


Visual Perception of British Women's Skin Color Distribution in Two Nonindustrialized Societies, the Maasai and the Tsimane'

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Abstract

In women with lightly pigmented skin in particular, facial skin color homogeneity decreases with age, primarily due to chronic exposure to solar ultraviolet radiation (UVR), leading to a decrease in perceived health and attractiveness. Perception of female skin may be influenced by continuous exposure to, and thus familiarity with, age-related changes in visible skin condition in a given society. Men and women of two traditional societies, the Maasai (Tanzania) and the Tsimane' (Bolivia), unfamiliar with lighter colored skin, judged images of British women's facial skin for age, health, and attractiveness. In both samples, images with homogeneous skin color (from the cheeks of younger women) were judged to be younger and healthier and received a stronger preference than corresponding images with heterogeneous skin color (from older women). We suggest that (i) human sensitivity for quality-related information from facial skin color distribution is universal and independent of any known age-dependent variation in skin in a given population and (ii) skin discoloration is universally associated with less positive judgment.

Keywords

skin, women, perception, Maasai, Tsimane'

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Evidence suggests strongly that visible skin color distribution (i.e., the homogeneity of the skin chromophores melanin and hemoglobin), in addition to skin topography information and facial shape characteristics, has an effect on perception of facial age, health, and attractiveness. For example, visible facial color distribution in shape- and topography-standardized faces of females can account for up to 20 years of apparent age (Fink, Grammer, & Matts, 2006), and homogeneous skin coloration selectively increases visual attention toward female faces, resulting in more positive statements about a woman's face (Fink et al., 2008). Moreover, age, health, and attractiveness assessments of skin images, isolated digitally the left cheeks of British women, correlate with an objective, quantitative measure of homogeneity (Matts, Fink, Grammer, & Burquest, 2007)—skin images with homogeneous skin coloration are perceived to be younger, healthier, and more attractive compared with their counterparts displaying more heterogeneous skin color distribution.

Studies that have manipulated skin color distribution and skin surface topography in female faces reported that both

males and females are remarkably sensitive to even small changes in these features. Faces with skin surface topography cues removed are judged significantly younger and more attractive than their original (unmodified) counterparts (Samson, Fink, Matts, Dawes, & Weitz, 2010). Observers can detect at

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least a 20% visual change in skin surface topography. Similar effects have been reported for the manipulation of skin color distribution, showing that a smoothing of facial skin color distribution of approximately 25% has a significant effect on health perception (Samson, Fink, & Matts, 2011).

This evidence of the impact of visible skin color distribution on perception of age, health, and attractiveness has been derived almost exclusively from investigations performed by indigenous members of Western societies. A common concern is that perception may be influenced by numerous (nonbiological) factors, including a general familiarity with age-related changes in skin condition, and ubiquitous images representing a supposed “ideal” of youth, health, and beauty, created and propagated by various sectors of industry and media. Because this influence is virtually impossible to control for in an experimental study, conclusions about possible hardwired mechanisms in deciphering age and health cues from visible skin coloration, in addition to questions about the universality of such a mechanism, remain speculative.

In this present study, we investigated perception of age, health, and attractiveness of cropped skin images (obtained from the cheeks of British women) in two nonindustrialized societies, that is, the Maasai of Ngorongoro, Tanzania, and the Tsimane’ of lowland Bolivia. Should skin discoloration be a universal concern, independent from familiarity with age-related changes of that skin, we expected to observe similar assessments to those reported in studies using indigenous members of Western, industrialized society. That is, we expected skin images obtained from younger women, showing less discoloration than those of older women, to be judged as younger, healthier, and more attractive than their older counterparts.

Material and Method

Participants

Participants comprised 90 individuals (49 men, 41 women) of the Maasai, seminomadic pastoralists, of Endulen in the Ngorongoro Conservation Area (Tanzania) and 82 individuals (42 men, 40 women) of the Tsimane’, small-scale forager-horticulturalists, in the area of Beni in northern Bolivia. Both societies have little or no access to Western media (e.g., magazines or newspapers), and electricity is unavailable. The study sites are not located near tourist destinations. The age of Maasai participants ranged from 18 to 80 years ($M = 36.61$, $SD = 16.58$) and, in the Tsimane’, from 17 to 50 years ($M = 31.78$, $SD = 11.73$).

Ethical approval of the study protocol and consent procedures was obtained from local ethical committees at Moscow State University, protocol #55, 2015, the Tanzania Commission for Science and Technology, #2016-176-ER-2009-151, the University of Wrocław, and the Great Tsimane’ Council.

Stimulus Material

Our stimuli were 18 color images, isolated digitally from photographs of left profiles of female faces. These women were

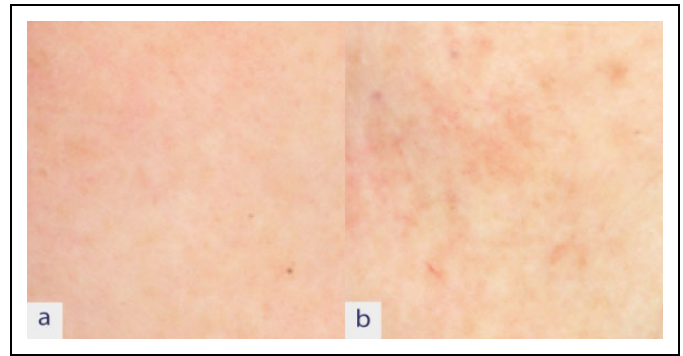


Figure 1. Skin images isolated digitally from the left hemiface of British women. Image “a” is chosen from the “young skin” set (little to no skin discoloration), and image “b” is from the “old skin” set (pronounced skin discoloration). The actual chronological age of the women who were imaged was 40 years (image “a”) and 74 years (image “b”).

photographed in the Reading area (United Kingdom) as part of a larger scale project on perception of female skin (see Matts & Fink, 2010, for review). The entire sample comprised 170 British women and girls from the ages of 11 to 76 years ($M = 37.39$, $SD = 17.35$). Photographs were collected using a custom digital imaging rig comprising a 6.2-megapixel digital single-lens reflex camera fitted with a 45 mm f/2.8 P lens (Nikon Corp, Tokyo, Japan), a fully cross-polarized multiple flash lighting system, and a chin rest to ensure accurate, reproducible positioning of individuals and overall component stability. This setup effectively eliminated visible high-frequency/low-amplitude skin surface topography (microtexture). Images were captured and stored in uncompressed format at a resolution of $3,277 \times 2,226$ pixels. No color correction or spatial filtering was applied to these images.

The cropped skin image samples from the left hemifaces had a size of 500×500 pixels and were taken from the same region of each face (Figure 1). The cheek area sampled was chosen as it was generally devoid of high-amplitude, low-frequency features (e.g., lines, wrinkles, furrows) that would have otherwise contributed significantly to visible contrast. Although the extraction of image samples was done automatically, some had to be adjusted slightly (i.e., moved to the left or right along the x -axis) when the selected region was partly covered by hair or included facial topography cues. Information on an objective measure of skin image homogeneity (Haralick’s homogeneity measure; Haralick, 1979) was available from analysis performed in a previous study (Matts et al., 2007).

Of the entire set of skin images, one to two images of each 5-year age cohort (using information on chronological age provided by female participants) were selected randomly (by computer) for inclusion in the stimulus set for the present study. Thus, we obtained a set of 18 images that were then printed on A6-sized glossy paper at a resolution of 133 dpi. The printouts were laminated and labeled (on the rear of each) with the female participants’ three-digit ID. This set was produced in duplicate, one set for presentation with the Tsimane’ (Bolivia) and another for presentation with the Maasai (Tanzania).

Table 1. Descriptive Statistics of Age, Health, and Attractiveness Perceptions of “Young Skin” and “Old Skin” Groups in the Maasai (a) and the Tsimane’ (b).

	Men		Women	
	Young Skin	Old Skin	Young Skin	Old Skin
	<i>M</i> (<i>SE</i>)	<i>M</i> (<i>SE</i>)	<i>M</i> (<i>SE</i>)	<i>M</i> (<i>SE</i>)
(a) The Maasai				
Age	0.67 (.03)	0.47 (.03)	0.54 (.03)	0.51 (.03)
Health	0.77 (.02)	0.50 (.03)	0.58 (.03)	0.52 (.03)
Attractiveness	0.70 (.03)	0.51 (.03)	0.61 (.03)	0.53 (.03)
(b) The Tsimane’				
Age	1.94 (.06)	1.23 (.07)	2.01 (.06)	1.49 (.07)
Health	2.08 (.06)	1.79 (.05)	2.17 (.06)	1.85 (.06)
Attractiveness	2.27 (.05)	1.93 (.07)	2.27 (.05)	1.93 (.07)

Procedure

In both societies, each participant viewed all 18 cards, one after the other, and was asked to assess them (in blocks) for age, health, and attractiveness. The order of blocks was randomized across participants, as was the order of images within each block (i.e., the investigator shuffled the cards before the start of each block). Participants were requested to estimate the age of the person the skin image corresponded to, judge the skin image for health, and provide a statement with regard to attractiveness. Participants received verbal instructions and their responses were recorded on paper by the investigators. They were allowed to look at the images for their decision as long as they wished. Responses were recorded as follows: Maasai: *age*, 0 = *old*, 1 = *young*; *health*, 0 = *unhealthy*, 1 = *healthy*; *attractiveness*, 0 = *dislike*, 1 = *like*; Tsimane’: *age*, 0 = *old*, 1 = *adult*, 2 = *young*, 3 = *baby*; *health*, 1 = *ill*, 2 = *average*, 3 = *healthy*; *attractiveness*, 1 = *unattractive*, 2 = *average*, 3 = *attractive*. Thus, in both samples, higher scores indicate that the respective skin image was perceived as younger, healthier, and more attractive by the participants compared with those receiving lower scores.

Results

For the analysis, the images were categorized into two sets (“young skin” vs. “old skin”), based on the chronological age of the person whom the image was taken from. The age range for young skin was 12–42 years ($M = 27.22$, $SD = 11.85$) and for old skin was 44–77 years ($M = 57.67$, $SD = 9.14$). Objective analysis of skin image homogeneity revealed a significant difference between the two sets, with young skin being more homogeneous than old skin (young: $M = 897.44$, $SD = 46.47$; old: $M = 806.89$, $SD = 56.87$; $t = 3.39$, $p < .01$).

Descriptive statistics of perceived age, health, and attractiveness scores of young skin and old skin images in the Maasai and Tsimane’ are reported in Table 1. To test for differences in age, health, and attractiveness, perceptions of young skin versus old skin and a possible effect of participants gender on

perceptions, mixed-model analyses of variance were performed with skin age-group as within-subject factor and gender as between-subjects factor, separately for the Maasai and the Tsimane’. In the Maasai, there was a significant main effect of skin age-group on perception of age, $F(1, 88) = 13.97$, $p < .001$, $\eta_p^2 = .14$; health, $F(1, 88) = 33.96$, $p < .001$, $\eta_p^2 = .28$; and attractiveness, $F(1, 88) = 16.77$, $p < .001$, $\eta_p^2 = .16$, and an effect of gender on perceptions of health, $F(1, 88) = 11.40$, $p < .001$, $\eta_p^2 = .12$, but not age, $F(1, 88) = 2.44$, $p = .12$, $\eta_p^2 = .03$, and attractiveness, $F(1, 88) = 1.34$, $p = .25$, $\eta_p^2 = .02$. Skin age-group and gender had a significant interaction effect on age and health assessment, age: $F(1, 88) = 8.14$, $p < .01$, $\eta_p^2 = .09$, health: $F(1, 88) = 13.90$, $p < .001$, $\eta_p^2 = .14$, but not on attractiveness: $F(1, 88) = 2.73$, $p = .10$, $\eta_p^2 = .03$. Thus, skin images obtained from young women were perceived as younger and received higher health and attractiveness ratings compared with those obtained from older women. Men provided more positive ratings than women, and this discrepancy in assessments was particularly evident for age and health assessments of young skin (Tukey’s test, young skin vs. old skin: men, $p < .001$, women, $p = .93$).

In the Tsimane’, there was a significant main effect of skin age-group on perception of age, $F(1, 80) = 86.87$, $p < .001$, $\eta_p^2 = .52$; health, $F(1, 80) = 22.52$, $p < .001$, $\eta_p^2 = .22$; and attractiveness, $F(1, 80) = 26.15$, $p < .001$, $\eta_p^2 = .25$, and an effect of gender on perception of age, $F(1, 80) = 6.39$, $p < .05$, $\eta_p^2 = .07$, but not health, $F(1, 80) = 2.13$, $p = .15$, $\eta_p^2 = .03$, and attractiveness, $F(1, 80) = 0.04$, $p = .95$, $\eta_p^2 = .00005$. No significant interaction effects of skin age and gender were detected, all $F(1, 80) < 2.05$, all $p > .16$, all $\eta_p^2 = .03$. Thus, men and women judged skin images of younger women as younger, healthier, and more attractive. Women’s age judgments were higher than men’s assessments, although, unlike the Maasai, no significant interaction effects of skin age-group and gender could be detected for the three attributes.

Discussion

Previous studies in Western samples showed that female skin coloration has a significant effect on visual perception of age, health, and attractiveness, both within whole faces and cropped skin images, and that this effect is independent of face shape and skin surface topography information (Fink, Matts, & Grammer, 2006). Moreover, the objective assessment of female skin coloration has revealed that the evenness of melanin and hemoglobin concentrations in skin correlates significantly and positively with assessments of youth, health, and attractiveness (Matts et al., 2007). The present study shows that these visual assessments of skin quality are not limited to Western observers but extend even to societies unfamiliar with lighter colored skin.

To date, it has been unclear if and to what extent perception of age, health, and attractiveness of facial skin might be driven by the observer’s familiarity with age- and health-related change within their own skin type. Since we are exposed constantly to significant individual variation within our own skin type, it is, therefore, possible that responses to age-/health-

related cues of skin discoloration are learned and do not reflect an adaptation. Indeed, the majority of studies on skin-derived cues of quality have been conducted in Western, educated, industrialized, rich, and democratic (WEIRD) societies (Henrich, Heine, & Norenzayan, 2010) and extrapolated to universal human behavior.

Our directly observed data suggest strongly that perception of skin color evenness transcends WEIRD societies. Given the similarities of age, health, and attractiveness perception in the Maasai and Tsimane' with that previously reported from industrialized societies, and the lack of evidence for cross-cultural transmission effects on quality assessments of lightly pigmented skin in these societies, we conclude that human sensitivity to variation in facial skin color distribution is a universal feature. The ability to perceive age- and health-related variation in facial skin contrast may have evolved to identify features that are particularly relevant in the assessment of female quality in the selection of mating partners. We do not propose that humans have been adapted to skin evenness per se but suggest that sensitivity to derive age- and health-related information from facial skin color distribution may have developed in consequence of selection pressures to identify young and healthy partners, and this sensitivity may be universal.

One may speculate that such selection pressure has acted more strongly on men than on women (which may explain higher male assessments of young skin in the Maasai). However, it is known from investigation of Western samples that facial skin color distribution plays a role in both men and women, in terms of age, health, and attractiveness perceptions (Fink et al., 2006, 2012; Matts et al., 2007). Whether women of preindustrialized societies are sensitive to variation in male facial skin color distribution needs to be tested. We consider this plausible, given the skin images we used in the present study were independent of facial context. Likewise, future studies should also investigate whether indigenous members of Western societies can discern age- and health-related skin quality cues of members of preindustrialized societies such as the Maasai and the Tsimane'. We consider this likely, as the human eye is highly sensitive to visual contrast and as age, health, and attractiveness assessments of facial skin are probably based on detecting contrast cues. However, we also expect own population skin characteristics to be more nuanced than that of other populations.

In conclusion, we suggest that human sensitivity for quality-related information from facial skin color distribution may be universal and independent of any known age-dependent variation in skin in a given population, as age, health, and attractiveness assessments of facial skin are driven by the assessment

of skin contrast. Cross-cultural comparison of visual skin color distribution perception in relation to skin type (lighter vs. darker pigmentation), however, may reveal variation in people's sensitivity to skin contrast cues and related assessments of skin quality.

Declaration of Conflicting Interests

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