



Orthodontists and patient's aesthetic perception to different types of profiles modified by a computer program

Percepción estética de cirujanos dentistas, ortodoncistas y pacientes a diferentes tipos de perfiles modificados por un programa de computadora

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ABSTRACT

Introduction: The concept of facial beauty and profile harmony play a decisive role in social relationships of all people. Therefore, it is intensely studied in scientific research. **Objective:** Assess esthetic perception that dentists, orthodontists and patients discern on computer-modified profiles. **Materials:** Using two Dolphin Imaging and Management[®] program modified profiles, assessment made by 30 patients, 30 orthodontists and 30 maxillofacial surgeons attached to the Graduate School, National School of Dentistry, National University of Mexico. **Methods:** Photographs and cephalographs of a Mexican man and a woman were used. Position of upper and lower jaws were modified by the Dolphin Imaging and Management[®] program, so as to create two sequences. 90 subjects (30 orthodontists, 30 maxillofacial surgeons and 30 patients of the Graduate School) assessed profiles in the visual, analogical scale. SPSS was used to process statistical analysis. Scores given by surgeons, orthodontists and patients for each profile were compared with the help of Kruskall-Wallis tests. **Results:** Reliability within evaluators was deemed as «good». Facial attraction perception of orthodontists and maxillofacial surgeons was generally in agreement. Patients thought otherwise. Interactions of anterior-posterior and vertical dimension, as well as amount of change between each dimension influences perception of facial attraction. **Conclusions:** Results suggest that facial attractiveness preferences among orthodontists and maxillofacial surgeons were generally in agreement. This information can help clinicians to plan treatment and suggest recommendations.

RESUMEN

Introducción: Los conceptos de belleza del rostro y armonía del perfil desempeñan una función decisiva en el terreno de las relaciones sociales del hombre, por lo cual es tema de intenso estudio en investigaciones científicas. **Objetivo:** Evaluar la percepción estética que sobre un perfil modificado por computadora tienen los cirujanos dentistas, ortodoncistas y pacientes. **Materiales:** 2 perfiles modificados por el programa Dolphin Imaging and Management[®], 30 pacientes, 30 ortodoncistas y 30 cirujanos maxilofaciales de la DEPeL. **Métodos:** Se utilizaron fotografías y cefalografías de un hombre y una mujer mexicana. La posición de la mandíbula y del maxilar fueron modificados por el programa Dolphin Imaging and Management[®] creándose dos secuencias, 90 personas (30 ortodoncistas, 30 cirujanos maxilofaciales, 30 pacientes de la DEPeL) evaluaron los perfiles en la escala analógica visual, todos los análisis estadísticos fueron procesados usando SPSS. Las puntuaciones dadas por cirujanos, ortodoncistas y pacientes para cada perfil fueron comparados con pruebas Kruskal-Wallis. **Resultados:** La confiabilidad dentro de los evaluadores fue buena y se encontró que las percepciones del atractivo facial entre cirujanos maxilofaciales y ortodoncistas contra pacientes tuvieron concordancia en general. Las interacciones de la dimensión vertical y anteroposterior, así como la magnitud de cambio entre cada dimensión influye en la percepción del atractivo facial. **Conclusiones:** Los resultados sugieren que las preferencias del atractivo facial por ortodoncistas y cirujanos dentistas están generalmente en acuerdo. Esta información puede ayudar a los clínicos en la planeación del tratamiento y a hacer recomendaciones.

Key words: Aesthetics, profile, perception.
Palabras clave: Estética, perfil, percepción.

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INTRODUCTION

Modern society grants strong emphasis to physical attractiveness. Facial esthetics is an important facial attribute upon which many opinions and perceptions are conceived. Cognitive science researchers proposed the idea that facial attractiveness perception can be a biological impetus in the selection of partners for human reproduction. For women, facial symmetry and average proportions in men have been influencing trait for selection process. For men, secondary sexual characteristics is the first influencing trait in selection of women.¹⁻³

Results of these studies came to the conclusion that population rules and sexual dimorphism bear influence on the perception of facial attractiveness. Dental-facial self-perception is an important factor for seeking orthodontic treatment.⁴⁻⁷ This is the main reason driving adults to seek treatment.^{8,9} The strongest motivation for adults subjected to orthognathic surgery was the desire to improve facial esthetics.¹⁰⁻¹⁴ Arpino & al¹⁵ found that orthognathic surgery was the one bearing less tolerance to attractive profile preference deviations when compared to clinical surgery. Self perception of poor esthetics is not always correlated to morphometric measures such as physical characteristics and cephalometric values.¹⁶⁻¹⁹

A recent study on psycho-social effects of orthognathic surgery concluded that orthognathic patients generally experiment self-esteem improvement and better accept facial and bodily image.²⁰

The final goal of orthodontic treatment is to improve dental-facial complex harmony achieving proper balance of bone, dental and soft tissues with respect to esthetics and function.²¹⁻²⁴ Assessment of soft tissues is an important aspect of orthodontic diagnosis and treatment planning; this encompasses profile analysis. Soft tissue profile experiments changes associated to surgical or non-surgical orthodontic treatments. These have been previously studied. Orthodontists as well as surgeons are involved in treatments affecting facial profile. Therefore, their perception of facial esthetics bears influence in treatment planning. Nevertheless, many surgical plans are visualized in the anterior-posterior plane through either conventional tracings or computer-assisted tracings to predict soft tissue profile. Ackerman and Profit²⁵ provided a clinical guide for esthetic profile. Clinical evaluations notwithstanding, a subjective element in personal perception of esthetic profile is to be expected. Moreover, surgeons and orthodontists' perceptions of esthetics can be considered the «golden rule» which the treatment will try to attain. Nevertheless, the clinician might not take into

consideration patient's perceptions. Orthodontists and clinicians must take into account the subjective response of the patient to what he considers an esthetic profile. This information can ease information among clinicians and patients. Previous methods used to analyze an attractive facial profile include the following: line tracing, silhouettes, facial pictures and slides. A study conducted by Spiropoulos and Halazonetis²⁶ concluded that the perception of an attractive profile was affected by the soft tissue profile contour; they observed adequate correlation of general public and orthodontists. Nevertheless, orthodontists tend to grant higher scores than general public.

The purpose of this study was to compare attractive male and female esthetic profile perception in a group composed of dentists, students, and general public.

MATERIAL AND METHODS

The sample was composed of 30 dentists, 30 orthodontists and 30 patients attending the Graduate School of the National School of Dentistry, National University of Mexico (UNAM). Dolphin Imaging and Graphics program[®] was used to scan profile pictures of Mexican men and women either with Class I or normal cephalometric values. Using Dolphin Imaging and Graphics[®] lateral cephalograms of 2 subjects in natural posture were scanned. Lateral cephalogram and profile images of each subject were adjusted using a simulated computer-analysis used for orthognathic surgery. Original images (*M4 in figure 1 and F5 in figure 2*) with their respective lateral cephalometries were used to generate another 6 manipulated images. In these created images, hard tissue normal values were altered in at least two standard deviations. Facial profile images were digitally manipulated in the anterior-posterior plane with little or no changes in the vertical plane. This was performed so that each generated profile would have a normal vertical proportion. These seven profiles were used for the possible growth of upper and lower jaw variations, as well as a bi-maxillary protrusive profile typical of Mexican subjects, and bi-maxillary retruded profile representing the typical straight profile in Caucasian subjects. Each image only had one manipulated dental or skeletal component. Mexican female and male profiles are as follows: M1 and F3 (bi-maxillary protrusion). These represent profiles with an advanced degree of upper and lower alveolar segments with upper and lower increase of incisor inclination which produces protrusion of upper and lower lip without altering the lower jaw's anterior-posterior profusion. M2 and F4 (lower jaw



Figure 1. Male profiles: M1 bimaxillary protrusion, M2, mandibular protrusion, M3, retruded lower jaw, M4, normal profile, M5 retruded upper jaw, M6 protrusive upper jaw, M7, bimaxillary retrusion.



Figure 2. Female profiles: F1, retruded lower jaw, F2, retruded upper jaw, F3, bimaxillary protrusion, F4, lower jaw protrusion, F5, normal profile, F6, protrusive upper jaw, F7 bimaxillary retrusion.

protrusion) represent profiles having only lower jaw development. M 3 and F 1 (lower jaw retrusion) represent profiles with posterior positioning only in the lower jaw. M4 and F5 (normal profile) represented Mexican profiles with skeletal Class 1 basal relation and incisor Class 1 with average of cephalometric normal values. These were used as templates from which the other profiles derived. M5 and F2 (upper jaw retrusion) were digitally-constructed profiles with only maxillary posterior placement. M6 and F6 were digitally built with only upper jaw anterior development. M7 and F7 (bi-maxillary retrusion) were digitally built to represent flat profiles with straight upper and lower incisors, and lesser anterior protrusion of alveolar segments according to features of Caucasian profiles.

Participants were asked to evaluate the 7 profiles given for each gender in a scale of 1 (very attractive)

to 7 (less attractive), with no repetitions when evaluating in one session. All statistical analyses were processed using SPSS. Scores given by surgeons, orthodontists and patients for each profile were compared through Kruskal-Wallis tests. Evaluation averages for each profile were also calculated.

RESULTS

The sample included 90 participants; 38.9% male and 61.1% female. The three evaluating groups concurred, within the scope of male profiles, that normal profile (M4) and lower jaw protrusion (M2) were assessed as most and less attractive respectively.

There was no significant difference in values for bimaxillary protrusion (M1), upper jaw retrusion (M5) and maxillary protrusion (M6). Significant differences were found in punctuation when assessing,

lower jaw protrusion (M2), lower jaw retrusion (M3), normal profile (M4) and bi-maxillary retrusion (M7, P: 001).

Paired comparisons showed that O placed M2 in a worse position than DDS and P. DDS assessed M3 as the least attractive when compared with O and P. DDS and O assessed M4 as slightly more attractive than P. All three groups considered M4 as the least attractive of each group. DDS allotted M7 higher scores than O.

When studying female profiles, bimaxillary protrusion (F7) was considered most attractive by DDS and P. O, considered normal profile (F5) as the most attractive. Lower jaw protrusion (F4) was considered the least attractive group by all three groups. There was no significant scoring difference for the following: lower jaw retrusion (F1), upper jaw retrusion (F2) bi-maxillary protrusion (F3) and normal profile (F5).

Significant differences were found in the following assessments: lower jaw protrusion (F4), upper jaw protrusion (F6) and bimaxillary retrusion (F7). Paired comparisons found that DDS and O assessed F4 as less attractive than P. all three groups considered F4 as the less attractive. evaluated F6 as most attractive, in disagreement with P. F7 average assessed by DDS was approximately one rung lower in comparison with O and P. All three groups determined that F7 was at the bottom of the table. Table IV shows high and positive correlations in the assessment of male and female esthetics. Correlation in evaluation o female esthetics was important only between groups O and P. Never-

theless, all correlations in evaluation of female esthetics were important.

DISCUSSION

Improvements in research methodology for this study were conducted, in contrast with Lew & al 's previous study. Both studies were conducted, at different times, in the same segment of Asian population. Our study included male and female profile analysis. Moreover, generated profiles included images with maxillary, mandibular or dental components manipulation, belonging to skeletal Class II and III with isolated mandibular discrepancies. Profiles of patients where orthodontic-surgical treatments were planned were excluded, since many orthodontic-surgical treatment plans would normally include correction of vertical skeletal discrepancies independently of patients's concerns.

Adults selected from the general public were chosen instead of teenagers, because of recent tendency of adults to seek orthodontic treatment or orthognathic surgery. Black and white images were developed to eliminate any possible influence of hair and skin color. Manipulated profiles were generated without extreme anterior-posterior changes in hard tissue profile, to thus provide more clinically realistic soft tissue profiles. Classification order was different between both sets of male and female profiles to prevent recognition patterns during analysis.

Table I. Comparative data on profile perception in groups of dentists, orthodontists and patients.

Photograph	D Dentists n = 30	O Orthodontists n = 30	P Patients n = 30	p*
Male				
M1 (bimaxillary protrusion)	5.77 (0.80)	4.97 (1.67)	5.24 (1.71)	0.106
M2 (lower jaw protrusion)	6.23 (0.88)	6.75 (0.79)	6.05 (1.58)	-0.001
M3 (retruded lower jaw)	5.68 (1.19)	3.68 (1.71)	3.59 (1.78)	-0.001
M4 (normal profile)	1.71 (0.86)	1.99 (1.24)	2.50 (1.32)	-0.001
M5 (maxilar retrusivo)	3.26 (1.09)	3.91 (1.46)	3.69 (1.76)	0.096
M6 (upper jaw protrusion)	3.29 (1.19)	2.82 (1.35)	3.13 (1.56)	0.152
M7 (bimaxillary retrusion)	2.13 (1.20)	3.88 (1.50)	3.78 (1.78)	-0.001
Female				
F1 (retruded lower jaw)	5.81 (0.95)	5.03 (1.59)	4.87 (1.95)	0.080
F2 (retruded upper jaw)	4.80 (1.13)	5.28 (1.03)	5.03 (1.36)	0.182
F3 (bimaxillary protrusion)	4.32 (0.91)	3.75 (1.55)	3.90 (1.61)	0.214
F4 (protrusive lower jaw)	6.61 (0.72)	6.45 (1.13)	5.81 (1.51)	-0.001
F5 (normal profile)	1.93 (0.69)	2.33 (1.24)	2.53 (1.48)	0.272
F6 (protrusive upper jaw)	3.00 (1.03)	2.76 (1.32)	3.45 (1.52)	0.002
F7 (bimaxillary retrusion)	1.45 (0.77)	2.44 (1.43)	2.41 (1.74)	0.002

* Data compared with Kruskal-Wallis test.

In both genders, flat profile, (normal or with bimaxillary protrusion) was perceived as the most attractive, whereas lower-jaw prognathism was perceived by all three groups as the least attractive. General public agrees with the research conducted by Mantzikos and Lew & al with respect to extreme limits of facial attractiveness. In all three groups, normal profile, or bimaxillary retrusion profile in males (M4, M7) and in females (F5, F7) were considered to be placed at the end of the attractiveness table. This similarity in perception confirms the usual treatment aim, that is to say, a straight profile, even in the case of Mexican patients. DDS and O groups conferred significantly lesser scores to M4 when compared to scores conferred by P. This then shows the existence in DDS and O of a trend to perceive M4 as more attractive than the P group. Nevertheless, in general terms, all 3 groups assessed M4 as the most attractive option. In a similar fashion, DDS showed trend to evaluate M7 more attractive than O and P. This can reflect influence of the education received by orthodontists and surgeons in a trend to improve profile to resemble more Caucasian features than Mexican parameters.

Similar evaluation patterns were also observed for female profile with bimaxillary protrusion (F7) which DDS group assesses as more attractive than groups O or P. This suggests that DDS group considers bimaxillary retrusion as an attractive, post-treatment profile for Chinese patients, while P group might consider this profile as barely acceptable. Could this point out to the idea that Mexican dentists experience a trend of overcorrecting, regardless of gender? Could it be construed that exposition to mass media for Latin specialists training might influence their perceptions? Is culture shock affecting perception of profile attractiveness as has been shown by other studies? It would be interesting to conduct a separate study to assess how Caucasian and Mexican DDS and P groups perceive what can be considered as an attractive profile.

In instances of lower jaw protrusion in males, (4), group O granted higher scores than DDS and P groups. This can mean that groups DDS and P are more tolerant to mandibular protrusion than O group. For the equivalent in female profile (F4), group P granted lower scores than DDS and O groups. This might suggest that group P can be more tolerant to mandibular protrusion than groups DDS and O. Nevertheless, the difference average margin was narrower and closer, and with lesser clinical importance for both genders, since all 3 groups determined that profiles with mandibular protrusion were the least attractive of all 7 profiles.

The fact of limiting evaluation to one lower jaw per image could allow identification, meanwhile lower or upper jaw problem was critically more influencing in the perception of facial esthetics. This concept is supported in the present paper where profiles with lower jaw protrusion or retrusion were perceived as less attractive than profiles with upper jaw protrusion or retrusion. This suggests that the position of the lower jaw is more critical than the position of the upper jaw in the process of evaluating patients, either with or without dental knowledge. Even though one single lower jaw discrepancy cannot be commonly taken into account in clinical situations, many skeletal malocclusions involve upper and lower jaws. This suggests that perception of surgical success at the end of treatment can depend more on the proper anterior-posterior position of the lower jaw to a greater extent than the position of the upper jaw in cases of upper and lower jaw surgery. Another obvious fact was that male profile with bimaxillary protrusion was not well accepted by either of the three groups. This differs with findings reported by Manganzini et al, where male profile with skeletal bimaxillary protrusion was deemed as attractive as when they showed bimaxillary retrusion. Female profile with bimaxillary protrusion was perceived as slightly more attractive than its male counterpart, based on the lower evaluation average granted by all three groups. This discovery suggests that bimaxillary protrusion is more acceptable in Mexican females than in males within the scope of the Latin community.

An interesting finding was the fact that groups O and P assessed male profile with lower jaw protrusion as more attractive than group DDS. This discovery tends to contradict psychoanalysts conclusions who state that a well developed mandible, with a strong chin is a secondary desirable sexual characteristic associated to a good facial attractiveness and preferred in women selection. Do these results indicate a change in trends in the perception of male profile in the Latin community? Does this mean that Latin male profile-with female profile elements is more desirable from the public's point of view? PENTO-Voak et al found that female preferences for facial characteristic changed during menstrual cycle: during phases when conception was less probable, lesser masculine features were preferred. Could the high number of women participating the group P have contributed to low evaluation scores? Could these preferences hypothesis alter feminine perception of masculine attractiveness, and could it be applied to profile preferences? Future research in this field could prove to be interesting. A

study conducted by Cochrane et al found that Class II profile was perceived as less attractive by group O and general public in Caucasian population. This was not the case with Latin groups O and P in this study. This contrast could be a result of ethnic and cultural factors influencing perception. Future research could confirm this observation and could influence in future treatment considerations, especially in patients coming from inter-racial communities.

Perceptual trend in female profile of all three groups was highly correlated. This could mean that DDS, O and P groups are more in agreement when it comes to assess female esthetic profile. A possible contribution to this discovery is social exposure to mass media which sometimes highlight physical shape and face. Correlations between DDS and O groups, and DDS and P groups were not statistically significant. Nevertheless, DDS and P groups correlation coefficient suggests that perception of O group could have been influenced by dental education. Lack of important correlation in male esthetic perception among DDS and other samples suggests a difference in perception of male profile. This can embody clinical implications where DDS group could have different esthetic criteria than other groups.

CONCLUSIONS

Normal profile, and bi-retruded bimaxillary profile were perceived as the most attractive by Mexican DDS, Orthodontists and Patients. Mandibular protraction profile, in males and females, was perceived by the three groups as the least attractive. Orthodontists and Patients were more tolerant to male mandibular retrusive profile than Dentists. Female bi-protrusive profile was better accepted than male bi-protrusive profile. Dentists, Orthodontists and Patients showed similar perception for different male and female profiles. All three groups showed high correlation when scoring female profiles. In the case of male profiles, perception of Orthodontists and Patients was not significantly correlated with Dentists.

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