ORIGINAL ARTICLE

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Influence of facial convexity on facial attractiveness in Japanese

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Dates: Accepted 24 January 2007

To cite this article:

Ioi H, Nakata S, Nakasima A, Counts AL: Influence of facial convexity on facial attractiveness in Japanese *Orthod Craniofacial Res* 10, 2007; 181–186

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Structured Abstract

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Objective – The purpose of this study was to assess and determine the range of the top three most-favored facial profiles for each sex from a series of varying facial convexity, and to evaluate the clinically acceptable facial profiles for Japanese adults. **Design** – Questionnaire-based study.

Subjects and methods – Silhouettes of average male and female profiles were constructed from the profiles of 30 Japanese males and females with normal occlusions. Chin positions were protruded or retruded by 2°, 4°, 6°, 8° and 10°, respectively, from the average profile. Forty-one orthodontists and 50 dental students were asked to select the three most-favored profiles for each sex, and they were also asked to indicate whether they would seek surgical orthodontic treatment if that image represented their own profile.

Results – For males, both the orthodontists and dental students chose the average profile as the most-favored profile. For females, both the orthodontists and dental students chose a slightly more retruded chin position as the most-favored profile. Japanese raters tended to choose class II profiles as more acceptable profiles than class III profiles for both males and females.

Conclusions – These findings suggest that Japanese patients with class III profiles tend to seek surgical orthodontic treatment more often.

Key words: facial attractiveness; facial convexity; facial esthetics; orthodontics

Introduction

When orthodontists develop a treatment plan for patients, they should utilize the established normal values for each ethnic group. For example, the average antero-posterior (A-P) lip position in Japanese adults is regarded to be relatively protrusive compared with that of Caucasians (1). It is important to consider the perceptions of a pleasing profile, because the goal of orthodontic treatment is to improve the patients' life by enhancing dental and jaw function and dentofacial esthetics (2). For Japanese males, a straight profile has historically been favored, whereas for Japanese females, a more convex profile has been favored (3). Although evidence exists that class II profiles are regarded as less attractive than class III profiles in some western countries (4–7), there has not been ample evidence to support what is facially attractive to the Asian people (8,9).

There are many patients that are considered borderline in determining whether a case warrants surgical or orthodontic camouflage treatment. In these cases, although cephalometric analysis can be useful, the decision-making process is largely based on subjective clinical judgment from the facial profile point of view. However, there is a lack of scientific evidence to guide the clinician on the range of skeletal discrepancy that is esthetically acceptable.

The purpose of this study was to assess and determine the range of the top three most-favored facial profiles of each sex from a series of varying facial convexity in facial silhouettes, and to evaluate the clinically acceptable facial profiles for Japanese adults. Facial silhouettes were chosen for rating facial profiles, rather than facial photos, to avoid subjective considerations (4,10).

Materials and methods Construction of the average Japanese facial profile

Average Japanese silhouettes were constructed from 30 cephalometric radiographs (15 males and 15 females) of Japanese adults aged 22–26 years. Inclusion criteria for this study was a Subspinale-Nasion-Supramentale (ANB) angle between 2 and 5°, a normal occlusion with minor or no crowding, all teeth present except third molars, no previous orthodontic treatment, and no prosthetic replacement of teeth. The mean and SD for soft tissue measurements were determined for each gender. Using these mean values, the average Japanese profile silhouettes were constructed for males and

females, respectively. The detailed process of constructing the average profile was reported in previous papers (11,12). The values of soft tissue measurements in this average profile were found to be within 1 SD of the current Japanese cephalometric norms (13).

Reliability

To assess the error of the method, 10 cases were randomly selected and traced at three separate times. Oneway analysis of variance, used to test the equality of means for the cephalometric measurements suggested that it was done in a consistent matter. Mean Scores for the soft tissue measurements (p = 0.82) did not significantly differ between three separate measurements. The method error can thus be considered negligible.

Construction of a series of profiles

The changes in facial convexity (G'–Sn–Pg') were generated by altering the A-P position of the chin without changing the vertical dimension. Chin positions were protruded or retruded by 2° , 4° , 6° , 8° , and 10° , respectively, from the average profile based on G'–Sn line. In each silhouette, the lips were morphed maintaining the lip outline and the lip protrusion in relation to the Sn–Pg' for males and females, respectively. In the course of this manipulations, the values of nasolabial angle were changed from 84° to 104° for males and 90° to 110° for females to fit each of the chin positions. A series of 11 profiles were developed and arranged for males and females on the A4 paper (Fig. 1). Since the values of 1 SD of facial convexity were $\pm 2.9^{\circ}$ for males and $\pm 4.9^{\circ}$ for females (12), these 11 profiles accounted for the possible



Fig. 1. Series of 11 profiles rated by orthodontists and dental students for males (upper row) and females (lower row).

A-P growth variations of jaw relationships in Japanese. The profile with the average facial convexity (no. 6) occupied the middle position in the series. From left to right, profile no. 1 depicted the most retrusive chin position, and no. 11 the most protrusive chin position.

Profile raters

The profile raters were 41 Japanese orthodontists (20 males, 21 females; age 33.0 ± 9.5 years), and 50 dental students in the fifth grade (29 males, 21 females; age 23.6 ± 2.3 years) from Kyushu University in Fukuoka, Japan. They were asked to choose the top three consecutive most-favored profiles for each sex. They were also asked to indicate, using the response choices of yes or no, whether they would seek surgical orthodontic treatment if that image represented their own profile.

Statistical analysis

The Fisher's exact probability tests were used to compare the differences in the scores between the top three most-favored profiles and the other profiles, and to compare the proportion of judges seeking surgical treatment between class II (nos 1–5) and class III (nos 7–11) profiles. A probability of <0.05 was considered as statistically significant.

Results

The most-favored Japanese facial profiles



For the orthodontist raters, the top three most-favored male profiles were 6, 5, and 7 (Fig. 2a), while the

For males, 78% of the orthodontists and 82% of the dental students would seek surgical treatment if their

Fig. 2. The distribution of the most-favored profiles: (a) orthodontists and dental students rating males, (b) orthodontists and dental students rating females.

most-favored female profiles were 5, 4, and 6 (Fig. 2b). The scores of the top three profiles for males and females were significantly larger than the other profiles (p < 0.05). For the dental students, the three most-favored male profiles were 6, 5, and 7 (Fig. 2a), while the most-favored female profiles were 5, 4, and 3 (Fig. 2b). The scores for the top three profiles for males were significantly larger than the other profiles (p < 0.05). The scores in these top three profiles for females were significantly larger than the other profiles (p < 0.05). The scores in these top three profiles for females were significantly larger than the other profiles (p < 0.05), except between nos 3 and 6. The range of the following soft tissue measurements associated with these most-favored profiles was determined: facial convexity, nasolabial angle or Z-angle (Table 1).

For males rated by both the orthodontists and the dental students, the most-favored facial convexity values ranged from 9.5° to 13.5° . The most-favored nasolabial angle values ranged from 93.0° to 95.0° . The most-favored Z-angle values ranged from 67.0° to 71.0° (Table 1).

For females rated by the orthodontists, the most-favored facial convexity values ranged from 13.2° to 17.2° . The most-favored nasolabial angle values ranged from 100.0° to 102.0° . The most-favored Z-angle values ranged from 63.0° to 67.0° (Table 1). For females rated by the dental students, the most-favored facial convexity values ranged from 15.2° to 19.2° . The most-favored nasolabial angle values ranged from 101.0° to 103.0° . The most-favored Z-angle from 101.0° to 103.0° . The most-favored Z-angle values ranged from 101.0° to 103.0° . The most-favored Z-angle values ranged from 61.0° to 65.0° (Table 1).

The clinically acceptable facial profiles

Table 1. Rar	nge of preferred	I Japanese facia	I profile values rated	d by orthodontists	and dental students
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	Orthodontists		Dental students	
Variables	Male	Female	Male	Female
Facial convexity (G'–Sn–Pg') (°)	9.5–13.5	13.2–17.2	9.5–13.5	15.2–19.2
Nasolabial angle (Cm-Sn-Ls) (°)	93.0–95.0	100.0-102.0	93.0–95.0	101.0–103.0
Z-angle (chin/lip line to FH plane) (°)	67.0–71.0	63.0–67.0	67.0–71.0	61.0–65.0



Fig. 3. The percentage of raters who would seek treatment if the images represented their profile: (a) orthodontists and dental students judging males, (b) orthodontists and dental students judging females.

profiles were represented by no. 11, a class III profile (Fig. 3a). On the other hand, 56% of the orthodontists and 68% of the dental students would seek surgical treatment if their profiles were represented by no. 1, a class II profile (Fig. 3a). Class III (nos 7–11) profiles showed a significantly larger proportion of judges seeking surgical treatment than class II (nos 1–5) profiles in the orthodontists (p < 0.05), while there was no significant difference in the proportion of judges seeking treatment between class II (nos 1–5) and class III (nos 7–11) profiles in the dental students.

For females, 85% of the orthodontists and 96% of the dental students would seek surgical treatment if their profiles were represented by no. 11, a class III profile (Fig. 3b). On the other hand, 63% of the orthodontists and 66% of the dental students would seek surgical treatment if their profiles were represented by no. 1, a class II profile (Fig. 3b). Class III (nos 7–11) profiles showed significantly larger proportion of judges seeking surgical treatment than class II (nos 1–5) profiles in both the orthodontists and dental students (p < 0.05).

Discussion

The objectives of orthodontic treatment are to achieve facial balance, through stabilization of the dentition, and the production of pleasing facial and dental esthetics (14). Therefore, it is important to identify and define the characteristics of a pleasing face, as well as those of a functioning occlusion. Our predecessors, including philosophers and artists, attempted to define beauty. However, it was difficult to determine the standards of beauty, because of the tremendous variations among people occupying different racial groups (12). We have previously reported that Japanese orthodontists and young adults prefer a more retruded lip position than the average Japanese lip position, even though their profiles have historically been characterized by more protruded lip features (11,12,15). These studies suggested that cephalometric values outside the normal range should be consider when tailoring an individual treatment plan. For the Japanese, it has been historically recognized that a more straight profile would be favored for males, and a more convex profile would be favored for females (3). Our hypothesis is that the perception of facial preference may be around the average profile on the basis of facial convexity. Perceptions may also differ regarding how acceptable facial esthetics are between class II and class III profiles.

The most-favored Japanese facial profiles

If the raters in this study chose the average profile as the most-favored one, they should have selected no. 6. Both the orthodontists and dental students chose no. 6 as the most-favored profile for males. This finding suggests that it would be helpful to use the Japanese cephalometric normal values when evaluating A-P chin position from the esthetic point of view. However, for females, both the orthodontists and dental students chose no. 5 as the most-favored profile. The tendency to prefer a slightly more class II profile was evident for the dental students. The judgement of facial attractiveness has been thought to depend on the individual's taste. However, psychologists reported that individuals are inclined to prefer neutral-looking faces representing the mathematical average of faces within the studied population (16,17). In this study, although this concept is applicable to facial preference for males, it was not the case for females, who prefer a slightly more class II profile. According to a study using a Caucasian sample by Perrett et al. (18), the faces people found most attractive were deliberately exaggerated computer-generated images, depicting higher cheek bones, a thinner jaw and larger eyes, than the average face. These facial features correspond with the soft tissue facial pattern of young adults. Peck and Peck (19) suggested that there might be an association between human facial preference and age-related features signaling youthfulness and, by extension, fertility, a powerful evolutionary selection pressure. The facial preference tendency for females in our study support his proposal, that is, a slightly more retruded chin position which equates with more vouthful-looking faces, were favored by Japanese raters.

For males, the orthodontists and dental students preferred the same ranges of facial convexity, nasolabial angle and Z-angle, respectively. For females, the dental students preferred a slightly more retruded chin position than the orthodontists, differing by $1.0-2.0^{\circ}$.

The clinically acceptable facial profiles

The questionnaire to indicate whether they would seek surgical orthodontic treatment if that image represented their own profiles would reflect the judgments of professional raters. In this study, Japanese raters tended to choose class II profiles as more acceptable profiles than class III profiles for both males and females. There is also evidence that in Japan, most cases requiring orthognathic surgery are those that exhibit class III profiles (20). These tendencies might result from not only the increased prevalence of class III patients in Japan (21,22), but the perception of Japanese people that they are less attractive. Conversely, in some western countries, class II profiles were rated overall as less attractive than class III profiles (4–7). The exact reason of the difference regarding the preference of facial profiles among different countries is unknown. However, it is important to recognize that ethnic or a racial difference may exist for the preference of facial profiles among different countries.

In this study, we found that in relation to A-P chin position, an average profile was favored for Japanese males and a slightly class II profile was favored for Japanese females. Japanese patients with class III profiles tended to seek surgical orthodontic treatment more often. However, all patients should not be treated to look alike. Some patients might not want their facial features altered to those considered to be the mostfavored by others. Different racial groups have different perceptions of what is attractive.

Conclusions

- 1) For male profiles, both the orthodontists and dental students chose the average profile as the most-favored profile.
- For female profiles, both the orthodontists and dental students chose a slightly more retruded chin position as the most-favored profile. This tendency was more evident for the dental students.
- In the estimation of both the orthodontists and the dental students for males, the ranges of the mostfavored facial convexity, nasolabial angle, and Z-angle values were 9.5–13.5°, 93.0–95.0°, and 67.0–71.0°, respectively.

- In the estimation of the orthodontists for females, the ranges of the most-favored facial convexity, nasolabial angle, and Z-angle values were 13.2– 17.2°, 100.0–102.0°, and 63.0–67.0°, respectively.
- 5) In the estimation of the dental students for females, the ranges of the most-favored facial convexity, nasolabial angle, and Z-angle values were 15.2– 19.2°, 101.0–103.0°, and 61.0–65.0°, respectively.
- 6) Japanese raters tended to choose class II profiles as more acceptable profiles than class III profiles for both males and females. Japanese patients with class III profiles tended to seek surgical orthodontic treatment more often.

Additional research, on the issues of the preference of facial profiles for the 'lay judges' of different age groups appears to be warranted.

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