

# Evaluation of well-balanced lip position by Japanese orthodontic patients

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**Introduction:** The purposes of this study were to assess and determine the range of a well-balanced anteroposterior lip position as evaluated by orthodontic patients from a series of varying lip positions in facial silhouettes, and whether the rater's sex and age were factors in the assessment. **Methods:** The average profiles were constructed from 30 Japanese male and female subjects with normal occlusion. A series of 13 profiles was developed for males and females, respectively. The lips were protruded or retruded by 1-mm increments from the average profile. One hundred fifty Japanese orthodontic patients were asked to choose the top 3 most-favored, well-balanced profiles for each sex. **Results:** The orthodontic patients tended to prefer a slightly retruded lip position than the average facial profile for both the male and female profiles. There was no significant difference between male and female raters in selecting the top 3 most-favored profiles. In the comparison of age groups, the over 30-year-old patients significantly preferred a more retruded lip position than did the 15- to 19-year-old and the 20- to 29-year-old patients for the female profile. **Conclusions:** These results suggest that, when we formulate a treatment plan, we should ask the patients about lip position before we start treatment. (Am J Orthod Dentofacial Orthop 2011;139:e291-e297)

Facial attractiveness influences personality development and social interactions.<sup>1-3</sup> According to Miller,<sup>4</sup> people mainly focus on another person's eyes and mouth during interpersonal interactions, with little time spent on other facial features. Therefore, the mouth is a highly influential characteristic of facial attractiveness.<sup>5,6</sup> Moreover, a large majority of orthodontic patients cite facial esthetics as a strong motivator for seeking treatment.<sup>7-12</sup> Therefore, it is important to set treatment goals of creating a well-balanced and proportional face and obtaining well-aligned dental arches. Facial esthetics are often evaluated from a proportional aspect by using the lateral view of the face from cephalometric radiographs

or facial photographs. In particular, the relationship between the lips and chin position is critical in evaluating the facial profile.

Many studies of a well-balanced Japanese facial profile were conducted between the 1950s and 1970s by Izuka and Ishikawa,<sup>13</sup> Yamauchi,<sup>14</sup> Yamauchi and Sakuda,<sup>15,16</sup> Yamauchi et al,<sup>17</sup> Iwasawa et al,<sup>18,19</sup> and Shishikura.<sup>20</sup> They reported that a pleasing Japanese female profile was characterized by a slightly retruded mandible having a large interincisal angle. However, the present Japanese perception of a pleasing facial profile might be changing to a more internationally pleasing one. Foster<sup>10</sup> evaluated the profile preferences among various ethnic groups by using silhouettes. The results indicated that the diversified groups seemed to share a common esthetic standard for the posture of the lips within 1 to 2 mm in most cases. This is because young Japanese adults experience more exposure to mass media, such as the Internet and worldwide communications and travel. Therefore, it is important to determine whether the present orthodontic facial standards are an adequate reflection of today's facial esthetic preferences.

The well-balanced Japanese profile has been evaluated by dental professionals and art students, who were professionally educated or disciplined in facial esthetics. Consequently, so far, no study has yet attempted to quantify the lip position of the most attractive Japanese profiles as evaluated by orthodontic patients.

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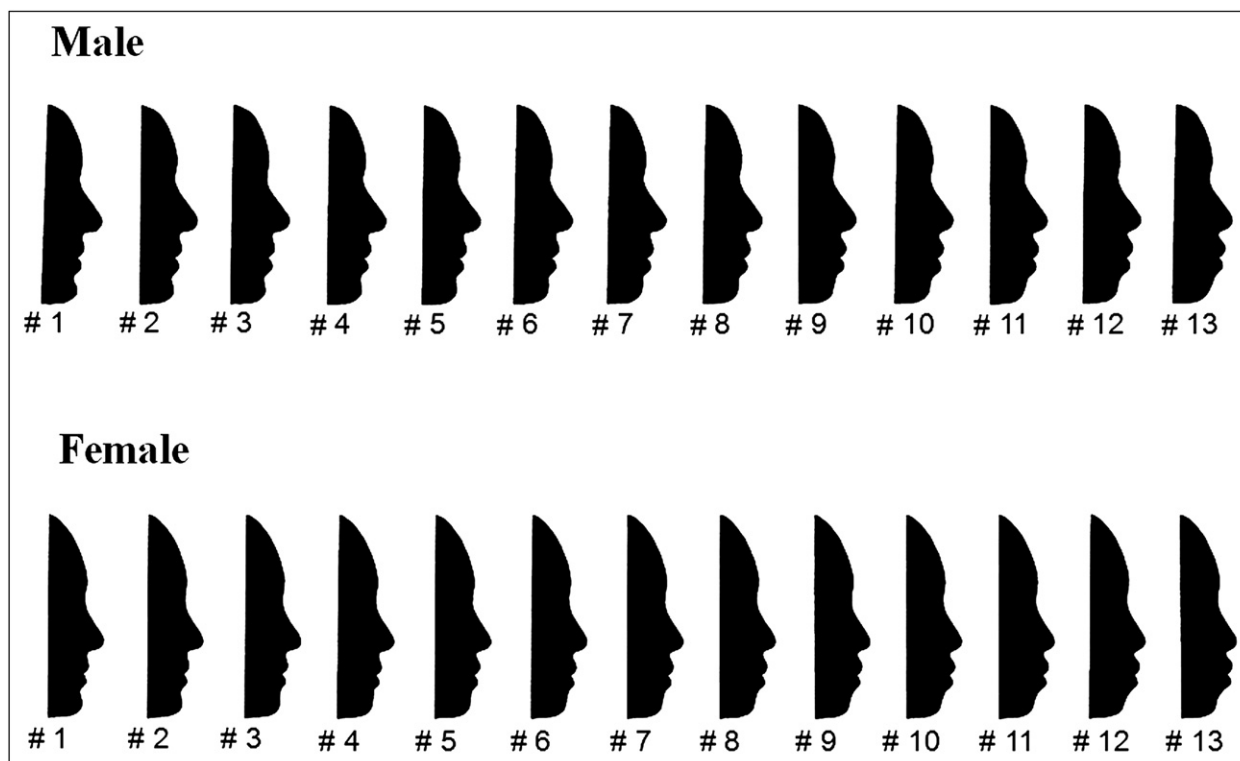


Fig 1. Series of 13 profiles rated by orthodontic patients for men (upper row) and women (lower row).

Shaw et al<sup>21</sup> and Prah-Andersen<sup>22</sup> reported that dental professionals are conditioned to take an overly critical view of any deviation from the norm. Giddon<sup>23</sup> emphasized that orthodontists must establish esthetic goals that correlate with the public's standards at that time. In light of these facts, it is important to assess the well-balanced lip position as evaluated by orthodontic patients so that they will be satisfied with their orthodontic outcomes.

The purposes of this study were to assess and determine the range of well-balanced anteroposterior lip positions as evaluated by orthodontic patients from a series of varying lip positions in facial silhouettes, and to elucidate whether the rater's sex and age were factors in the assessment.

#### MATERIAL AND METHODS

This study was performed in accordance with the guidelines of the Helsinki Declaration (1996).

Average Japanese silhouettes were constructed from 30 cephalometric radiographs (15 men, 15 women) of patients aged 22 to 26 years. The inclusion criteria for this study were an ANB angle between 2° and 5°, normal occlusion with minor or no crowding, all teeth present

Table I. Age distribution of the orthodontic patients

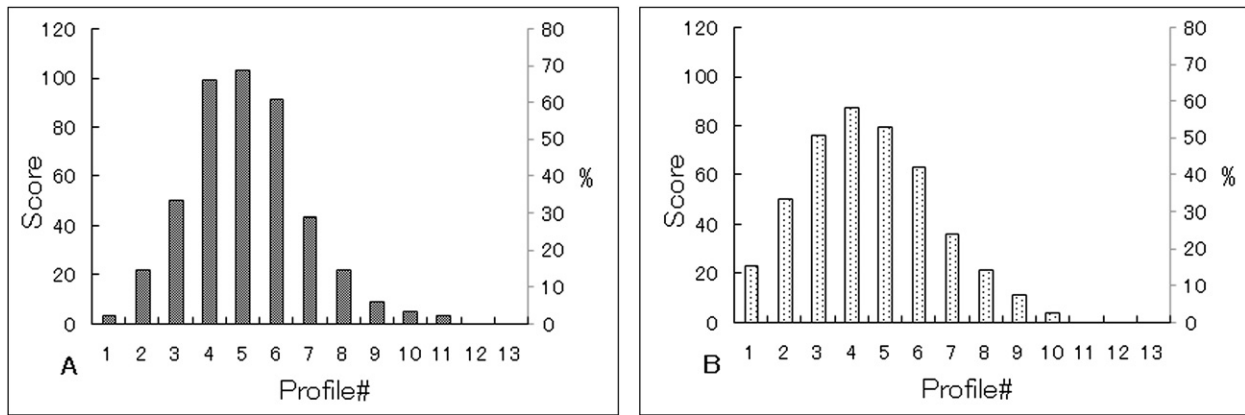
Age (y)	Sex (n)	
	Male	Female
15-19	21	34
20-29	22	42
Over 30	7	24

except the third molars, no previous orthodontic treatment, and no prosthetic replacement of teeth.

The detailed methods for constructing an average Japanese facial profile were described in a previous article.<sup>24</sup>

A series of 13 profiles was developed for men and women, respectively (Fig 1). In the series, the average profile (number 7) was located in the center. The lips were protruded or retruded in 1-mm increments from the average profile, and the lip positions were changed parallel to the Frankfort horizontal plane. Profile number 1 was the most retractive, and number 13 was the most protrusive.

The profile raters were 150 Japanese orthodontic patients 15 years of age or older, treated at Kyushu



**Fig 2.** Distribution of the most-favored profiles: **A**, orthodontic patients rating men; **B**, orthodontic patients rating women.

**Table II.** Range of preferred Japanese lip protrusion values by the orthodontic patients

Variable	Range	
	Male	Female
Upper lip protrusion (Ls to Sn-Pg) (mm)	3.4 to 5.4	2.5 to 4.5
Lower lip protrusion (Li to Sn-Pg) (mm)	2.7 to 4.7	2.4 to 4.4
Upper lip to E-line (Ls to E-line) (mm)	-5.5 to -3.5	-4.5 to -2.5
Lower lip to E-line (Li to E-line) (mm)	-2.0 to 0	-1.5 to 0.5
Z-angle (chin-lip line to FH plane) (°)	72.0 to 75.0	73.0 to 75.0
Nasolabial angle (Cm-Sn-Ls) (°)	104.0 to 107.0	109.0 to 115.0

**Table III.** Range of least-preferred Japanese lip protrusion values by the orthodontic patients

Variable	Range	
	Male	Female
Upper lip protrusion (Ls to Sn-Pg) (mm)	10.4 to 12.4	9.5 to 11.5
Lower lip protrusion (Li to Sn-Pg) (mm)	9.7 to 11.7	9.4 to 11.4
Upper lip to E-line (Ls to E-line) (mm)	2.5 to 4.5	2.5 to 4.5
Lower lip to E-line (Li to E-line) (mm)	5.0 to 7.0	5.5 to 7.5
Z-angle (chin-lip line to FH plane) (°)	61.5 to 64.5	66.0 to 68.0
Nasolabial angle (Cm-Sn-Ls) (°)	93.5 to 96.5	88.0 to 94.0

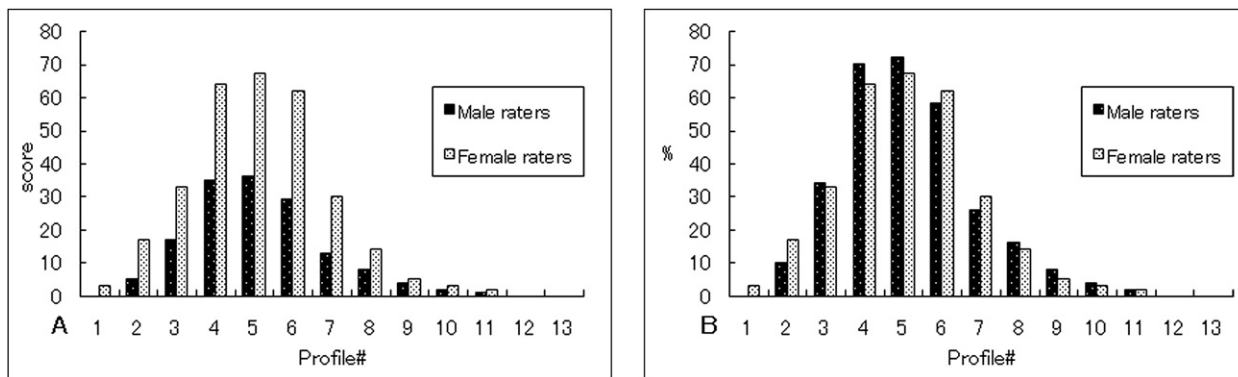
University Hospital (50 male; age, 22.7 ± 8.0 years; 100 female; age, 24.5 ± 8.8 years). Dental specialists, dental students, and art students were excluded from this study. The raters were asked to choose the top 3 most-favored, well-balanced profiles for each sex. We gave a score of 1 to each the top 3 most-favored profiles. The age distribution of the orthodontic patients is shown in Table I.

**Statistical analysis**

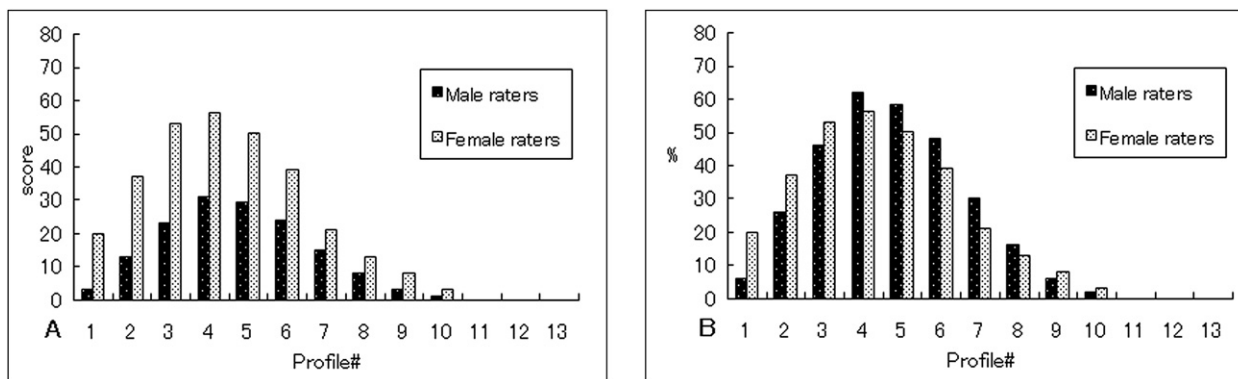
Chi-square tests were used to compare the differences in the scores between the top 3 most-favored profiles and the other male and female profiles.<sup>25</sup> This test was also used to compare the sex and age-group differences in selecting the top 3 most-favored profiles. A probability of less than .05 was considered to be statistically significant.

**RESULTS**

The top 3 most-favored male profiles were numbers 5, 4, and 6 in that order (Fig 2, A). The scores in these top 3 profiles were significantly higher than the secondary favored profiles (*P* < 0.05). The top 3 most-favored female profiles were numbers 4, 5, and 3 (Fig 2, B). The scores in the top 3 profiles were not significantly higher than the secondary favored profiles. From the numbers 4, 5, and 6 profiles for the male profile and the numbers 3, 4, and 5 profiles for the female profile, the range of the following soft-tissue measurements was determined: lip protrusion to Sn-Pg and the esthetic line, Z-angle, and nasolabial angle for men and women (Table II). For the male profile, the most-favored lip protrusion values relative to Sn-Pg were 3.4 to 5.4 mm for the upper lip and 2.7 to 4.7 mm for the lower lip. The most-favored lip protrusion ranges relative to the esthetic line were -5.5 to -3.5 mm for the upper lip and -2.0 to 0 mm for the lower lip. The range of the most-favored Z-angle values was 72.0° to 75.0°. The range of most-favored nasolabial angle values was 104.0° to



**Fig 3.** Comparison of the distribution for the most-favored male profiles between the male and female patients: **A**, male and female patients rating men (score); **B**, male and female patients rating men (%).



**Fig 4.** Comparison of the distribution for the most-favored female profiles between the male and female patients: **A**, male and female patients rating women (score); **B**, male and female patients rating women (%).

107.0°. For the female profile, the ranges of the most-favored lip protrusion values relative to Sn-Pg were 2.5 to 4.5 mm for the upper lip and 2.4 to 4.4 mm for the lower lip. The most-favored lip protrusion ranges relative to the esthetic line were -4.5 to -2.5 mm for the upper lip and -1.5 to 0.5 mm for the lower lip. The range of the most favored Z-angle values was 73.0° to 75.0°. The range of most-favored nasolabial angle values was 109.0° to 115.0°. The 3 least-favored lip positions were numbers 11, 12, and 13 for both the male and female profiles (Fig 2). From these 3 consecutive least-favored profiles, the range of the unesthetic lip protrusion values was determined (Table III).

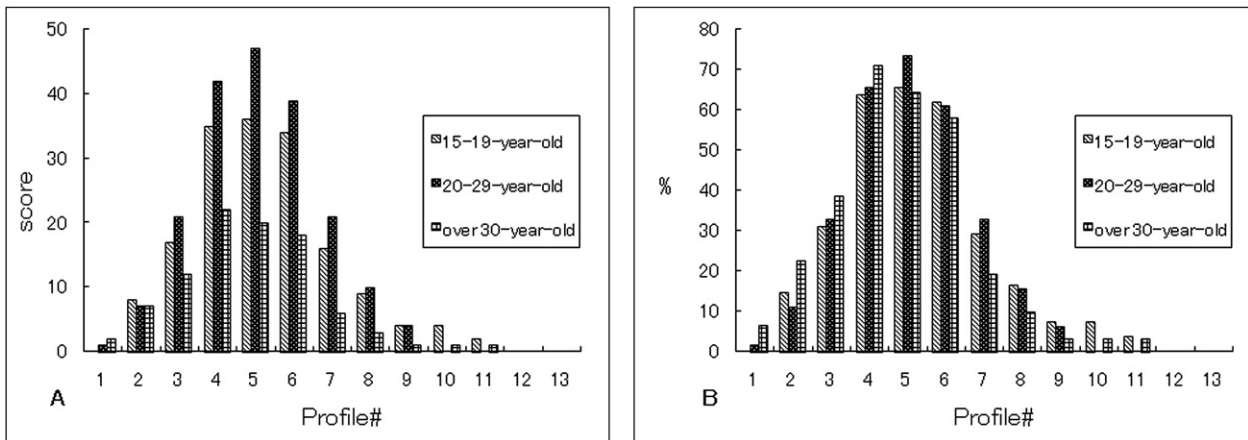
For comparisons between the male and female raters, the top 3 most-favored male profiles were 5, 4, and 6 for both the male and female raters (Fig 3). The top 3 most-favored female profiles were 4, 5, and 6 for the male raters and 4, 3, and 5 for the female raters (Fig 4). Although the female raters tended to prefer a more

retruded lip position than did the male raters, no significant difference was observed between the 2 groups.

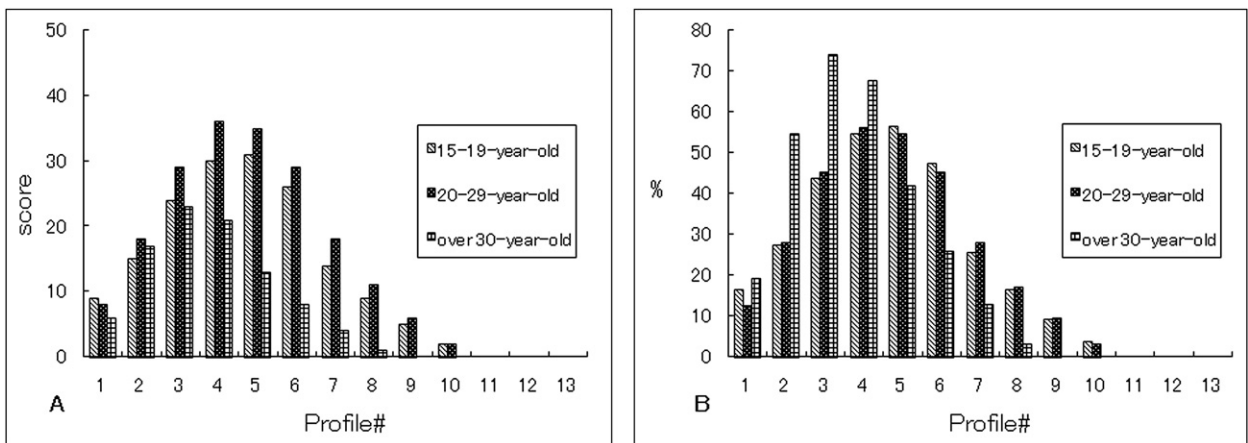
For the comparison of age groups, the top 3 most-favored male profiles were 5, 4, and 6 for both the patients aged 15 to 19 and 20 to 29 years. These were 4, 5, and 6 in the over 30-year-old patients in that order (Fig 5). The top 3 most-favored female profiles were 5, 4, and 6 in the 15 to 19-year-old patients and 4, 5, 3, or 6 in the 20 to 29-year-old patients. The order was 3, 4, and 2 in the over 30-year-old patients (Fig 6). The over 30-year-old patients significantly preferred a more retruded lip position than the other age groups for the female profiles.

**DISCUSSION**

The media cannot be ignored as a major source of influence for defining cultural standards. The mass media are influential in unifying the public's tastes. Internet,



**Fig 5.** Comparison of the distribution for the most-favored male profiles among the different age groups: **A**, the 3 age groups rating men (score); **B**, the 3 age groups rating men (%).



**Fig 6.** Comparison of the distribution for the most-favored female profiles among the different age groups: **A**, the 3 age groups rating women (score); **B**, the 3 age groups rating women (%).

television, motion pictures, magazines, books, and newspapers all provide daily reinforcement for facial stereotypes.<sup>26</sup> People who are potential candidates for orthodontic treatment are likely to be profoundly influenced by such media. The hypothesis is that the perception of beauty might have changed based on increased world-wide access to variations in pleasing facial profiles. Considering the possibility that the perception of beauty might also have changed with the passage of time, we believed it was reasonable to reevaluate the perception of well-balanced, pleasing faces of Japanese people in the 21st century.

Silhouettes were used in this study instead of photographs to assess a profile outline shape. By using silhouette images, all extrinsic and intrinsic distracting variables (such as hairstyle, make-up, and skin complexion) were eliminated. These variables could influence an evaluator's

esthetic score rating.<sup>27</sup> Spyropoulos and Halazonetis<sup>28</sup> reported that the esthetics score was significantly influenced by hairstyle rather than profile outline shape. Elimination of these variables allowed the evaluators to focus on the profile.

In a study with frontal photographs, Langlois and Roggman<sup>29</sup> suggested that attractive faces were only average and are consistent with evolutionary pressures that favor characteristics close to the mean of the population and with cognitive processes that favor prototypical category members. On the other hand, Alley and Cunningham<sup>30</sup> reported that some facial features with atypical dimensions such as large eyes, cheekbones, and chins for men were more attractive than the same features with average dimensions. They concluded that an average facial appearance is preferred, but not ideally attractive. In a profile study, Miyajima et al<sup>31</sup> reported



that there has been a gradual shift in preference toward a flatter facial profile than the typical Japanese, due in part to the influence of Europeans and Americans. In this study, the orthodontic patients tended to prefer a slightly more retruded lip position than the average facial profile for both the male and female profiles. This tendency was more evident for the female profile. These results suggest that it might be preferable to make the treatment plan not only by using the skeletal or soft-tissue mean values, but also taking into account the patient's preference of a facial profile.

Farrow et al<sup>26</sup> reported that laypeople tended to show a greater preference for a straighter profile than orthodontists, and bimaxillary profiles were selected as the least-favored profiles by both laypeople and orthodontists. On the contrary, MacKoy-White et al<sup>32</sup> reported that orthodontists preferred flatter profiles than laypeople. Chan et al<sup>33</sup> also reported that the bimaxillary retruded profile was more highly ranked by orthodontists than by dental students and laypeople, although the differences were not statistically significant. We found that orthodontic patients favored a more retruded lip position than the average silhouette for both the men and women. Our previous study demonstrated that orthodontists favored a retruded lip position (-3 to -1 mm) compared with the average Japanese female profile.<sup>24</sup> The orthodontic patients, particularly the female ones, appeared to favor a more retruded lip position (-4 to -2 mm) than the orthodontists for the female profile. These results suggested that, when we make a treatment plan, we should query the patients about lip position before we start treatment. Some patients might want their facial features altered to those they consider to be well-balanced rather than those considered attractive by orthodontists.

For comparisons between the male and female raters, although there was no difference in selecting the top 3 most-favored male profiles in this study, the female raters tended to prefer a more retruded lip position than the male raters for the female profiles. Farrow et al<sup>26</sup> reported that the female raters preferred a slightly more retrusive profile than the male raters. Our results also confirmed that there might be some sex difference in evaluating the female profile.

There have so far been few studies investigating facial preference among different age groups. Recently, many people spanning a wide range of ages have sought orthodontic treatment. Therefore, this study was conducted to investigate whether different age groups prefer different facial profiles. Bishara et al,<sup>34</sup> who investigated facial and dental changes in adulthood, reported that the relative changes in the position of the lips compared with nose and chin position cause the lips to

appear more retrusive at 46 years old than those at 25 years for both the male and female profiles. Formby et al<sup>35</sup> reported that the male profile straightened with age, and both lips became more retrusive. Therefore, it was expected that the patients over 30 years of age would not prefer the retruded lip position that was typical of aging facial features. However, these patients significantly preferred a more retruded lip position than those aged 15 to 19 and 20 to 29 years in regard to the female profiles. Udry<sup>36</sup> reported that older raters did not rate youthful faces as attractive. Patients over 30 years of age might prefer more age-appropriate profiles. Consideration must therefore be given to the sample size for the over 30-year-old patients because of the relatively small sample size in this study. Although it was still useful for analyzing the groups to evaluate whether there were any interesting trends, the groups were available samples, and there might have been some bias.

The perception of Japanese laypersons in evaluating the soft-tissue profile might be different from that of the orthodontic patients. Additional research on the issue of assessing the preference of the soft-tissue profile among Japanese laypersons with a large sample size thus appears to be warranted.

## CONCLUSIONS

1. The orthodontic patients tended to prefer a lip position that was slightly retruded compared with the average facial profile for both the men and women. This tendency was more evident for the female profile.
2. Although there was no sex difference in selecting the top 3 most-favored male profiles, the female raters tended to prefer a more retruded lip position than the male raters for the female profile.
3. For the comparison of age groups, there was no difference in selecting the top 3 most-favored male profiles among the different age groups. However, the patients over 30 significantly preferred a more retruded lip position than those aged 15 to 19 and 20 to 29 years for the female profile.

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