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Research Article

Perception of Tunisian Orthodontists, Dentists and Laypersons Towards Altered Smile Esthetics

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Abstract

Objective: This study aimed to evaluate how dental practitioners and laypersons differ in their perception of altered smile aesthetics based on viewing images of a digitally manipulated smile.

Materials and Methods: A photograph with ideal smile characteristics was selected and digitally manipulated to create changes in maxillary dental midline shift, inter-incisor diastema, crown width of the lateral incisor, crown length of central incisor and gingival exposure.

To assess the attractiveness of the pictures, a score from 1 to 10 was given by different evaluators. The response were then analyzed and processed with SPSS software version 17.0 using the Kriskal Wallis Test and the Mann Whitney Test.

Results: Orthodontists were more critical and gave lower scores than dentists and

laypeople when evaluating different altered smiles.

Age, gender and years of dental practice showed no signification correlation with the attributed scores, contrary to the educational level.

The unattractive smile are those with 3mm midline diastema between the maxillary central incisors and with 3mm decrease of the maxillary left central incisor crown lenght.

Keywords: Orthodontists; Laypersons; Smile Esthetics; Tunisian; Gingival Exposure

Introduction

The smile is one of the most essential human facial expressions that enhances the reward value of an attractive face.

Providing patients with an attractive wellbalanced smile is a challenge faced by most dental specialists.

However, esthetic perception varies between people and can be influenced by gender, personal experience, and social environment.

Materials and Methods

Subjects

The sample consisted of 220 tunisan persons divided into 3 groups: 38 orthodontists (17.3%), 95 general dentists (43.2%), 87

laypersons (39.5%), aged between 19 and 66 years (Mean: 32.68 with SD: 8.43), 35% men and 65% women.

The orthodontists and the general dentists were both graduates from the University of Dental Medicine of Monastir.

The lay people group had different backgrounds : teachers, engineers, nurses, farmers, housewives, unemployed people and others without any dental backgrounds.

The selection of the raters was random and they were consulted either by e-mail, social networks (Facebook) or directly.

Variables and measurements

Twenty-one modified photographs of ideal woman's smile were used in this study.

The smile features in the photographs were digitally altered by Adobe Photoshop CS6 software (Adobe Systems Inc., San Jose, CA).

The alterations were intentionally created to resemble a smile aesthetic discrepancy. The photographs were grouped into five sets, each representing an altered smile feature, with alteration increments ranging from 0.5 to 1 mm. The altered features were as follows: [1] Crown length of the central incisor, [2] Crown width of the lateral incisor, [3] gingival exposure, [4] maxillary midline shift, and [5] midline diastema.

All five alterations were selected after consulting with clinically experienced orthodontists and general dentists and were chosen based on their frequency and clinical significance in esthetic planning.

The photographs were coded for identification with one letter and one number such as 'A2', 'E4' and were grouped randomly.

Crown length of the central incisor

The image was altered by decreasing the crown length of the maxillary left central incisor by adjusting the gingival marginal level by 0.5 increments up to 3 mm (Figure 1).

Crown width of the lateral incisor

Symmetrical crown width alterations were made to the maxillary lateral incisors.

Figure 1: Photographs showing alteration to the crown length of the central incisors.

(A1) no alterations, (A2) Central incisor crown length alteration by 0.5 mm increment; (A3) 1 mm increment; (A4) 2 mm increment; (A5) 3 mm increment.

The alteration was limited to the mesio-distal width of the lateral incisors, which was decreased by 1 mm (Figure 2).

Figure 2: Photographs showing a decrease in the width of the maxillary right lateral incisor by (B1) 1 mm, (B2) 2mm, (B3) 3 mm, (B4) 4 mm.

Gingival exposure

The anterior gingival display was measured from the lower border of the upper lip till the gingival margin of the anterior teeth.

The smile was altered by progressively moving the upper lip superiorly 1 mm, 3 mm and 4 mm to create a 'gummy smile' or inferiorly -3 mm to create low smile.

Modifications were based on the relationship of the upper lip with the gingival margin of the maxillary incisors (Figure 3).

Figure 3: Photographs showing a decrease in the gingival exposition by (C1) -3 mm, and an increase by (C2) 1mm, (C3) 3 mm, (C4) 4 mm.

Maxillary midline shift

A maxillary dental midline shift was made, while the lower midline and the lip cupid bow were fixed and used as a reference.

A 1-mm increment was used to shift the maxillary midline to the right of the patient (Figure 4).

Figure 4: Photographs showing alterations to maxillary dental midline.

(D1) 1 mm deviation, (D2) 2 mm deviation, (D3) 3 mm deviation, (D4), 4 mm deviation.

Midline diastema

The image was altered by creating a midline diastema between the maxillary central incisors by 0.5 mm inrements up to 3 mm.

Figure 5: Photographs showing an increase in the maxillary midline diastema by (E1) 0.5 mm, (E2) 1mm, (E3) 2 mm, (E4) 3 mm.

Survey form

The survey was wrote out in Arabic language and provided to the raters participating in this study.

It allowed to collect some personal informations : Age, sex, educational attainment (primary, secondary, university), job (dentist, orthodontist or other), working years for dentists and orthodontists (less than 5 years, between 5 and 10 years, over 10 years) and to give a score from '1' to '10' for 21 modified images of smile to assess its attractiveness.

Smiles classification

Classification of the images was done using a score from 1 to 10, with values over 5 being regarded as esthetic and those below 5 considered unaesthetic. The evaluators were then asked to mark their score next to each image to assess its attractiveness ; taking into consideration that 1 meant the least attractive and 10 the most attractive smile.

Statistical analysis

All the data was collected and analyzed using SPSS software version 17.0. Descriptive data are presented as medians and quartiles.

The Kriskal Wallis Test was used not only to identify any difference in perception of altered smile aesthetics between orthodon-

tists, dentists and laypeople, but also to identify any statistically significant differences between educational level, practice years for dentists and orthodontists and the perception of altered smiles.To investigate a possible association between sex, age and the perception towards smile discrepancies, the Mann Whitney was adopted. The significant rate was set at 5%.

Results

Perception following altered maxillary left central incisor crown length

All changes in this parameter showed a statistically significant difference relative to the groups (Table 1).

		E1	E2	E3	E4
Orthodontists	Median	6	3.5	3	2.5
	First quartile	4.750	2	2	1
	Third quartile	7	4	5	3.25
Dentists	Median	5	4	4	3
	First quartile	4	2	2	1
	Third quartile	7	5	5	4
Laypeople	Median	7	5	5	4
	First quartile	5	4	3	2
	Third quartile	8	6	6	5
Signification rate		0.000	0.000	0.001	0.001

Table 1: Medians comparison of scores attributed to smiles according to altered maxillary left central incisor crown length and results of Kruskal-Wallis test.

Perception following altered maxillary right lateral incisor crown width

The difference in perception between orthodontists, dentists and laypeople became significant only when right lateral crown width was decreased by at least 2 mm (Table 2).

Perception following altered gingival exposure

The difference between the three groups was not significant at any modification of the gingiva-lip distance (Table 3).

Perception following altered Maxillary dental midline shift

The difference in perception between the three groups was not significant with any modification of the dental midline deviation.

		C1	C2	C3	C4
Orthodontists	Median	7	6	6	5.5
	First quartile	6	5	5	4
	Third quartile	8	8	7	6
Dentists	Median	7	6	6	6
	First quartile	6	5	5	4
	Third quartile	8	8	7	7
Laypeople	Median	8	7	6	7
	First quartile	6	6	5	6
	Third quartile	9	8	8	8
Signification rate		0.432	0.004	0.044	0.000

Table 2: Medians comparison of scores attributed to smiles according to altered maxillary right lateral incisor crown width and results of Kruskal-Wallis test.

		D1	D2	D3	D4
Orthodontists	Median	5	7	6	5
	First quartile	4	5.7	4.7	3
	Third quartile	7	8	7	6
Dentists	Median	5	8	6	6
	First quartile	4	6	4	4
	Third quartile	8	8	6	7
Laypeople	Median	5	8	6	6
	First quartile	4	6	4	4
	Third quartile	8	9	8	7
Signification rate		0.085	0.364	0.940	0.084

Table 3: Medians comparison of scores attributed to smiles according to thr variations of lip to gingiva distance and results of Kruskal-Wallis test.

The dentist and the layperson group were less critical and rated all smiles at the same as the ideal one. They could not detect a midline deviation even when we shifted the dental midline a 4 mm (Table 4).

Perception following altered maxillary Midline diastema

All three groups were able to identify a small amount of space between the maxillary central incisors. A smile with a 3 mm diastema (E4) was considered by the three groups as the most unattractive smile in the survey.

		A1	A2	A3	A4	A5
Orthodontists	Median	7	7.5	7	6.5	6
	First quartile	6	6	6	5	5
	Third quartile	8	9	8	8	7
Dentists	Median	7	7	7	7	7
	First quartile	5	5	6	5	5
	Third quartile	8	8	8	8	8
Laypeople	Median	7	7	8	7	7
	First quartile	6	6	6	6	6
	Third quartile	8	8	9	8	8
Signification rate		0.250	0.222	0.252	0.090	0.084

Table 4: Medians comparison of scores attributed to smiles according to maxillary dental midline shift and results of Kruskal-Wallis test.

There was a significant difference in relation to midline diastema between the groups except for a distance between the central incisors of 0.5 mm (Table 5).

		B1	B2	B3	B4
Orthodontists	Median	7	6	4	2
	First quartile	6	5	3	1
	Third quartile	8	7	6	4
Dentists	Median	7	6	5	2
	First quartile	5	4	3	1
	Third quartile	8	7	6	4
Laypeople	Median	8	7	5	3
	First quartile	6	6	4	1
	Third quartile	9	8	7	5
Signification rate		0.096	0.007	0.018	0.034

Table 5: Medians comparison of scores attributed to smiles according to maxillary midline diastema and results of Kruskal-Wallis test.

Age, educational level, years of dental practice and altered smile characteristics

As far as the age variable, there was no association with the attributed scores depending on the Mann Whitney test ($P > 0.05$).

Anyhow, the older people gave the highest scores for most of smiles.

Regarding the professional training parameter, the Kruskal-Wallis Test showed a was a statistically significant difference between the educational level and the following smiles: A1, A3, A5, B1, B2, B4, C1, C3, C4, D2, E1 ($P < 0.05$).

The people who had never attend university for study tended to give a higher scores.

Despite the wide range (less than five years to over 10 years), the Kruskal-Wallis Test showed that years of dental practice had no effect on esthetic perception.

Discussion

This study focused on perception of tunisian orthodontists, dentists and laypersons towards altered smile esthetics.

Orthodontists were more critical and gave lower scores than dentists and laypeople when evaluating different altered smiles.

The results confirm that the orthodontists have a different assessment of smile esthetic features compared to that of the dentists and the lay people.

Regarding the gender parameter, there was no statistically significant difference in our study and the most unaesthetic smile was the one with 3 mm diastema for both sex. However, there was a correlation regarding the gummy smile according to Pinho [1] which the female evaluators found it less attractive. This finding is in contradiction with Paula and al.'s study [2].The difference is probably due to the fact that these authors investigated the self-perception of adolescents concerning exposure of the anterior teeth/malocclusion during smiling.

Excessive gingival display is a common feature, especially among females. Therefore, the Gummy smile is not necessarily unaesthetic in the eyes of the public [3].

Concerning the age factor, no significant correlation was found between the age of the evaluator and the attributed scores.

This is in according with several studies [4-6] that have evaluated esthetic perception in terms of smiles in different age groups. The results of most of them suggested that there were dissimilar perceptions in different age ranges due to evolving attitudes, lifestyles, and opinions. Radically different to Tuzgiray findings [7], age is a factor affecting the perception of smile esthetics.

Our study showed that younger individuals aged below 30 years made harsher evaluation of these smiles. This is in according with the study of Lacerda-Santos., *et al*. [8].

Our hypothesis was that orthodontists were more critical and gave lower scores then dentists and laypeople when evaluating different altered smiles and it was confirmed in our study. In additions, it was expected that the smiles containing deviations from the norms would receive significantly lower evaluations. The unattractive smiles are those with 3 mm midline diastema between the maxillary central incisors and with 3 mm decrease of the maxillary left central incisor crown length. Dental specialists need more objective and quantitative data to guide their decisions accurately and to promote better communication with patients when planning treatment that responds to the patient's needs. Dental specialists seem to be less tolerant in their evaluations, and these differences in perception should be discussed with the patient when planning the treatment to achieve a magnificent and youthful smile.

Changing the proportions of the tooth reduces the perception of an esthetic smile.

Moreover, any decrease in the tooth length or width is considered to decrease the smile's attractiveness when rated by either dentists or laypersons.

Changes in crown length starting from 1 mm often were noticed by dental professionals or lay people. In these situations, the clinician must decide to treat this problem when it is noticeable by various approaches such as periodontal surgeries or orthodontic tooth movement complemented by composite restorations. A benefit of orthodontic tooth movement is that the supporting tissues-bony structure, periodontal ligament, and soft-tissue components-move along with the teeth. Therefore, any intrusive or extrusive tooth movement can be used to obtain gingival margin symmetry without surgery [12].

In this study, orthodontists and general dentists were able to detect a lateral incisor crown width narrowing of 4 mm, whereas lay people did not notice a change.

Therefore, dentists appear to be more sensitive to smaller peg-shaped lateral incisors. To have a normal aesthetic smile, the lateral incisor width should be two-thirds the width of the central incisor, or it should follow the golden proportion of 0.618 of the width of the central incisor. If a patient has a small peg-shaped lateral incisor, composite build-up or ceramic veneers may be used to meet the golden proportion of an aesthetic smile [13-17].

Our study involves the perception of gingival display upon smiling and found that orthodontists were more critical especially when evaluating the smile with a gingival exposure increment of 4 mm.. These results confirm that the gingiva plays a fundamental role in the structural composition of the smile; however, it should not be exposed to an extent exceeding 3 mm.

After all, the increasing distance from gingiva to lip during the smile was not noticeable by the general dental or lay population.

The low smile revealing only the maxillary incisors, in turn, was scored as the least attractive. This result may be backed by the presence of a low smile line that denotes characteristics of aging.

For the coincidence of the dental and facial midline, orthodontists were more critical about this discrepancy Indeed, a deviation of less than 4 mm (this which corresponds to a half central incisor) between the facial and dental midline is not noticed by either the patients or the dentists. The lack of perception of dental midline asymmetries by Tunisian laypersons and dentists in our investigation was similar to finding in other studies such as Kokish[9], Pinhos [10], Talic [11].

A small amount of space between the maxillary central incisors was rated as unattractive by the three groups.

So we can say that this type of smile with diastema was the only variation that proved to be a decisive factor in severely compromising the esthetic result.

The low acceptability of this factor is perhaps attributable to the esthetic principle broken, which was its unity. A smile that creates a sense of unity is considered more attractive[15,18]. In the other smiles, other principles, such as harmony and balance, were more severely compromised. Perhaps the principle of unity is more important than other esthetic principles [18,19] in the determination of the attractiveness of a smile in the Tunisian society. Kokich and Rodrigues confirmed this idea and have shown the compromising effect of a smile with diastema as well [9,12,20].

Conclusion

The findings of this study showed that orthodontists had higher perception of aesthetic components of the smile and gave lower scores than dentists and laypeople.

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