Original Article

Influence of Age on Perception of Best Esthetical Profile

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ABSTRACT

Statement of the Problem: As an important determinant of social acceptability, facial attractiveness can be influenced by decisions of orthodontists through treatment. The perception of facial attractiveness is influenced by several factors.

Purpose: The purpose of this study was to determine the difference in perception of facial attractiveness among male and female raters in different age groups through comparison of silhouettes.

Materials and Method: 208 subjects (99 male, 109 female) aged between 18 to 70 years were assigned to three groups of young adults, middle-aged and senior and rated pre-designed silhouettes on a 7-level rating scale (1= the least esthetic, 7=the most esthetic). Two series of 7 silhouettes were prepared for men and women in which the mandible was protruded or retruded in 2-mm increments from the average. The evaluators were asked to grade the profiles separately for male and female. T-test and one-way ANOVA were used for the statistical analysis with $\alpha = 0.05$.

Results: The first and third age groups, favored female profile 2 among class II profiles. However, the second age group preferred the average profile. Male class II profiles were rated exactly as female ones among the three age groups. The average female class III silhouette was preferred in all age groups. The first and second age group preferred the average male profile in male class III silhouettes. The oldest group however, preferred profile 2. For both sexes, the least acceptable profile in each set of silhouettes was the most protruded or retruded.

Conclusion: There were few differences in perception of facial attractiveness between different age groups. In all groups, even small mandibular protrusion was unacceptable and mild retrusion was considered attractive.

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Introduction

Facial attractiveness is undoubtedly an important determinant of social acceptability of an individual and of his self-esteem and a crucial influential factor in at least the initial phases of development of a social interaction. [1-4] Literature suggests that people with attractive faces are generally considered more successful, likeable, and kinder than those who are not as attractive. [5]

In the past few years, due to improved appliance aesthetics, treatment mechanics and social acceptability, there has been a substantial increase in the proportion of adult patients seeking orthodontic treatment. [6] Therefore, orthodontists and maxillofacial surgeons are now addressing the aesthetic and functional needs of both the adolescent and the adult subgroups.

As with other subjective concepts such as prefere-

nce of visual arts, music and even food, perception of esthetics has been under the influence of various factors such as cognition, emotion, individual differences, ethnicity, culture, and cultural revolution. Since cultural convictions have constantly been revolutionized through history, [7] it can be hypothesized that criteria of beauty and attractiveness have changed amongst generations. Moreover, several factors such as ethnic and racial differences, [8-10] sex, age, education, socioeconomic status, and geographic location [8, 10-14] also affect the esthetic preferences of the public.

Literature shows that the perception of an ''ideal'' face changes over time and is influenced by current fashions. [12-13, 15-17] Long-term observation during these studies revealed the preference of fuller and more protrusive lip profiles.

Such continuous change in perception of attractiveness throughout the 20th century suggests that the public view of facial beauty may not be constant; however, research also shows that eight-year-old children's criteria for attractiveness are the same as those of adults and that a preference transition occurs with age from bialveolar protrusion to orthognathic profile. [18]

Patel *et al.* [19] reported that age had no correlation with perception score. Both adolescents and adults rated the straight profile as the most attractive profile.

In profile view, the sagittal prominence of the mandible is an important determinant of attractiveness. For a given population, the average value of this parameter varies with age, gender, and ethnicity. It may also be perceived differently amongst different age groups of that population. [20]

Although the gap between facial esthetic perceptions among generations has been explored in a few ethnicities, to the best of our knowledge, there is no study exploring the effect of age on perception of facial beauty in Iranian population concerning positioning of the mandible through implementation of silhouettes. The goal of this study was to investigate the effect of age on the judgment of the Iranian population about facial beauty using two-dimensional silhouettes of different classes of malocclusion in male and in female genders.

Materials and Method

Preparation of the images

Computer software (Adobe Photoshop) was used to create idealized male and female profile silhouette images based on normal linear and angular measurements presented by Jacobson. [21] This measurements considered following parameters including ideal Z-angle; E-plane to the upper lip and E-plane to the lower lip; soft-tissue convexity (Gn′-Sn-Pg′), upper lip protrusion (Ls to Sn-Pg′), and lower lip protrusion (Li to Sn-Pg′); H-line to N′-Pog (H-angle), H-line to subnasale, and H-line to the lower lip; and subnasale perpendicular to the lower lip and subnasale perpendicular to the chin.

Profile image manipulation (incremental)

In order to create class-II (Figure 1) and class-III (Figure 2) male and female profile silhouettes, the mandibular prominence of the idealized profile template was altered in two-millimeter increments from -12 to 12mm.

The raters, questionnaire, and rating method

The panel of raters included 150 subjects, 49 men and 101 women, between the ages 18 and 70. The subjects were selected through convenient sampling amongst people referred to Shiraz School of Dentistry. The selection criteria were as no previous orthodontic or facial surgical treatment, no facial deformities, and no history of facial trauma. These criteria were considered in order to eliminate raters with obviously abnormal faces and those who had previously been advised concerning esthetic ideals. The raters were divided into three age groups as young adults (18- 34 years old), middle-aged (35- 49 years old), and senior (50- 70 years old). The raters were provided with a questionnaire on which they determined their age and gender. The raters were provided with two sets of male and two sets of female ima-

Figure 1: Class II female and male silhouettes. Position of B point has been incrementally retruded from the straight profile in silhouettes depicted in each row from -2mm to -12mm of retrusion.

Figure 2: Class III female and male silhouettes. Position of B point has been incrementally protruded from the straight profile in silhouettes depicted in each row from +2mm to +12mm of protrusion

ges. Each image is identified by a double letter. They were asked to rate each image in terms of facial attractiveness using the following rating scale as (1) extremely unattractive, (2) very unattractive, (3) slightly unattractive, (4) neither attractive or unattractive, (5)slightly attractive, (6)very attractive, and (7) extremely attractive. In each set, the images were placed in random order and identified by a randomly assigned double letter (Ga). A duplicate of one of the male images was used to assess intra-observer reliability.

During the rating process, each rater was seated in a quiet place apart from the other raters and was given 10 minutes to complete the questionnaire. All the questionnaires were filled anonymously and were marked by numeric codes. A duplicate of one of the images in each section was used to assess intra-examiner reliability. Two series of seven profiles for men and women were prepared in which the mandible was protruded or retruded in 2-mm increments from the average profile. After collecting the data, we rearranged the profiles orderly from average to the most retruded or to the most protruded profile in order to interpret them more easily and make them comparable with previous studies. Therefore, in the analysis of data, profile 1 was the average profile for each sex, while profile 7 represented the most retruded or protruded profile. In order to avoid regression to mean error that may disturb raters' views, the profiles were arranged randomly rather than orderly (Figure 1 and 2); this could make the study become double-blinded and valid.

Statistical analyses

The similarity or dissimilarity between different groups and subgroups was analyzed using t-test and one-way analysis of variance (ANOVA). The significance of the difference between scores attributed to each of the two profiles was assessed Friedman and pairwise test. All statistical analyses were carried out using the Statistical Package for Social Sciences (version 15.0; SPSS Inc.,

Chicago, IL, USA) with a significance level of $p < 0.05$.

Results

A total of 208 observers were recruited in this study with equal participants in each age group.99 males and 109 females with average age of 40.07 participated in the study. Tables 1 and 2 respectively demonstrate the mean scores attributed to each profile by different age groups, genders, and figures 3 to 6, schematically compares the scores attributed to profiles by raters in each age group. According to the raters in the first age group,

Table 1: Mean score attributed to silhouettes by each age group

	Group 1	Group 2	Group 3
C3 f1	6.4±1.2	6.3±1.4	6.1±1
C3 f2	5.9±0.5	5.8±1.3	5.9±1.1
C3 f3	5±0.8	4.8±0.7	5±0.9
C3 f4	4±0.4	4.1±0.5	4.2±1
C3 f5	3.2±0.7	3.1±0.8	3.2±0.8
C3 f6	2±0.7	2.2±1	2±0.9
C3 f7	1.2±0.8	1.48±1.4	1.2±0.9
C3 m1	6.3±1.1	6.1±1.4	5.9±1.4
C3 m2	6.1±0.6	5.9±1.3	6±0.9
C3 m3	5±0.6	5±0.7	5.2±1
C3 m4	4.1±0.7	4±0.6	4.1±0.7
C3 m5	3±0.7	3.1±0.8	3.2±0.9
C3 m6	2.2±0.6	2.2±0.9	2.1±0.7
C3 m7	1±0.2	1.44±1.44	1.2±0.8
C2 f1	5.2±1.5	5.84±1.5	4.6±2
C2 f2	5.4±1.3	5.80±1.2	5.1±1.8
C2 f3	5.1±1.4	4.8±1.2	4.9±1.5
C2 f4	4.7±1.2	4.1±1.1	4.6±1.3
C2 f5	3.6±1.4	3.3±1	3.6±1.1
C2 f6	2.1±1	2.52±1.3	2.8±1.7
C2 f7	1.4±0.98	1.5±1.4	2.2±2
C2 m1	5.6±1.7	5.8±1.6	5.5±1.6
C2 m2	6.1±0.9	5.6±1.5	5.8±1.2
C2 m3	5.3±1	5.1±1	5.2±1.2
C2 m4	4±0.6	4±1	4.2±1.2
C2 m5	3.3±1.1	3.4±0.9	3.4±1.1
C2 m6	2±0.6	2.2±1	2.1±0.9
C2 m7	1.4±0.9	1.5±1.4	1.4±1.2

C3, Class III; C2, class II; F, female; M, male; 1, average straight profile; 2, 2mm of retrusion/ protrusion; 3, 4mm of retrusion/ protrusion; 4, 6mm of retrusion/protrusion; 5, 8mm retrusion/ protrusion; 6, 10mm retrusion/protrusion; 7,12mm retrusion/protrusion

Table 2: Mean score attributed to silhouettes by each sex

	M	F
C3 f1	6.4±1	6.2±1.3
C3 f2	5.9±0.9	5.8±1
C3 f3	5±0.6	4.9±0.9
C3 f4	4.2±0.6	4.1±0,7
C3 f5	3.2±0.7	3.1±0.8
C3 f6	2±0.7	2.1±1
C3 f7	1.1±0.7	1.4±1.2
C3 m1	6.2±1.1	6±1.4
C3 m2	6±1	6±0.9
C3 m3	5.1±0.8	5±0.8
C3 m4	4.1±0.6	4.1±0.7
C3 m5	3.2±0.9	3±0.7
C3 m6	2±0.4	2.2±0.9
C3 m7	1.1±0.8	1.2±1
C2 f1	4.4±1.9	5.6±1.6
C2 f2	4.9±1.7	5.7±1.3
C2 f3	5±1.6	4.9±1.3
C2 f4	4.8±1.5	4.3±1.1
C2 f5	3.9±1.3	3.3±1.1
C2 f6	2.7±1.4	2.4±1.4
C2 f7	2±1.9	1.5±1.4
C2 m1	5.5±1.5	5.7±1.7
C2 m2	5.8±1.4	5.9±1.1
C2 m3	5.3±1.2	5.2±1
C2 m4	4.2±1	4±1
C2 m5	3.5±1.1	3.3±1
C2 m6	2.1±0.8	2.1±0.9
C2 m7	1.4±1	1.5±1.2

C3, Class III; C2, class II; F, female; M, male; 1, average straight profile; 2, 2mm of retrusion/protrusion; 3, 4mm of retrusion/ protrusion; 4, 6mm of retrusion/protrusion; 5, 8mm retrusion/protrusion; 6, 10mm retrusion/ protrusion; 7,12mm retrusion/ protrusion.

the most favored female class II profile was profile 2 (2mm retrusion of mandible); however, the Wilcoxon test revealed that this preference was not significant in comparison to profiles 1 and 3 (*p*> 0.05). The least desired class II female profile was the last one in the set with 12mm of mandibular retrusion but not statistically significant (*p*> 0.05). The second age group preferred profile number 1 (the average profile) among female class II profiles. According to the Wilcoxon test, this preference was significant in comparison with all other profiles (*p*= 0.00) except the one with 2mm of retrusion (*p*= 0.24). The third age group also rated profile number 2 the highest. Both the second and third age group rated the female profile with 12mm of retrusion the lowest.

For the male class II profiles, the ratings among the three age groups were exactly as ratings observed for female class II, with the profile with 2mm of mandibular retrusion rated the highest by raters in the first and third age group and the average profile preferred in the second age group. The results of the Friedman test
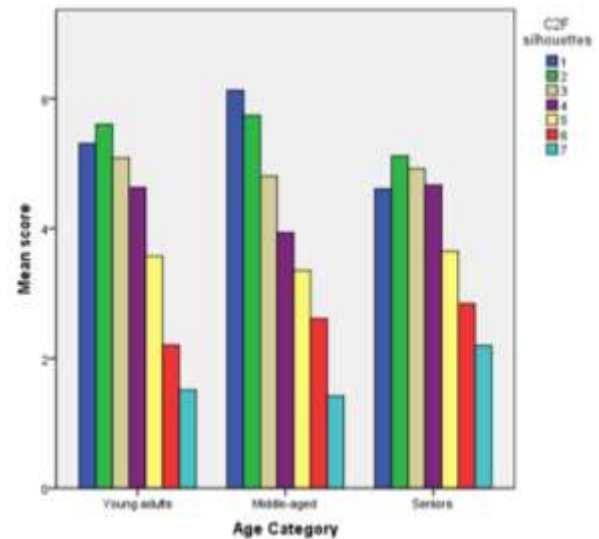

Figure 3: Mean score attributed to each female class II silhouette by raters in different age groups
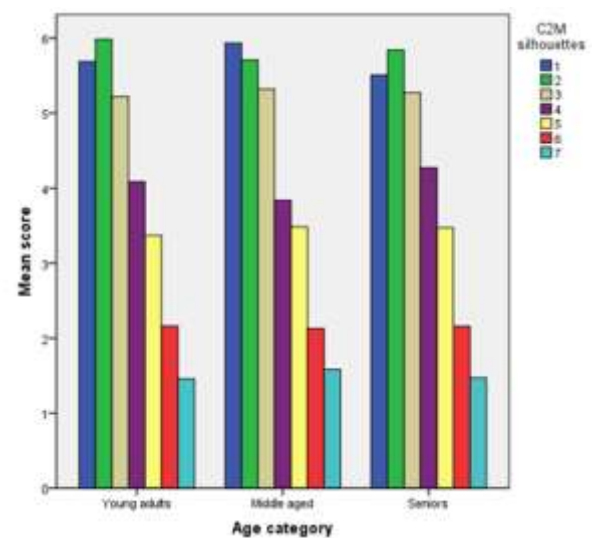

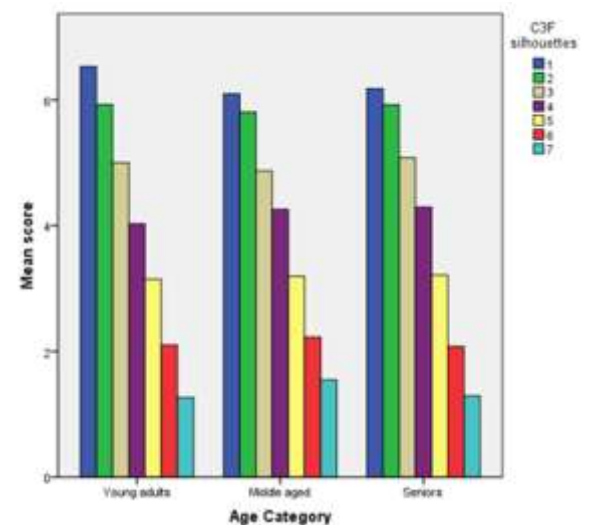**Figure 4:** Mean score attributed to each male class II silhouette by raters in different age groups

Figure 5: Mean score attributed to each female class III silhouette by raters in different age groups
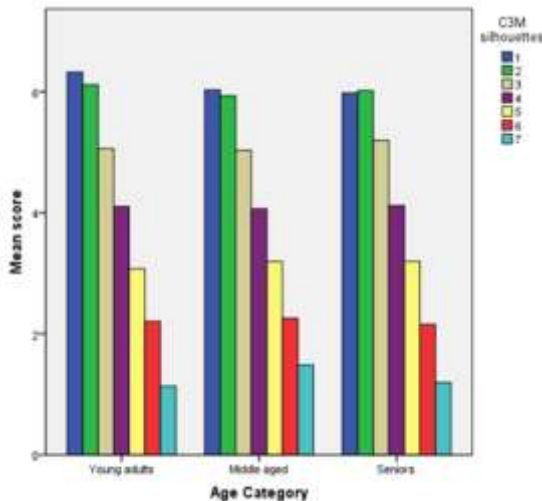
Figure 6: Mean score attributed to each male class III silhouette by raters in different age groups

Table 3: Pair-wise comparisons and p-values of profile images that did not receive significantly different mean scores by different groups

	Profiles		*p* Value
Class II	F1	F2	1.00
	F1	F3	1.00
	F1	F4	0.061
	M1	M2	1.00
	M1	M3	1.00
Class III	F1	F2	1.00
	M1	M2	1.00

F1, average female with straight profile; F2, female with 2mm of mandibular retrusion/protrusion; F3, female with 4mm of mandibular retrusion; F4, female with 6mm of mandibular retrusion; M1, male with average straight profile; M2, male with 2mm of mandibular retrusion/protrusion; M3, male with 4mm of mandibular retrusion.

and pairwise comparisons (Table 3) demonstrated that raters in all groups did not score the first three male and female profiles in the class II group significantly different (*p*> 0.05). For female class III silhouettes, raters in all age groups preferred the average profile and even 2mm of mandibular protrusion significantly lowered the score (*p*< 0.05). The first and second age group preferred the average male profile in male class III silhouettes. The oldest group however, preferred the male with 2mm of mandibular protrusion; yet the difference in scores was not significant. Males in general scored the female with 4mm of retrusion better while females preferred 2mm less retrusion. Both sexes preferred 2mm of retrusion for male silhouettes. However, even 2mm of mandibular protrusion was rated lower than the average male and female profile. The difference between 0-4mm of retrusion and protrusion was significantly noticed solely for the protruded position and the difference be-

tween the average profile and the profile with 4mm of retrusion was not significantly appreciated (Table 3). Evidently, for both sexes the least acceptable profile in each set of silhouettes was the one with the most protrusion or retrusion. The result of intraclass correlation was 0.93, with 95% CI (0.75, 0.98).

Discussion

Contrary to the study hypothesis, there were few differences in perception of facial attractiveness between different age groups. They reported almost similar views of attractiveness about mandibular position in profile view. In all age groups, even small advancement in mandible was not acceptable and mild mandibular retrusion was considered attractive. In this study, we assessed the most favorable profile with a series of varying anteroposterior mandibular positions in facial silhouettes rated by 150 people in three age groups. Since the results of this study would have influenced decision-making concerning considering or not of orthognathic surgery to reposition the mandible, adolescents were excluded from the target population.

The Likert-type rating scale was used in this study since it is introduced in psychology literature as the most useful rating method. [21] The effect of hair, skin complexion, and eyes are eliminated through application of androgynous silhouettes in esthetic studies. [22] Large eyes, cheekbones, and chins are reported to be amongst other distracters of solely evaluating the profile, which are therefore masked through employing androgynous silhouettes. [23]

Changes of ideal facial attractiveness over time have been previously investigated in studies conducted by Nguyen and Turley, [11] Auger and Turley [14] and Yehezkel and Turley. [17] They concluded that preference of both female and male profiles changed significantly over time and that over the past 70 years lip areas increased, the nasolabial angle decreased, and the profile became more convex.

This trend of acceptable profiles was also reported by the observers of our study. Slightly convex profiles were rated the highest in both male and female groups and the straight profile was preferred over the profile with even the slightest amount of mandibular protrusion. However, generations seemed to share the same view regarding the most attractive profile. This is in

agreement with Patel *et al.* [19] who showed that age had no correlation with perception score. In their study, both adolescents and adults rated the straight profile as the most attractive profile. The severe concave profile was rated as least attractive by both adolescents and adults. In a study, Morar [24] also concluded that advancing age does not exert a significant influence on the perception of profile preference. In contrast, however, Park *et al.* [25] concluded that in Korean society, young adults preferred a straight lip profile while middle-aged and senior groups showed a preference towards slightly retruded lips. Their results confirmed the results of a study by Shimomura *et al.* [26]

In their study, Turkkahraman and Gokalp, [18] assessed facial profile preference of adults and adolescents without eliminating the bias of color pictures of the face. No significant difference was found between age groups for the male profile. As for the female profile however, the orthognathic female was preferred by the adult group while adolescents preferred a more retrusive profile. In addition, some consider the perception of facial attractiveness to be largely subjective, being influenced by a multitude of factors such as age, sex, personality, socioeconomic status, and education. [27,28]

Results of a study by Kissler *et al.* [29] revealed that although the preference for facial attractiveness is elaborated with the subject's age, both the direction of preferences and preference strengths did not vary systematically between different age groups. Cross *et al.* [30] also demonstrated that age of judge did not significantly influence his preference of portrait photographs.

The results of both abovementioned studies confirm our results, despite the fact that facial portraits and not silhouettes were employed in these studies.

While Park and Shimomura [25-26] have focused on the influence of conventional orthodontic treatment and evaluated the preference of lip position among different age groups, our study investigated the influential effect of age on preference of mandibular positioning. The inconsistency in results is likely attributable to the fact that repositioning of the mandible creates a significant change in esthetic standards of the face, while repositioning of the lips may not be as influential.

In addition, the constancy of views among different generations in our study may be related to the fact that people now have almost equal access to various

media and perceptions of facial attractiveness are constantly being influenced by suggestion presented therein. Moreover, the interaction of different generations and different socioeconomic levels has been made possible through the advent of a variety of virtual social groups. It is therefore quite possible that the views are conducted towards a single esthetic value.

Considering another result of this study, although mild convexity was better rated and differences between 2 and 4mm of mandibular retrusion was not significantly appreciated by the observers, even small amounts of mandibular protrusion was noticed and not tolerated. This is in agreement with the statement that class III patients are much more concerned with the treatment of their condition in comparison with patients with mild to moderate mandibular retrusion. [31]

In addition, in the class II group, comparisons between every profile with the profile with more than 6mm of retrusion resulted in significantly different scores. For class III group scores were significantly different in comparisons of every profile with the profile with more than 2mm of protrusion. Therefore, it can be assumed that even mild additions to the severity of problem results in significantly lower scores with this trend of rating, starting from moderate levels of retrusion but from mild levels of protrusion. De Sena *et al.* [32] demonstrated that the anteroposterior positioning of the mandible exerts strong influence on the level of facial attractiveness. In their study however, the most pronounced Cl II was the profile that received the lowest score for male individuals and the straight profile showed higher acceptance.

According to our results, it can be assumed that males in general prefer females with moderate levels of mandibular retrusion. This may be because mandibular retrusion creates a more feminine profile and it is as such better accepted by the male group. However, statistical analysis revealed that the difference between preference of 2 and 4mm of retrusion is not significant.

Based on the results of this study, the gap in perception of facial attractiveness between different Iranian generations seem to be minimal and accordingly, in treatment planning session the orthodontist can guide the adult and the adolescent patient similarly regarding the most attractive profile. The small sample size might be considered a limitation of the current study that could

have influenced the significance of the obtained results. Larger sample sizes may be able to reveal differences in perception of facial attractiveness among different generations.

Conclusion

Based on the results of this study, there are few differences in perception of facial attractiveness between different age groups. In all age groups, even small advancements in mandible are not acceptable and mild mandibular retrusion is considered attractive.

Acknowledgments

Conflict of Interest

None declared.

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