Aesthetic perception and acceptability of the latest generation orthodontic devices

Gabriele Rossini¹, Ambra Sedran², Simone Parrini³, Fabrizio Sanna³, Andrea Deregibus⁴

¹ DDS, PhD Student, School of Specialization in Orthodontics, Department of Surgical Sciences, CIR Dental-School, University of Turin, Turin, Italy
² Dental Student, Department of Surgical Sciences, CIR Dental-School, University of Turin, Turin, Italy
³ DDS, School of Specialization in Orthodontics, Department of Surgical Sciences, CIR Dental-School, University of Turin, Turin, Italy
⁴ MD, PhD, Head, School of Specialization in Orthodontics, Department of Surgical Sciences, CIR Dental-School, University of Turin, Turin, Italy

KEYWORDS
Adults, Esthetics, Orthodontics.

ABSTRACT
Aim: To identify significant differences regarding general public’s perception of orthodontic devices in terms of aesthetics, readiness to undergo treatment and perceived economic value.

Materials and methods: 6 different orthodontic devices were shown, using a photo-editor software on a smile photograph, to a group of 30 randomly selected adults (mean age 34.06 years) and a questionnaire regarding aesthetics, readiness to undergo treatment and perceived economic value of orthodontic appliances was administered.

Results: For all categories, the ranking was as follows.
1. Orthodontic aligners.
2. Brackets with aesthetic Teflon-coated wire.
3. Self-ligating ceramic brackets with aesthetic Teflon-coated wire.
4. Self-ligating brackets with metal wire.
5. Ceramic brackets with metal wire.

Significant differences (p<0.05) were found regarding esthetics and perceived economic value. Metal components influenced negatively the scoring for all variables.

Conclusion: Acceptability of orthodontic appliances is significantly related to esthetics, readiness to undergo treatment and perceived economic value.

Introduction
In recent decades, oral aesthetics and straight teeth have become increasingly important for dental professionals and patients (1-4). Patients generally request orthodontic treatment to improve the quality of their lives both functionally and in terms of a ‘winning’ smile. These high aesthetic expectations do not just relate to the results after orthodontic treatment but, for the patients, also affect the choice of treatment. A choice also determined by the comfort offered by the orthodontic device during treatment.

According to the guidelines of modern orthodontics, although ideal occlusion is still the primary objective, the aesthetic results have become a significant factor in patients satisfaction (5). However, the concept of beauty is subjective, and people’s perceptions can depend on various factors relating to culture, geography and psychology (6-8).

It has been reported by numerous studies that orthodontic specialists have quite a different perception of dental aesthetics from that of the general public (7-8).

Parrini et al., in a systematic review of the 2016 literature, identified average values and thresholds of perception for tooth defects from the point of view of the general public (9). This study further highlighted the sizeable gap between the opinions of professionals and patients. Scientific studies have been carried out to analyse the liking for different types of braces (10-11), but given the speed of technological development and the social influence on the perception of aesthetics, this study was conducted with the aim of identifying the significant differences in opinions of the general public regarding orthodontic devices in terms of aesthetics, readiness to undergo treatment and perceived economic value.

Materials and methods
A master photo of the ‘smile’ was obtained from a previously selected model. The photo was taken...
with a Nikon D32 camera (Macro 105mm lens, ring flash) and imported in RAW format to a photo editing program (Photoshop, Adobe Inc.). Using the photo editing program, 6 types of braces were fitted virtually (Figure 1).

- Jupiter brackets (TNB Dental, Turin, Italy) with aesthetic Teflon-coated wire (J).
- Orthodontic aligners (ALL).
- Self-ligating brackets with metal wire (SLB).
- Self-ligating ceramic brackets with aesthetic Teflon-coated wire (SLEB).
- Metal brackets with metal wire (B).
- Ceramic brackets with metal wire (EB).

A group of 30 evaluators were randomly selected to create a pool of subjects who had never received any type of professional dental education.

An assessment sheet was provided for each image, modifying the one previously used by Rosvall et al. in a similar study (11).

The assessment sheet consisted of a VAS scale of 100 mm and 3 questions about the willingness to personally (or have their children) undergo treatment with the device shown, and also an assessment of the additional economic contribution that observers would be prepared to pay for that device if they were willing to undergo orthodontic treatment.

Each image was shown to the observers twice in non-consecutive order, obtaining a total of 12 assessment sheets from each observer.

**Statistical analysis**

After assessing the normal distribution of measurements, a one-way ANOVA test was used for paired samples and inter-group comparisons were performed for all the devices.

**Results**

A pool of 30 patients was selected (15 male 15 female,) whose mean age was 34.06 years.

The summary of the results of the evaluations is shown in Table 1.

<table>
<thead>
<tr>
<th></th>
<th>VAS (mm)</th>
<th>Acceptability YES</th>
<th>% YES</th>
<th>Acceptability NO</th>
<th>% NO</th>
<th>Acceptability for children YES</th>
<th>% YES</th>
<th>Acceptability for children NO</th>
<th>% NO</th>
<th>Additional Economic Contribution (€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>J</td>
<td>65,1</td>
<td>25,5</td>
<td>85,0%</td>
<td>4,5</td>
<td>15,0%</td>
<td>29</td>
<td>96,7%</td>
<td>1</td>
<td>3,3%</td>
<td>875,0</td>
</tr>
<tr>
<td>ALL</td>
<td>80,2</td>
<td>30</td>
<td>100,0%</td>
<td>0</td>
<td>0,0%</td>
<td>30</td>
<td>100,0%</td>
<td>0</td>
<td>0,0%</td>
<td>1191,7</td>
</tr>
<tr>
<td>SLEB</td>
<td>60,5</td>
<td>24,5</td>
<td>81,7%</td>
<td>5,5</td>
<td>18,3%</td>
<td>29</td>
<td>96,7%</td>
<td>1</td>
<td>3,3%</td>
<td>850,0</td>
</tr>
<tr>
<td>SLB</td>
<td>46,1</td>
<td>21,5</td>
<td>71,7%</td>
<td>8,5</td>
<td>28,3%</td>
<td>23,5</td>
<td>78,3%</td>
<td>6,5</td>
<td>21,7%</td>
<td>733,4</td>
</tr>
<tr>
<td>EB</td>
<td>44,8</td>
<td>19,5</td>
<td>65,0%</td>
<td>10,5</td>
<td>35,0%</td>
<td>22</td>
<td>73,3%</td>
<td>8</td>
<td>26,7%</td>
<td>741,7</td>
</tr>
<tr>
<td>B</td>
<td>24,5</td>
<td>3,5</td>
<td>11,7%</td>
<td>26,5</td>
<td>88,3%</td>
<td>12,5</td>
<td>41,7%</td>
<td>17,5</td>
<td>58,3%</td>
<td>591,7</td>
</tr>
</tbody>
</table>

Table 1 Mean values
For all the categories, the order of liking in descending order was as follows.
- ALL
- J
- SLEB
- SLB
- EB
- B

The ANOVA test results revealed significant differences as regards both the VAS values and the additional economic contribution.

Regarding the VAS values, significant differences were found in all the inter-group comparisons, except in the following cases (Table 2, Figure 2):
- J vs. ALL;
- J vs. SLEB;
- SLB vs. SLEB;
- SLB vs. BE;
- SLEB vs. BE.

Regarding the additional economic contribution, significant values were recorded in the following cases (Table 3, Figure 3):
- J vs. ALL;
- J vs. B;
- ALL vs. SLEB;
- ALL vs. SLB;
- ALL vs. BE;
- ALL vs. B;
- SLEB vs. B.

Discussion
Analysing the opinions of prospective adult patients regarding their perception of the orthodontic device provided statistically and clinically significant results. As already shown by previous studies (12-14), the presence of metal parts in the device is a determining factor in the readiness of adult patients to undergo the treatment, and also in proposing it to their children.

Although there are no data in the literature regarding the relationship between acceptability of the device and level of compliance during treatment, less collaboration can be expected from the patient if the device used is disliked. Results according with this point of view, although relating to post-treatment retainers, were described by Mirzakouchaki et al., in 2016 (15).
The unattractive appearance of the metal parts influenced all the remaining variables analyzed, also affecting the assessment of the economic value. It is interesting to note how the adult patients would pay about twice the price of a metal multi-bracket device for the latest-generation aligners or aesthetic brackets. This type of evaluation was included because, in recent years, the economic aspect has acquired an ever greater role in the process of choosing orthodontic treatment. The base figure used for assessing the additional economic contribution was a treatment of 24 months at a price of 4000 euros; we point out that it is not the authors’ intention to determine or suggest prices for the different types of devices.

Regarding the VAS values of liking, contrary to what was expected, no significant differences were found between orthodontic aligners, Jupiter brackets and self-ligating aesthetic brackets. This may seem counterintuitive given the different natures of brackets and aligners as regards their size and visibility. However, the perceptions of patients were probably strongly influenced by an aesthetic rather than metal arch being used. Additionally, corroborating the results already stated earlier, the presence of metal parts in the aesthetic self-ligating brackets reduced their aesthetic appeal and they do not show any major differences from other types of brackets, apart from the conventional ones in metal.

Limitations in this study are the lack of stratification of the groups based on socio-cultural and income conditions, and also the fact that this was a sample of adults only and not of adolescents/children, who proved to have different opinions about orthodontic devices (10).

### Conclusions

For all the variables analyzed, the ranking obtained was as follows: ALL > J > SLEB > SLB > EB > B. Acceptability values exceeding 50% were recorded for all the devices, except for the conventional metal brackets. Values over 80% were recorded for ALL, J and SLEB.

No significant differences emerged from adult patients in their levels of acceptance for the devices, for themselves or for their children.

### Table 3 Multiple comparisons after ANOVA test Additional Economic Contribution

<table>
<thead>
<tr>
<th></th>
<th>Mean Diff,</th>
<th>95.00% CI of diff,</th>
<th>Summary</th>
<th>Adjusted P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>J vs. ALL</td>
<td>-316,7</td>
<td>-535,1 to -98,26</td>
<td>***</td>
<td>0,0007</td>
</tr>
<tr>
<td>J vs. SLB</td>
<td>141,7</td>
<td>-76,74 to 360,1</td>
<td>ns</td>
<td>0,4246</td>
</tr>
<tr>
<td>J vs. SLEB</td>
<td>25</td>
<td>-193,4 to 243,4</td>
<td>ns</td>
<td>0,9995</td>
</tr>
<tr>
<td>J vs. B</td>
<td>283,3</td>
<td>64,93 to 501,7</td>
<td>**</td>
<td>0,0034</td>
</tr>
<tr>
<td>J vs. EB</td>
<td>133,3</td>
<td>-85,07 to 351,7</td>
<td>ns</td>
<td>0,4948</td>
</tr>
<tr>
<td>ALL vs. SLB</td>
<td>458,3</td>
<td>239,9 to 676,7</td>
<td>****</td>
<td>&lt;0,0001</td>
</tr>
<tr>
<td>ALL vs. SLEB</td>
<td>341,7</td>
<td>123,3 to 560,1</td>
<td>***</td>
<td>0,0002</td>
</tr>
<tr>
<td>ALL vs. B</td>
<td>600</td>
<td>381,6 to 818,4</td>
<td>*****</td>
<td>&lt;0,0001</td>
</tr>
<tr>
<td>ALL vs. EB</td>
<td>450</td>
<td>231,6 to 668,4</td>
<td>*****</td>
<td>&lt;0,0001</td>
</tr>
<tr>
<td>SLB vs. SLEB</td>
<td>-116,7</td>
<td>-335,1 to 101,7</td>
<td>ns</td>
<td>0,6394</td>
</tr>
<tr>
<td>SLB vs. B</td>
<td>141,7</td>
<td>-76,74 to 360,1</td>
<td>ns</td>
<td>0,4246</td>
</tr>
<tr>
<td>SLB vs. EB</td>
<td>-8,333</td>
<td>-226,7 to 210,1</td>
<td>ns</td>
<td>0,9999</td>
</tr>
<tr>
<td>SLEB vs. B</td>
<td>258,3</td>
<td>39,93 to 476,7</td>
<td>*</td>
<td>0,0104</td>
</tr>
<tr>
<td>SLEB vs. EB</td>
<td>108,3</td>
<td>-110,1 to 326,7</td>
<td>ns</td>
<td>0,7091</td>
</tr>
<tr>
<td>B vs. EB</td>
<td>-150</td>
<td>-368,4 to 68,4</td>
<td>ns</td>
<td>0,3585</td>
</tr>
</tbody>
</table>

Table 3 Multiple comparisons after ANOVA test Additional Economic Contribution

### Figure 3 Mean and Standard Deviation – Additional Economic Contribution
The additional economic contribution for the aesthetic devices can, according to the adults, be up to twice that for the standard metal brackets.

**References**