness and bipedal locomotion, the breasts were displayed more prominently and their pendulous morphology was adaptive for breast-feeding babies (LeBlanc & Barnes, 1974). Smith (1986) suggested that breasts provide a soft cushion that is psychologically comforting to the infant. Large breasts may serve as storage organs for milk (Low, Alexander, & Noonan, 1987). However, it is important to note that the size of the non-lactating breast is not indicative of its potential to produce milk (Anderson, 1988; Caro, 1987; Caro & Sellen, 1990; Mascia-Lees, Relethford, & Sorger, 1986). While localized fat storage is required as energy reserves for gestation and lactation (Anderson, 1983; Jasienska, 2009), fat in the breasts may have evolved in parallel with gluteal/femoral fat reserves (Pawlowski, 1999).

It has been suggested that sexual selection via mate choice may have enhanced the expression of permanently enlarged breasts in women (Barber, 1995). However, while men may become sexually aroused by images of female breasts (Freund, Langevin, & Zajac, 1974), male preferences for female breast size appear to be highly variable. Ford and Beach (1951) identified cross-cultural differences in male preferences for breast size and morphology. For example, among the Sudanese Azande, men prefer long pendulous breasts; Alorose men of the Alor Island in Indonesia prefer large breasts and men of the Kenyan Massai tribes prefer firm, upright breasts. Research quantifying male preferences for female breast size has also yielded mixed results. Studies have concluded that men in Western cultures rate images of women with small breasts (Furnham, Swami, & Shah, 2006), medium-sized breasts (Horvath, 1981) or larger than medium-sized breasts (Furnham, Dias, & McClelland, 1998; Singh & Young, 1995) as most attractive. However, these studies are subject to methodological problems, as most have used line drawings of women in bathing suits or silhouettes as stimuli. Such images do not allow people to distinguish between changes in breast shape, size, and areolar configuration. Across the lifespan, such changes may be used to gauge a woman’s age and reproductive status (Gallup, 1982; Marlowe, 1998; Symons, 1995).

A further problem in research quantifying male preferences for female breast morphology concerns the lack of cross-cultural data. If selection has acted upon mate preferences from

the earliest phases of human evolution, encouraging men to attend to certain morphological traits (Buss, 2003; Grammer, Fink, Møller, & Thornhill, 2003), one would predict concordance in preferences for those traits across societies that currently vary in socioeconomic status and exposure to Western mass media. The current study tested these ideas using a questionnaire survey quantifying attractiveness judgments for various aspects of female breast morphology among Melanesian men from Papua New Guinea (PNG), Polynesian men in Samoa, and men of European descent in New Zealand (NZ).

A number of theories propose either that breast morphology signals nubility in young women or that they are more important as signals of sexual maturity and fertility (Gallup, 1982; Marlowe, 1998; Symons, 1995). In a sample of 119 Polish women, women with larger breasts and lower WHRs had higher circulating levels of 17- β -estradiol and progesterone (Jasienska, Ziolkiewicz, Ellison, Lipson, & Thune, 2004), which are predictors of the probability of conception (Lipson & Ellison, 1996). Jasienska et al. found that women with larger breasts had higher levels of circulating estradiol, independent of WHR. Therefore, we tested the hypothesis that men should judge large breasts as most attractive as a signal of fecundity.

Directional asymmetry in morphological traits may be strongly determined by genetic and environmental factors, as well as resistance to pathogens (Møller, 1999). Thus, symmetry in morphological traits may enhance attractiveness as a signal of mate quality (Møller & Thornhill, 1998). Women with more symmetrical breasts have been shown to have higher fecundity in the UK, the U.S., and Spain (Manning, Scutt, Whitehouse, & Leinster, 1997; Møller, Soler, & Thornhill, 1995). In contrast, women with greater breast asymmetry have a higher probability of developing breast cancer (Scutt, Lancaster, & Manning, 2006) and may experience difficulty lactating due to deficient glandular development (Niefert, Seacat, & Jobe, 1985). We tested the hypothesis that men should prefer symmetrical breasts as a signal of fecundity, maternal health, and pathogen resistance.

Breast maturation in girls is typically measured through fat deposition (Tanner, 1962). However, the maturation of the areolae may also be indicative of female sexual maturity. During adolescence in girls, areolar diameter increases and is larger at the onset of menarche than in pre-pubescence (Biro, Falkner, Khoury, Morrison, & Lucky, 1992). The size and shape of the areolae in women may influence men’s attractiveness judgments of women’s breasts (Barber, 1995; Guthrie, 1976). We examined the hypothesis that changes in areolar size should affect male judgments of female attractiveness, with men preferring breasts with large areolae as a sign of reproductive maturity.

Areolar pigmentation shows important variations with age, being lightest at the onset of menarche and darkening as women mature (Garn, Selby, & Crawford, 1956), particularly during pregnancy and lactation (Garn & French, 1963; Muzaffar, Hussain, & Haroon, 1998; Pawson & Petrakis, 1975). Areolar pigmentation may be an index of parity and lighter pigmentation

of the areolae may be sexually attractive to men as a signal of youth (Goodhart, 1964; Guthrie, 1976; Montagna & Macpherson, 1974). Thus, we tested the hypothesis that lightly pigmented areolae might be most attractive to men.

Method

Participants

Each questionnaire had a cover sheet for demographic data, including the participant's sex, age, and marital status. Participants were interviewed individually and were not asked to give their names. This study was approved by the human ethics committee at Victoria University of Wellington.

Papua New Guinea (PNG) is the eastern half of the island of New Guinea and has a population of 4.5 million people. Agriculture is the principle income in PNG. The Okapa district is located in the Eastern Highlands Province. There are approximately 54,000 people living in the Okapa district. These people form five separate ethnic groups, as defined on linguistic grounds: Fore, Auyana, Kimi, Keagana, and Kanite. We conducted surveys among the Kanite. There are approximately 8,000 Kanite people living in the Okapa district. We interviewed 100 men (M age \pm SD = 29.58 years \pm 10.84, range = 18–58 years) from three small villages: Kimiagomo, Yafanagomo, and Foseya. In this region, polygynous marriages can occur. Of the 100 men interviewed, 42% were unmarried, 48% were married to one wife, and the remaining 10% were married to two or more wives. The region is extremely remote and has no main water supply, electricity, television, Internet access or land phone lines. All the participants were subsistence farmers.

Samoa is a chain of islands in Western Polynesia with a population of 182,548. Participants were recruited on the two main islands of Upolu and Savai'i. Agriculture is the main employment on the island. These islands are not as exposed to the kind of media influences that are common in Western cultures. For example, magazines (including fashion magazines) are not commonly found, even in the capital Apia. Equally, there are no large billboards advertising fashion. While Samoa has electricity and television, broadcasting is restricted to state run channels on which the bulk of programming focuses on local news and religious events. Outside of the capital, Internet access is extremely sparse. A total of 53 Polynesian men (M age \pm SD = 27.89 years \pm 9.74, range = 18–71 years), 23% of whom were married, completed questionnaires. We opportunistically recruited participants of various occupations. Some worked in restaurants or drove taxis in and around the capital Apia, while others were farmers and fisherman from more rural and remote areas of the islands.

New Zealand (NZ) has a population of 4 million people living on the North and South islands. It is an industrialized country where the principle incomes are the import and export

trade, agriculture, and tourism. NZ is wealthier than PNG and Samoa and has much greater exposure to media influences such as magazines, television, cinemas, and billboard advertising. Seventy men of European descent (M age \pm SD = 24.63 years \pm 6.20, range = 18–46 years), 24% of whom were married, were recruited opportunistically from in and around Wellington city. Some men were University students, worked in office jobs, some were manual laborers and others were servers in cafés and bars.

A 3 (Culture) \times 2 (Marital Status) chi-square test revealed significant differences in numbers of married and unmarried men among the three cultures, $\chi^2 = 27.50$, $df = 2$, $p < .001$. In NZ, 17/70 (24.3%) of participants were married, in Samoa 12/53 (22.6%) were married, and in PNG 58/100 (58%) were married. A one-way ANOVA for culture showed a significant main effect of participants' age, $F(2, 125) = 7.80$, $p < .001$. Post-hoc Bonferroni tests revealed that men from PNG were significantly older on average than men from NZ ($p = .002$). Samoan men were slightly older on average than NZ men ($p = .057$). Mann–Whitney U -test showed that married men were significantly older than unmarried men ($p < .001$).

Measures

Participants were asked to rate the attractiveness of images of women that varied in four parameters of breast morphology: breast size, breast symmetry, areolar size, and areolar pigmentation. Each page contained three images, as detailed below. Participants were asked to select only the image that they found most attractive. Alternatively, if none of the images was preferred, participants had the option to rate all the images as equally attractive. To construct the various images, two photographs of a Caucasian woman's torso were scanned from Simblet (2001). In one photograph, the woman was front-posed and in the second image the same woman was oblique-posed. These images are hereafter referred to as the standard image from which experimental manipulations were made using Adobe Photoshop version 7.0. The questionnaire format was identical in each culture except that the skin color of the entire image, including the areolae, was matched to that which was typical to the ethnic group being studied. Using Adobe Photoshop, the desaturate function was employed to render the image to black and white. Then, using the hue and saturation function, the hue, saturation, and lightness levels were manipulated qualitatively to match the skin color of a photograph of a woman from Samoa and PNG. Examples of the images are included in Figs. 1, 2, 3, and 4.

Parameter 1 measured male preferences for oblique-posed female torsos that varied in breast size. Breast size was assessed using anthropometric measures (Brown, La, Ringrose, Hyland, Cole, & Brotherston, 1999). Using Adobe Photoshop, the breasts were cropped out of the image. Breast size was then manipulated before the breasts were blended back into the image. Participants selected from three images, the standard

image (medium-sized), one image in which medium-sized breasts were increased by 20% (large), and an image where the medium-sized breasts had been reduced to 80% (small). Parameter 2 quantified male preferences for front-posed torsos that varied in breast symmetry. A bilaterally symmetrical image was created by dividing the standard image in two, vertically, from the suprasternal notch, and copying and pasting one side to create a mirror image. From this symmetrical image, two further images were created. In one image, the left breast alone was lowered in one increment (3% of the total

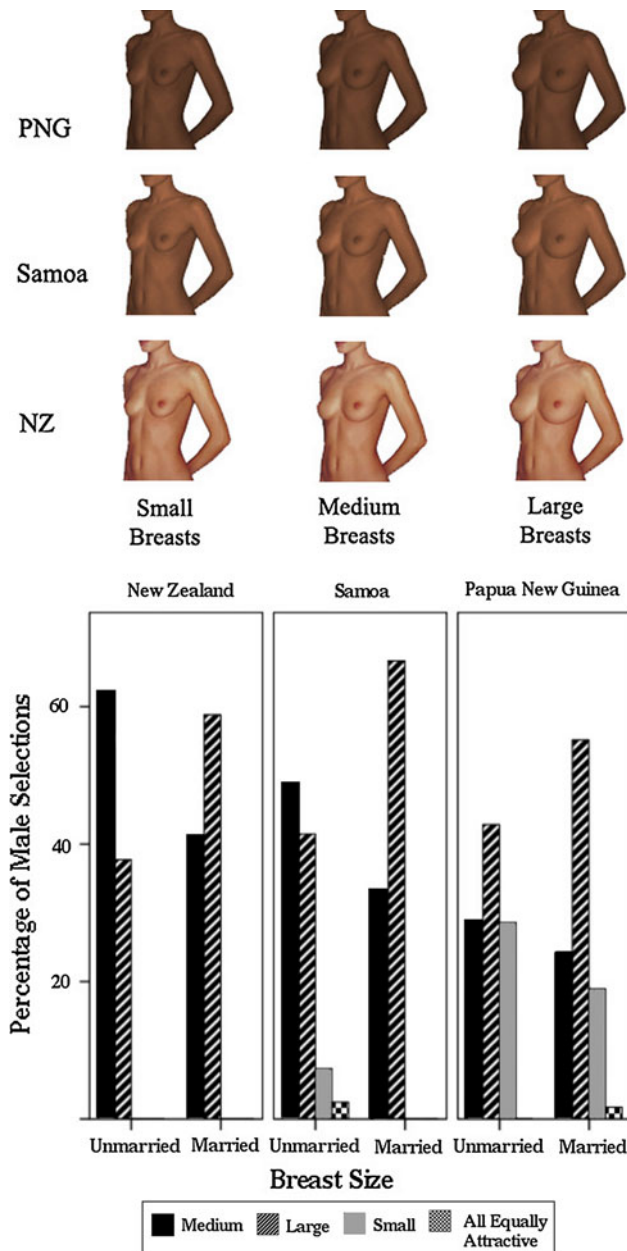


Fig. 1 Above the histograms are shown the stimuli used to test the role of breast size in men’s judgments of women’s attractiveness. Data are the percentages of selections made by married and unmarried men in each culture for images of women varying in breast size

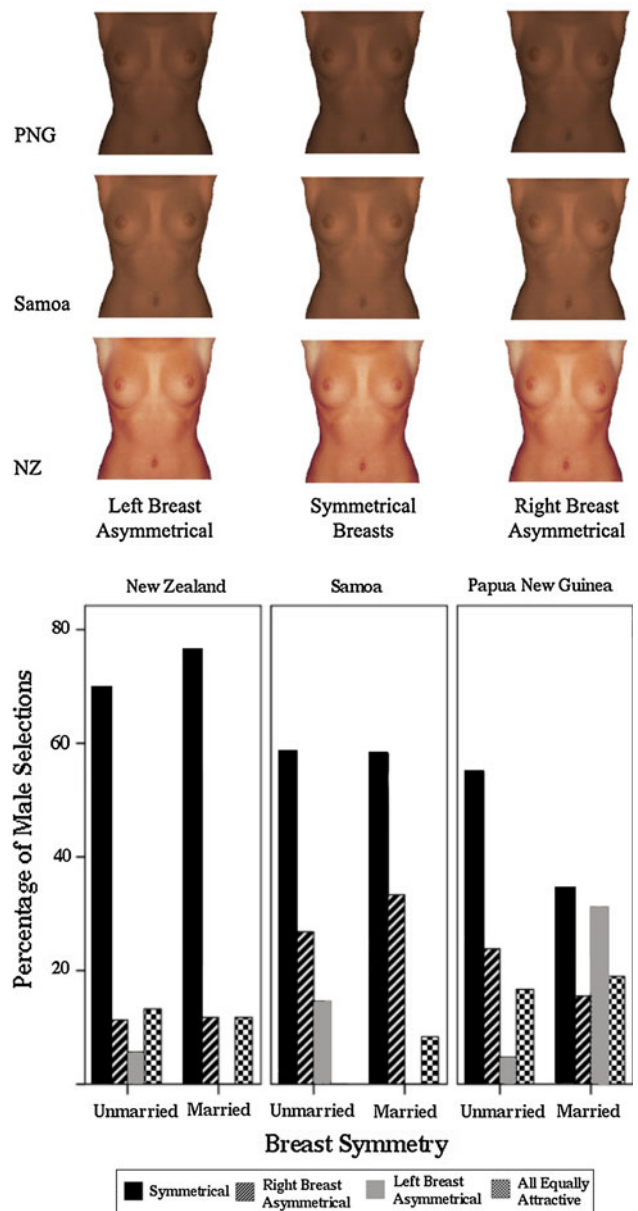


Fig. 2 The images used to test the role of breast symmetry in men’s assessments of women’s attractiveness are presented above the histograms. Each panel depicts the percentage of selections made by married and unmarried men in each culture for images of women varying in breast symmetry

height of the image). This procedure was repeated in a second image in which only the right breast was lowered by one increment. Thus, participants were shown three images, one in which the breasts were symmetrical and two in which the breasts were asymmetrical. Parameter 3 assessed male preferences for oblique-posed female torsos that differed in areolar size. The areolae were cropped out of the image in Adobe Photoshop. Size adjustments were made (+50% and –50% of the standard image) before the areolae were blended back into the image. Participants chose between the standard (medium-sized) image,

an image with large areolae (+50% of the standard image), and an image with small areolae (−50% of the standard image). Parameter 4 examined male preferences for three oblique-posed female torsos that varied in areolar pigmentation. The areolae were cropped out of the image using Adobe Photoshop. From the standard image (medium-pigmented areolae), areolar pigmentation was then altered in a stepwise fashion (+15 units of brightness and −10 of contrast) to produce one image with darkly pigmented areolae and one with lightly pigmented areolae.

Data Analysis

In order to examine whether there were statistically significant differences within and between cultures for particular images, data from the three cultures were entered into a mixed logistic regression model, with culture, age, and marital status as factors. In a logistic regression model, one of the four possible choices (Image 1, 2, 3, or “all images are equally attractive”) was selected as a baseline or reference point. The logistic regression model then calculated the odds of selecting each of the other choices as opposed to the reference choice, taking into account the culture, marital status, and age of a particular individual.

Results

Parameter 1: Male Preferences for Female Breast Size

Unmarried men from NZ selected medium-sized breasts more often (62.3%) than both unmarried and married men from Samoa (48.8 and 33.3%, respectively) and PNG (28.6 and 24.1%, respectively). Married men preferred large breasts in each culture (NZ = 58.8%; Samoa = 66.7%; PNG = 55.2%; Fig. 1). Logistic regression analyses revealed that unmarried men were more likely than married men to select small breasts as most attractive, $\beta = 6.32$; SE = 1.43; 95% CI (3.52, 9.12), $p < .001$. Compared to men from NZ, the image with small breasts was less likely to be selected by men from Samoa, $\beta = -16.74$; SE = 4.82; 95% CI (−26.19, −7.29), $p < .001$ and PNG, $\beta = -14.09$; SE = 4.59; 95% CI (−23.10, −5.09), $p = .002$. However, it is important to note that NZ was selected as the baseline choice in these comparisons. Given the low number of selections for small breasts in NZ, the results of this comparison may not be reliable.

Parameter 2: Male Preferences for Female Breast Symmetry

In NZ, unmarried and married men preferred symmetrical breasts (69.8 and 76.5%, respectively). Similarly, in Samoa 58.5% of unmarried men and 58.3% of married men preferred symmetrical breasts. However, in PNG, unmarried men

preferred symmetrical breasts more than married men (54.8 and 34.5%, respectively; Fig. 2). Logistic regression analyses showed that unmarried men were more likely than married men to select as most attractive the image in which the left breast was asymmetrical, $\beta = 5.28$; SE = 1.62; 95% CI (2.11, 8.45), $p < .001$. However, men in all three cultures were less likely to pick this image than the image depicting symmetrical breasts; NZ: $\beta = -21.89$; SE = 4.12; 95% CI (−29.97, −13.81), $p < .001$; Samoa: $\beta = -26.95$; SE = 4.36; 95% CI (−35.49, −18.41), $p < .001$; PNG: $\beta = -20.59$; SE = 3.87; 95% CI (−28.17, −13.01), $p < .001$.

Parameter 3: Male Preferences for Female Areolar Size

In NZ, unmarried and married men selected medium-sized areolae more often (79.2 and 76.5%, respectively) than unmarried and married men from Samoa (48.8 and 33.3%, respectively) and PNG (42.9 and 22.4%, respectively). Preferences among married men from Samoa and PNG were greatest for the large areolar size (Samoa: 50.0%; PNG: 36.2%). As can be seen in Fig. 3, men in these cultures varied considerably in their preferences for female areolar size and the logistic regression yielded no statistically significant interactions.

Parameter 4: Male Preferences for Female Areolar Pigmentation

Unmarried men from NZ selected medium and darkly pigmented areolae evenly (47.2 and 47.2%, respectively). However, 82.4% of married men selected medium pigmented areolae. Among unmarried Samoan men, medium and darkly pigmented areolae were most attractive (41.5 and 48.8%, respectively). Married men from Samoa preferred darkly pigmented areolae (66.7%). In PNG, unmarried and married men preferred darkly pigmented areolae (47.6 and 53.4%, respectively) (Fig. 4). Logistic regression analyses revealed that unmarried men, compared to married men, chose medium pigmented areolae more frequently, $\beta = 5.07$; SE = 2.27; 95% CI (.62, 9.52), $p = .026$. Men from each culture were less likely to choose lightly pigmented areolae than medium pigmented areolae, NZ: $\beta = -15.27$; SE = 6.42; 95% CI (−27.86, −2.69), $p = .017$; Samoa: $\beta = -15.86$; SE = 7.21; 95% CI (−29.99, −1.73), $p = .028$; PNG: $\beta = -12.91$; SE = 6.39; 95% CI (−25.43, −.38), $p = .043$ as were older men, $\beta = -.33$; SE = .14; 95% CI (−.60, −.06), $p = .017$.

Discussion

Given that variations in physique and sexual preferences may occur in different parts in parts of the world, a challenge in

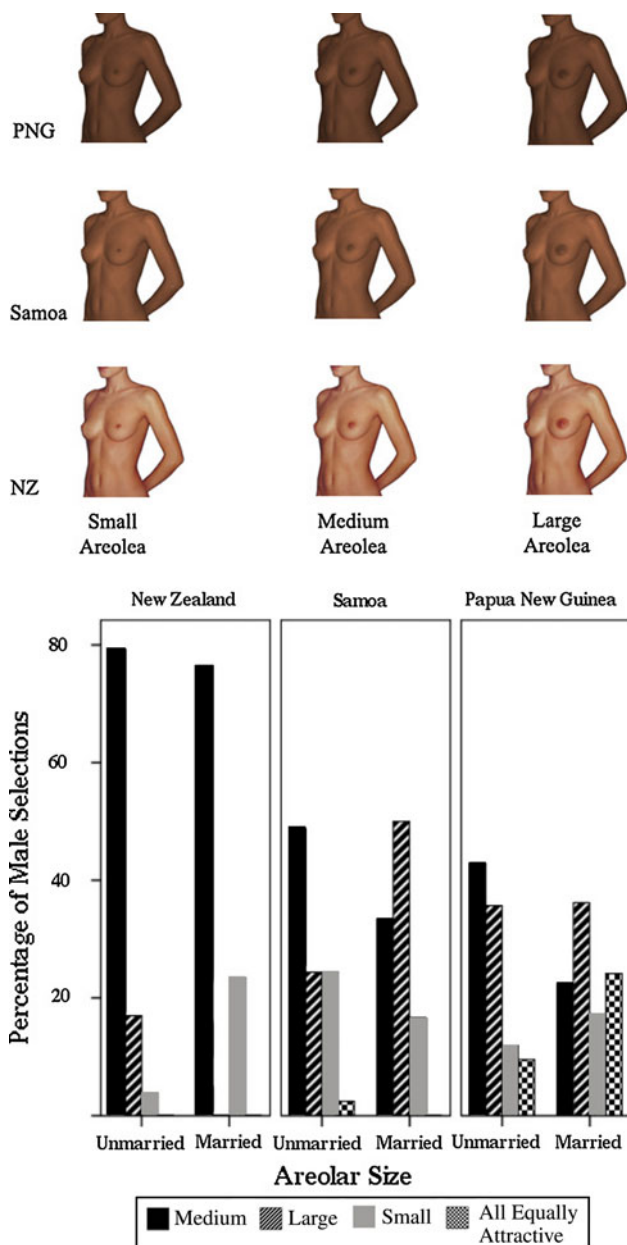


Fig. 3 Data are the percentage of selections made by married and unmarried men in each culture for images of women varying in areolar size. The images used in each culture are shown above the panels

studies of human morphology and physical attractiveness is to obtain cross-cultural data. The results reported here are the first of their kind for Polynesian and Melanesian men and they provide some useful comparisons, and contrasts, with the findings of studies among Caucasian men.

In the current study, men in each culture judged medium and large breasts as more attractive than small breasts. This provides some support for the hypothesis that men prefer large breasts as a cue to female fecundity, as women with larger breasts and narrow waists have significantly higher levels of estradiol during their menstrual cycles (Jasienska et al., 2004).

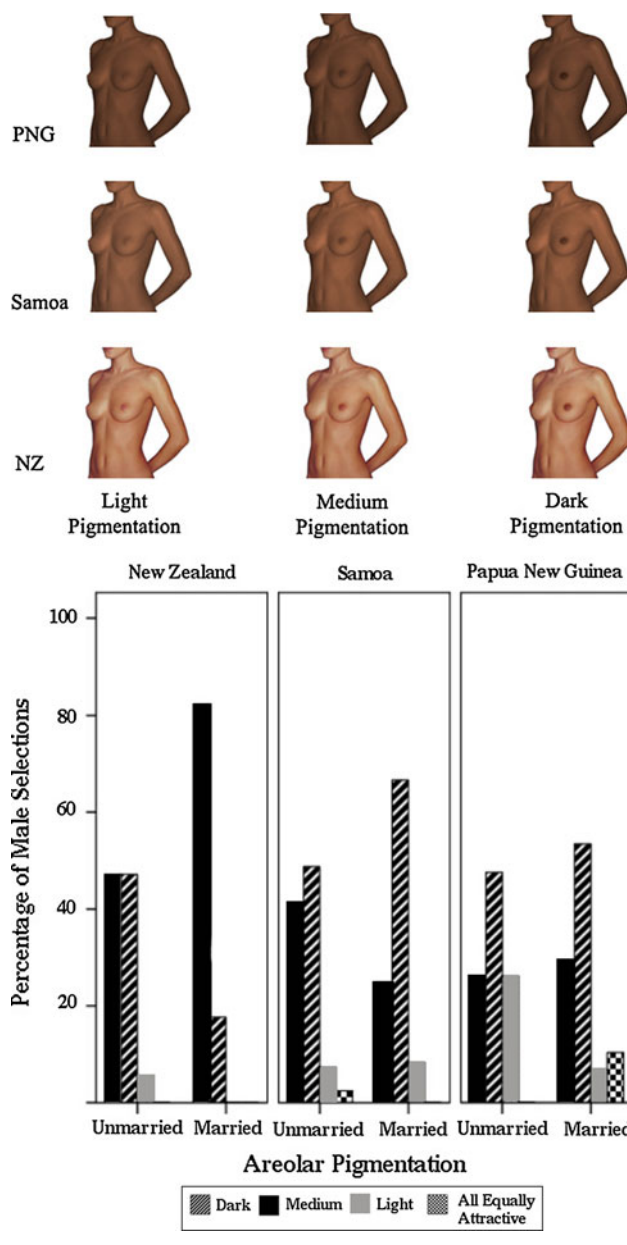


Fig. 4 The images used to test the role of areolar pigmentation in men’s judgments of women’s attractiveness are shown above the histograms. Data are the percentage of selections made by married and unmarried men in each culture for images of women varying in areolar pigmentation

The men we interviewed in PNG, all of whom were subsistence farmers, reported a greater preference for large breasts compared to men from Samoa and NZ. The physiological costs of pregnancy and lactation are considerable for women (Jasienska, 2009). Repeated pregnancies deplete energy reserves, which negatively affects female nutritional status (the maternal depletion syndrome) (Winkvist, Rasmussen, & Habicht, 1992). Maternal depletion has been documented among several ethnic groups in PNG (Garner, Smith, Baea, Lai, & Heywood, 1994; Tracer, 1991). Anderson, Crawford, Nadeau, and Lindberg (1992) have provided evidence that, in developing

nations and pre-industrial societies, men may prefer women who have higher levels of body fat as a cue to healthy storage of calories required for pregnancy and lactation. This may explain the greater preference for large breasts among subsistence farmers in PNG compared to men from Samoa and NZ. In such living conditions, where food is scarce and subsistence farming is very physically demanding, female fat distribution may provide direct information to men of female fecundity that may be of somewhat less importance in better-nourished cultures such as NZ.

Married men in each of these cultures stated a greater preference for large breasts than unmarried men. Why married men should be more sensitive to such traits is a difficult question, as evolutionary theory predicts that men, irrespective of marital status, should find young, healthy women most attractive as mates (Buss, 2003; Kenrick & Keefe, 1992; Symons, 1979). It may be that married men, whose partners have undergone changes in breast morphology due to pregnancy and lactation, have a learned preference for larger breasts. However, at present, this suggestion is purely speculative.

Bilateral symmetry may relate to underlying genetic quality and attractiveness in insects, birds, and mammals (Møller, 1999; Møller & Thornhill, 1998). In humans, symmetrical faces are rated as most attractive (Rhodes & Simmons, 2007). Female breast symmetry correlates with fecundity, as measured by the number of offspring, in samples from the UK, Spain, and, the U.S. (Manning et al., 1997; Møller et al., 1995). Caucasian men from North America rate symmetrical breasts as more physically attractive than asymmetrical breasts (Singh, 1995). We found that men in NZ, Samoa, and PNG rated symmetrical breasts as most attractive. It has been suggested that pathogens may negatively affect developmental stability which, in turn, is reflected in the degree of symmetry in morphological traits (Møller & Swaddle, 1997). People from cultures with high levels of pathogens may place a greater value on physical attractiveness in a potential partner as an indication of phenotypic quality (Gangestad & Buss, 1993). However, we found that men from NZ and Samoa reported the highest preference for symmetrical breasts whereas in PNG, where there is comparatively a much greater incidence of diseases such as malaria, only 34.5% of married men preferred symmetrical breasts. Thus, at present, our data did not support the hypothesis that men living in a higher pathogen environment have greater preferences for traits indicative of stronger immunity during development.

The nipple and areola in women may be sexual signals to men (Goodhart, 1964; Guthrie, 1976; Montagna & Macpherson, 1974). Given the relationship between female sexual maturation and areolar configuration (Biro et al., 1992; Garn et al., 1956), it is plausible that areolar size and shape affects male preferences for female breasts. Barber (1995) suggested that because there is no ecological or adaptive argument for cross-cultural variation in areolar size and configuration, such variation

in morphology “could be understood as a product of intersexual selection driven by arbitrary masculine tastes within reproductively, and culturally, isolated populations.” In the current study, male preferences for areolar size showed no distinct pattern across cultures. Men from PNG, the most culturally isolated group in this study, tended to prefer larger areolae. Similarly, in Samoa, unmarried men preferred medium-sized areolae and married men preferred the largest areolae. In contrast, the majority of men in NZ preferred the medium-sized areolae. To our knowledge, this study was the first attempt to quantify male preferences for female areolar size cross-culturally and our results suggest that male preferences for this female trait are culturally specific.

Women’s areolae are often lighter in the early stages of menarche, darken somewhat with age and considerably more during pregnancy and lactation (Garn & French, 1963; Garn et al., 1956; Muzaffar et al., 1998; Pawson & Petrakis, 1975). Thus, areolar pigmentation may be a signal of parity, with lighter pigmentation of the areolae signaling female nubility to men (Symons, 1995). In a study conducted in Austria and the U.S., men preferred lighter, red-colored areolae (Grammer, Fink, Juetter, Ronzal, & Thornhill, 2001). In the current study, areolar pigmentation had a significant effect on male preferences for images of female breasts. However, unlike the study by Grammer et al. (2001), men in PNG, Samoa, and NZ preferred medium or darkly pigmented areolae, with lightly pigmented areolae being judged least attractive. These results suggest that male preference for female areolar pigmentation reflects a preference for sexual maturity rather than youth and nubility.

The use of computer-generated stimuli in studies of human morphology and physical attractiveness allows for the role of traits in mate choice to be studied in isolation from surrounding traits. However, this method may be problematic. Firstly, using computer programs to match the skin color of a stimulus image to that of the population from which data are being collected does not produce an exact replication of skin color seen in real life. Secondly, some cultures may be more or less familiar with computers, which, in turn, could affect the way they judge computer-morphed images. Indeed, men from PNG and Samoa are far less familiar with computers than men from NZ. Furthermore, women’s breasts undergo considerable changes in their external appearance due to age and reproductive status (i.e., adolescent, adult, lactating). It has been suggested that these changes may affect female attractiveness (Gallup, 1982; Marlowe, 1998; Symons, 1995). Symons (1979, 1995), for example, suggested that the nulliparous breast shape should provide men with a signal of a woman’s age, health, and fertility. Men across cultures may, therefore, have a profound preference for breast shape that signals nulliparity. It should be noted that in this study no attempt was made to specifically model features indicative of pregnancy, lactational status, and other traits that may define multiparous breast morphology.

The firmness of the breasts, which changes due to age and repeated pregnancies, may be a strong determinant of female attractiveness (Marlowe, 1998). However, relatively few studies have been conducted to test these ideas and the computer-generated stimuli utilized in the present study are not sufficiently realistic to model such changes in breast morphology. Areolar pigmentation darkens during pregnancy and lactation, and areolar color was modeled in our study. However, such changes do not occur in isolation, and may not be relevant in the absence of associated changes in breast firmness as well as size. A challenge for future work will be to collect quantitative data on how men assess these aspects of women's breast morphology using natural images.

The current study demonstrates the danger in drawing conclusions about the role of human morphology in mate preferences when data are restricted to one culture. It will be important for future studies to expand data collection to include other cultures if meaningful conclusions are to be drawn on the effects of sexual selection on evolution of female breast morphology. We hope that this study stimulates further cross-cultural research on human physique and sexual attractiveness.

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