

# Evaluation of Anteroposterior Lip Positions in the Most-Favored Iranian Facial Profiles Using Silhouette

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## Abstract

**Objective:** One of the most important goals of orthodontic treatment is to create an esthetic, well balanced facial profile. However, the components of a well-balanced Iranian facial profile have not yet been established. The purpose of this study was to evaluate the anteroposterior lip position of the Iranian population and to compare the perception of orthodontists, dental students and orthodontic patients using a series of silhouettes with varying anteroposterior lip positions.

**Materials and Methods:** Average female and male silhouette profiles were constructed from the profiles of 30 Iranian men and women with a normal skeletal relationship. The lips in each average profile were protruded or retruded in 2-mm increments and the 7 images were arranged randomly. Thirty orthodontists, 30 dental students and 30 orthodontic patients were asked to score each silhouette from 1 (very bad) to 5 (very good).

**Results:** Both the orthodontists and the students preferred the average profile for men and slightly more retruded lip position for women. Orthodontic patients had a wide range of preference for men and selected more retruded lip positions for women. The least-favored profile was the most protrusive in the 3 groups.

**Conclusion:** These findings suggest that Iranian orthodontists, dental students and orthodontic patients prefer an average profile for men and slightly retruded profiles for women.

**Key Words:** Orthodontics; Esthetics; esthetics; lip

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## INTRODUCTION

"Esthetics" is a Greek term meaning the people's concept of beauty and attractiveness. This is a true subjective phenomenon [1], so everybody has their own concept about esthet-

ics and this fact causes a society to believe thick lips look beautiful but in another society, thin lips are preferred. Factors such as age, sex, race, maturity, and educational and cultural levels may influence the people's concept

of esthetics [2-6]. Today, the role of soft tissue in orthodontic diagnosis and treatment planning is increasing and soft tissue is considered as not only the primary limitation of treatment, but also the most important factor in measuring the treatment success rate [7,8]. Lip position has an important effect on facial profile esthetics that makes orthodontists align the anterior teeth carefully based on the patient preference [9-15].

The concepts of non-orthodontists as a group over whom treatment is performed, should be regarded in determining a well-balanced, pleasing profile, because the most important goal of orthodontic treatment in today's soft tissue paradigm is to create an esthetic profile [16-17]. The concepts of laypersons beside orthodontic patients and clinicians were evaluated in former studies and the differences between them were analyzed [18]. Increasing internationalization in the recent years makes it inevitable that the future orthodontic community will consist of orthodontists and patients of various races or ethnicities in different countries [19-34]. Therefore, being aware of the preferences for facial esthetics of various races is crucial for orthodontists.

Evaluation of well-balanced faces using silhouette has been conducted in Japanese [35] and Korean [36] populations; however, there are no studies of profiles evaluated by Iranian young adults who may become orthodontic patients. The aim of this study was to determine the perceptions of Iranian orthodontists, young adult dental students and orthodontic patients of well-balanced, pleasing profiles and to compare these perceptions.

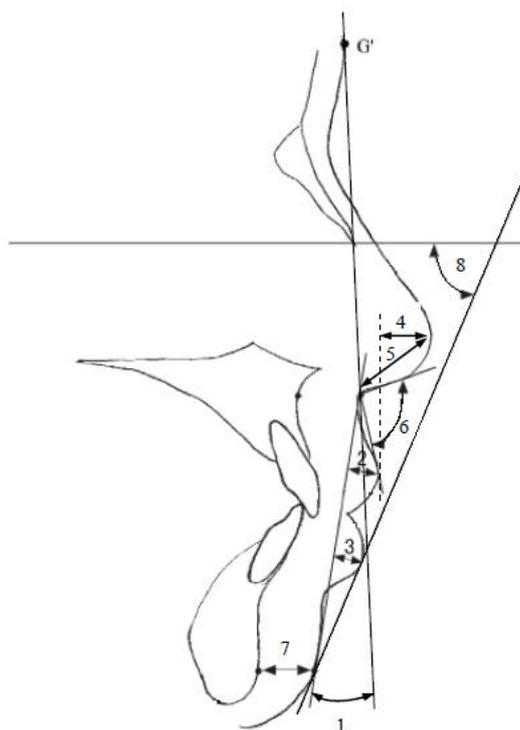
In order to rate facial profiles, facial silhouettes were chosen rather than facial photos, to decrease subjective considerations [37-38]. The purpose of this study was to evaluate the anteroposterior lip position of the most-favored, pleasing profiles of each sex from a series of varying lip positions in facial silhouettes.

#### MATERIALS AND METHODS

At first, 30 cephalometric radiographs (15 men and 15 women) of adolescents and young adults aged 20 to 23 years were traced and an average profile was constructed accordingly. All lateral cephalometric radiographs were taken at natural head position with the teeth in maximum intercuspation.

**Table 1.** Soft and Hard Tissue Landmarks Used in the Study.

Landmark		Explanation
1.Glabella	G'	The most anterior point on the soft tissue forehead
2.Nasal tip point	Pn	The most anterior point on the sagittal surface of the nose
3.Subnasal	Sn	Point at which nasal septum merges with the upper cutaneous lip in the midsagittal plane
4.Columella point	Cm	The point tangent with the lower surface of the nose from Sn
5.Labra superius	Ls	The most anterior point on the upper lip
6.Stomion superius	Sto.S	The most inferior point on the upper lip vermilion
7.Labrale inferius	Li	The most anterior point on the lower lip
8.Pogonion	Pg	The most anterior point on the hard tissue chin
9.Soft tissue pogonion	Pg'	The most anterior point on the soft tissue chin



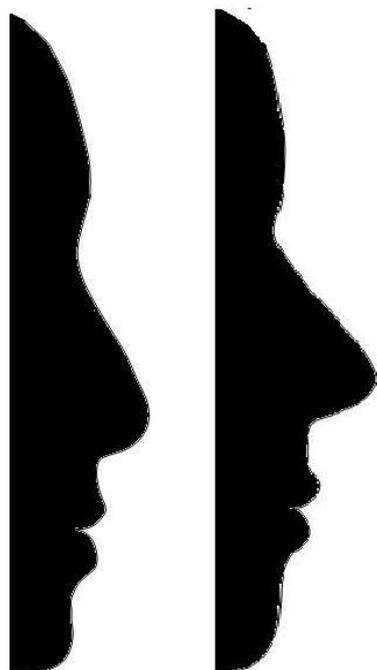
**Fig 1.** Soft tissue cephalometric reference points and analysis: 1, facial convexity ( $G'-Sn-Pg'$ ); 2, upper lip protrusion ( $Ls$  to  $Sn-Pg'$ ); 3, lower lip protrusion ( $Li$  to  $Sn-Pg'$ ); 4, nasal prominence ( $Ls-Pn$  parallel to  $FH$ ); 5, nasal length ( $Pn-Sn$ ); 6, nasolabial angle ( $Cm-Sn-Ls$ ); 7, chin thickness ( $Pg- Pg'$ ); 8, Z-angle (chin/ lip line to  $FH$  plane)

To unify the cephalograms in terms of magnification and other cephalometric errors, all the cephalograms were taken in a single center and exposed at 100 kV, 10 mA. Cephalograms with improper head positioning and discluded teeth were excluded. Inclusion criteria for this study were an ANB angle between  $2^\circ$  and  $5^\circ$ , Frankfort mandibular plane angle of a  $22^\circ$ - $28^\circ$ , normal inclination of upper and lower incisors (normal upper 1 to SN and IMPA), normal overjet and overbite, presence of all teeth except third molars and no previous orthodontic treatment.

All cephalograms were traced and digitized by an operator using Dolphin Imaging software version 10 (Dolphin Imaging, Chatsworth, California, United States). Cephalometric analyses were performed with the same program on a personal computer.

To assess method error, all the cases were traced at 2 separate times and one-way analysis of variance performed to assess the equality of means for the cephalometric measurements. Results did not show any significant difference between two measurements ( $p=.91$ ), so the method error could be ignored. Most of the soft tissue reference points and angles are shown in Fig 1 and the definition of landmarks used can be seen in Table 1.

The profile raters were 30 Iranian orthodontists (15 men, aged  $39.4 \pm 12.3$  years; 15 women, aged  $28.8 \pm 2.3$  years), 30 dental students (15 men, aged  $24.8 \pm 2.9$  years; 15 women, aged  $23.1 \pm 2.1$  years) and 30 orthodontic patients (15 men, aged  $19.4 \pm 1.8$ ; 15 women, aged  $18.3 \pm 2.2$ ). They were asked to score each profile from 1 (very bad) to 5 (very good).



**Fig 2.** Average silhouette profile for men (left) and females (right)

The numbers 2, 3 and 4 represented “bad”, “average” and “good”, respectively.

With the purpose of assigning reliability and measurement error, the rating was repeated at a one week interval and in each case the resultant rated kappa coefficient was more than 85 percent.

In order to rank each profile in the series of 7 profiles in each group and sex, the Friedman test; and to determine the significance of these differences, Wilcoxon signed rank test was used.

The Kruskal-Wallis test was employed to analyze the differences among the three groups about their viewpoints on each profile in each sex. To compare the viewpoints of each group between male and female profiles, the Mann-Whitney test was used.

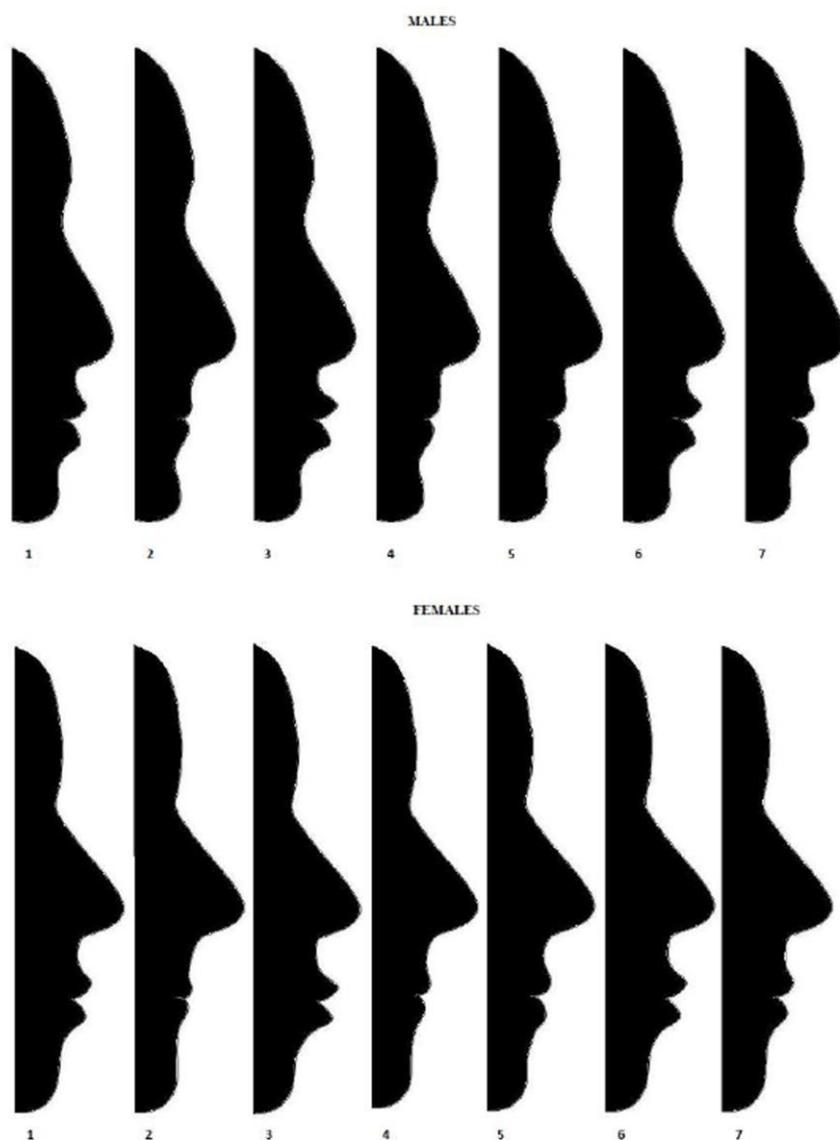
## RESULTS

Three angular and seven linear measurements for the soft tissue analysis were obtained (Table 2). Then using these mean values, we constructed the average profile for each sex and made its silhouette by means of the software “Adobe Photoshop CS4”. The average silhouette for men and women are shown in Fig 2.

A series of 7 profiles were prepared for men and women in which lips were protruded or retruded in 2-mm increments from the average profile. By means of the software, the lip positions were changed parallel to the Frankfort horizontal plane. In order to avoid regression to mean error that may disturb raters’ views, the profiles were arranged randomly rather than orderly (Fig 3); this could make the study become double-blinded and valid.

**Table 2.** Mean and SD of Iranian Soft Tissue Measurements

Variable	Men		Women	
	Mean	SD	Mean	SD
Facial Convexity (G'-Sn-Pg') (°)	131.31	3.01	128.97	4.06
Nasal Prominence (Ls to Pn parallel to FH) (mm)	15.26	2.73	14.42	3.97
Nasal Length (Sn-Pn) (mm)	21.72	2.20	19.36	1.47
Nasolabial Angle (Cm-Sn-Ls) (°)	110.36	10.64	109.8	8.28
Upper Lip Protrusion (Ls to Sn-Pg') (mm)	1.79	2.23	1.55	2.44
Lower Lip Protrusion (Li to Sn-Pg') (mm)	-1.58	2.78	-1.86	3.35
Upper Lip to E-Plane (Ls to E-line) (mm)	-3.50	1.87	-3.63	2.32
Lower Lip to E-Plane (Li to E-line) (mm)	-1.08	2.19	-1.21	3.42
Chin Thickness (Pg- Pg') (mm)	13.76	2.45	12.15	1.61
Z Angle (chin/lip line to FH plane) (°)	71.10	5.85	71.39	8.56

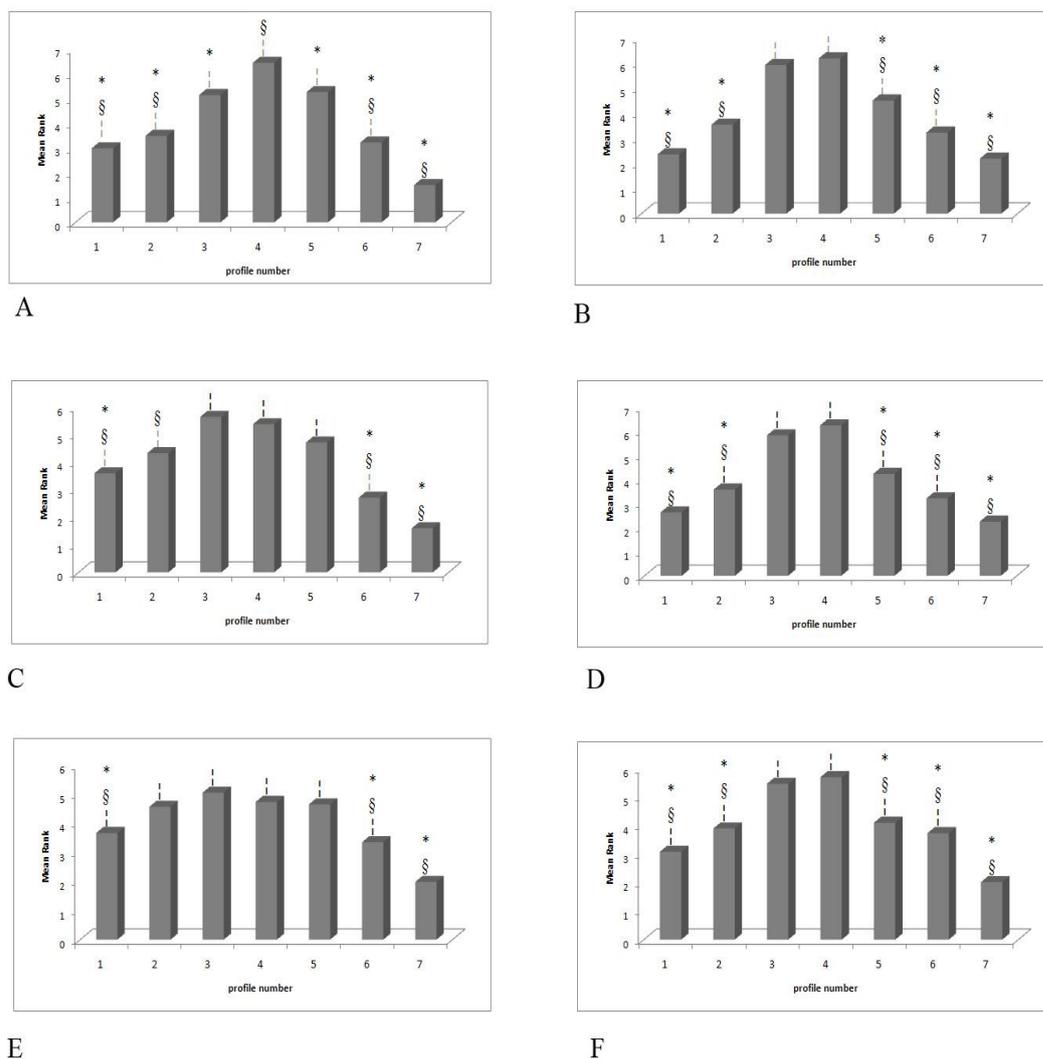


**Fig 3.** Series of 7 randomly arranged profiles rated by orthodontists, dental students and orthodontic patients for men (upper row) and women (lower row)

After collecting the data, we rearranged the profiles orderly from the most retruded to the most protruded profile in order to interpret them more easily and make them comparable with previous studies.

So in the analysis of data, profile 4 was the average profile for each sex, while profile 1 represented the most retruded and profile 7 meant the most protruded profile (Table 3).

According to the orthodontists, the most favored male profile was profile 4 (average profile) showing significant difference with the other ones ( $P < 0.01$ ), after that were profiles 5 and 3 (2 mm retruded and 2mm protruded from the average profile) without significant difference between them, followed by profiles 2 and 6; and the least desired profile was profile 7 with significant differences compared to



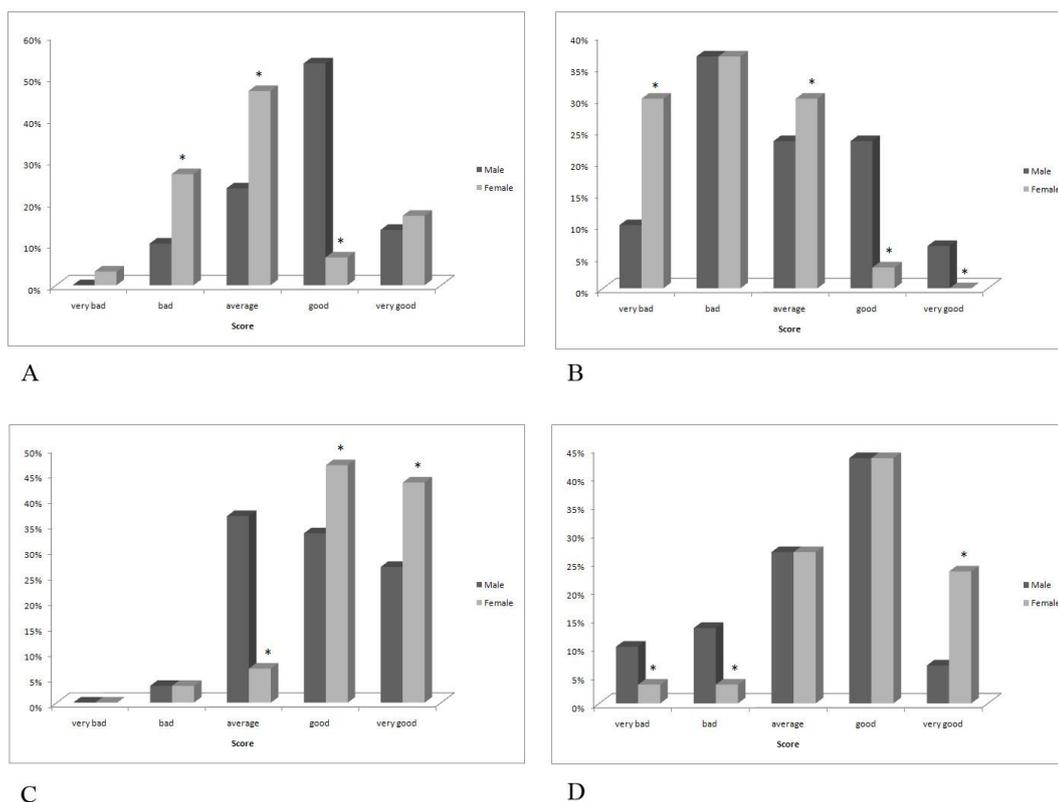
**Fig 4.** Distribution of most-favored profiles; A, orthodontists rating men; B, orthodontists rating women; C, dental students rating men; D, dental students rating women; E, orthodontic patients rating men; F, orthodontic patients rating women. \* represents the significant difference with profile 4 ( $P<0.05$ ); § represents the significant difference with profile 3 ( $P<0.05$ ); and † represents the significant difference with profile 7 ( $P<0.05$ ).

the other profiles ( $P<0.01$ ).

For female profiles, orthodontists preferred profiles 4 and 3 as the best ones with significant difference to other profiles ( $P<0.01$ ). Profiles 5, 2, 6 and 1 were placed in the next positions and again the least favored profile was profile 7, which had a significant difference with the other profiles ( $P<0.05$ ) (Fig 4).

For the dental students, profiles 3, 4 and 5 (average profile and its 2mm neighbors) without any significant differences among them were chosen as the most favored male profiles ( $P<0.05$ ).

Profiles 1, 2 and 6 were in the following preferences and the least favored profile was profile 7 ( $P<0.001$ ).



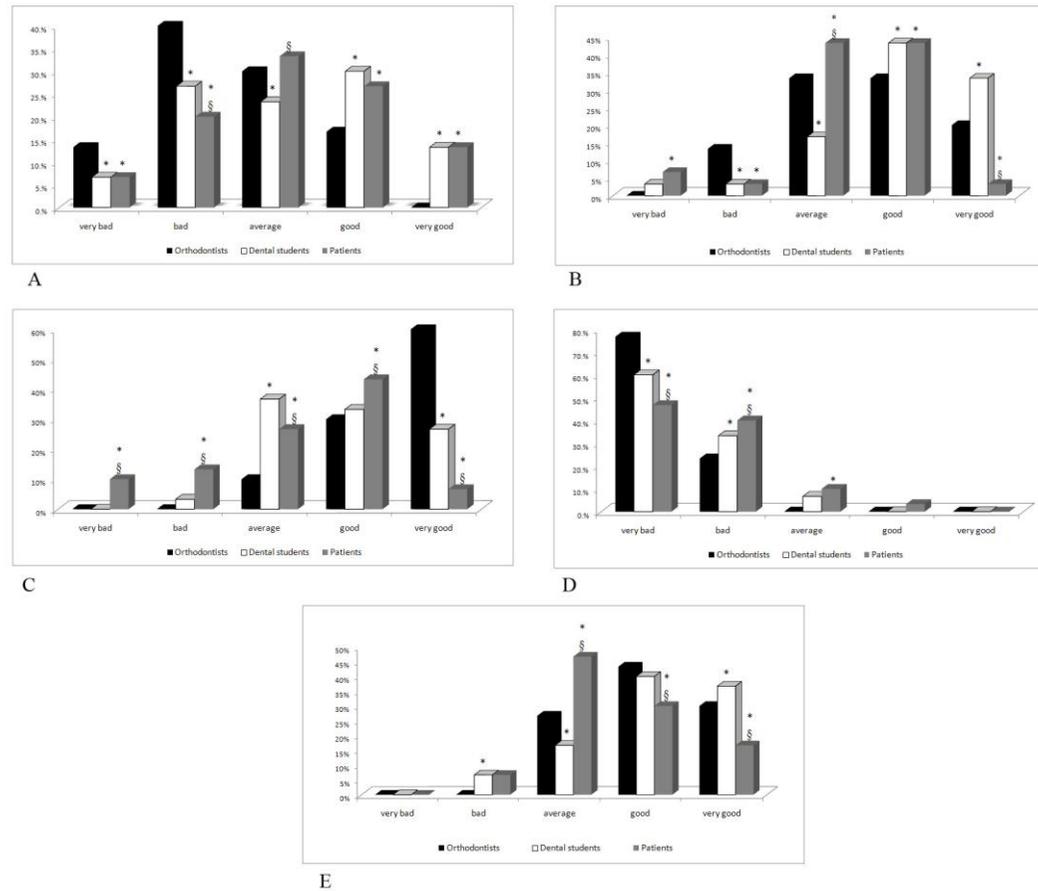
**Fig 5.** Comparison between males and females; A, orthodontists rating profile 5; B, dental students rating profile 1; C, dental students rating profile 4; D, orthodontic patients rating profile 4; \* represents the significant difference between sexes ( $P < 0.05$ ).

The most favored female profiles were profiles 4 and 3 ( $P < 0.001$ ) without any significant differences between them, followed by profiles 5, 2, 6 and 1; and finally profile 7 was selected as the worst profile ( $P < 0.01$ ) (Fig 4).

In orthodontic patients, profiles 3, 4, 5 and 2 with no significant difference among them were placed at the top of the favored male profiles and showed significant differences with profiles 1 and 6 that were rated less ( $P < 0.05$ ).

**Table 3.** Definition of Each Profile Number After Rearranging the Profiles

Profile Number	Definition
1	Average profile plus 6mm lip retrusion
2	Average profile plus 4mm lip retrusion
3	Average profile plus 2mm lip retrusion
4	Average profile
5	Average profile plus 2mm lip protrusion
6	Average profile plus 4mm lip protrusion
7	Average profile plus 6mm lip protrusion



**Fig 6.** Comparison among groups; A, profile 2 rated by men; B, profile 3 rated by men; C, profile 4 rated by men; D, profile 7 rated by men; E, profile 3 rated by women. \* represents the significance difference with orthodontists (P<0.05); § represents the significance difference with students (P<0.05).

The least favored profile was again the most protruded one (profile 7) that had significant difference with the others ( $P < 0.05$ ). The most favored female profiles were 4 and 3; while profiles 5, 2, 6 and 1 -with a significant difference- were placed in the next favorite positions ( $P < 0.05$ ) and profile 7 was selected as the ugliest profile ( $P < 0.05$ ).

Comparison between males and females rated by orthodontists in each profile showed that there was a significant difference between sexes only in profile 5 ( $P < 0.05$ ). Males were more preferred by the orthodontists than females in this profile (Fig 5).

According to dental students, profiles 1 and 4 showed significant differences between sexes ( $P < 0.05$ ). In profile 1, the male profile was more acceptable than the female profile; but in profile 4 (average profile), the female profile was more selected by the dental students than the male one (Fig 5).

In orthodontic patients, the difference between sexes was significant only in profile 4, in which females had more chance to be selected by the patients (Fig 5).

Then we compared the viewpoints of orthodontists, dental students and patients in each profile separately. In male profiles, there were significant differences among the three groups in profiles 2, 3, 4 and 7 ( $P < 0.05$ ). Profile 2 (average profile plus 4mm of lip retrusion) was more favored by the dental students and the patients than the orthodontists (Fig 6).

In profile 3 (average profile plus 2mm of lip retrusion), Profile 3 (average profile plus 2mm of lip retrusion), was favored most by the dental students and then by orthodontists and patients respectively.

(Fig 6); however, profile 4 (average profile) was much more preferred by the orthodontists than the other groups (Fig 6). Finally, profile 7 (the most protruded profile) was more acceptable according to the patients, dental students and orthodontists in a decreasing order (Fig 6). In female profiles, there was a significant difference among the three groups only in profile

3 ( $P < 0.05$ ): dental students, orthodontists and patients rated this profile more in a decreasing order.

## DISCUSSION

Achieving facial balance and pleasing facial and dental esthetics is one of the most important objectives of orthodontic treatment that may be reached by stabilizing the dentition [39]. In order to reach this goal, first it was necessary to find the perception of different people involving orthodontic treatment about facial harmony and balance. The purpose of this study was to evaluate the anteroposterior lip position of the Iranian population and compare the views of orthodontists, dental students and orthodontic patients according to a series of silhouettes with varying anteroposterior lip positions.

To date, no studies have evaluated the anteroposterior lip positions among the Iranian population. In a similar study conducted by Ioi et al. [35], orthodontists rated the most-favored Japanese profiles as "slightly more retruded than the average" for both men and women and in another study they reached the similar finding in Korean students.<sup>36</sup> However; in the present study, we found that Iranian orthodontists preferred the average profile as the most favored one in both men and women. In both sexes, the most favored profile - according to orthodontists- was profile 4 (average profile), but in the next favorite, there was a difference between men and women: in men, profiles 5 and 3 were selected indifferently but in women, profile 3 was ranked higher than 5.

It implies that after the average profile, orthodontists may prefer more retruded profiles in women rather than men.

In dental students, the average profiles and the 2mm retruded and 2mm protruded profiles were selected as the most pleased male profiles, but in females, profiles 4 and 3 were preferred to profile 5 so dental students, like orthodontists, after the average profile may

choose more retruded profiles in women rather than men. In orthodontic patients, results had less contrast compared with the other groups; so that in males, 4 profiles (2, 3, 4 and 5), which represented average profiles with 4mm retruded lips to 2mm protruded lips, were rated similar to each other; but in females, the differences were clearer and the average and 2mm retruded profiles were selected more than the others. Thus, it can be said that according to patients, more retruded profiles compared to the average profile were found more favorable. In all three groups, the most protruded profile (profile 7) was selected as the least favored profile that is in agreement with previous studies in the Japanese population [35-36]. Comparison between sexes, rated by orthodontists, showed that only in profile 5 (2mm protruded than the average profile), men were considered more favorable than women. This is in accordance with previous results of preference of more retruded profiles for women. Dental students preferred the most retruded profile in men and the average profile in women. In orthodontic patients also there was a similar finding, i.e. the average profile was considered more acceptable in women rather than men. Comparison among the three groups showed that in males, the rates of orthodontists had more contrast compared to the other groups. They selected the average profile significantly higher than the other profiles and the most protruded one significantly lower than the others. The evaluation of differences among the groups showed that their views were in general agreement. All of them preferred the average profile as the best one and the most protruded profile as the worst. Although there were some minor differences among them, there were general agreement among these three groups, which was in accordance with previous studies [40-43]. Additional research on the issue of the antero-posterior chin position for most-favored profiles in the Iranian population appears to be warranted.

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