PERCEPTION OF JORDANIAN POPULATION TO ALTERED DENTAL AESTHETICS USING COMPOSITE RESIN RESTORATIONS

1WADDAH S EL-NAJI, BDS, JBRestDent
2AMJAD M ALWARAWREH, BDS, DDS, JB (Ortho), Fellow (Ortho), Diploma (Ortho)
3RAGHDA W SHAMOUT, BDS, JBOrth
4SALEM A SARAYREH, BDS, JB PaedoDent
5HAYTHAM F RABADI, BDS, MFDSRCS, JBOMS

ABSTRACT

The objective of this study was compare perception of Jordanian evaluators toward attractiveness of dental photographs of patients before and after anterior teeth alteration with composite resin restorations in sequence and randomly and between genders, using a 10-point numerical scale.

Eight cases were treated with aesthetic alteration of maxillary anterior teeth using composite restorations and selected for this study. For each case, two coloured digital photographs of their teeth before and after treatment were taken, arranged in two catalogues (in one catalogue arranged in sequence and randomly in the other) and subjected to 320 Jordanian evaluators (220 female and 110 males; with a mean age of 24.97±9.09 years), for rating. They were required to rate the esthetic attractiveness for each photograph on a 10-point numerical scale (ranged from 1=very unattractive to 10=very attractive). The scores were recorded for each photograph; the mean values were calculated and compared between the two groups and between genders using SPSS (v.17). Paired t-test was used to reveal the differences in mean scores of the evaluators recorded in Sequence and Randomized before and after treatment. Level of significance was set at 0.05.

Although males were slightly older than females, the difference was statistically insignificant. The percentage of mean difference between after and before treatment was higher for the in sequence compared to randomized group (39.6% and 22.1%; respectively). A statistically significant difference in mean scores were recorded between before and after treatment in both groups (p=0.0001) and between the two groups after treatment (p=0.01). However, the mean differences between the two groups before treatment were not statistically significant. Although males recorded higher scores compared to females in both groups, before and after treatment but the differences were not significant. However, statistically significant differences (p<0.0001) were recorded between the two groups, before and after in the same gender.

Evaluators found the photographs after treatment more attractive than those before treatment particularly when they viewed the cases in sequence rather than randomly with almost similar gender esthetic perception toward dental alterations. In addition, they recorded approximately 40% of improvement in their perception in sequence compared to 22% randomly.

Key Words: Anterior teeth alteration, Composite resin, Dental attractiveness, Esthetic, Jordan, Perception.

INTRODUCTION

Composite resin was introduced into the field of conservative dentistry to minimise the drawbacks of the acrylic resins that replaced silicate cements in the 1940s1. In 1955 Buonocore used orthophosphoric acid to improve the adhesion of acrylic resins to the surface of the enamel2. Composite resin restorations have been greatly developed in the recent years, in terms of physical, chemical properties and esthetic properties, making them more appropriate and reliable due to their translucency and ability to produce natural-looking restorations.3 Although many other materials and techniques have been introduced to dental esthetics like porcelain-laminate veneers, implants and all-ceramics, composite resin restorations remain the simplest, least costly and more conservative4.
For centuries, literature has indicated that the teeth possess a beauty of their own and also that they greatly contribute to facial beauty. The evaluation of attractiveness is a subject of controversy, spacing and mid line diastema is one of the factor which affect the dental attractiveness. Moreover, other factors such as personal experiences and social environment may affect the judgment of the evaluators.

Several studies and articles are focused on creating standards for “smile analysis.” Moreover, Most of the studies evaluated facial, oral and dental esthetics. The perception of lay people toward dental esthetics has also been well-documented in the dental literature.

Several researchers evaluated dento-facial photographs by rating esthetic attractiveness using scales. Different types of scales were used to evaluate esthetic perception; many researchers used The Visual Analogue Scale (VAS), others used Likert scale and others used a 5- or 10-point numerical scales. In addition, gender variation in esthetic perception was one of the factors mostly considered.

Although several studies focused on smile esthetics, most of them used digital computerized alteration to investigate raters’ perception, however, the perception of lay people toward actual alteration of teeth with any restorative mean received little attention, and to the author’s knowledge, at least in Jordan, no studies were found in the literature.

The aim of this study was to compare perception of Jordanian evaluators toward attractiveness of dental photographs of patients before and after anterior teeth alteration with composite resin restoration in sequence and randomly and between genders, using a 10-point numerical scale.

METHODOLOGY

The present research project was approved by The Higher Research and Ethical Committee at Royal Medical Services, represented by the Head of the Dental Specialities of the Department of Dentistry in the Royal Medical Services.

A total of 30 patients were treated (by the corresponding author; in the Restorative Clinic, Division of Dentistry at Prince Zaid Hospital, Tafela, Jordan) with aesthetic alteration of maxillary central incisors using composite restorations. Of these, eight cases were randomly selected for this study. Informed consent form was obtained from the participants to be exposed to coloured digital photographs of their teeth before and after treatment and to use it in this study. For each case two exposures were taken in natural day light, using a digital camera (Canon G10, 12 MP, Tokyo, Japan) in the frontal pose (Fig 1). Each photograph was obtained using a standardized procedure by positioning the subject 50cm from the camera with the head in upright position. Photographs were printed on 6”x4” photo glossy paper.

The evaluators comprised 320 Jordanian participants (220 female and 110 males) with a mean age 24.97±9.09 years (ranged between 16 and 60 years) from different geographical locations in the north, middle and south of Jordan (Irbid, Amman and Tafela) were able to respond to questionnaires used in the study and willing to accept the protocol and give informed consent were selected and accepted to participate in this study.

Questionnaire

All recruited evaluators were subjected to answer a specially designed questionnaire which included information regarding age, gender, medical insurance number, occupation and place of residence. The questionnaire comprised two printed pages with two catalogues that included the sets of the coloured photographs. The first catalogue (A) contained 16 photographs of 8 patients, arranged in sequence before and after esthetic teeth alteration treatment. The second catalogue (B) contained the same 16 pictures in unarranged (randomized) fashion. For each catalogue, evaluators were required to rate the esthetic attractiveness for each photograph on a 10-point numerical scale (score 1=very unattractive to score 10=very attractive). For catalogue A, the evaluators’ perception of esthetic improvement were performed by rating the photographs before and after treatment, then calculated by subtracted Rating before treatment from Rating after treatment divided by sum of both scores multiply by 100%.

Method error

The reliability of the questionnaire was tested by random selection of 15 evaluators who were required to complete the questionnaire again after one week interval. For each evaluator, the two ratings were compared using Cronbach’s one-alpha. Paired Student’s t-test was performed to unveil statistically significant differences between the two ratings for the same evaluator, (mean difference 0.072 ± 0.13 mm; P value = 0.84). As there were strong Cronbach’s coefficient and small mean difference between the two ratings, it was assumed that the questionnaire would be reliable.

Statistical analysis

Statistical analysis was performed using SPSS Statistic Version 17 (SPSS Corporation, Chicago, IL,
USA). A one-sample student’s t-test was used to evaluate the differences in mean age between males and females. Paired t-test was used to reveal the differences in mean scores of the evaluators recorded in Sequence and Randomized before and after treatment. Furthermore, Paired t-test was used to determine whether there were gender differences in the mean values of the two groups. Ninety-five percent confidence intervals about the mean were constructed for differences between sequential and randomized groups and male and female evaluators. Level of significance was set at 0.05.

**RESULTS**

The mean age of evaluators was 24.97±9.09, ranged between 16 and 59 years; approximately two-thirds of the evaluators were females. Although males were slightly older than females, however, the difference was statistically insignificant (p>0.05). The distribution of gender in relation to different age groups is shown in Table 1.

Table 2 shows the mean values of evaluators’ scores (for the eight cases evaluated in this study) in sequence and randomized groups, before and after treatment. The highest mean score of evaluation recorded (7.58±1.88) was higher for the in sequence group compared to randomized group (39.6% and 22.1%; respectively).

Table 3 shows that a paired-sample student’s t-test was used to evaluate the differences in mean values of the evaluators’ scores in the two groups (in sequence and randomized) before and after treatment. A statistically significant difference in mean scores of evaluators were recorded between before and after treatment in both groups (p=0.0001, Student’s t-test) and between the two groups after treatment (p=0.01, Student’s t-test). However, the mean differences between the two groups before treatment were not statistically significant.

Table 4 shows the differences in the mean scores of the evaluators in sequence and randomized before and after treatment in relation to gender. Male evaluators recorded higher scores compared to females in both groups, before and after treatment. Female evaluators recorded slightly higher value in mean difference between after and before treatment (% of improvement in evaluators’ perception) in sequence group compared to males (39.8% and 39.2%; respectively). Inversely, in randomized group, males recorded higher values of improvement compared to female evaluators (23.3% and 20.8%; respectively).

A paired Student’s t-test was used to reveal gender differences in the mean scores of the evaluators in both groups, before and after treatment. Statistically significant differences (p<0.0001) were recorded between the two groups (in sequence and randomized), before and after in the same gender. However, gender differences were statistically insignificant (Table 5).

**DISCUSSION**

Several studies and articles are focused on creating standards for “smile analysis”. Most of the studies that evaluated oral and dental esthetics focused the amount of upper and lower gingival display in dynamic states of smile and speech.

This study, however, focused on the perception of lay people to attractiveness of altered anterior teeth by rating photographs at anterior pose of 16 pictures represented 8 cases. For each case, one photograph was taken preoperatively and the other postoperatively. The uniqueness of this study is the differentiation by the sex of the evaluator and by the sex of the evaluated images.

Dental alterations were performed to improve the dental esthetics of the patients. Composite resin direct filling material was used for eight selected cases, who had maxillary anterior teeth with median diastema, irregular incisal edges of central incisors, peg-shaped/ small lateral incisors, contra-lateral crown length-width discrepancy and/or tilted teeth. It has been reported that dental asymmetry, median diastema and incisal edge irregularities unattractive.

In the present study, the evaluators rated the attractiveness of maxillary anterior teeth alteration; they scored standardized photographs before and after treatment. The importance of this study is that restorative dentistry frequently entails correction of tooth size discrepancies associated with differing lengths and/or widths. Consequently, tooth dimensions may be an important aspect of esthetic reconstruction, where identification of anterior incisor positioning is critical to smile analysis, and correction of tooth size discrepancies are tantamount to dental esthetics.

The presence of maxillary anterior teeth plays an important role in facial esthetics. The maxillary central incisor is considered to be the primary reference tooth, more important than the rest of the anterior teeth in regards to the amount of visible coronal tooth structure.

Saver used standardized photographs to assess the importance of incisor positioning in smile esthetics, in addition, Išıksal et al. used photographs to compare treated and untreated smiles. Similarly, in this study, two actual photographs for each patient, were taken using a digital camera before and after treatment of the maxillary anterior teeth using composite resin restoration. In contrary to previous studies, that used a computerized photographic alterations.
### TABLE 1: AGE AND GENDER DISTRIBUTION OF THE EVALUATORS

<table>
<thead>
<tr>
<th>Gender</th>
<th>Male (110)</th>
<th>Female (210)</th>
<th>Total (320)</th>
<th>t-test</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;20</td>
<td>42</td>
<td>85</td>
<td>127</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-29</td>
<td>22</td>
<td>75</td>
<td>97</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30-39</td>
<td>30</td>
<td>42</td>
<td>72</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40-49</td>
<td>13</td>
<td>7</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50-59</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>27.77 (10.66)</td>
<td>23.49 (7.80)</td>
<td>24.97 (9.09)</td>
<td>10.75</td>
<td>0.29 (NS)</td>
</tr>
</tbody>
</table>

*one-sample Student’s t-test.

### TABLE 2: MEAN (SD) SCORES OF THE EVALUATORS IN SEQUENCE AND RANDOMIZED

<table>
<thead>
<tr>
<th>Case No.</th>
<th>In Sequence</th>
<th>Randomized</th>
<th>Improvement (in %)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before Mean (SD)</td>
<td>After Mean (SD)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1.87 (1.20)</td>
<td>6.09 (1.83)</td>
<td>42.2</td>
</tr>
<tr>
<td>2</td>
<td>3.14 (1.48)</td>
<td>7.23 (1.68)</td>
<td>40.9</td>
</tr>
<tr>
<td>3</td>
<td>3.41 (1.65)</td>
<td>7.56 (1.76)</td>
<td>41.5</td>
</tr>
<tr>
<td>4</td>
<td>4.70 (1.80)</td>
<td>8.60 (1.46)</td>
<td>39.0</td>
</tr>
<tr>
<td>5</td>
<td>4.50 (1.83)</td>
<td>8.22 (1.67)</td>
<td>37.2</td>
</tr>
<tr>
<td>6</td>
<td>4.52 (2.05)</td>
<td>8.30 (1.64)</td>
<td>37.8</td>
</tr>
<tr>
<td>7</td>
<td>3.75 (1.85)</td>
<td>7.48 (1.75)</td>
<td>37.3</td>
</tr>
<tr>
<td>8</td>
<td>2.96 (1.77)</td>
<td>7.18 (1.98)</td>
<td>42.2</td>
</tr>
<tr>
<td>Total</td>
<td>3.62 (1.93)</td>
<td>7.58 (1.88)</td>
<td>39.60%</td>
</tr>
</tbody>
</table>

### TABLE 3: DIFFERENCES IN MEAN SCORES OF THE EVALUATORS RECORDED IN SEQUENCE AND RANDOMIZED BEFORE AND AFTER TREATMENT (PAIRED SAMPLE T-TEST)

<table>
<thead>
<tr>
<th>Paired Differences</th>
<th>Mean</th>
<th>SD</th>
<th>Std. EM</th>
<th>Correlation</th>
<th>df</th>
<th>t-test</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBT vs SAT</td>
<td>-2.205</td>
<td>2.585</td>
<td>0.0511</td>
<td>0.566</td>
<td>2559</td>
<td>-99.890</td>
<td>0.0001</td>
</tr>
<tr>
<td>RBT vs RAT</td>
<td>-3.965</td>
<td>2.0083</td>
<td>0.0397</td>
<td>0.582</td>
<td>2559</td>
<td>-43.159</td>
<td>0.0001</td>
</tr>
<tr>
<td>SBT vs RBT</td>
<td>0.316</td>
<td>2.116</td>
<td>0.0418</td>
<td>-0.0450</td>
<td>2559</td>
<td>7.557</td>
<td>0.511 (NS)</td>
</tr>
<tr>
<td>SAT x RAT</td>
<td>-1.444</td>
<td>2.566</td>
<td>0.0507</td>
<td>0.163</td>
<td>2559</td>
<td>-28.480</td>
<td>0.01</td>
</tr>
</tbody>
</table>

SBT: in Sequence before treatment; SAT: in Sequence after treatment; RBT: Randomized before treatment; RAT: Randomized after treatment; SD: standard deviation; Std.EM: standard error mean; vs: versus.

### TABLE 4: MEAN (SD) SCORES OF THE EVALUATORS IN SEQUENCE AND RANDOMIZED BEFORE AND AFTER TREATMENT IN RELATION TO GENDER

<table>
<thead>
<tr>
<th>Gender</th>
<th>In Sequence</th>
<th>Randomized</th>
<th>Improvement (in %)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before Mean (SD)</td>
<td>After Mean (SD)</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>3.67 (1.80)</td>
<td>7.59 (1.91)</td>
<td>39.20</td>
</tr>
<tr>
<td>Female</td>
<td>3.59 (2.00)</td>
<td>7.57 (1.83)</td>
<td>39.80</td>
</tr>
<tr>
<td>Total</td>
<td>3.62 (1.93)</td>
<td>7.58 (1.88)</td>
<td>39.60%</td>
</tr>
</tbody>
</table>
The nose and chin were eliminated from the images to reduce the number of confounding variables. For the same reason, anterior teeth alterations were performed in eight patients of both genders. However, other studies used only females. Some researchers used visual analogue scale others used Likert scale (numerical rating of 5 points). In this study, however, attractiveness ratings were recorded on a 10-point numerical scale for each photograph. A 10-point scale has been used in several studies, the advantage of this scale was that it had a wider range compared to the other scales thus it enabled the evaluators to rate much accurately.

Regarding for the number of photograph in this study; we used 16 pictured and showed them in Randomized and in sequential order; on oppsite to other studies which used only one picture, altered it and presented it to the evaluator only in sequential order. In this study, although females comprised approximately two-thirds of evaluators, gender did not affect the aesthetic evaluation. These findings are in agreement with previous studies, and in accordance with Hunt et al., who reported that more than 78% of the raters were females. On the contrary, other researchers reported significant gender differences on aesthetic evaluation.

A wide age range was used in this study reflects different perception of laypeople to dental esthetics, at least in one study, however, a narrower range limited to adults below age of 40 was used.

In this study, evaluators rated the photographs in sequence with higher scores compared to the same photographs when they viewed them randomly, this could be explained by the opportunity they were given to compare between the pictures before and after treatment in each case, however, this was not possible randomly were they only rated each picture as a case. In addition, when statistically significant differences (p=0.0001, t-test) were recorded in both groups before and after treatment, this finding reflects the importance of anterior teeth positioning and shape preference to the evaluators, However, the evaluators rated the pictures with low scores before treatment in both sequential and randomized similarly. This finding emphasized the importance of and necessity to cosmetic alteration of unesthetic malposed or small size of maxillary lateral incisor, median diastema and/or attrition of maxillary central incisor teeth.

On the other hand, the evaluators recorded pictures after treatment with higher scores but still significantly (p=0.01, t-test) rated pictures in sequence with scores higher than those viewed randomly. The explanation for such a finding is that the evaluators found the pictures attractive, rated higher to those shown to them before and after treatment as they were given the chance to compare between two pictures of the same case. An interesting finding was that, although statistically insignificant, male evaluators recorded slightly higher scores in both groups, before and after treatment.

The data clearly point to the importance of the perception of the evaluator regardless his or gender toward the esthetics of anterior teeth alteration, as this study reported statistically (p=0.0001, t-test) a significant difference in perception of attractiveness with higher
### Fig 1: Coloured digital photographs of eight cases before and after esthetic tooth alteration who were subjected to rating by the evaluators

<table>
<thead>
<tr>
<th>Case 1</th>
<th>Case 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Before" /></td>
<td><img src="image2" alt="After" /></td>
</tr>
<tr>
<td><img src="image3" alt="Before" /></td>
<td><img src="image4" alt="After" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Case 3</th>
<th>Case 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image5" alt="Before" /></td>
<td><img src="image6" alt="After" /></td>
</tr>
<tr>
<td><img src="image7" alt="Before" /></td>
<td><img src="image8" alt="After" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Case 5</th>
<th>Case 6</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image9" alt="Before" /></td>
<td><img src="image10" alt="After" /></td>
</tr>
<tr>
<td><img src="image11" alt="Before" /></td>
<td><img src="image12" alt="After" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Case 7</th>
<th>Case 8</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image13" alt="Before" /></td>
<td><img src="image14" alt="After" /></td>
</tr>
<tr>
<td><img src="image15" alt="Before" /></td>
<td><img src="image16" alt="After" /></td>
</tr>
</tbody>
</table>
scores after treatment compared to same untreated case. Approximately 40% improvement in perception of the evaluators was recorded in photographs shown in sequence compared to 22% for those shows randomly.

It is very difficult to compare these findings with other studies due to variation in methodology, measuring tools used and sample size. In addition, most studies focused on smile esthetic analyses used computerized alteration of photographs opposite to actual dental alteration performed clinically using composite resin restoration.

A strength of this study was that the evaluators represented different geographical regions in Jordan with a relatively reasonable number of evaluators from both genders of a wide age range. Although these factors have not been investigated in this study, as it will be considered in upcoming researches in the future. Previous studies investigated the perception of dental professionals in terms of dento-facial and smile esthetics and reported conflicting findings. 15,18,36,39,45,46

However, an important limitation is that this work did not include the perception of dentists toward the tooth alterations performed in this study, further studies still needed to compare between the perception of lay people and dentist.

Furthermore, the results of this study can be applied to Jordanian population only since they cannot be compared with other races because the literature devoid from similar studies, on the contrary to researches concerned with smile esthetics in which there were similarity reported between Jordanian people and Europeans22,47, Americans6,7,34 and Japanese30 in their perception of attractiveness of smile.

Further studies are still needed to include a wide range of socio-economic status and different educational levels; and to include more cases and study the effect of age on perception of the evaluators towards attractiveness in relation to dento-oro-facial complex.

CONCLUSION

Evaluators rated different photographs of altered (after treatment) anterior teeth with high scores compared to those before treatment. Evaluators found the photographs more attractive when viewed the cases in sequence (before then after treatment) than those of the same cases viewed randomly. Males and females showed no significant differences in their evaluation of attractiveness of anterior teeth, both in sequence and randomly, before and after treatment.

Evaluators viewed photographs in sequence recorded an improvement in their perception of approximately 40% compared to those when viewed randomly (22%). In addition, male evaluators recorded almost similar improvement in perception to females.

REFERENCES


Altered dental aesthetics & composite restorations


