The Online
ANGLE ORTHODONTIST
An International Journal of Orthodontics and Dentofacial Orthopedics
79th Anniversary 1930-2009

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The Angle Orthodontist: Vol. 75, No. 6, pp. 953–958.

Preferences for Facial Profiles Between Mexican Americans and Caucasians

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ABSTRACT

The objective of this study was to determine differences between Mexican American and Caucasian judges in the acceptability of lip protrusion in computer animations of two male and two female persons of Mexican descent. Thirty Caucasians and 30 Mexican Americans of varying age, sex, education, and level of acculturation responded to facial profile computer animations that moved lips from an extreme protrusive to an extreme retrusive position. Judges were asked to complete two tasks: (1) to press the mouse button when the image was perceived to be most pleasing (MP) and (2) to determine the boundaries of a zone of acceptability (ZA) of lip protrusion by pressing the mouse button when the moving image became acceptable and releasing it when the image of the protrusion became unacceptable. In general, Mexican Americans preferred upper or lower lip positions to be less protrusive than did Caucasians. Larger mean ZAs for both upper and lower lip positions with male computer animation images and lower lip position for female computer animation images were found among Caucasians when compared with low-acculturated Mexican Americans. A significant mean difference in midpoint of acceptability (MA) for lip position between Caucasians and low-acculturated Mexican Americans was observed for both upper and lower lip position with female computer animation images.

KEY WORDS: Computer imaging, Orthodontics, Esthetics.

Accepted: November 2004. Submitted: October 2004

INTRODUCTION Return to TOC

Attention to physical appearance, particularly of the face, has become a very important issue in modern society.[1] Although evidence exists for a universal standard for proportions involved in facial attractiveness,[2] there may be differences in perception of the soft tissue drape among ethnic groups. Specifically, there are no studies determining whether the anthropometric bases of the profile preferences of Hispanic groups residing in the United States differ from existing standards. This deficiency is surprising because Hispanics will most likely become the largest US ethnic minority.[3,4]

Although there appears to be considerable agreement across cultures about what facial anatomical relationships are attractive, there are variations in the soft-tissue drape related to possible cultural influences on the perception of attractiveness.[5] Nevertheless, Martin[6] found that American whites and American blacks share a common esthetic standard: the Caucasian facial model. On the other hand, the African

group rated Caucasian features attractive less often than did either American group. Farrow et al[7] selected 15 African American patients at random in an attempt to discover what African Americans find attractive about their profiles. Lateral photographs were taken and altered by computer to produce four different profile types, which differed in horizontal lip position. In response to the photographs displayed to African American and Caucasian lay persons, general dentists, and orthodontists, African Americans preferred a profile that was straighter than the norm for their race but more protrusive than Caucasian standards. Thus, African Americans prefer a straighter but not necessarily Caucasian profile that, as Peck and Peck[8] note, is the product of many cultural mechanisms and media reinforcements operating in our society. Using the Downs and Steiner analyses, Garcia[9] found that Mexicans were more bimaxillary prognathic than Caucasians.

Acculturation is defined as the process of learning and behavioral adaptation that takes place when individuals are exposed to a new culture.[10] As a minority group, Hispanics are exposed to the mainstream cultural patterns of the United States that are expected to modify their values, norms, attitudes, and behaviors. Because one of the most easy and reliable measures of acculturation-related changes is language use, a “Linguistic Proficiency Subscale” of the Bidimensional Acculturation Scale for Hispanics[11] was used in this study. This subscale, which consists of 12 items, has the highest validity of all the subscales. A low score indicates a low acculturation level. According to Gurin et al[12] low-acculturated Mexican Americans tend to live and work in ethnically segregated communities in which English is not spoken. They are also usually first generation immigrants who have spent most of their lives in Mexico and have had fewer opportunities to interact with Caucasians and other ethnic groups.

Modern technological advances and increased availability of computer software assist patient-clinician communication related to diagnosis and treatment planning. Using custom computer software, animated sequences of discrete image distortions of patient profiles have been used to assess profile preferences.[1,13–16] This interactive computer program enables patients to participate actively in treatment planning decisions by visualizing a variety of profile changes that could be achieved with orthodontic treatment or in conjunction with orthognathic surgery. Moreover, it is possible to determine a “dynamic range rather than a single point of acceptable changes to the patient.”[17] The objective of the present study was to compare Mexican American preferences for lip protrusion with those of Caucasians and relate these differences to the level of acculturation of Mexican Americans.

MATERIALS AND METHODS Return to TOC

Recruitment and selection of judges

Thirty Mexican American and 30 Caucasian volunteers, ranging from 18 to 65 years of age (36% in the 18–33 age interval, 43% in the 34–49 age interval, and 21% in the 50–65 age interval), who were parents of orthodontic patients participated in this study. For the purpose of this study, Caucasians were defined as any persons born in the United States of European descent. Dental professionals, dental students, and orthodontic patients were excluded to avoid biases in the profile judgments based on education or experience.

Color digital photographs of the profile view of two adult men and two adult women of Mexican descent were obtained. The subjects for the pictures had normal Class I molar and canine relations with overbite and overjet of 2 ± 1 mm. The photographs were taken in natural head position with the lips closed at rest at a standardized distance of five feet and with a calibration ruler behind the head. The background for all the photographs was adjusted for optimal brightness and contrast using the computer software program Adobe Photoshop 5.0 (Adobe Systems Inc, San Jose, Calif). The photos were then imported to a computer file and digitized using the customized PERCEPTOMETRICS™ (Health Programs International, Wellesley, Mass) software program.[13–16] The lips of the unaltered images were distorted horizontally to extreme protrusive and extreme retrusive positions. The upper lip was defined by subnasale to the interlabial gap; the lower lip was defined by the interlabial gap to supramentale.

The program allows for the creation of 20 or more frames of profile images in both the protrusive and retrusive directions from the unaltered image. For this project a total of 43 frames were created, 21 in each direction from the unaltered image. The animation settings in the PERCEPTOMETRICS™ program were interframe delay of 259 ms and animation pause delay of 3000 ms. Because of anatomical limitations, the distance between the unaltered image and the extreme retrusion was greater than the distance between the unaltered and the extreme protrusion in those subjects who already had relatively more protrusive lips in the unaltered photograph. As shown previously,[18,19] differences in distances between the morphing extremes and the unaltered picture have little influence on perception even though they alter the velocity of the apparent movement. The protrusion of the lips was measured as the distance from the most protrusive point on the upper (ls) and lower (li) lips to the E-line[20] extended from pronasale to pogonion.

Experimental procedure and data collection

All judges completed a four-item questionnaire about their ancestry, age, sex, and level of education. In addition, Mexican American judges were asked to fill out a Short Acculturation Scale[11] in English or Spanish.

After having an opportunity to practice with the computer animation, judges were asked to complete two tasks. In Task One, the judges were asked to indicate the most pleasing lip (MP) position by pressing the left mouse button in response to six counterbalanced displays of the moving image. In three trials the image moved from the extreme protrusion position (P) and in another three trials the image moved from the extreme retrusion position (R) in this sequence: R P, P R, R P, R P, P R, and R P. In Task Two, the judges were asked to

indicate a range or zone of acceptability (ZA) by depressing the left mouse button when the lip position in the image became acceptable and releasing the button when it was no longer acceptable because the images moved in counterbalanced order for six trials between the protrusive and retrusive extremes. The distance between the mean of the retrusive and protrusive boundaries provided the range of acceptability for each image (ZA) from which the midpoint of acceptability (MA) was determined.

Data analyses

The PERCEPTOMETRICS™ program uses an x (horizontal) and y (vertical) coordinate system to generate responses to each of the digitized points on the unaltered image, which subsequently move with each frame of the created movie. When the judges depress the mouse button to indicate the most pleasing image, the x and y coordinates for all the digitized points of the most pleasing (MP) frame are generated. In this study, all the distortions were horizontal and only x coordinates were analyzed.

Using Adobe Photoshop 5.0, the E-line was drawn on each of the four unaltered images for calculation of the horizontal distances and direction of the upper lip and lower lip from the E-line. For example, for the first female image in Figure 1, the distances of the upper and lower lips to the E-line were −3.5 and 0.0 mm, respectively; for the second female image, −5.5 and −3.5 mm; for the first male image, −2.0 and +3.0 mm; and for the second male image, −5.0 and −3.5 mm.

Using a spreadsheet, the x (horizontal) coordinates of the upper and lower lips of the unaltered images were subtracted from the x coordinates of the frame rated by the judges as the MP. The same procedure was followed for the frames selected for the retrusive and protrusive boundaries that determined the ZA. The distance (mm) was then computed between the unaltered image and the image the judges selected as MP for Task One or for the acceptable protrusion or retrusion boundaries in Task Two. The mean ± SD for the six trials in each of the two tasks (MP and ZA) of each image was then obtained.

The data recorded in the PERCEPTOMETRICS™ program were analyzed relative to the E-line for each of the two male images and the two female images separately; that is, x distances from the lips of the unaltered images to the E-plane were added or subtracted according to the PERCEPTOMETRICS™ data so that the unaltered images could be quantified relative to the E-line. Because same-sex between-face correlations were statistically significant ($P < .05$; coefficient of correlations based on two male images ranged from 0.287 to 0.553 and for the two female images ranged from 0.246 to 0.517), the measurements from the two male images were averaged, as were the data from the two female images, producing simplified sex-related records based on the E-plane as a superimposition reference.

The responses of the judges for five lip positions were obtained according to the method of Kitay et al.[17] (1) R: The average point at which the feature became acceptable when the image was moved from the extreme retrusion toward the unaltered and from the unaltered toward the extreme retrusion. (2) P: The average point at which the feature became acceptable when the image was moved from the unaltered toward the extreme protrusion and from the extreme protrusion toward the unaltered. (3) ZA: Determined by subtracting the R and P distance at which the profile became acceptable from the R and P distances at which the feature was no longer acceptable. (4) MA: The midpoint between the mean R and P boundaries ([P − R]/2 + R). (5) MP: The subject's preferred profile for that image.

Analysis of variance (ANOVA) followed by the post hoc Scheffé test were used to determine statistically significant differences in mean responses for the lip positions among the high-acculturated Mexican Americans, low-acculturated Mexican Americans, and Caucasians for each image with the sex separated. Pearson correlations were used to test between-face position associations. Data collected from the four people appearing in the images were analyzed using the same statistical methods to detect differences between self-evaluation and evaluation of others.

RESULTS Return to TOC

Acculturation

R, P: The mean of two female images was 0.20 ± 2.05 mm for lower lip protrusion of low-acculturated Mexican Americans compared with 1.90 ± 1.31 mm for Caucasians ($P \leq .002$); mean upper lip protrusion was −3.23 ± 2.03 mm for low-acculturated Mexican Americans compared with −1.61 ± 1.10 mm for Caucasians ($P \leq .002$). For the combined male images, the mean upper lip protrusion for low-acculturated Mexican Americans was −2.41 ± 2.43 mm compared with −0.66 ± 1.64 mm for the Caucasians ($P \leq .018$).

ZA: Low- and high-acculturated Mexican Americans were compared with Caucasians. Only for the male image was significance found; the mean upper lip ZA was 5.88 ± 2.59 mm for low-acculturated Mexican Americans compared with 7.57 ± 2.16 mm for Caucasians ($P \leq .049$).

MA: Low and high-acculturated Mexican Americans were compared with Caucasians. For MA, the mean lower lip for the female image of the low-acculturated Mexican Americans was −2.58 ± 1.93 mm compared with −1.35 ± 0.84 mm for the Caucasians ($P \leq .008$). The upper lip of the low-acculturated Mexican Americans MA was −5.96 ± 2.10 mm compared with −4.69 ± 0.76 mm for the Caucasians ($P \leq .016$).

Response differences by gender

In general, no significant mean differences were found between the preferred female image and male profile images for Caucasians, low-acculturated Mexican Americans, or high-acculturated Mexican Americans.

Self-evaluation

The results reported above were based on the data analysis of 60 subjects and included the four subjects whose faces were used as stimulus images. In general, the self-evaluations of faces were similar to the results obtained from the other 56 judges.

DISCUSSION Return to TOC

The primary hypothesis was that preferred lip positions for the male and female computer animation images would be different between Mexican Americans and Caucasians. In the present study, a statistically significant mean difference was found for both male and female computer animation images between the low-acculturated Mexican Americans and the Caucasians in the mean preferred positions of the lower and upper lip. When comparing high-acculturated Mexican Americans and Caucasians, a statistically significant mean difference was found for preferred lip position of lower lip and upper lip in response to the female images only. Foster[20] and Czarnecki et al,[21] on the other hand, using profile silhouettes, found that the judges preferred more protrusive lips in females than in males. For ZA, Caucasian judges indicated a greater ZA than the low-acculturated Mexican Americans for both the upper lip and lower lip of the computer-animated male faces. For the female image, only the ZA for lower lip was greater for the Caucasians compared with low-acculturated Mexican Americans.

Based on the premise that facial profile preferences are cultural in character and therefore would be influenced by ethnic norms, a second hypothesis was that the preferred lip positions would differ between the Caucasians and low-acculturated Mexican Americans and would not differ between the Caucasians and high-acculturated Mexican Americans. In support of this hypothesis, significant mean differences were found between the Caucasians and low-acculturated Mexican Americans for the MA of the lower lip and upper lip for female computer animation images. Low-acculturated Mexican American judges preferred MP upper and lower lip positions to be less protrusive than the Caucasians, for both male and female computer animation images.

The final hypothesis was that the judges' preferences in lip protrusion would differ from the Ricketts E-line norm,[22] defined as the straight line connecting the tip of the nose (pronasale) to the most protrusive point on the chin (soft tissue pogonion). The E-line norm for Caucasians is that the upper lip should be −3 ± 2 mm to the E-line and the lower lip should be −2 ± 2 mm to the E-line. Only the mean lower lip measurement for the ZA among Caucasian judges for male computer animation images was found to be significantly larger than the Ricketts norm for Caucasians.

For several of the comparisons, the sample sizes were too small for demonstration of significant differences. However, even if the samples had been large enough to detect statistical significance, the differences found may not be clinically significant for individual patients because the effect sizes were all less than one mm. Burcal et al[23] took profile view photographs of two males and two females and altered them to simulate incremental postsurgical horizontal changes at pogonion of two, four, six, and eight mm. Only about half of a group of lay people could recognize a four mm profile change in photographs, and at least a six mm change was required before it could be noted by more than two-thirds of the lay people. Romani et al[23,24] demonstrated greater sensitivity in a study in which respondents evaluated pairs of images differing by one, three, or five mm in horizontal mandibular or maxillary position. They found that approximately 60% of the lay people could detect one mm changes, whereas approximately 90% of them could detect changes of three mm.

CONCLUSIONS Return to TOC

1. Mexican Americans in this study preferred upper or lower lip positions to be less protrusive than the Caucasians, particularly for female computer animation images.

2. With female computer animation images, a significant difference exists between mean MA lower and upper lip positions between Caucasians and low-acculturated Mexican Americans as compared with Caucasians and high-acculturated Mexican Americans.

3. The mean lower lip protrusion preference among Caucasian judges for male computer animation images was significantly higher than the Ricketts norm for Caucasians.

4. The PERCEPTOMETRICS™ method aids the clinician in determining peoples' profile preferences.

ACKNOWLEDGMENTS

We would like to thank the National Institute of Dental and Craniofacial Research for supporting this study under grant DE 10292.

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FIGURES Return to TOC

Click on thumbnail for full-sized image.

FIGURE 1. Three sample frames (maximum retrusive, unaltered, and maximum protrusive) of the two men and two women used for the computer animations

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