The influence of maxillary incisor torque on the esthetic perception of the smile

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Abstract

Purpose: An esthetically pleasing smile is one of our patients’ main goals. However, it is not always clear that the esthetic perceptions of patients and clinicians are the same. The purpose of this study was to evaluate and quantify the discrepancies in the esthetic perception of maxillary incisor torque among professionals, and between professionals and the general public.

Materials and methods: A photograph of a 30-year-old woman was digitally manipulated to obtain nine smile images and nine full-profile images with various maxillary incisor torques, while maintaining the overjet. The images were evaluated in an online survey by three different groups: laypersons (LP, n = 21), orthodontists (OR, n = 20), and specialists in dental esthetics (SDE, n = 19).

Results: From among the smile images, the LP group preferred the 80-degree option (the angle that forms the tangent between the crown of the maxillary incisor and the functional occlusal plane), the SDE group preferred the 75-degree option, and the OR group preferred the 70-degree option. From among the full-profile images, both the LP and the SDE groups preferred the 80-degree option, while the OR group preferred the 75-degree option. To analyze the data and verify or reject the hypotheses of normality and homoscedasticity, ANOVA and Kruskal-Wallis tests were used.

Conclusions: The LP and SDE groups coincided, in contrast to the OR group, which preferred more protrusive torques and was less tolerant of retroinclined maxillary incisors.

Introduction

The smile is one of the most important and fundamental facial expressions in the demonstration of amiability, approval, and appreciation. It is also known to be an essential foundation in psychosocial adaptation: those with pleasant teeth and smiles are considered more attractive, more intelligent, and more popular than their peers.

The dental treatment goal that most guarantees patient satisfaction is an esthetically pleasing smile. Therefore, regardless of their dental field, dentists should pay particular attention to esthetics at the outset, during treatment, and upon completion of treatment, especially as there are treatments in some specialties that sacrifice facial esthetics in favor of other objectives.

Numerous articles refer to studies of smile analysis. The perspective of most of these studies is the frontal view; few are carried out from the perspective of the lateral or peripheral views. Kerns et al.\(^1\) found that profile and frontal views of the same smile were not similarly rated for esthetic appeal. Schlosser et al.\(^2\) found that, from a profile view, it might be more acceptable in some cases to maintain or increase maxillary dental protrusion for optimal facial esthetics, rather than to retract the anterior maxillary teeth.

A common approach to achieving the esthetic evaluation of our patients should be shared between dental professionals, as we currently rely on various cephalometric analyses to evaluate the attractiveness of a face, despite it having been demonstrated that good facial harmony can exist within a wide range of cephalometric values.\(^3,4\) Similarly, a well-managed orthodontic case that upon completion meets the American Board of Orthodontics’ criteria for satisfactory treatment (Table 1) can result in an unesthetic smile.\(^5\) Furthermore, professional opinion regarding the evaluation of smile esthetics may differ from the perceptions and expectations of patients and the general public.\(^6,7\)

The established esthetic standards of the general public, as well as the gradual evolution of these standards, have a direct effect on orthodontics, orthopedics, orthognathic surgery, and, ultimately, on all specialties. We therefore need to understand social preferences in relation to dentofacial attractiveness and the smile.

The aim of this study was:

- To evaluate the differences between professionals and the general public regarding the esthetic perception of maxillary incisor torque.
- To establish the ranges, from a strictly esthetic and clinical perspective, within which to finalize anterosuperior inclinations.
- To accumulate data for designing treatment plans from an esthetic perspective, not based exclusively on the classical criteria.

Materials and methods

A 30-year-old female mesofacial patient was selected, with skeletal class I, and a normal overjet.

A video and photographs were taken in profile, all from the same distance, with the head placed in an “esthetic position” as recommended by Bass\(^8\) (a corrected natural head position adjusted
by the clinician so that the face does not appear to be tilted up or down), un-moving, with the patient repeating the phrase “Chelsea eats cheesecake on the Chesapeake” throughout the video.

The frame that best represented the patient’s social smile was selected, as well as the corresponding photograph in profile. A teleradiographic lateral image of the skull was added for posterior cephalometric analysis.

The photographs were manipulated using Adobe Photoshop, version CS6, inclining the anterior trapezoidal sector 5 degrees at a time (Fig 1), so as not to create striking defects in the smile, with

### Table 1
Summary of the ABO Objective Grading System for scoring dental casts and panoramic radiographs

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alignment</td>
<td>In the anterior region, the incisal edges and lingual surfaces of the maxillary anterior teeth, and labioincisal surfaces of the mandibular anterior teeth, are chosen as the guide to assess anterior alignment. In the maxillary posterior region, the mesiodistal central groove of the premolars and molars is used to assess the adequacy of alignment. In the mandibular arch, the buccal cusps of the premolars and molars are used to assess proper alignment.</td>
</tr>
<tr>
<td>Marginal ridges</td>
<td>Marginal ridges are used to assess proper vertical positioning of the posterior teeth. In patients with no restorations, minimal attrition, and no periodontal bone loss, the marginal ridges of adjacent teeth should be at the same level.</td>
</tr>
<tr>
<td>Buccolingual inclinations</td>
<td>Buccolingual inclinations of the posterior teeth are taken into account in order to establish proper occlusion in maximum intercuspation and avoid balancing interferences.</td>
</tr>
<tr>
<td>Occlusal relationship</td>
<td>Occlusal relationship is used to assess the relative anteroposterior position of the maxillary and mandibular posterior teeth. The most verifiable method of scoring this criterion is to use Angle’s relationship.</td>
</tr>
<tr>
<td>Occlusal contacts</td>
<td>A major objective of orthodontic treatment is to establish maximum intercuspation of opposing teeth. Therefore, the functioning cusps are used to assess the adequacy of this criterion.</td>
</tr>
<tr>
<td>Overjet</td>
<td>In the posterior region, the mandibular buccal cusps and the maxillary lingual cusps are used to determine proper position within the fossae of the opposing arch. In the anterior region, the mandibular incisal edges should be in contact with the lingual surfaces of the maxillary anterior teeth.</td>
</tr>
<tr>
<td>Interproximal contacts</td>
<td>Interproximal contacts are used to determine if all spaces within the dental arch have been closed. Persistent spaces between teeth after orthodontic therapy are not only unesthetic but can lead to food impaction.</td>
</tr>
<tr>
<td>Root angulation</td>
<td>If roots are properly angulated, sufficient bone will be present between adjacent roots, which could be important if the patient were susceptible to periodontal bone loss at some point in time.</td>
</tr>
</tbody>
</table>
point of rotation in the incisal border so that the overjet variations did not influence the respondents’ decisions. Nine distinct inclinations were obtained.

From these nine variations, 18 images were obtained: nine with a focus on the lower third, and nine in full profile, so we would also be able to evaluate whether distortion exists when assessing only the lower third. Dental, gum, and facial imperfections were eliminated so as not to distract the respondents.

Questionnaire

The selected images were distributed on the internet with the help of a professional survey company (Webtools). The respondents were asked questions to evaluate them and assess whether they met the inclusion criteria. They then went on to analyze the images. The responses were collected using a Smile Perception Questionnaire (SPQ).9

The images were divided into three groups:
- The first group was shown a sequence of the nine images of the lower facial third with a visual analog scale (VAS) line graded from 0 to 100, with 0 being ‘very unpleasant’ and 100 being ‘very agreeable.’ Resolution settings and computer monitor size can affect the VAS. Therefore, to standardize the survey responses, evaluation was based on the percentage of the length of the line in pixels, regardless of the monitor used.
- The second group was shown the same set of images as for the first group, and the respondents indicated which image they liked the most, and which they liked the least.
- The third group was shown the nine images in full profile. Similarly, the respondents indicated which image they liked the most, and which they liked the least.

Sample

The images were distributed among 22 orthodontists (OR group), 24 specialists in dental esthetics (SDE group), and 24 laypersons (LP group). The latter served as the control group.
Taking into account failure to respond, incomplete tests, and unmet inclusion criteria, the number of responses that were finally analyzed were: 20 from the OR group (experience 22.35 years ± 9.44), 19 from the SDE group (experience 22.32 years ± 6.51), and 21 from the LP group (age 39.43 years ± 3.43).

The inclusion/exclusion criteria for each group are outlined below.

### Orthodontists (OR)

**Inclusion criteria:**
- Having completed 3 years of postgraduate study in orthodontics.
- Being a member of a national orthodontics society.
- Having a minimum of 10 years’ experience.

**Exclusion criteria:**
- Not practicing orthodontics exclusively.

### Specialists in dental esthetics (SDE)

**Inclusion criteria:**
- Having a minimum of 10 years’ experience.

**Exclusion criteria:**
- Not practicing dental esthetics exclusively.

### Laypersons (LP)

**Inclusion criteria:**
- Having completed undergraduate university study.
- Between 30 and 50 years of age.

**Exclusion criteria:**
- They, their children, and their parents have never had any form of orthodontic treatment.

The responses underwent statistical analysis. The options most liked by the LP group were analyzed cephalometrically, and three angular measurements were taken corresponding to the following planes of reference:

- **Maxillary incisor:** Esthetic plane proposed by Fradeani;\(^{10}\) When the head of the patient is upright, looking to the horizon, the Frankfurt plane tilts up 8 degrees in the front, making a new parallel plane to the floor, which is known as the esthetic plane. We considered this measurement to be more exportable to other facial patterns because it is parallel to the horizontal with the head upright.
- **Maxillary incisor:** Na- A point: We used this method as an orthodontic cephalometric reference, in accordance with the analysis proposed by Steiner.\(^{11}\)
- **Crown tangent of the maxillary incisor – functional occlusal plane:** This being the measurement with the greatest clinical application of the three that were taken.

### Statistics

Differences between the scores obtained for each photograph were analyzed using the ANOVA test or the Kruskal-Wallis test, to see whether or not they agreed with the hypotheses of normality and homoscedasticity. The hypothesis of normality was studied using the Shapiro-Wilk test, and that of homoscedasticity using the Bartlett test. When significant
differences were found, the post hoc Tukey test was used in the parametric cases, and the Nemenyi test in the nonparametric cases. This was done to detect differences between the two. Pearson’s chi-squared test was used to analyze the differences between qualitative variables, where $P$ values $< 0.05$ were considered statistically significant.

The statistical analysis was carried out using the R program (R Development Core Team, 2015), version 3.2.0. R: A language and environment for statistical computing [Computer Software Manual], Vienna, Austria. Available at: http://www.r-project.org (ISBN 3-900051-07-0).

Results

The first group of responses was for a sequence of nine images of the inferior facial third with a VAS line graded from 0 to 100, with 0 being ‘very unpleasant’ and 100 being ‘very attractive’ (Fig 2). The images were labeled according to the angle of the tangent of the clinical crown of the maxillary incisor and the functional occlusal plane (Fig 3).

Table 2 summarizes the main values studied for each smile, and Figure 4 shows the box plot for each smile.

With regard to the 100-degree smile (angle formed by the tangent of the clinical crown and the functional occlusal plane), the hypothesis that the means are equal was rejected (Kruskal-Wallis test: $P < 0.01$). Differences were detected between the OR and LP groups ($P < 0.001$), and between the OR and SDE groups ($P = 0.003$). No difference was detected between the LP and SDE groups ($P = 0.733$). As well as noting a difference between the perception of the OR and the other groups, it was also noted that the OR group particularly disliked this smile.

**Fig 2** One of the images from the sequence of nine images of the inferior facial third with a VAS line graded from 0 to 100, with 0 being ‘very unpleasant’ and 100 being ‘very attractive.’
Fig 3  Sequence of nine images of the lower facial third, labeled according to the angle of the tangent of the clinical crown of the maxillary incisor and the functional occlusal plane. Images were not shown sequentially so as not to influence the respondents’ decisions. (a) 90-degree smile. (b) 75-degree smile. (c) 70-degree smile. (d) 80-degree smile. (e) 85-degree smile. (f) 60-degree smile. (g) 95-degree smile. (h) 65-degree smile. (i) 100-degree smile.
Fig 4  Box plot for each smile. Note that the 85-degree, 90-degree, 95-degree, and 100-degree smiles are statistically significant.
Table 2  Relationship between each smile and each group

<table>
<thead>
<tr>
<th></th>
<th>60-degree smile</th>
<th>65-degree smile</th>
<th>70-degree smile</th>
<th>75-degree smile</th>
<th>80-degree smile</th>
<th>85-degree smile</th>
<th>90-degree smile</th>
<th>95-degree smile</th>
<th>100-degree smile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laypersons (LP) n = 21</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mean</td>
<td>20.67</td>
<td>23.24</td>
<td>53.95</td>
<td>57.62</td>
<td>59.38</td>
<td>52.95</td>
<td>38.95</td>
<td>25.29</td>
<td>29.90</td>
</tr>
<tr>
<td>median</td>
<td>17.00</td>
<td>22.00</td>
<td>54.00</td>
<td>58.00</td>
<td>57.00</td>
<td>53.00</td>
<td>41.00</td>
<td>22.00</td>
<td>29.00</td>
</tr>
<tr>
<td>s.d.</td>
<td>16.30</td>
<td>17.34</td>
<td>24.72</td>
<td>19.06</td>
<td>23.92</td>
<td>24.35</td>
<td>21.08</td>
<td>17.89</td>
<td>18.77</td>
</tr>
<tr>
<td>Orthodontists (OR) n = 20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mean</td>
<td>17.55</td>
<td>26.60</td>
<td>63.75</td>
<td>70.25</td>
<td>53.30</td>
<td>38.85</td>
<td>21.55</td>
<td>10.05</td>
<td>9.30</td>
</tr>
<tr>
<td>median</td>
<td>15.00</td>
<td>28.00</td>
<td>74.00</td>
<td>73.50</td>
<td>53.50</td>
<td>34.00</td>
<td>18.50</td>
<td>6.50</td>
<td>6.00</td>
</tr>
<tr>
<td>s.d.</td>
<td>11.31</td>
<td>15.58</td>
<td>25.06</td>
<td>18.63</td>
<td>20.42</td>
<td>22.76</td>
<td>14.01</td>
<td>11.99</td>
<td>13.43</td>
</tr>
<tr>
<td>Specialists in dental esthetics (SDE) n = 19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mean</td>
<td>16.26</td>
<td>14.95</td>
<td>52.79</td>
<td>60.84</td>
<td>52.16</td>
<td>54.37</td>
<td>37.58</td>
<td>20.53</td>
<td>23.58</td>
</tr>
<tr>
<td>median</td>
<td>11.00</td>
<td>12.00</td>
<td>53.00</td>
<td>64.00</td>
<td>47.00</td>
<td>54.00</td>
<td>35.00</td>
<td>18.00</td>
<td>17.00</td>
</tr>
<tr>
<td>s.d.</td>
<td>16.78</td>
<td>12.28</td>
<td>19.75</td>
<td>21.06</td>
<td>25.68</td>
<td>24.26</td>
<td>21.48</td>
<td>15.95</td>
<td>16.58</td>
</tr>
</tbody>
</table>

Figures represent scores of mean, median, and standard deviation (s.d.) obtained over a VAS line.

For the 95-degree smile, the hypothesis that the means are equal was rejected (Kruskal-Wallis test: \( P = 0.01 \)). Significant differences were only detected between the OR and LP groups \( (P = 0.007) \). For comparison, the OR and SDE groups showed \( P = 0.084 \), and the LP and SDE groups showed \( P = 0.685 \).

The results for the 90-degree smile suggest that the hypothesis of normality in all modalities should not be rejected (Shapiro-Wilk test: LP: \( P = 0.48 \); OR: \( P = 0.3 \); SDE: \( P = 0.63 \)), and that the hypothesis of homogeneity of variances should not be rejected (Bartlett test: \( P = 0.14 \)), but that the hypothesis of equal population means should be rejected (ANOVA test: \( P = 0.01 \)). The Tukey test indicated that significant differences occurred between certain level pairs. Ordering them by significance results in the following relation: OR and LP \( (P = 0.01) \), and SDE and OR \( (P = 0.03) \), respectively. By contrast, no difference was seen between the SDE and LP groups \( (P = 0.97) \).

Regarding the 85-degree smile, the hypothesis that the means are equal was rejected (Kruskal-Wallis test: \( P = 0.046 \)). Differences were detected between the OR and LP groups \( (P = 0.003) \), and between the OR and SDE groups \( (P = 0.04) \). No differences were detected between the LP and SDE groups \( (P = 0.810) \).

The 80-degree, 75-degree, 70-degree, and 65-degree smiles indicated that the hypothesis of normality in all of the modalities, the hypothesis of homogeneity of variances, and the hypothesis of equal population means should not be rejected.
Table 3  Relationship between “Smile you like the most” and each group

<table>
<thead>
<tr>
<th></th>
<th>LP</th>
<th>OR</th>
<th>SDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>65-degree smile</td>
<td>0 (0%)</td>
<td>2 (10%)</td>
<td>1 (33.33%)</td>
</tr>
<tr>
<td>70-degree smile</td>
<td>6 (28.57%)</td>
<td>9 (45%)</td>
<td>4 (21.05%)</td>
</tr>
<tr>
<td>75-degree smile</td>
<td>6 (28.57%)</td>
<td>7 (35%)</td>
<td>7 (36.84%)</td>
</tr>
<tr>
<td>80-degree smile</td>
<td>7 (33.33%)</td>
<td>2 (10%)</td>
<td>7 (36.84%)</td>
</tr>
<tr>
<td>85-degree smile</td>
<td>2 (9.52%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
</tr>
</tbody>
</table>

Figures represent the number of times (and percentage in each group) that each smile was chosen.

Table 4  Relationship between “Smile you dislike the most” and each group

<table>
<thead>
<tr>
<th></th>
<th>LP</th>
<th>OR</th>
<th>SDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>60-degree smile</td>
<td>8 (38.10%)</td>
<td>0 (0%)</td>
<td>8 (42.11%)</td>
</tr>
<tr>
<td>65-degree smile</td>
<td>1 (4.76%)</td>
<td>0 (0%)</td>
<td>2 (10.53%)</td>
</tr>
<tr>
<td>70-degree smile</td>
<td>1 (4.76%)</td>
<td>1 (5%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>75-degree smile</td>
<td>1 (4.76%)</td>
<td>0 (0%)</td>
<td>2 (10.53%)</td>
</tr>
<tr>
<td>80-degree smile</td>
<td>1 (4.76%)</td>
<td>1 (5%)</td>
<td>1 (5.26%)</td>
</tr>
<tr>
<td>90-degree smile</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>1 (5.26%)</td>
</tr>
<tr>
<td>95-degree smile</td>
<td>1 (4.76%)</td>
<td>1 (5%)</td>
<td>2 (10.53%)</td>
</tr>
<tr>
<td>100-degree smile</td>
<td>8 (38.10%)</td>
<td>17 (85%)</td>
<td>3 (15.79%)</td>
</tr>
</tbody>
</table>

Figures represent number of times (and percentage in each group) that each smile was chosen.

For the 60-degree smile, the hypothesis that the means are equal was not rejected (Kruskal-Wallis test: $P = 0.46$).

The second group of responses was for the same set of images, where the respondents indicated which images they liked the most, and which they liked the least.

Analysis was carried out to study the relationship between “Smile you like the most” and each group, with the result being that no relationship existed (chi-squared test: $P = 0.20$). Table 3 shows the number of times that each photograph was chosen by each of the groups. It can be seen that the LP group preferred the 80-degree smile, the SDE group preferred the 75-degree smile, and the OR group preferred the 70-degree smile.

Analysis was also carried out to study the relationship between “Smile you dislike the most” and each group (Table 4). It was established that an association did exist (chi-squared test: $P = 0.02$). The options most disliked by the LP group were the 60- and 100-degree smiles (38.10% each), while 85% of the
**Fig 5**  Sequence of the nine manipulated full-profile images. Images were not shown sequentially so as not to influence the respondents’ decisions.
OR group opted clearly for the 100-degree smile. In the SDE group, the majority choice was the 60-degree smile (42.11%), followed by the 100-degree smile (15.79%).

For the third group of responses, the nine photos were full-profile images (Fig 5). Similarly, the respondents had to indicate which profile they liked the most (Table 5), and which they liked the least (Table 6).

Analysis was carried out to study the relationship between each group and “Profile you like the most,” and showed no association (chi-squared test: $P = 0.09$).
The majority of the LP group chose the 80-degree smile (38.10%), followed by the 75-degree smile (28.57%), showing the same preference as the SDE group: 80-degree smile (57.89%), and 75-degree smile (26.32%). This was compared with the OR group to establish whether a slight difference could be identified; however, this was not significant (the OR group chose the 75-degree smile in 45% of cases, followed by the 70-degree smile in 25% of cases, and the 80-degree smile in 15% of cases).

Similarly, an analysis was carried out to study the relationship between each group and “Profile you dislike the most,” and it was shown that a relationship exists (chi-squared test: \( P = 0.01 \)).

Differences can be seen because the majority option chosen by the LP and SDE groups was the 60-degree smile (42.86% and 57.89%, respectively), while the OR group chose the 100-degree smile in 70% of cases.

Finally, the choice preferred by the LP group was determined by the following parameters:

- Angle between the maxillary incisor and esthetic plane (Fig 6): 97 degrees.
- Angle between the maxillary incisor and Na- A point: 15 degrees.
- Tangent of the clinical crown of the maxillary incisor and the functional occlusal plane: 80 degrees.

**Discussion**

One of the main objectives of any dental specialty is patient satisfaction, and among the aspects that best define that satisfaction is the esthetics of the smile. Owing to the unique focus of each dental specialty, esthetics is not understood in exactly the same way by all dental practitioners, and, most importantly, this understanding does not always coincide with that of the patient. The authors of this article agree with other authors (Johnston et al., Kokich et al.) regarding the difference in criteria between specialists and patients; however, we also think that it is important to unify those criteria for the benefit of the patient.

Kokich et al. were the first to use the computer to modify photographs for esthetic investigation. Through this technique, alteration was within very defined variables. Since then, this method has been used to measure the acceptance...
of various smile characteristics in a reliable way (Wagner et al, Ker et al, Kokich et al, Rosenstiel and Rashid). Due to the desire to achieve the most natural social smile, instead of taking one photograph within a series of photographs, the technique described by Ackerman and Ackerman was preferred, ie, positioning the video camera at smile height and asking the patient to repeat the phrase "Chelsea eats cheesecake on the Chesapeake." This video recording was complemented with lateral photographs in a way that made the photomontage as natural as possible when changing the angles of the incisors and making small trapezoidal inclinations of the posterior sections.

The VAS has been used in various studies to measure dental and facial esthetics with moderately high correlation coefficient reliability. Web surveys have also been used previously, with the consequent social discrimination of assuming that everyone has internet access. However, our own design of the inclusion criteria used in this study considered this, as all participants had a history of higher education. This is an important point to take into consideration when generalizing the results.

Due to the variety of mechanisms through which the questionnaires could be accessed via the internet, we expressly asked the participants to connect from desktop computers in order to minimize the risk of bias error resulting from the size of the image.

Taking into account a previous study by Moore et al on smile esthetics, in which it was demonstrated that there are no differences in judgment between men and women, no gender discrimination of participants was made in this study. Barriers to inclusion in each group were high in the present study; it was not sufficient for participants to only have a university education (as in the study by Ghaleb et al), they were also required to have completed stringent levels of specialization within their fields.

The majority of studies undertaken to date have looked at the frontal view of the smile. Sabri carried out a review of eight aspects to take into consideration for an attractive smile, all of which were from a frontal perspective. However, we agree with various authors that the anteroposterior position of the maxillary incisors, as well as buccolingual inclinations, have a determining effect on the attractiveness of a smile.

The protrusive positions of the maxillary incisors have great esthetic importance. Similarly, some studies support the labial torque of the incisors defending the position that increasing it improves the esthetics of a smile. This coincides with the results of the OR group in the present study; however, it does not coincide with the results of the SDE or LP groups. This differs from studies that demonstrate, using digital modification, that inclination of the incisors is preferable to protrusive incisors. We have included the fact that the occlusion remained equal in every photograph, and therefore the variation of the torque rotated on the incisal axis could be the reason for the LP and SDE groups preferring less-protrusive inclinations than in other studies. These results led us to believe that in the planning of orthodontic treatment, there should be reasonable guidelines for the position of the inferior incisor; thereafter, the case could
be completed with esthetic treatments to improve the inclination of the anterior sector.

Due to the contradictions that exist between different studies that result from the extensive use of facial photography,19,29 we decided to show our participants photographs of the smile exclusively, with facial distractions eliminated. Also, photographs of the full profile were shown, so that the effect of the smile on facial attractiveness could be appreciated. The LP group preferred the same position of the incisors in smile and in profile, while both professional groups (SDE and OR) differed, retroclining 5 degrees each in the photographs in profile. The LP and SDE groups agreed on the full-profile images.

It is possible that the OR group’s preference for a more protrusive torque could be because orthodontists have become accustomed to seeing this as a necessary consequence of gaining space for alignment, and that protrusion of the inferior incisor will be more pronounced if not controlled with treatment mechanics. As a second effect, the protrusion of the mandibular incisors produces the vestibulization of the maxillary incisors in order to achieve contact, assuming this alteration in the esthetic of the incisors’ torque. As a result of this vestibulization of the maxillary incisors, a secondary intrusion is accomplished, resulting in inverted smile lines.

As far as the least liked options were concerned, the OR group made it clear that they least preferred the most protrusive incisors in all the photographs. The LP and SDE groups coincided every time: they shared their dislike of the most protrusive incisors with the OR group, both in the smile and in the full-profile images.

Among orthodontists we see a tendency to like the protrusive profiles at the labial level, sacrificing the esthetics of the incisal torque. It would be interesting to carry out studies to see which aspect should be prioritized from an esthetic point of view, and whether complementary techniques are taken into account, such as hyaluronic microfillings, which could be a good complement for achieving both objectives without sacrificing either.

We agree with the widespread opinion that cephalometric standards should not be the main goal in orthodontics, and that additional criteria should be taken into account.5 However, we intended to objectify the results obtained in order to further direct our treatment plan. We chose the esthetic plane described by Fradeani10 because it refers to the position of the head; thus, it helps to avoid possible errors incorporated in the occlusal plane because of the variation of individual facial patterns.30 However, the occlusal plane can be best controlled clinically. As the most common cephalometric measurement, we chose the angulation of the maxillary incisor as proposed by Steiner11 (maxillary incisor – Na- A point), resulting in the esthetic inclination chosen by the LP group being 7 degrees more lingual than that proposed by Steiner.

Conclusions

Taking our research goals and the analysis of our results into consideration, we can conclude the following:
Regarding the differences of perception, the LP and SDE groups were almost always in agreement; not so the OR group, which preferred more positive torque (more labial inclination) compared with the other two groups, especially compared with the LP group.

Secondly, the LP group most favored the clinical crown tangent of the maxillary incisors at 80 degrees to the occlusal plane in mesofacial patients, and especially disliked the maximum protrusion. This is coincident in the full-face and the lower third images.

Finally, in order to establish our goals, we must take into consideration that laypersons’ tastes differ from the accepted cephalometric norms. Therefore, treatment plans in orthodontics should start positioning the maxillary incisor straighter than what has been accepted to date.

References