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EVALUATION OF DENTAL PARAMETERS PERCEPTION BY LEBANESE PROSTHODONTISTS, ORTHODONTISTS AND AESTHETIC DOCTORS

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Abstract

The aim of this study was to compare the effect of varying smile parameters with respect to three indices between Lebanese dentists (prosthodontists and orthodontists) and medical doctors.

245 participants were divided into 3 groups. A photograph of the smile that conforms to a woman's aesthetic standards has been digitally altered to provide a reference image. Next, images where modified then evaluated. The collected data was analyzed.

Dental professionals critically judged dental aesthetics by focusing on the gingivo-dental characteristics that make the smile less pleasant. Dental professionals detected minimal dental discrepancies in a smile, unlike doctors who assessed the smile in relation to the entire face since their judgment is global.

Lebanese doctors have a different perception of oral aesthetics from Lebanese prosthodontists and orthodontists.

Keywords: Aesthetics – smile – dental discrepancies.

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ÉVALUATION DE LA PERCEPTION DES PARAMÈTRES DENTAIRES PAR DES DENTISTES LIBANAIS SPÉCIALISTES EN PROTHÈSES, EN ORTHODONTIE ET EN ESTHÉTIQUE

Résumé

Le but de cette étude était de comparer la perception de divers paramètres du sourire par rapport à trois indices entre les dentistes libanais (prosthodontistes et orthodontistes) et les médecins travaillant dans le domaine de l'esthétique.

245 participants ont été répartis en 3 groupes. Une photographie du sourire conforme aux normes esthétiques d'une femme a été modifiée numériquement pour avoir une image de référence. Ensuite, les images ont été modifiées puis évaluées.

L'analyse des données a montré la présence d'une différence entre les orthodontistes et les prosthodontistes d'une part et entre les médecins d'autre part.

Les professionnels dentaires jugent de manière critique l'esthétique dentaire en se concentrant sur les caractéristiques gingivo-dentaires qui rendent le sourire moins agréable. Les professionnels dentaires détectent des écarts dentaires minimes dans un sourire, contrairement aux médecins qui évaluent le sourire par rapport à l'ensemble du visage puisque leur jugement est global.

Les médecins libanais ont une perception de l'esthétique buccale différente de celle des prosthodontistes et orthodontistes libanais.

Mots- clés : esthétique – sourire – complexe gingivo-dentaire.

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Introduction

The 21st century has offered remarkable improvements in quality of life, of which the emergence of cosmetic surgical procedures in the medical field. This is mainly due to the improvement of appearances and physical looks, which directly impact people's self-esteem, indulging an increasing demand for cosmetic services [1, 2].

According to the American Society of Plastic Surgery, nearly 18 million cosmetic procedures were performed in 2018 (25% growth from 2017) in the United States generating more than 16 trillion US dollars. This is driven by a combination of psychological and emotional satisfactions on physical betterments [3].

In the dentistry field, the aesthetic aspect of the teeth and the beauty of a smile are gaining more and more importance and popularity. There are various factors that contribute to the attractive traits and appeal of the face [4]; therefore improving people-to-people contacts, employment prospects, and the social and financial success of an individual [5].

However, the concept of a "beautiful smile" remains a complex data to define. There is no exclusive definition or fixed parameters of a beautiful smile, and the most representative factors remain the ideas brought by society rather than by science [6]. Beauty is therefore a highly subjective concept, and is not an absolute entity [7]small head rotation (<10 degrees.

Despite this, aesthetic clinicians have attempted to quantify different aspects of beauty based on objective measures, rather than subjective standards [8].

The shape, position and color of the teeth as well as the gum tissue and lips determine the harmony of a smile. However, smiling is also a complex dynamic expression involving several aspects of the face [9]. The lips are considered to be the "frame" of the smile. In fact, a multitude of facial muscles work together during the smile and animate the lips to reveal the teeth and periodontal structures [10].

Fig. 1: Reference smile.

Cosmetic surgeries but also corrective injections such as hyaluronic acid and botulinum toxin are more and more practiced to improve the appearance of the lips and therefore the smile.

Such lip treatment can be a valuable procedure to complement cosmetic rehabilitation, therefore enabling the dentist to manage the smile as a dynamic entity [11].

To date, there have been no studies comparing the perception of dentists (prosthodontists and orthodontists) and medical doctors working in the esthetic field (maxillofacial, dermatologists, otolaryngologists, plastic surgeons). The purpose of this study was to evaluate and compare the perceptions of a select pool of Lebanese prosthodontists, orthodontists and aesthetic doctors, on altered smile aesthetics based on viewing images of a digitally manipulated smile.

Materials and methods

Selection of the smile, photos and modifications

A female individual with smile characteristics close to the "Golden Proportions" was selected for this study. The female signed a consent form and has agreed to use and edit the pictures of her smile, exhibited in the following sections.

With a professional camera (Canon 750D kit, Canon 100mm f2.8 usm, Canon flash MR -14) a frontal photo of the lower 1/3 of the face is taken. The labio-mental groove and the tip of the nose are taken in the frame. The patient in a natural position lets her teeth show off.

To reduce elements of confusion, the nose and chin are cropped from the photo. Image manipulation is done by specific software (Adobe Photoshop CS6; Adobe Systems Inc, San Jose, California, USA). To have a perfect symmetry between the teeth and the lips, the photo is bisected and manipulated on one side before starting the other manipulations (Fig. 1).

The smile photograph was altered based on the following variables:

The incisal edge: it was altered bilaterally by increasing discrepancies between centrals and laterals of 0.5 mm (Fig. 2a), 1 mm (Fig. 2b) and 1.5 mm (Fig. 2c), respectively.

The smile arc: it was modified by accentuating (Fig. 3a) and reversing (Fig. 3c) the curvature of the anterior teeth in relation to the curvature of the lower lip.

The occlusal cant: it was modified by tilting the midline of 1 mm (Fig. 4b) and of 2 mm (Fig. 4c).

Questionnaire

A questionnaire was set up on an online platform. It is divided into two separate parts. The first part focuses

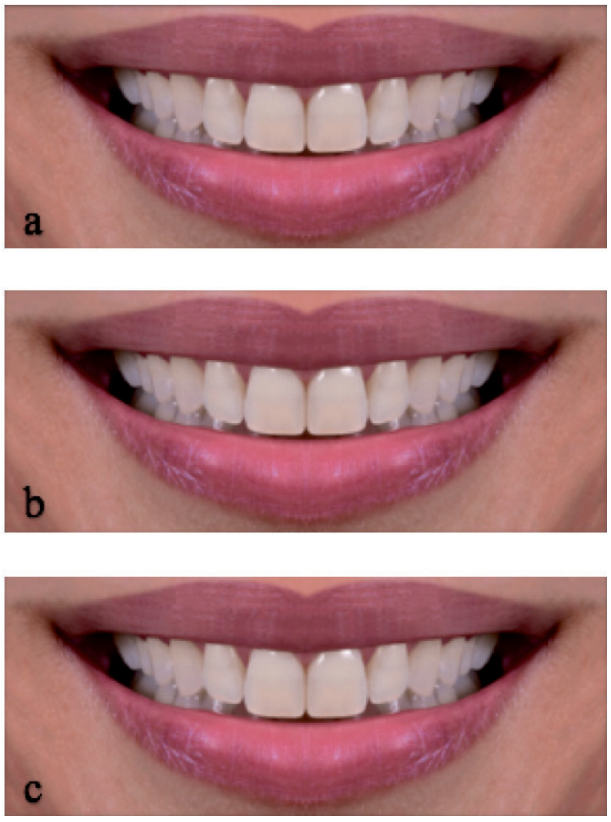

Fig. 2: Discrepancies between centrals and laterals of 0.5 mm (a), 1 mm (b) and 1.5 mm 2 (c).

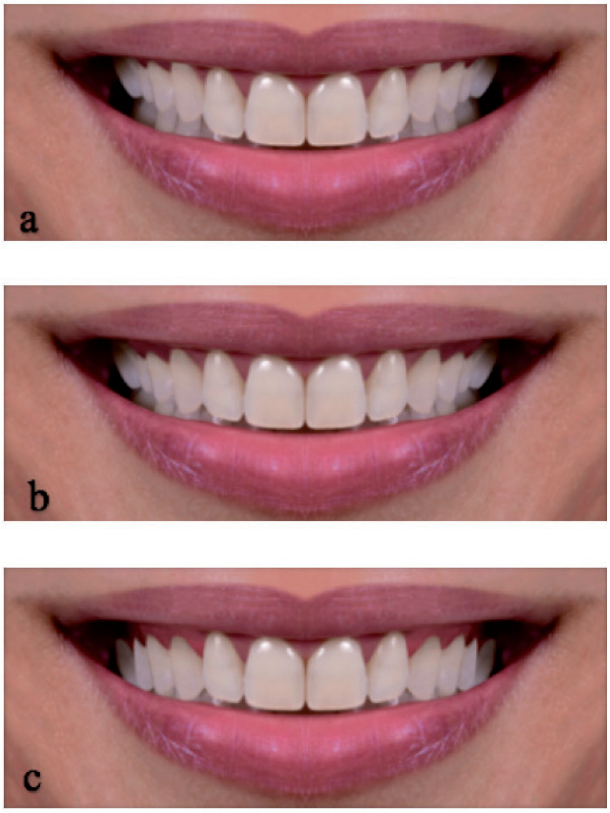

Fig. 3: Smile arc accented (a), normal (b) and reversed (c).

on personal information (age, sex, profession and specialty). The second part includes the photos of the modified smiles. Under each photo is displayed a visual analog scale (VAS) delimited from the least attractive on the left to the most attractive on the right.

The visual analog scale is basically a tool for measuring the intensity of pain. Several authors have used this method to judge attractiveness. Its use in perception judgment, attractiveness and aesthetics provides simple, fast and reproducible results (12).

Recruitment of evaluators

Approval for the study was given by the Ethics Committee of the Saint Joseph University of Beirut. All participants were informed about the aims and protocol of the study.

The studied population was divided into 3 groups of Lebanese practitioners: prosthodontists, orthodontists and medical doctors practicing aesthetic medicine.

Fig. 4: Occlusal cant normal (a), tilted of 1 mm (b) tilted of 2 mm (c).

Each sample included 80 practitioners from each specialty. It was therefore a set of 240 candidates who were included in the study.

The selection criteria included dentists or doctors aged 30–55 years. Were excluded people with visual disturbances, heavy consumers of alcohol and those on medications that affect cognitive and consciousness.

Statistical analysis

Data analysis was undertaken using the software IBM SPSS Statistics (Version 25.0). The level of significance used corresponds to $p \leq 0.05$. Analyzes of variance with repeated measurements were used in order to compare the VAS score (the incisal edges, the smile arc and the occlusal cant) according to the different populations (prosthodontists, orthodontists and doctors). They were followed by univariate analyzes and multiple Bonferroni comparisons.

Results

A total of 245 participants were included in the study: 79 doctors with a specialty in the aesthetic field (48 men and 31 women), 82 prosthodontists (42 men and 40 women) and 84 orthodontists (50 men and 34 women). The median age of doctors, prosthodontists and orthodontists was 41.5 ± 6.8 years, 39.9 ± 6.6 years and 40.1 ± 6.8 years.

Discrepancies between the incisal edges

Mean and standard deviation of VAS score for discrepancies between the incisal edges are presented in the following table by profession.

Comparison between the discrepancies

Among doctors, the mean scores VAS were significantly different between the different discrepancies ($p = 0.016$); it was smaller when the offset of the incisal edges was 1.5 mm and the difference was not significant between 0.5mm and 1mm ($p = 0.903$).

Among prosthodontists, the mean scores VAS were significantly different between the different offsets ($p < 0.001$); it was smaller when the offset of the incisal edges was 1.5 mm and the difference was not significant between 0.5mm and 1mm ($p = 1.000$).

Among orthodontists, the mean scores VAS were significantly different between the different offsets ($p = 0.001$); it was smaller when the offset of the incisal edges was 1.5 mm and the difference was not significant between 0.5mm and 1mm ($p = 0.682$).

Comparison between the professions

At 0.5mm, the VAS score was significantly different between the professions ($p = 0.014$); it was smaller among prosthodontists, intermediate among orthodontists and higher among doctors.

At 1mm, the VAS score was not significantly different between professions ($p = 0.374$).

At 1.5mm, the VAS score was significantly different between occupations ($p = 0.013$); it was smaller among prosthodontists, intermediate among orthodontists and higher among doctors.

Difference between the smile arc discrepancies

Mean and standard deviation of VAS score for discrepancies between the smile arcs are presented in the following by profession.

Comparison between the arc form

Among doctors, the VAS score was significantly different between the smile arc shifts ($p < 0.001$); it was smaller when the arc was reversed, and the difference was not significant between ideal curve and exaggerated curve ($p = 1.000$).

Among prosthodontists, the VAS score was significantly different between the smile arc shifts ($p < 0.001$); it was smaller when the arc was reversed, and the difference was not significant between ideal curve and exaggerated curve ($p = 0.891$). Among orthodontists, the VAS score was significantly different between the smile arc shifts ($p < 0.001$); it was smaller when the arc was reversed, intermediate when the arc was exaggerated and high when the arc was ideal.

Comparison between the professions

When the smile curve was exaggerated, the VAS score was significantly different between professions ($p = 0.001$); it was higher among doctors and the difference was not significant between orthodontists and prosthodontists ($p = 1.000$).

When the smile curve was ideal, the VAS score was not significantly different between professions ($p = 0.217$).

When the smile curve was reversed, the VAS score was significantly different between professions ($p < 0.001$); it was higher among doctors and the difference was not significant between orthodontists and prosthodontists ($p = 1.000$).

Difference between occlusal cant discrepancies

Mean and standard deviation of VAS score for discrepancies between the smile arcs are presented in the following by profession.

Comparison between the titling

Among doctors, the VAS score was significantly different between the different photos of the incisal plane ($p < 0.001$); it was smaller for the tilt of 2.0mm, intermediate for a 1mm tilt and high in the absence of tilt.

Among prosthodontists, the VAS score was significantly different between the different photos of the incisal plane ($p < 0.001$); it was smaller when the tilt was 2.0mm, intermediate for a 1mm tilt, and high when there was no tilt.

Among orthodontists, the VAS score was significantly different between the different photos of the incisal plane ($p < 0.001$); it was smaller when the tilt was 2.0mm, intermediate for a 1mm tilt and high when there was no tilt.

Discrepancies between the incisal edges				
Profession	0.5 mm	1 mm	1.5 mm	p
Doctor	7.23 ± 1.441 b / e	7.08 ± 1.412 b	6.71 ± 1.618 a / e	0.016
Prosthodontist	6.55 ± 1.573 b / d	6.78 ± 1.610 b	6.00 ± 1.499 a / d	<0.001
Orthodontist	6.90 ± 1.376 b / de	6.83 ± 1.211 b	6.29 ± 1.444 a / d,e	0.001
P	0.014	0.374	0.013	

Table 1: Discrepancies between the incisal edges depending on the profession
a – b: different letters indicate the presence of a significant difference between the discrepancies according to Bonferroni's multiple comparisons
d – e: different letters indicate the presence of a significant difference between the professions according to Bonferroni's multiple comparisons

Smile arc				
Professions	Accented	Normal	Reversed	p
Doctor	6.92 ± 1.551 b / e	6.80 ± 1.399 b	6.04 ± 1.675 a / e	<0.001
Prosthodontist	6.21 ± 1.529 b / d	6.39 ± 1.727 b	4.12 ± 1.738 a / d	<0.001
Orthodontist	6.13 ± 1.187 b / d	6.57 ± 1.261 c	4.31 ± 1.674 a / d	<0.001
P	0.001	0.217	<0.001	

Table 2: Evaluation of the smile arc depending on the profession.
a – b: different letters indicate the presence of a significant difference between the discrepancies according to Bonferroni's multiple comparisons
d – e: different letters indicate the presence of a significant difference between the professions according to Bonferroni's multiple comparisons

Tilting of the occlusal cant				
Profession	Normal	Tilted of 1 mm	Tilted of 2 mm	p
Doctor	7.39 ± 1.368 c / e	6.95 ± 1.404 b /e	6.26 ± 1.665 a / e	<0.001
Prosthodontist	6.66 ± 1.657 c / d	5.68 ± 1.465 b / d	4.55 ± 1.840 a / d	<0.001
Orthodontist	6.85 ± 1.331 c / d	5.33 ± 1.500 b / d	4.38 ± 1.749 a / d	<0.001
P	0.005	<0.001	<0.001	

Table 3: Evaluation of the occlusal cant depending on the profession.
a – b: different letters indicate the presence of a significant difference between the discrepancies according to Bonferroni's multiple comparisons
d – e: different letters indicate the presence of a significant difference between the professions according to Bonferroni's multiple comparisons

Comparison between the professions

When the occlusal cant was ideal, the VAS score was significantly different between professions (p = 0.005); it was greater among doctors and the difference was not significant between orthodontists and dentists (p = 1.000).

When the tilting was 1mm, the VAS score was significantly different between professions (p<0.001); it was greater among doctors and the difference was not significant between orthodontists and prosthodontists (p = 0.371).

When the tilting was 2mm, the VAS score was significantly different between professions (p <0.001); it was greater among doctors and the difference was not significant between orthodontists and prosthodontists (p = 1.000).

Discussion

During social interactions, the face is a very important factor for the judgment of aesthetics; mouth and eyes are the areas where people focus the most [13].

Smile is also considered as a very important element in non-verbal communication and plays a major role in the self-esteem of each individual. On the other hand, the perception of the smile depends not only on the concerns associated with the teeth, but also on the surrounding soft tissues [14].

The high number of participants is a strength of the study: 82 prosthodontists, 84 orthodontists and 79 doctors.

In this study, the smile was modified using computer software to mimic various dental differences. Indeed, the use of digitally enhanced photos in order to obtain a perception or a given assessment as to the aesthetics of a smile is well cited in the literature [15-18]. To reduce the elements of confusion, the nose and chin were eliminated from the photos. All the elements of the face are therefore removed to keep only the smile. In fact, images of the participant's entire face could influence dentists' and doctors' responses [19].

The evaluators assessed the attractiveness of the modified images on a 10 points visual analog scale, which was found to produce simple, rapid and reproducible results. Higher scores indicate better aesthetics [20]. This type of scale is considered more precise, more sensitive and less subject to distortions and biases in comparison with multiple choice scales [21]. However, other studies show that using this scale is not always easy for assessors and prevents them from giving their full opinions on the photos [22].

The appreciation of the smile in this study is based on three components of the smile which are the following: the discrepancies of the incisal edges, the smile arc and the offset of the occlusal cant.

The offsets between the levels of the incisal edges of the central incisor and the lateral incisor

The ideal position of the incisal edges is not unanimous among the authors. A study conducted by Sandler and his colleagues suggests that an offset of only 0.5 mm would be ideal [23]. This value is similar in our analysis according to doctors and orthodontists. Kerr and his collaborators think that the presence of an offset not exceeding 0.5mm is attractive, and it also allows the establishment of a smile arc without interference during lateral movements [24]. On the other hand, in contrast with the result of this study, Springer and his collaborators say that an approximate offset of 1.5 mm would be more pleasant for a smile [25]. According to Thomas and al., for prosthodontists, a good esthetic of the smile depends on the length of the lateral incisor which must be proportional to the length of the central [26]. In our results, prosthodontists would prefer a 1 mm offset between the central and lateral incisors. Machado in his study concludes that the lag should be between 1 and 1.5 mm for women and smaller in men with a lag between 0.5 and 1 mm (2). So almost all the studies, ours included, converge on the same conclusion regarding this point: an offset should exist between the free edges of the centrals and laterals in order to contribute to having an aesthetic smile. A study conducted by Machado et al. shows that while the central incisors are symmetrical, minor differences in the vertical position between the central and lateral incisors do not necessarily need to be treated [27]. Kerr et al. have stated that the positioning of the incisal edges should depend on individual preference and should be assessed when finishing a smile [24]. Another study has shown that orthodontists are more observant in detecting non-ideal positions. Their decisions could be based on an excessive concern for perfection and could lead to unnecessary treatment [28].

The smile arc

A consonant smile arc has been considered to be a major factor in the aesthetics of the smile [29]. The importance of the curvature of the smile arc is directly linked to the youth factor, as indicated in a study by Vig and Brundo, claiming that the flat arc, gives the person an old smile [30]. Unlike another study, who found that the smile arc does not really contribute to a pleasant or attractive smile [31]. In this study, prosthodontists and orthodontists would prefer an ideal smile arc. Prosthodontists and orthodontists have been shown to prefer smiles where the arc should follow the curvature of the lower lip [32]. The results of this study reveal that doctors would consider an exaggerated smile to be more aesthetic. Whereas Stolz and colleagues confirm that an exaggerated curvature of the smile arc with too low central incisors or too high lateral incisors gives the unaesthetic appearance of a "rabbit smile" [33]. Parekh and colleagues have found that flat smile arcs are extremely unacceptable, but slightly flatter curves than the ideal standard may be acceptable [34]. However, in a study with prosthodontists, orthodontists and lay people, 27% of lay people find the flat

arc smile quite attractive. Whereas for prosthodontists and orthodontists it is more pleasant when the smile arc is consonant because it plays a main role in aesthetics [35]. Other research by Saffarpour and his collaborators indicates that the arc of a flat or inverted smile would be accepted by people who are not specialists in dental aesthetics [36]. Orthodontists would be sensitive to the rating of the arc of smile because the results of several researches confirm that at the end of an orthodontic treatment, many smiles would end up with a straight or flattened arch [37], which is inconsistent with our results where Lebanese orthodontists would prefer an ideal smile arc.

Tilting of the occlusal cant

According to Olivares and his collaborators, the inclination of the occlusal plane is a characteristic which must be evaluated in the aesthetics of the smile. It can be seen in both the frontal and sagittal planes, whenever the lips are relaxed but more clearly when smiling [38]. The inclination of the occlusal plane or "occlusal cant" is a form of asymmetry which manifests itself when a person smiles but which is not perceived in intraoral images or on study models [39]. Padwa and his collaborators have shown that an occlusal tilt greater than 4 degrees is detected with a frequency of more than 90% by professionals and laypeople [40]. In this study, orthodontists were more sensitive to the inclination of the occlusal cant and, in fact, assigned lower scores than prosthodontists followed by doctors. But the inclination of the incisal plane was clearly perceived because the larger the offset, the lower the notes. Another study confirms this and shows that general dentists find the inclined occlusal plane more acceptable than orthodontists [38]. According to a different study, the specialty of the evaluators affected the evaluation of the esthetics of the smile when an inclined occlusal plane was present [29]. This is contrary to the conclusion of Padwa et al. who suggest that, in clinical examination, the differences in detection of the inclination of the incisor plane depend on the degree of inclination [40].

Miller indicates in his analysis that an observant and trained eye easily detects any defect which is not in harmony with its environment [41]. This is confirmed by Rafique and his collaborators, who indicate that dental professionals detect even slight differences in a smile [42].

Dental professionals critically judge dental aesthetics by focusing on the characteristics that make the smile less pleasant. This could be the result of the professional training of dentists which provides them with well-targeted scientific elements to be able to make an objective aesthetic dental criticism, unlike doctors who don't directly treat dental elements and their surrounding tissues but work on the result of the variation of these elements on facial aesthetics.

Conclusion

The perception of the attractiveness of a smile is affected by one's social context, personal experiences, and exposure. With the limitations that this study may have, we were able to conclude that Lebanese doctors, prosthodontists and orthodontists have divergent perceptions and views. It would be interesting to expand on this analysis in other part of the world, namely MENA, Europe, and North America to assess if the perception of the smile attractiveness of the aesthetic doctors in other regions is different from that of the dentists.

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