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# Facial Profile Attractiveness Outcome in Sagital and Vertical Dimensions, Using Computerized Prediction

## Resultados da Atratividade do Perfil Facial nas Dimensões Sagital e Vertical Utilizando Previsão Computadorizada

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## ABSTRACT

**Aim:** To assess the perception of facial attractiveness in profile digital images in the sagital and vertical plan.
**Methods**: The facial profiles of 80 patients (20 Class II, 20 Class III, 20 open bite and 20 deep bite) male and female samples were evaluated. The lateral cephalometry radiographs of the all samples were digitized and systematically altered regarding the location of the mandible and maxilla in the sagital and vertical plan, using Dolphin Imaging software program (version 10.0). Five manipulated profile images together with the patients' own profile were presented to the raters including laypersons, orthodontists and surgeons. The facial attractiveness of the profile images were assessed using a 6-scaled (visual analogue scale). The data were analyzed using Kruskal Wallis and Mann Whitney U tests.
**Results**: The most attractive facial profiles were normal images in both patients' groups as assessed by all judges Severe Class III facial profiles in both Class II and Class III patients' images and severe open bite facial profiles in both deep bite and open bite patients' images ranked as the least attractive. No significant differences were found in the overall rankings of male and female profile images between female and male raters.
**Conclusion**: The profile attractiveness decreased with the more deviations from the normal profile proportions and more scattered ideas were shown by raters. Specialists can use the results of the beauty perception by the laypersons to modify the treatments and consequently increase the patients' satisfaction.

## DESCRITORES

Orthodontics; Cephalometry; Dental occlusion; Malocclusion; Esthetics; Software.

## RESUMO

**Objetivo:** Avaliar a percepção da atratividade facial em imagens digitais de perfil no plano sagital e vertical.
**Método:** Foram avaliados perfis faciais de 80 pacientes (20 Classe II, 20 Classe III, 20 mordida aberta e 20 mordida profunda), pertencentes ao sexo masculino e ao feminino. As radiografias cefalométricas de todos os indivíduos foram digitalizadas e sistematicamente alteradas em relação à localização da mandíbula e da maxila no plano sagital e vertical, usando o software Dolphin Imaging (versão 10.0). Cinco imagens de perfil, manipuladas em conjunto com o perfil dos próprios pacientes, foram apresentadas aos avaliadores, incluindo leigos, ortodontistas e cirurgiões. A atratividade facial das imagens de perfil foram avaliadas através de uma escala visual analógica. Os dados foram analisados pelo teste de Kruskal Wallis e Mann Whitney.
**Resultados:** Os perfis faciais mais atrativos foram os de imagens normais, em ambos os grupos de pacientes, sendo considerado por todos os avaliadores perfis faciais graves os casos de Classe III. Tanto as imagens de pacientes graves Classe II e Classe III, como os perfis faciais de mordida aberta e mordida profunda, foram classificados como menos atraentes. Não foram encontradas diferenças significativas na classificação geral de imagens de perfil masculino e feminino entre avaliadores do sexo feminino e masculino.
**Conclusão:** A atratividade do perfil diminuiu na medida em que maiores eram os desvios das proporções do perfil normal e opiniões mais divergentes foram emitidas pelos avaliadores. Especialistas podem usar os resultados da percepção da beleza pelos leigos para modificar os tratamentos e, consequentemente, aumentar a satisfação dos pacientes.

## KEY-WORDS

Ortodontia. Cefalometria. Oclusão dentária. Maloclusão. Estética. Programas Informáticos.

## INTRODUCTION

The aims of the orthodontic treatments is to achieve a well-balanced and proportional face in addition to well-arranged dental arches in an optimum occlusal relationship to enhance facial esthetics and attractiveness[1,2]. According to the orthodontists, facial esthetics establishes with the nose, lips and the chin presenting an attractive complex when they are observed into the face or its standard image. Orthodontic treatments can improve facial attractiveness by means of aligned teeth, developing an esthetic smile, pleasing facial profile or modifying skeletal deformities in the sagital and vertical dimensions[3,4]; although, meeting all the esthetic needs of the patients is impossible due to the subjective nature of the esthetics and different perceptions judged by the individuals.

The beauty is a complex phenomenon with the considerable differences existing in its perception[5]. Furthermore, minimum alterations of the facial proportions has been shown to possibly make apparent changes in the person's face[5] so that, the patients' perception of the beauty and their judgments of it are crucial in the treatment plan.

Studies to assess image beauty perception are classified into two main groups including those to evaluate the facial profile properties of the attractive individuals[6] and studies to show photographic images (drawing or silhouette) to the observers asking them to determine the beauty rankings[3,7,8].

There is inadequate knowledge in the literature to express patients' beauty perception; as some studies results are not generalized for being able to assess different groups of treatment receiving or presenting. Furthermore, some investigations did not use distinct measures to select laypersons. Profile esthetics has been investigated through the various techniques like line drawings, photographs, silhouettes or others all with their specific benefits, shortcomings and certain biases[9]. More realistic presentation of profile pictures are available to the judges compared to the previous methods including drawings or silhouettes due to the advances made using computerized software to assess facial profile and possibility of obtaining digital images partly because of being able to alter facial profile through the soft tissue contour. Therefore, model differences has been removed due to their specific characteristics and the effect of confounding variables like hairstyle, skin tone, race, gender and others are deleted[9].

The purpose of the present study was to assess the perception of facial profile attractiveness by the specialists (surgeon and orthodontist) and laypersons (the patient and one of their attendants) prior to the orthosurgery treatment in the sagital and vertical dimensions among patients referred to the Department of Orthodontic Shahid Beheshti University Dental School (2010 -2011).

## METHODOLOGY

Twenty white adults with the class II (10 males, 10 females) as well as 20 class III malocclusion samples with the average overjet differences between 6-8mm and fair appropriate vertical dimensions (y axis of 64-68 degrees), also 20 white adult with the deep bite (10 males, 10 females) as well as open bite samples with the average overbite differences between 6-8 mm and (y axis of 68-72 degrees) and fair appropriate sagital dimensions (overjet of 1-3mm difference) among the patients referred to the Orthodontic Department of Shahid Beheshti University and a private clinic that had been undergone orthognathic surgery, were selected. The samples were aged 18-30 years old having at least high school educations. The individuals were instructed about the study objectives and processes. All patients agreed to participate in the investigation and gave written consent forms for this purpose. Furthermore, no extra radiographies were taken throughout the study using existing lateral cephalometric radiographs in the patients' records. The patients had their own complete diagnostic records including their primary lateral cephalometric radiographs. The individuals with severe craniofacial anomalies, cleft lip/palate or excessive surgeries like genioplasty and rhinoplasty were excluded. The patients' cephalographs images were scanned by Microtek Scanner in the maximum resolution of 4800*9800 dpi and the following alterations were done using Dolphin Imaging software Version 10.0 on the scanned images.

The alterations on the cephalometric radiographs of class II malocclusion patients' were done regarding mandibular displacement at B point. These manipulations included displacement of B point ranging from +2mm and +4mm, edge to edge profile, and mandibular displacement for +8mm and +10 mm. The latter displacements, in another word, was done 2mm and 4mm further than edge to edge profile.

In class III malocclusion patients, profile manipulations were performed focusing on the mandibular displacement at B point too. The manipulations were included mandibular displacements at B point for -2mm and -4mm, edge to edge profile, -8mm and -10 mm. Thereafter, the original images of severe class III patients together with 5 altered profile images were assessed.

The alterations on the cephalometry radiography of deep bite patients were done regarding maxillary posterior displacement by leffort technique, which included +2mm maxillary superior displacement, +4mm, edge to edge, +2mm and +4mm above the edge to edge position.

In open bite cases the manipulations were included maxillary posterior displacement in the same way, -2mm inferior displacement of the maxillary posterior, -4mm, edge to edge, -8 and -10mm which

means -2 and -4mm below the edge to edge position respectively (Fig. 1,2,3).

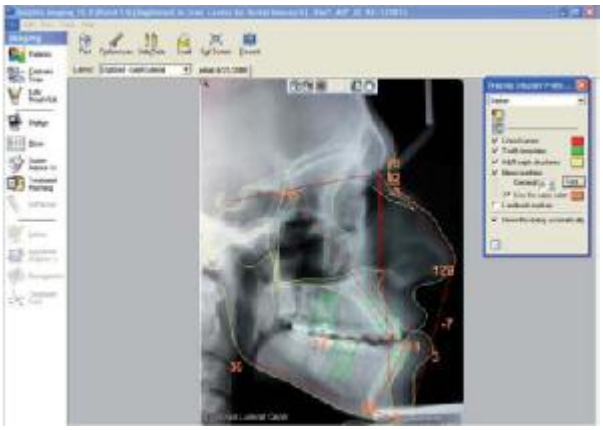

**Figure 1. Digitized cephalometry in Dolphin imaging software.**

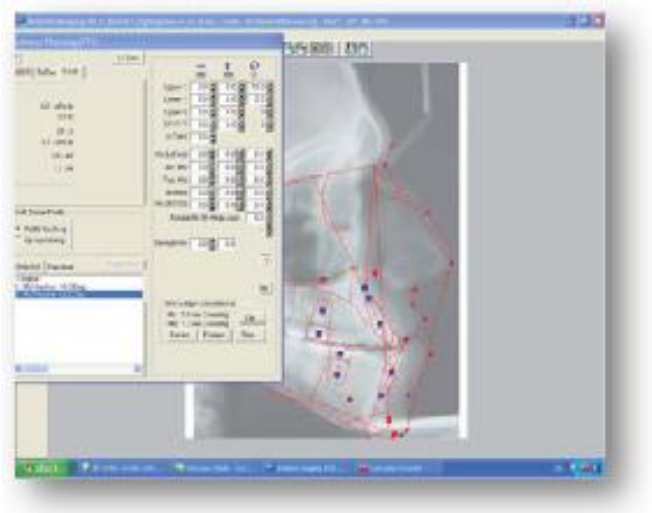

**Figure 2. Entering of the data for alterations on the radiographs.**

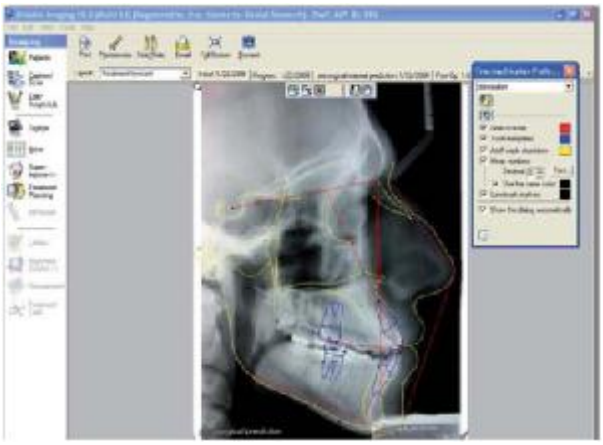

**Figure 3. Prediction after the alterations.**

All the 6 images were imported into Abobe Photoshop CS3 Extended Version 10.0 in which the patients' profiles were isolated and their colors were converted into black. With the conversion of profile images into the black ones, the confounding effects of the patient's gender, complexion, race and other factors were eliminated; All profile pictures of the patients were shown on a screen importing randomly into Office PowerPoint 2007 software program. In total, 20 series of class II, class III, deep bite and open bite profile images were obtained (Figs 4, 5, 6, 7). The class II malocclusion images were numbered from C1 to C20 as well as class III images from A1 to A20. The deep bite cases also numbered from B1to B20 as well as open bite images from F1to F 20. All manipulated pictures were shown using a, b, c, d, e and f letters as the representatives for severe class II, normal, slight class II, edge to edge, slight class III and severe class III profiles in the class II malocclusion patients as well as severe class III, slight class III, edge to edge, normal, slight class II and severe class II in the class III malocclusion patients .severe deep bite, slight deep bite, edge to edge, slight open bite and severe open bite in deep bite patients; severe open bite, slight open bite, edge to edge, slight deep bite and severe deep bite in open bite cases.

**Figure 4. Manipulated profile images of the Class II malocclusion patients.**

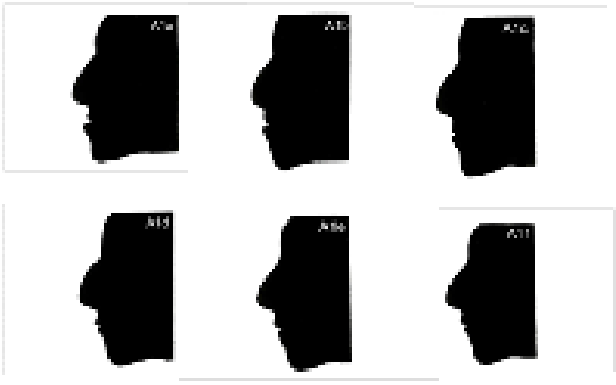

**Figure 5. Manipulated profile images of the Class III malocclusion patients.**

Three rater groups were used to evaluate the facial attractiveness of the profile images including laypersons (the patients and 2of his/her relatives), 3 orthodontists (member of staff) and 3 surgeons (member of staff).

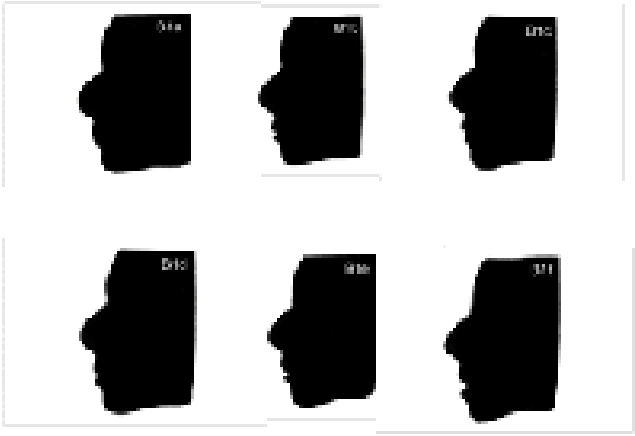

**Figure 6. Manipulated profile images of the deep bite patients.**

**Figure 7. Manipulated profile images of the open bite patients.**

All the raters were assessed regarding their reliability to evaluate the image attractiveness and diagnosed to be eligible for the study. The assessments were done using 6-scaled VAS (visual analogue scale) with 1 representing the most attractiveness and 6 as the least attractiveness according to the rater. The raters were given the CD of profile images and questionnaire forms while the patients were asked to complete them until a week. The raters judged the profiles' attractiveness in distinct hours of the day to eliminate the influence of factors like tiredness on their point of view. Furthermore, they were asked to observe the images in an overall view and make their decisions later (Fast show technique). All raters were told that there was no right or wrong answers and the mere aim was to determine their idea regarding the profile attractiveness. The questionnaires were completed and underwent statistical evaluations. The mean central tendency indices of the ranking scores were calculated for the overall population, males and females and the rater types. Kruskal-Wallis nonparametric test was used to compare the rankings of the raters as well as Mann-whitney U test for the differences obtained regarding the paired comparisons or gender.

## RESULTS

Generally, normal profile images (b) were the most attractive profiles among all malocclusion. The lowest score was given to the severe class III profile with the minimum differences to the maximum scores for the most unattractive images. The mean and other central tendencies of the manipulated profile images of class II patients are shown in Table 1. The rankings of the manipulated profile images in the class II patients were compared by Kruskal-Wallis test among the raters. The results showed significant differences regarding their rankings towards severe class II profiles ($p<0.006$), slight class III ($p<0.001$) and severe class III profiles ($p<0.0001$) while no distinct differences were noted among the rater groups in the assessment of normal ($p=0.24$), slight class II ($p=0.62$) and edge to edge ($p=0.4$) profiles. The mean and other central tendencies of the manipulated profile images of class II patients are shown in Table 2 according to raters group.

Normal profile images (d) were rated as the most attractive profiles in the assessment of the altered class III images among all raters, with a mean VAS score of 2.18 out of 6. The central tendency indices of the manipulated profile images of class III patients are shown in Table 3.

**Table 1. Mean and central tendencies of the manipulated profile images of Class II patients according to all raters.**

| Profile | Num. | Mean score | SD | Min | Max | Percentile scores | | | Ranking |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 25th percentile | 50th percentile | 75th percentile | |
| Severe class II | 120 | 3.45 | 1.5 | 1.0 | 6.0 | 2.0 | 3.0 | 4.0 | 4 |
| Normal | 120 | 2.04 | 1.23 | 1.0 | 6.0 | 1.0 | 2.0 | 3.0 | 1 |
| Slight class II | 120 | 2.37 | 1.21 | 1.0 | 6.0 | 1.0 | 2.0 | 3.0 | 2 |
| Edge to edge | 120 | 3.01 | 1.19 | 1.0 | 6.0 | 3.0 | 2.0 | 4.0 | 3 |
| Slight class II | 120 | 4.52 | 1.06 | 1.0 | 6.0 | 4.0 | 5.0 | 5.0 | 5 |
| Severe class III | 120 | 5.61 | 0.79 | 3.0 | 6.0 | 6.0 | 5.0 | 6.0 | 6 |

**Table 2. Mean and central tendencies of the manipulated profile images of Class II patients according to raters group.**

| Profile | Judges | Number | Mean score | SD | Standard error |
|---|---|---|---|---|---|
| Severe class II | Layperson | 40 | 3.74 | 1.89 | 0.30 |
| | Orthodontist | 40 | 2.46 | 1.02 | 0.16 |
| | Surgeon | 40 | 2.82 | 1.19 | 0.19 |
| Normal | Layperson | 40 | 2.31 | 1.38 | 0.22 |
| | Orthodontist | 40 | 1.92 | 0.87 | 0.14 |
| | Surgeon | 40 | 1.89 | 1.37 | 0.22 |
| Slight class II | Layperson | 40 | 3.31 | 1.29 | 0.21 |
| | Orthodontist | 40 | 3.41 | 1.13 | 0.18 |
| | Surgeon | 40 | 3.64 | 1.23 | 0.19 |
| Edge to edge | Layperson | 40 | 2.41 | 1.36 | 0.22 |
| | Orthodontist | 40 | 2.21 | 0.88 | 0.14 |
| | Surgeon | 40 | 2.49 | 1.27 | 0.20 |
| Slight class II | Layperson | 40 | 4.1 | 1.39 | 0.22 |
| | Orthodontist | 40 | 5.03 | 0.16 | 0.03 |
| | Surgeon | 40 | 4.44 | 1.02 | 0.16 |
| Severe class III | Layperson | 40 | 5.13 | 1.08 | 0.17 |
| | Orthodontist | 40 | 5.97 | 0.16 | 0.03 |
| | Surgeon | 40 | 5.71 | 0.6 | 0.09 |

**Table 3. The central tendency indices of the manipulated profile images of Class III patients according the total raters.**

| Profile | Number | Mean score | SD | Min | Max | Percentile scores | | | Ranking |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 25th percentile | 50th percentile | 75th percentile | |
| Severe class III | 120 | 5.43 | 0.86 | 3.0 | 6.0 | 5.0 | 6.0 | 6.0 | 6 |
| Slight class III | 120 | 4.03 | 1.55 | 1.0 | 6.0 | 3.0 | 5.0 | 5.0 | 5 |
| Edge to edge | 120 | 2.65 | 1.44 | 1.0 | 6.0 | 1.0 | 2.5 | 4.0 | 2 |
| Normal | 120 | 2.18 | 1.23 | 1.0 | 6.0 | 1.0 | 2.0 | 3.0 | 1 |
| Slight class II | 120 | 3.11 | 1.53 | 1.0 | 6.0 | 2.0 | 3.0 | 4.0 | 3 |
| Severe class II | 120 | 3.61 | 1.37 | 1.0 | 6.0 | 3.0 | 4.0 | 5.0 | 4 |

The results of Kruskal-Wallis test to compare the profile attractiveness in the class III patients among the rater groups showed significant differences in the rankings of severe class III ($p<0.0001$), slight class III ($p<0.0001$) and severe class II profiles ($p<0.0001$), while no significant differences were observed among them in the preference of edge to edge ($p=0.46$), normal ($p=0.23$) and slight class II ($p=0.52$) images. Therefore, more disparities were evident among the raters with the most alteration made from the normal values. The mean and other central tendency indices of the altered profile images in class III patients are shown in Table 4 regarding the raters group. The central tendency indices of the manipulated profile images of deep bite patients are shown in Table 5.

The results of Kruskal-Wallis test to compare the profile attractiveness in the deep bite patients among the rater groups showed significant differences in the rankings of severe deep bite ($p<0.007$), slight deep bite ($p<0.001$), severe open bite profiles ($p<0.01$), and slight open bite ($p<0.001$) while no significant differences were observed among them in the preference of edge to edge ($p=0.99$) and normal ($p=0.79$) images. The mean and other central tendency indices of the altered profile images in deep bite patients are shown in Table 6.

The central tendency indices of the manipulated profile images of open bite patients are shown in Table 7. The results of Kruskal-Wallis test to compare the profile attractiveness in the open bite patients among the rater groups showed significant differences only in the rankings of severe open bite ($p<0.01$). Other profile images showed no significant differences among the rater groups (slight open bite: $p=0.89$, edge to edge: $p=0.72$, normal: $p=0.06$, slight deep bite: $p=0.20$ and severe deep bite: $p=0.66$)

**Table 4. Mean and central tendencies of the manipulated profile images of Class III patients according to raters group.**

| Profile | Judges | Number | Mean score | SD | Standard error |
|---|---|---|---|---|---|
| Severe class III | Layperson | 40 | 5.28 | 0.93 | 0.15 |
| | Orthodontist | 40 | 5.9 | 0.3 | 0.05 |
| | Surgeon | 40 | 5.13 | 0.97 | 0.15 |
| Slight class III | Layperson | 40 | 4.13 | 1.52 | 0.24 |
| | Orthodontist | 40 | 4.73 | 1.09 | 0.17 |
| | Surgeon | 40 | 5.23 | 1.62 | 0.26 |
| Edge to edge | Layperson | 40 | 2.48 | 1.54 | 0.24 |
| | Orthodontist | 40 | 2.63 | 1.19 | 0.19 |
| | Surgeon | 40 | 2.85 | 1.58 | 0.25 |
| Normal | Layperson | 40 | 2.48 | 1.5 | 0.24 |
| | Orthodontist | 40 | 1.9 | 1.08 | 0.17 |
| | Surgeon | 40 | 2.15 | 1.05 | 0.17 |
| Slight class II | Layperson | 40 | 3.25 | 1.43 | 0.23 |
| | Orthodontist | 40 | 2.85 | 1.35 | 0.21 |
| | Surgeon | 40 | 3.23 | 1.78 | 0.28 |
| Severe class II | Layperson | 40 | 3.4 | 1.49 | 0.24 |
| | Orthodontist | 40 | 3.0 | 0.88 | 0.14 |
| | Surgeon | 40 | 4.43 | 1.26 | 0.19 |

**Table 5. Mean and central tendencies of the manipulated profile images of deep bite patients according to all raters.**

| Profile | Number | Mean score | SD | Min | Max | Percentile scores | | | Ranking |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 25th percentile | 50th percentile | 75th percentile | |
| Severe deep bite | 120 | 4.0 | 1.48 | 1.0 | 6.0 | 3.0 | 4.0 | 5.0 | 4 |
| Normal | 120 | 1.84 | 1.08 | 1.0 | 5.0 | 1.0 | 1.0 | 2.0 | 1 |
| Slight deep bite | 120 | 2.68 | 1.48 | 1.0 | 6.0 | 2.0 | 2.0 | 3.0 | 2 |
| Edge to edge | 120 | 3.23 | 1.42 | 1.0 | 6.0 | 2.0 | 3.0 | 4.0 | 3 |
| Slight open bite | 120 | 4.28 | 1.29 | 1.0 | 6.0 | 4.0 | 4.0 | 5.0 | 5 |
| Severe open bite | 120 | 4.98 | 1.34 | 1.0 | 6.0 | 4.0 | 6.0 | 6.0 | 6 |

**Table 6. Mean and central tendencies of the manipulated profile images of deep bite patients according to raters group.**

| Profile | Judges | Number | Mean score | SD | Standard error |
|---|---|---|---|---|---|
| Severe deep bite | Layperson | 40 | 4.53 | 1.60 | 0.25 |
| | Orthodontist | 40 | 3.65 | 1.44 | 0.23 |
| | Surgeon | 40 | 3.83 | 1.26 | 0.19 |
| Normal | Layperson | 40 | 1.95 | 1.28 | 0.20 |
| | Orthodontist | 40 | 1.93 | 1.14 | 0.18 |
| | Surgeon | 40 | 1.65 | 0.74 | 0.12 |
| Slight deep bite | Layperson | 40 | 3.28 | 1.63 | 0.26 |
| | Orthodontist | 40 | 2.70 | 1.36 | 0.22 |
| | Surgeon | 40 | 2.05 | 1.19 | 0.19 |
| Edge to edge | Layperson | 40 | 3.20 | 1.32 | 0.21 |
| | Orthodontist | 40 | 3.25 | 1.68 | 0.26 |
| | Surgeon | 40 | 3.23 | 1.27 | 0.21 |
| Slight open bite | Layperson | 40 | 3.68 | 1.44 | 0.23 |
| | Orthodontist | 40 | 4.33 | 1.29 | 0.20 |
| | Surgeon | 40 | 4.83 | 0.81 | 0.13 |
| Severe open bite | Layperson | 40 | 4.38 | 1.66 | 0.26 |
| | Orthodontist | 40 | 5.15 | 1.21 | 0.19 |
| | Surgeon | 40 | 5.43 | 0.81 | 0.13 |

**Table 7. The central tendency indices of the manipulated profile images of open bite patients according to total raters.**

| Profile | Number | Mean score | SD | Min | Max | Percentile scores | | | Ranking |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 25th percentile | 50th percentile | 75th percentile | |
| Severe open bite | 120 | 4.54 | 1.48 | 1.0 | 6.0 | 4.0 | 5.0 | 6.0 | 6 |
| Slight open bite | 120 | 3.73 | 1.26 | 1.0 | 6.0 | 3.0 | 4.0 | 5.0 | 4 |
| Edge to edge | 120 | 3.25 | 1.61 | 1.0 | 6.0 | 2.0 | 3.5 | 4.0 | 3 |
| Normal | 120 | 2.45 | 1.52 | 1.0 | 6.0 | 1.0 | 2.0 | 3.0 | 1 |
| Slight deep bite | 120 | 2.63 | 1.53 | 1.0 | 6.0 | 1.0 | 2.0 | 3.5 | 2 |
| Severe deep bite | 120 | 4.40 | 1.64 | 1.0 | 6.0 | 3.0 | 5.0 | 6.0 | 5 |

**Table 8. Mean and central tendencies of the manipulated profile images of open bite patients according to raters group.**

| Profile | Judges | Number | Mean score | SD | Standard error |
|---|---|---|---|---|---|
| Severe deep bite | Layperson | 40 | 4.11 | 1.75 | 0.28 |
| | Orthodontist | 40 | 4.31 | 1.54 | 0.25 |
| | Surgeon | 40 | 5.18 | 0.81 | 0.13 |
| Slight deep bite | Layperson | 40 | 3.68 | 1.21 | 0.19 |
| | Orthodontist | 40 | 3.72 | 1.26 | 0.20 |
| | Surgeon | 40 | 3.78 | 1.35 | 0.21 |
| Edge to edge | Layperson | 40 | 2.95 | 1.71 | 0.28 |
| | Orthodontist | 40 | 2.38 | 1.46 | 0.23 |
| | Surgeon | 40 | 2.05 | 1.28 | 0.20 |
| Normal | Layperson | 40 | 3.42 | 1.75 | 0.28 |
| | Orthodontist | 40 | 3.28 | 1.73 | 0.28 |
| | Surgeon | 40 | 3.05 | 1.36 | 0.21 |
| Slight open bite | Layperson | 40 | 2.66 | 1.48 | 0.24 |
| | Orthodontist | 40 | 2.95 | 1.7 | 0.27 |
| | Surgeon | 40 | 2.30 | 1.38 | 0.22 |
| Severe open bite | Layperson | 40 | 4.18 | 1.83 | 0.29 |
| | Orthodontist | 40 | 4.36 | 1.69 | 0.27 |
| | Surgeon | 40 | 4.65 | 1.39 | 0.22 |

## DISCUSSION

The study suggested that the profiles with the normal proportions were the most favored profiles among class II, class III, deep bite and open bite patients, while the rankings were continuously decreased together with the higher deviations from the normal values in all rater groups. The least scores were given to the severe class III profiles (in sagital dimension) and severe open bite (in vertical dimension) with the most deviations from the normal values in both patients groups. Furthermore, diversities were observed among the ratings of the judges on altered profiles, so that, laypersons and orthodontists more agreed in the rankings of the manipulated class III profiles' attractiveness while they differently judged altered class II profiles .

Due to the similar perception of profile attractiveness in the half of comparisons in both image groups, it seems that relatively similar standards to exist for facial esthetics in the studied population. However, some differences were notable among the rater groups in perception of profile attractiveness which were consistent with the other studies[7,10,11,12]. Different perception of the esthetics may be related to different educational background, socio-economic factors, variables related to the used technique for assessing attractiveness (silhouette, photography or differently scaled VAS) or the used methodology for the studies. Dental specialists (orthodontists and surgeons) are more critical at their ratings than laypersons because of their specialized education, training background and scientific knowledge regarding dentofacial deformities[13]; although, some differences were noted between them .Dentists are able to discriminate profile changes more accurately

due to the knowledge received to detect severe deviations from the normal values[9,14]. However, laypersons are fairly informed regarding the esthetic ranking today due to the influence of mass media or some scattered knowledge of the area[10]. This finding may justify the observed slight differences between the laypersons and orthodontists in the ranking of class III profile images.

The rater's social class was more important in ranking of dental and skeletal beauty[17]. Raters with a lower socio-economic situation are used to give fewer attractiveness scores than those with higher status.

Similar assessments between patients and dental specialists towards facial profile attractiveness were showed in previous study[9]. Furthermore, female and male normal profiles were shown as the most attractive profiles according to Asian adults similar to the present study[10]. The male normal class I profile as the most attractive profile image among Jordanian population too[7]. Similar rankings of the facial esthetics among orthodontists and surgeons without any significant differences in the mean attractiveness scores were found in literature[18]. Furthermore, no significant preference of specific facial profiles was noted between orthodontists and surgeons[19]. Contrary to these reports, significant differences were observed between these groups in the rankings of some manipulated profiles in the present study. No statistically significant differences were observed in the overall rankings of the male and female profile images between female and male raters suggesting similar measures for facial esthetics assessments between both genders. Most studies did not show significant differences in this regard resembling our results; however, others found females to give higher attractive scores than males to all photographs while male raters to be more sensitive to evaluate facial esthics[20]. Gender has been shown to have an effect on profile esthetics in the Turkish individuals[12].

Different factors are influential on the ranking of the facial esthetics. Simultaneously, rater or profile model variables might affect the raters' opinions regarding the facial attractiveness. Significant differences were inevitable among the raters when ranking facial beauty even using wrapped profiles to make similar outline shapes. In addition, other factors like the model sex or his/her race can affect the results[21].

In this study, all profile images were converted into the black-colored ones using computerized simulation method and Photoshop software in order to eliminate the confounding effects of different variables. Digital color images were used to show the models in the Powerpoint software which has gained more popularity among different groups. Digital image outline or silhouettes are able to remove the role of interfering variables in the subjective assessment of facial attractiveness[22]. No profile images were altered with the higher proportions to make more realistic images similarly to those encountered in the clinical situations. Furthermore, the presentation of female and male profiles was different and randomized.

As different assessments of the facial attractiveness were expressed by the laypersons in some cases, orthodontists and surgeons must be aware of these different ideas. By this, they will be able to cooperate with the patients and produce more similar beauty judgments increasing the success of treatments and achieving patients' satisfaction in turn.

## CONCLUSION

The results of the this study showed that the normal profile images were the most attractive profiles among both patients' group as suggested by 3 raters while the severe class III and severe open bite profiles were the least attractive images without any significant differences among male and female raters and female and male profile images . In overall, laypersons and dental specialists ratings were somehow similar in the assessment of facial profile attractiveness in the sagital and vertical dimensions.

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