# AJO-DO

# Influence of orthodontic appliance design on employment hiring preferences

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**Introduction:** The objective of this study was to evaluate the extent to which different types of orthodontic appliances influence the hiring process of an individual applying for a customer service position. **Methods:** A total of 7 images were created for 2 adult models: 1 male and 1 female. One image was produced without orthodontic appliances, and 6 simulated the use of orthodontic appliances, including a conventional metallic appliance with a gray elastic ligature, a conventional metallic appliance with blue elastic ligature, a conventional appliance with a transparent elastic ligature, a self-ligating metal appliance, a self-ligating esthetic appliance, and a clear aligner. A photo album was designed for each model and delivered, along with a questionnaire, to individuals in charge of job interviews and hiring. These evaluators included 236 individuals, divided into 4 groups according to age and gender: males between 18-35 years (M), males over 35 years (M > 35), females between 18-35 years (F), and females over 35 years (F > 35). The evaluators quantified the chance of hiring the models using a Visual Analogue Scale. The Mann-Whitney test was used to compare the evaluators according to gender and age. The Wilcoxon test was used to compare the models according to gender. The Kruskal-Wallis and Dunn post hoc tests were used to compare the appliances according to design. A 5% significance level was used for all tests. **Results:** The clear aligner group showed the highest likelihood of being hired, followed by the group without orthodontic appliances, the groups with esthetic appliances (ie, conventional appliance with a transparent elastic ligature, and self-ligating esthetic appliance), and the groups with metallic appliances (ie, self-ligating metal appliance, conventional metallic appliance with gray elastic ligature, and conventional metallic appliance with blue elastic ligature). **Conclusions:** Assuming all other qualifications of the applicants are equivalent, the use of an orthodontic appliance may influence job interviews. The better the esthetics of the appliance, the higher the likelihood of the individual being hired. (Am J Orthod Dentofacial Orthop 2019;156:758-66)

P hysical appearance and attractiveness are intimately related, and, often, an individual with a good appearance is regarded as a person of great willpower, wisdom, morality, responsibility, and social prestige.[1–4]

Personal physical appearance, along with sexual identity, is the most easily observed characteristic during social interactions,[5] and the face is an essential part of interpersonal communication.[6,7] Teeth are the most noticeable component of facial architecture.[8] In addition, smile harmony is of foremost importance for

physical beauty. It is fundamental for esthetic evaluation, and, when unpleasant, it directly affects an individual's social and psychological well-being.[3]

Different fields of expertise in modern dentistry aim to provide more esthetically pleasant and healthy smiles for patients, whose primary concern is usually an esthetic improvement. A patient seeks to be considered attractive by himself or herself as well as by the social group to which he/she belongs.[9,10] The interaction between different structures, such as the shape of the lips, teeth, and cheeks, defines smile esthetics and ultimately influences the perception of facial attractiveness.[11,12]

Factors that motivate adult patients to seek orthodontic treatment have been previously investigated. The desire to align the teeth and improve the smile were the primary motivators, but the decision to use braces was usually related to social acceptance, as a way to improve one's presentation in society.[13]

Individuals with the most esthetically pleasant smiles scored better in social attributes such as popularity, leadership, and academic performance in a study

evaluating how smile esthetics interfere with the perception of students' athletic, academic, and social capabilities.[7] Laypeople associate social judgment with physical attributes, and dental appearance is usually analyzed under this same perspective.[10,14,15] In line with this, Pithon et al[1] evaluated the influence of dental esthetics on hiring during job interviews. The authors concluded that subjects with a smile considered ideal had a higher probability of being hired than subjects with compromised dental esthetics. Similarly, it was suggested that the esthetics of orthodontic appliances also affect people's assessments and judgments.[16]

Agreeing on the type of appliance is often a fundamental part of the process to approve an orthodontic plan. However, the promise of an esthetic appliance is not enough.[17] Meeting the expectations of adult patients regarding appliance design is essential for treatment satisfaction. Therefore, providers should take time to understand these expectations.[13,16]

Smile esthetics can interfere with social relationships and the reception of an individual by his/her peers, and it is generally acknowledged that orthodontic treatment improves smile esthetics. Usually, treatment modalities require at least a year to be completed, and, because the use of orthodontic appliances affects a patient's esthetics, this study aimed to analyze the influence of orthodontic appliances on the perceptions of individuals responsible for hiring during a job interview by having them evaluate photographs of smiling individuals with different appliance designs. The impact of the age and gender of these evaluators was also investigated.

## MATERIALS AND METHODS

The research ethics committee of Sagrado Coração University approved this study under protocol number 10.760.673.

Two young-adult model volunteers with pleasant faces according to subjective esthetic facial evaluation, proper dental alignment, passive lip seals, and pleasant smiles were selected, one from each gender. Then, after both provided written informed consent, 5 removable hybrid appliances were created with 0.018-inch steel wire (Fig 1) based on plaster casts of the volunteers. The 5 appliance designs included conventional metallic appliances with gray (CMG) or blue elastic ligature (CBM), conventional esthetic appliances with a transparent elastic ligature (CE), and metallic and esthetic self-ligating appliances (SM and SE, respectively). A clear aligner (AI) was also manufactured for each volunteer, amounting to 6 appliances each.

Frontal facial photographs were taken of the models wearing each of the appliances. The photographs were taken with a Sony DSC-HX300 digital camera (Tokyo, Japan) with each individual in a natural head position, facing forward, and smiling. A total of 7 photographs were taken of each model, including 6 using orthodontic appliances and 1 without any appliance (W). Each photograph was printed life-sized onto 21.0 × 29.7-cm (A4) photographic paper and numbered from 1-7: (1) W; (2) CMG (Roth MAX, Morelli; Sorocaba, Brazil); (3) CMB (Roth MAX, Morelli); (4) CE (Iceram-S, Orthometric; Marília, Brazil); (5) SM (SLI, Morelli); (6) SE (Evolution, Tecnident/V8; São Carlos, Brazil); (7) AI (Essix Clear Aligner, Dentsply; Bradenton, Fla; Figs 2 and 3). The photographs were grouped according to gender: one male and one female.

A mean, standard deviation of 27.1 was obtained in the pilot experiment evaluating the difference between the appliances with 23 evaluators. Then, a sample of 236 evaluators was necessary, considering a 5% significance level and 80% power of detecting a minimum difference of 5 points between 2 appliances.

The evaluators were individuals responsible for hiring for positions requiring customer service, face-to-face service for all kind of commerce. They were divided into groups according to gender and age. Two age groups were selected, including 1 with individuals aged between 18-35 years, and another with individuals aged >35. For the group aged 18-35 years, 58.9% (n = 66) were females (F) and 41.1% (n = 46) were males (M). For the group >35 years, 41.9% (n = 52) were females (F > 35) and 58.1% (n = 72) were males (M > 35). Considering the total sample, the mean age of the evaluators was 37.1 (standard deviation [SD], 11.3) years, regardless of gender. The mean age of the female evaluators in group F was 28.1 (SD, 4.0) years and 45.1 (SD, 10.4) years in group F > 35. The mean age of the male evaluators in group M was 27.8 (SD, 4.5) years and 45.4 (SD, 8.4) years in group M > 35.

After signing the informed consent forms, each evaluator received 2 photo sets (female and male models' photographs). Each set included the 7 photographs of the model (male or female) and a questionnaire. All photographs in each set were randomly arranged on a table, allowing the visualization of all images at the same time. The evaluators had 5 minutes to visualize each set of photographs and complete the questionnaire without researcher interference.

Evaluators were asked the following question to complete the questionnaire: "What would be the likelihood of hiring these candidates?" They completed a Visual Analogue Scale (VAS), and the scores assigned to each image would reflect the likelihood of that individual being hired. All 7 images belonged to the same
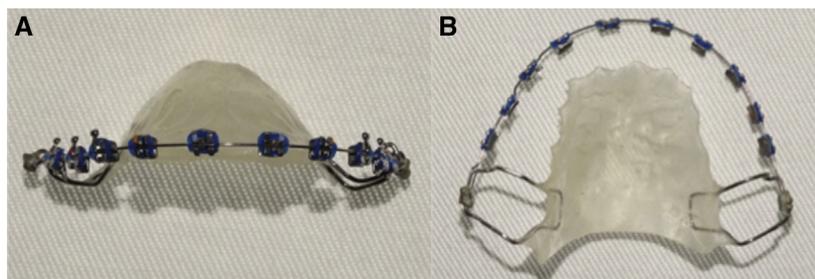
**Fig 1.** Hybrid appliance (an association between a removable appliance and a fixed appliance): **A,** frontal view; **B,** occlusal view.
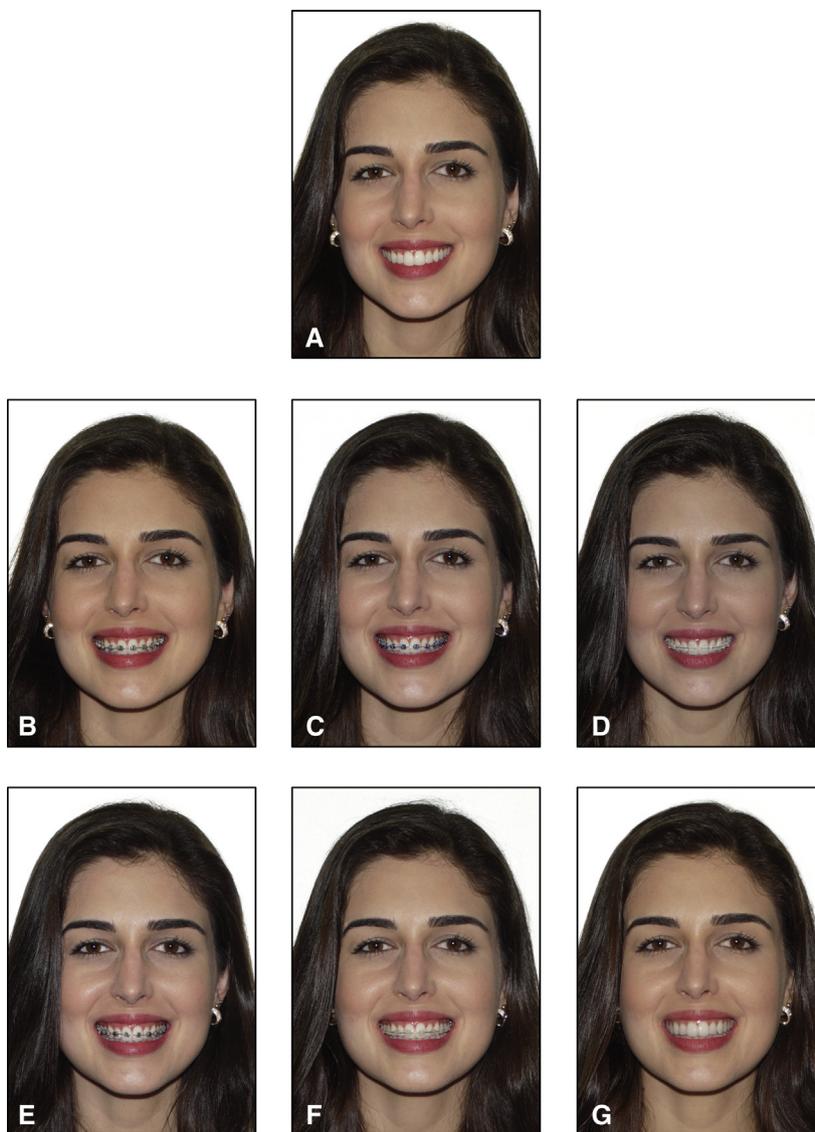


**Fig 2.** Female frontal face photograph with smile in natural head position: **A,** without any appliance (W); **B,** CMG; **C,** CMB; **D,** CE; **E,** SM; **F,** SE; **G,** AI.
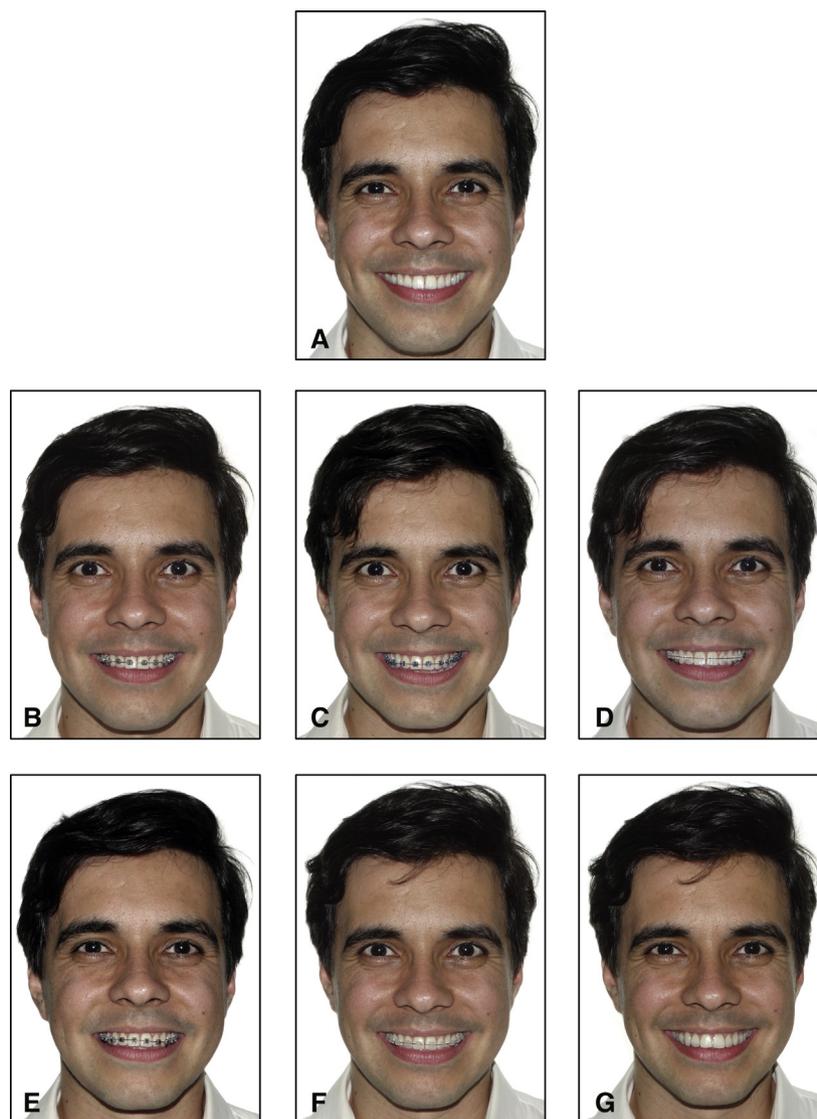
**Fig 3.** Male frontal face photograph with smile in natural head position: **A,** without any appliance (W); **B,** CMG; **C,** CMB; **D,** CE; **E,** SM; **F,** SE; **G,** AI.

individual, so the only difference was the presence of an orthodontic appliance and the different designs, which enabled the identification of whether the type of appliance influenced the likelihood of being hired. A 100-mm horizontal line represented this scale, with the left indicating a lower probability of being hired and the right indicating a higher probability of being hired. Each evaluator used a vertical line to mark the position on the horizontal line that coincided with his/her opinion on the chance of hiring the individual in each image (Fig 4). The numerical values were recorded and stored in an Excel table (Microsoft, Redmond, Wash) for statistical analysis.

### Statistical analysis

The data were grouped according to age, gender, and the type or lack of appliance used. All measurements were assessed using the Kolmogorov-Smirnov normality test. As the distribution was not normal, the data were described in tables and graphs using the median values and the semi interquartile range.

The Mann-Whitney test was used to compare genders and age groups of the evaluators. The Wilcoxon test was used to compare the gender of the models, and the Kruskal-Wallis and Dunn post hoc tests were used to compare appliances. A 5% significance level was adopted for all tests. All statistical procedures

Lower probability of
being hired

Higher probability
of being hired

**Fig 4.** VAS.

were performed using SPSS software (version 17; Chicago, Ill).

## RESULTS

In all evaluator groups and regardless of model gender, significant differences ($P < 0.001$) were observed among the appliances. The highest score was obtained by the AI group, followed by the W, SE, CE, SM, CMG, and, finally, the CMB group (Table I).

A statistically significant difference between the male and female models was observed among all types of appliance designs, regardless of the gender or age of the evaluators. Higher scores were obtained by the appliances on the female model (Table II and Fig 5).

A statistically significant difference was observed between the F and F > 35 groups for the SE appliance on the female model (Table III). A statistically significant difference between the genders of the evaluators was observed only for the group aged >35 regarding the AI appliance (Table III), with the male evaluators assigning higher scores compared with female evaluators.

A statistically significant difference was observed only for the esthetic appliances on the male model (CE, SE, AI), with the M > 35 groups assigning higher scores (Table IV).

## DISCUSSION

Several studies have indicated that social attractiveness and personal traits are judged based on face and body esthetics.[1-4] Social interaction, quality of life, and well-being are influenced by physical characteristics, thus affecting physical attraction itself, as well as individuals' social lives.[4,5,18,19]

The method used for recording the level of the intention of hiring in this study was the VAS, a widely utilized method established as a quick, simple, and inexpensive method for recording judgment values regarding attractiveness and esthetics.[1,7,20,21] The objective of this study was to evaluate the extent to which the different types of orthodontic appliances influence the hiring process of someone applying for a position involving face-to-face customer service in all types of commerce.

Our results showed that, in all evaluator groups and regardless of gender (Table I), there was a preference for hiring individuals with aligners (AI group; $P < 0.001$),

**Table I.** Median values and SQR of all the evaluator groups, without distinction between gender of the model

| Appliance | Median values | SQR |
|---|---|---|
| W | 90.0[b] | 7.0 |
| CMG | 78.0[d] | 13.0 |
| CMB | 74.5[e] | 17.0 |
| CE | 80.5[c] | 12.0 |
| SM | 75.0[de] | 17.0 |
| SE | 81.0[c] | 12.5 |
| AI | 93.0[a] | 4.0 |

Different letters represent statistically significant difference among appliances ($P < 0.001$).
*W,* without any appliance; *CMG,* conventional metallic appliance with grey elastic ligature; *CMB,* conventional metallic appliance with blue elastic ligature; *CE,* conventional aesthetic appliance with transparent elastic ligature; *SM,* self-ligating metal appliance; *SE,* self-ligating aesthetic appliance; *AI,* clear aligner; *SQR,* semi interquartile range.

**Table II.** Median values and SQR for the male and female models, of all the evaluator groups

| Appliance | Female models Median values | SQR | Male models Median values | SQR | P values (between gender) |
|---|---|---|---|---|---|
| W | 90.5[b] | 6.0 | 89.0[b] | 8.4 | <0.001* |
| CMG | 80.5[e] | 11.9 | 75.0[d] | 14.5 | <0.001* |
| CMB | 75.0[e] | 16.4 | 73.0[d] | 18.0 | 0.009* |
| CE | 81.0[cd] | 11.4 | 79.5[c] | 13.0 | 0.002* |
| SM | 78.0[de] | 15.4 | 73.0[d] | 17.0 | 0.001* |
| SE | 83.0[c] | 11.5 | 80.0[c] | 13.5 | 0.002* |
| AI | 94.0[a] | 3.5 | 92.0[a] | 4.4 | 0.001* |

Different letters represent statistically significant difference among appliances ($P < 0.001$).
*W,* without any appliance; *CMG,* conventional metallic appliance with grey elastic ligature; *CMB,* conventional metallic appliance with blue elastic ligature; *CE,* conventional aesthetic appliance with transparent elastic ligature; *SM,* self-ligating metal appliance; *SE,* self-ligating aesthetic appliance; *AI,* clear aligner; *SQR,* semi interquartile range.
*The mean difference between genders is significant ($P < 0.05$).

which reinforces the idea that braces with a subtler appearance are more likely to be accepted by patients and favored in the customer service field. In this context, all esthetic appliances were rated statistically higher than metallic appliances. Furthermore, a score of 93 mm was
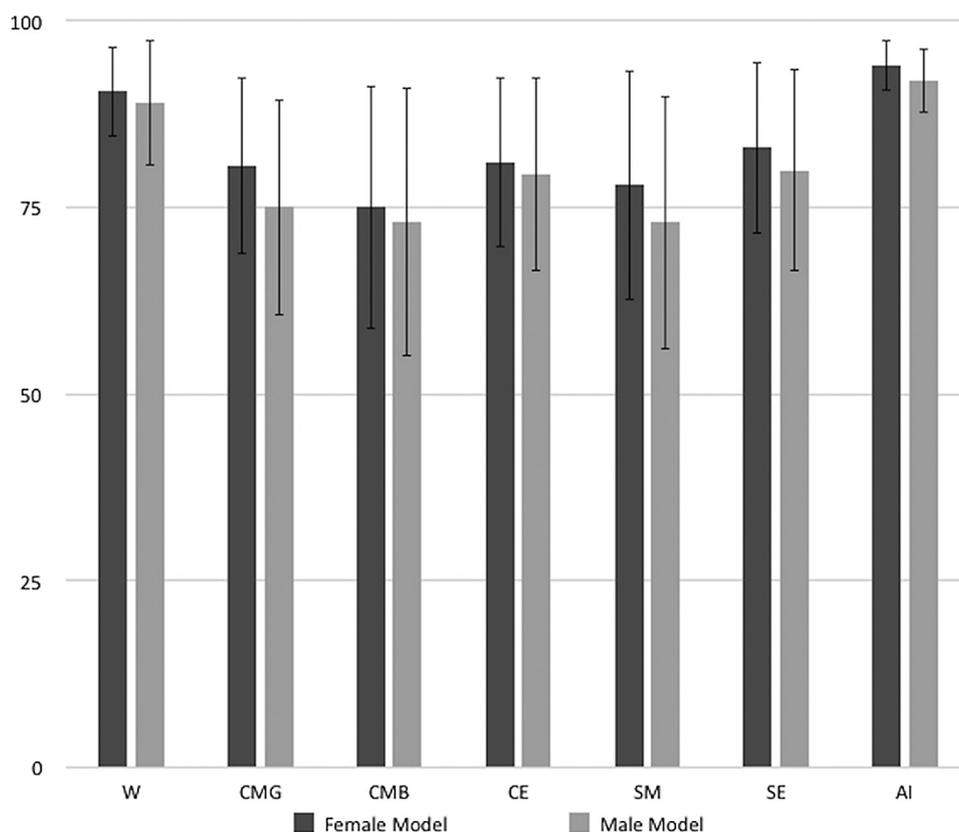
**Fig 5.** Median values for the male and female models, including all evaluator groups and bars with the standard deviations. *W*, without any appliance; *CMG*, conventional metallic appliance with grey elastic ligature; *CMB*, conventional metallic appliance with blue elastic ligature; *CE*, conventional aesthetic appliance with transparent elastic ligature; *SM*, self-ligating metal appliance; *SE*, self-ligating aesthetic appliance; *AI*, clear aligner.

**Table III.** Median values and SQR of each evaluator group, per type of appliance, regarding the female model

| Appliance | 18-35 years (female) | | >35 years (female) | | 18-35 years (male) | | >35 years (male) | |
|---|---|---|---|---|---|---|---|---|
| | *Median value* | *SQR* | *Median value* | *SQR* | *Median value* | *SQR* | *Median value* | *SQR* |
| W | 90.0 | 7.6 | 91.0 | 5.9 | 90.0 | 5.8 | 92.0 | 4.0 |
| CMG | 82.0 | 12.6 | 79.5 | 7.5 | 80.5 | 13.3 | 81.5 | 13.6 |
| CMB | 76.0 | 14.9 | 73.5 | 9.9 | 77.0 | 18.1 | 78.0 | 21.3 |
| CE | 81.5 | 12.9 | 77.0 | 12.5 | 82.5 | 12.8 | 83.5 | 10.5 |
| SM | 80.0 | 13.6 | 77.0 | 13.4 | 80.0 | 14.5 | 78.0 | 22.6 |
| SE | 87.0* | 10.8 | 77.5* | 10.6 | 83.0 | 16.9 | 82.5 | 11.9 |
| AI | 94.0 | 5.0 | 93.0† | 3.6 | 94.0 | 4.8 | 94.0† | 2.0 |

*W, without any appliance; CMG, conventional metallic appliance with grey elastic ligature; CMB, conventional metallic appliance with blue elastic ligature; CE, conventional aesthetic appliance with transparent elastic ligature; SM, self-ligating metal appliance; SE, self-ligating aesthetic appliance; AI, clear aligner; SQR, semi interquartile range.*
*\*Statistically significant difference between the age groups; †Statistically significant difference between the genders of the evaluators.*

obtained for the aligner, statistically different from the score of 90 mm for the smile without any appliance. Our finding may suggest that the aligner makes the teeth shinier, and occlusal contact with the appliance causes a

bite opening; this may improve smile esthetics and the chance of being hired according to the evaluators. Although better accepted by patients concerned with esthetics, it appears that aligners may not be as effective as

**Table IV.** Median values and SQR of each evaluator group, per type of appliance, regarding the male model

| | Female evaluators | | | | Male evaluators | | | |
|---|---|---|---|---|---|---|---|---|
| | 18-35 years (female) | | >35 years (female) | | 18-35 years (male) | | >35 years (male) | |
| Appliance | Median value | SQR | Median value | SQR | Median value | SQR | Median value | SQR |
| W | 86.5 | 10.0 | 89.5 | 6.8 | 86.5* | 12.8 | 90.5* | 5.5 |
| CMG | 78.0 | 13.8 | 72.0 | 12.4 | 74.0 | 17.6 | 78.5 | 15.6 |
| CMB | 73.5 | 14.1 | 70.0 | 15.1 | 69.0 | 19.8 | 77.5 | 23.6 |
| CE | 80.0 | 15.6 | 76.0† | 12.3 | 79.0 | 17.6 | 84.0† | 10.3 |
| SM | 73.0 | 16.8 | 71.0 | 15.3 | 72.5 | 16.5 | 75.0 | 20.4 |
| SE | 78.0 | 14.3 | 75.5† | 14.6 | 81.5 | 18.1 | 81.5† | 8.8 |
| AI | 91.0 | 6.1 | 90.5† | 5.4 | 90.0* | 5.9 | 94.0*,† | 3.0 |

*W,* without any appliance; *CMG,* conventional metallic appliance with grey elastic ligature; *CMB,* conventional metallic appliance with blue elastic ligature; *CE,* conventional aesthetic appliance with transparent elastic ligature; *SM,* self-ligating metal appliance; *SE,* self-ligating aesthetic appliance; *AI,* clear aligner; *SQR,* semi interquartile range.
*Statistically significant difference between the age groups; †Statistically significant difference between the genders of the evaluator.

fixed appliances in achieving significant improvement in a malocclusion. This limitation should be highlighted, as it is essential to determine the appropriate patients for this treatment protocol.[22]

Table II shows the comparison between the models regardless of gender or age of the evaluators. As in Table I, the preference for hiring both models in the aligner group is higher than all other groups, SE and CE groups are found in intermediate positions, and metallic braces, whether self-ligating or conventional, are ranked last[23] (Fig 5). The absence of an orthodontic appliance or the use of an aligner has been shown to cause the perception of increased intellectual ability. Similarly, the appearance of an orthodontic appliance influences social assessments.[16]

The most qualified candidates are usually selected to fill a position, although facial and body esthetics also influence the decision. In this context, the smile appearances of adult patients, who make up most of the labor market, was strongly influenced by the use of orthodontic appliances, which may justify patients' increased concern with the type of appliance that often results in treatment withdrawal. Therefore, the technological progress of orthodontic appliances and materials has made the treatment of those requiring better esthetics more feasible. Poor esthetics of the appliances is one of the main reasons adults choose not to undertake orthodontic treatment, and it accounts for 10.7% of initial treatment rejections.[24] Similarly, the use of braces may affect social judgments, and therefore, the absence of an appliance or the use of esthetic appliances such as aligners are preferred among adults,[16] which supports the preference for esthetic orthodontic appliances in adults.[23]

When comparing the models (Table II), all evaluators rated the female model as having a higher probability, in absolute values, of being selected (Fig 5). When the gender of the candidate is the only associated factor in this controlled environment, and the esthetics of the appliances are not taken into account, all scores for the female model were statistically higher than those for the male model. This preference for female workers may be explained in the context of employability in commerce as women occupy more positions than men in the public service and administration sectors.[25]

According to our results, the best likelihood of being hired by both male and female evaluators in both age groups was obtained when the model wore an AI appliance (Table III). However, when the gender of the evaluator was investigated, a statistically significant difference was noted, with the male evaluators (M > 35) assigning higher scores to the AI group than the female evaluators (F > 35). In addition, the SE appliance was ranked higher by younger female evaluators than by older female evaluators, which suggests that younger women responsible for hiring are more likely to be influenced by the esthetics of the appliance.[26] On the other hand, those aged >35 are less likely to be influenced by social media, which may be reflected in their definitions of esthetic, modern, and current as standards of quality and competence.[5] Likewise, a similar study[1] reported that younger evaluators considered individuals with an ideal smile to be more intelligent and to have better chances of being hired for a job, reflecting the influence of the media and society's beauty standards.[26] Although we only considered the gender and age of the evaluators, many other factors related to interviewers' backgrounds, including orthodontic history, could affect their opinions and should be investigated in future research.

An evaluation of the male model (Table IV) showed that the highest likelihood of being hired by all

evaluators was also obtained with the aligner appliance. However, when comparing the results of the older male evaluators and their female counterparts, the male evaluators attributed a significantly higher classification to the esthetic appliances (CE, SE, AI). Still, there was a tendency of higher scores being assigned to the female model, regardless of the age or gender of the evaluator (Fig 5). This difference may result from the preference for hiring women for customer service jobs, which contradicts Henson et al,[7] who claimed that the assessment of characteristics, such as leadership and academic ability, is not influenced by the gender of the sample or the evaluators. This finding maybe because of the fact that, in their research, these abilities were evaluated in isolation and not within the context of job recruitment. Furthermore, our study may have been limited in that we used the static evaluation of photographs instead of video to better simulate the interactive interview process.

It is essential to highlight that, although significant differences among the appliance designs influenced the models' chances of being hired, all VAS scores assigned by the evaluators were high (between 74.5-93), leading us to conclude that the use of orthodontic appliances does not completely jeopardize one's chance of being hired. Another relevant issue involves the transient or limited duration required for orthodontic treatment; when desired, the malocclusion should be treated appropriately to increase patients' satisfaction, even though it may influence a job search.

Finally, when properly indicated for a patient's malocclusion, the design of an orthodontic appliance should also be considered when the patient has the need to apply for a job or even to find a partner; the individual may encounter better social acceptance when less impact is caused by the orthodontic appliance.[16] On the other hand, the more esthetically pleasing the appliance, the higher its cost. Therefore, the appliance design must be considered a social investment for attaining a job or for better social acceptance. As such, the data obtained in this research suggests that the better the esthetics of an individual's smile with the orthodontic appliance, the better the possibility of recruitment.

## CONCLUSIONS

1.  Aligners (AI) showed the highest rate of acceptance for recruitment according to the evaluators, regardless of age or gender.
2.  Esthetic appliances (SE, CE) obtained better results than metallic appliances (SM, CMG, CMB), regardless of being self-ligating or conventional.

3.  Assuming all other qualifications of the applicants are equivalent, the presence of an orthodontic appliance, as well as the type of appliance, may influence the possibility of recruitment during a job interview, and therefore, the better the esthetics of the orthodontic appliance, the higher the probability of being hired.

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