



# Chapter 169

## The perception of facial esthetics and the attractiveness of the smile associated with malocclusions and piercing assessed by eye-tracking

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### **ABSTRACT**

**Objective:** This study investigates the perception of facial aesthetics and the attractiveness of the smile, with associated malocclusions and lip piercing, via eye tracking. **Methods:** In the frontal images of the smiling faces of a male and a female, the teeth were altered by adding the IOTN grades 1, 5, and 8, in conjunction with a "ball" type piercing located in the upper left lip. The images were evaluated by 96 laypeople aged 18 to 76 years old and divided into young adults, middle-aged adults, and elderly people. Two software programs, OGAMA, and The Eye Tribe Tracker®, were used together. A visual analog scale (VAS) was applied with a questionnaire surveying individuals' perceived employability, honesty, intelligence, and ability to meet obligations. Kruskal-Wallis and one-way ANOVA tests were applied ( $p < 0,05$ ). **Results:** There was no difference in the ANOVA test for assessing AOI at the first fixation of the gaze or in the fixation time, regardless of the age or sex of the raters. The presence of a piercing does not cause an initial focus on the piercing area. Images with IOTN grade 1 showed more attractiveness than IOTN grades 5 and 8 for both genders. "Employability", "intelligence", and "meets the obligations" influence VAS response. **Conclusions:** Piercing did not obscure the malocclusion. Young adults consider people with aligned teeth more intelligent and have a greater chance of finding a job than middle-aged and elder adults, independent of the presence of piercings.

**Keywords:** Piercing, Perception, malocclusion, esthetics.

## 1 INTRODUCTION

It is estimated that between 8% and 50% of the population has piercings.<sup>1</sup> The number of people with intra and perioral piercings has not been estimated, but there has been an increase in this group of patients in dental offices.<sup>2</sup>

There is literature regarding the harm caused by the placement and use of piercings;<sup>3,4</sup> however, there are few studies<sup>5</sup> on the aesthetic perception of perioral piercings. Several studies have employed images evaluated by laypeople and orthodontists<sup>6,7</sup> to understand laypeople's aesthetic perception and apply the knowledge acquired clinically by the orthodontist.

A pleasing smile involves a harmonious relationship between the teeth, the gingival scaffold, and the lip framework. The importance of physical and facial attractiveness, in which the smile arguably plays a major role, has been studied and related to job recruitment decisions,<sup>8</sup> initial impressions, susceptibility to peer pressure, voting and juror decisions, and social interactions, including dating decisions.<sup>9,10</sup>

The Orthodontic Treatment Index (IOTN),<sup>11</sup> is an observational system with different degrees of severity used to determine the need for the treatment of malocclusions, and it is also useful in perception studies and various aspects of perception research.<sup>12</sup>

Eye-tracking technology, which has the advantage of perceiving and recording the observer's eye movements, has been widely used to research facial expressions, sex, race, and the need for orthodontic treatment using intra-oral and facial photos.<sup>13</sup> This technology can complement the use of a visual analog scale (VAS) to facilitate the analysis of the psychosocial aspect of the aesthetic sense in the case of lip piercings and dental malocclusions.

The objective of this study was to evaluate the perception of facial aesthetics and the association of different malocclusions with the presence of lip piercings, using eye-tracking technology. Additionally, the study uses images of smiling individuals to determine if they are viewed as employable, honest, intelligent, and capable of meeting obligations through a questionnaire and the VAS of these models.

## 2 MATERIALS AND METHODS

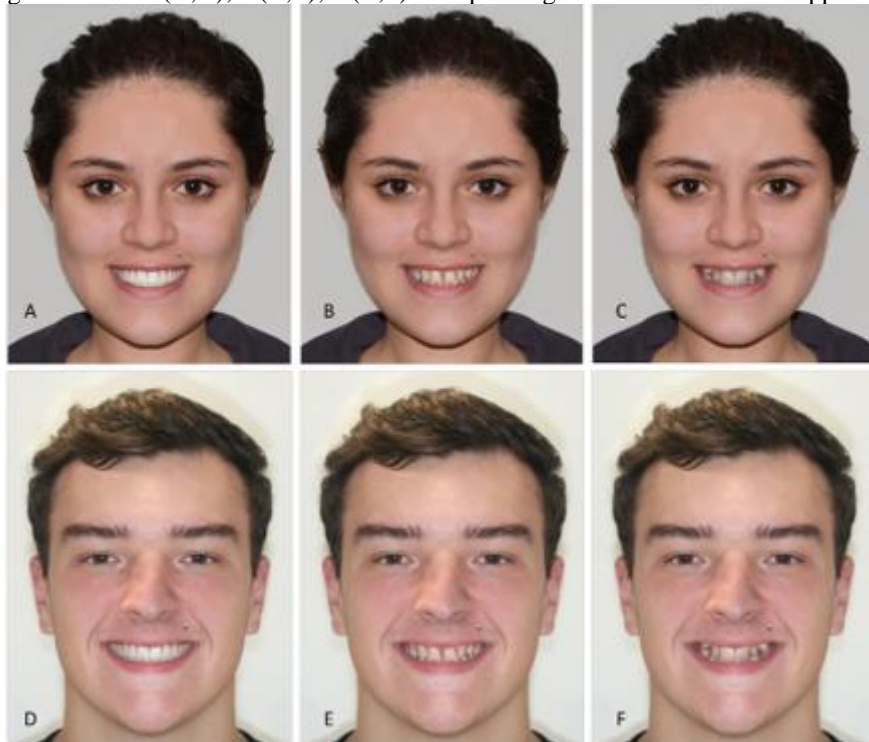
This was an observational, cross-sectional study that was approved by the ethics committee of the University (approval number: 3,729,413). Sample calculation was performed obeying the heterogeneous population of Paraná. Adopting an infinite population, 95% confidence level, and 10% margin of error showed that 96 people were necessary for the study.

## 3 DATA PREPARATION

Two frontal images of the smiling faces of young, Caucasian models with good facial aesthetics, one male and one female, were obtained with a Canon Rebel XTI camera (Canon, Tokyo, Japan) with the horizontal plane of Frankfurt parallel to the ground.

Photoshop® (Adobe Systems Inc., San Jose, California) was used to remove facial imperfections to minimize interference in the study (e.g., skin spots), and IOTNs grade 1 (the highest dental attractiveness), grade 5, and grade 8 (definite need for orthodontic treatment)<sup>11</sup> were added, in conjunction with a “ball” type piercing located in the upper left lip (Fig. 1).

Fig 1. IOTNs. 1 (A,D); 5 (B,E); 8 (C,F) with piercing on the left side of the upper lip.

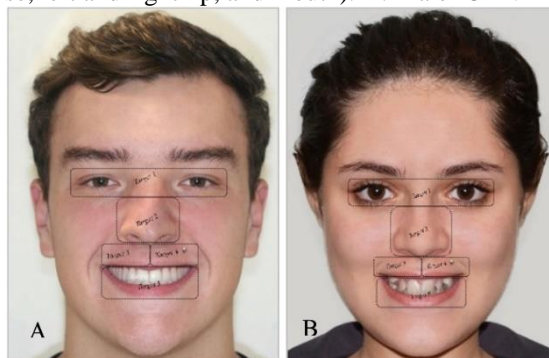


## Raters

Five areas of interest (AOI) not visible to raters were added in the female (Fig 2A) and male (Fig 2B) photographs: eyes, nose, above the right lip, above the left lip, and mouth.

A total of 108 people were invited to participate, and 96 people met the inclusion criteria: absence of previous neurological and/or visual conditions that could interfere with the study and no recent use of alcohol or medications that could interfere with cognitive skills. 12 people had their data excluded from the research as they did not meet all participation requirements.

Fig 2. AOI (eyes, nose, left and right lip, and mouth). A. Male IOTN=1; B. Female IOTN=8.



Data were collected from 96 laypeople in 4 different cities in the state of (the name is omitted), with validated data obtained from 50 men and 46 women, 48 (50%) of whom had graduated in higher education, and 48 (50%) who had not graduated. The raters were recruited randomly in the streets and were invited to participate in the research without being given information on what they would be evaluated by at any time during the research. Evaluators were aged from 18 to 76 years old. The study population was classified into three groups: young adults (14-44 years) comprising 43 people, middle-aged adults (45-59) with 33 people, and elderly participants (over 60 years) with 32 people.<sup>14</sup>

### **Data collection**

To obtain eye-tracking results, the raters were positioned at a distance of 60 cm from a high-resolution (768 x 1366 pixels) Dell P23 17 monitor in an upright position to maintain the actual proportions of facial size. The Eye Tribe hardware was positioned just below as recommended by the manufacturer, and a 9-point calibration was conducted in conjunction with OGAMA software (Freie Universitat, Berlin). The software was calibrated to have a reliability of 92%. The images were arranged in a randomly provided order by the website <randomier.org>, and the sequence of images was the same for all evaluators. No detail about the research was revealed to the observers, nor did they have contact with each other.

### **Questionnaire**

After the eye-tracking session, each observer answered a 5-part questionnaire (4 questions and one VAS answer) in the Qualtrics® (Seattle, Washington, USA) application form using a Dell Inspiron 7375 touch 2-in-1 computer or the observer's mobile device, with the premise that the answers would be sitting in front of the researcher. Each image was shown to the rater again while they answered.

The questions, based on Henson et al.<sup>15</sup> and Pithon et al.,<sup>8</sup> were: (1) If you had to search for someone to work with you, would you consider hiring this person?; (2) In your opinion, would you judge this person to be intelligent?; (3) In your opinion, would you judge this person to be honest?; and (4) In your opinion, does this person seem to meet their obligations on time? The answers were arranged such that if the rater selected the alternative, it would be considered as “yes,” and if there was no selection of the variable, it would be considered as “no.”

### **Visual Analog Scale**

In addition, a VAS was concomitantly applied with the 4-question survey, with a score established on a gradation of 0 to 100 using a digital slide bar, 0 indicating a score of least attractive and 100 being the most attractive.

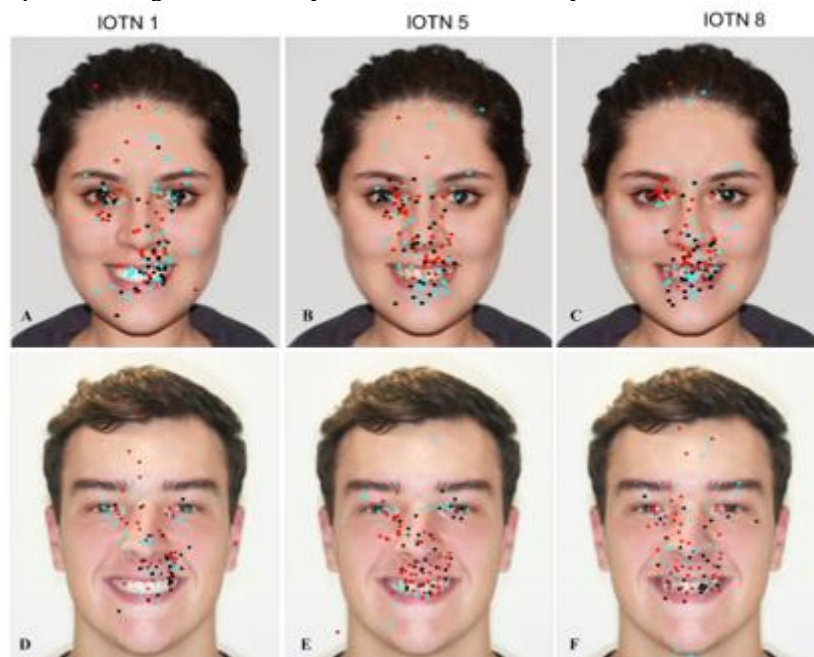
## 4 STATISTICAL ANALYSIS

The results obtained from the eye-tracking and questionnaires were tabulated in the Microsoft Excel version 16.0 software (Microsoft, Redmond, WA) and analyzed in the SPSS version 25 (Statistical Package for Social Sciences Software) (SPSS Inc., Chicago, IL) program. Kruskal-Wallis test was applied to analyze significant differences between images when distribution was nonparametric, and for parametric, one-way ANOVA was employed. Levene's homogeneity test was applied to identify homogeneous or heterogeneous distribution. Post-hoc testing was conducted to identify statistical differences; if a homogeneous population, Tukey HSD was used, and if heterogeneous, Games-Howell test was applied. Pearson chi-square were applied between the different IOTN's in contrast to the variables "Would you consider hiring this person?," "Would you judge this person to be intelligent?," "Would you judge this person to be honest?," and "Does this person meet his or her obligations on time?."

## 5 RESULTS

Eye-tracking generated Dotmaps (Fig. 3) for each IOTN grade, which was divided by raters' age group into female (Fig. 3 A-C) and male (Fig. 3 D-F) models' images. It was observed that for the female model, the IOTN grades 1, 5, and 8 showed that dotmaps were concentrated entirely at the mouth (more to the left side) in the piercing location. For the male model, the dotmaps showed a high concentration of dots at the nose and eyes with greater dispersal. Regardless of the IOTN and the age assessed, it is not possible to observe an absolute predominance in any AOI.

Fig 3. Dotmaps superimpositions. Age from 15-55 years old in blue, 45-59 years old in black and over 60 years old in red.



Regarding the eye-tracking, statistical difference was reported in the AOI's contrasting IOTNs for complete fixation time upon the mouth with piercing between grade 1 male and grade 8 female ( $p=0.011$ ), showing the piercing attracted the eye more in the IOTN=1, while the malocclusion received more attention in the female grade 8. Time until first fixation on the mouth showed a statistical difference when comparing the IOTN=1 female and grade 8 male ( $p=0.022$ ), where the rater quickly perceived the mouth in the male grade 8 malocclusion (Table 1). A box plot (Fig. 4) shows the quartiles distribution, median, and outlier values of AOI fixation time.

Referring to attractiveness, VAS scores showed the difference between IOTN grade 1 compared with IOTN grades 5 and 8 for both genders, where grade 1 was considered more attractive. IOTN grade 5 and 8 did not show a statistical difference between them (Table 1).

Fig 4. Box Plot with quartiles distribution, median and outlier values of AOI fixation time: eyes, nose, lip with piercing, lip without piercing, and mouth.

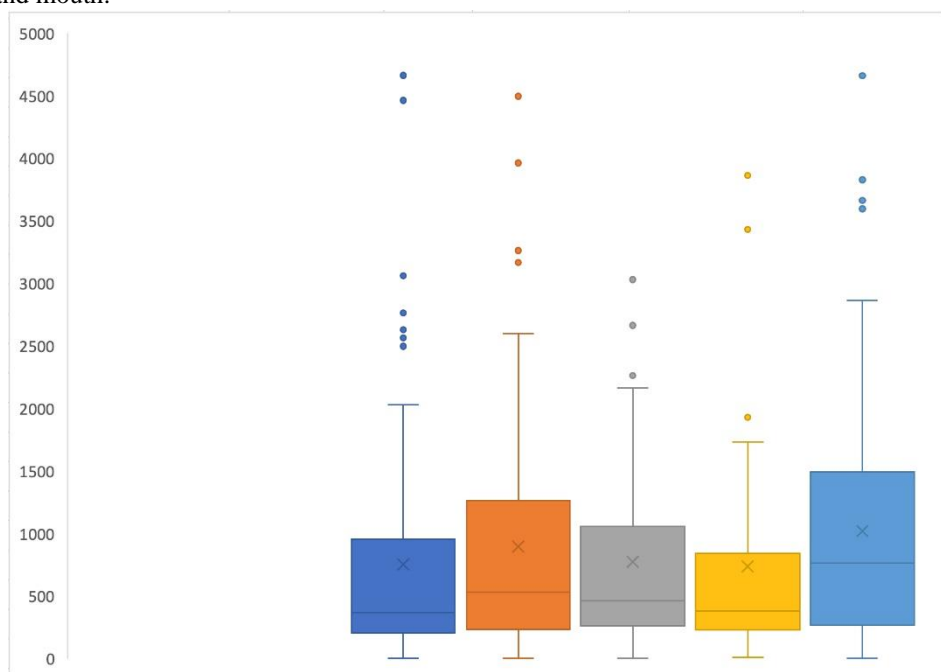


Table 1. A. Kruskal-Wallis test regarding different age groups and IOTN 1											
	Complete fixation time at eye	Complete fixation time at nose	Complete fixation time at upper lip with piercing	Complete fixation time at upper lip without piercing	Complete fixation time at mouth	Time until 1 fixation in eye	Time until 1 fixation in nose	Time until 1 fixation in upper lip with piercing	Time until 1 fixation in upper lip without piercing	Time until 1 fixation in mouth	VAS
	Mean (SD)										
IOTN 1 FEMALE YOUNG ADULTS	682.8 (694.44)	1443 (1592.51)	954.66 (1177.98)	.	1800.42 (1197.06)	499.8 (986.10)	132.67 (229.78)	1981.5 (2108.26)	.	1073.07 (1125.80)	78.00 (19.92)
IOTN 1 FEMALE MIDDLE AGE ADULTS	1478.6 (1702.15)	132 (134.32)	654.33 (354.25)	.	792.2 (741.21)	966.4 (1302.52)	1064.94 (1317.05)	1732 (2445.91)	.	3271.6 (1342.60)	72.15 (28.25)
IOTN 1 FEMALE ELDERS	806.2 (683.23)	433.5 (388.77)	1687.33 (1187.13)	.	1298.85 (800.82)	752.8 (1138.04)	1619.25 (1532.32)	722 (901.92)	.	1574.85 (1393.46)	73.87 (22.55)
IOTN 1 MALE YOUNG ADULTS	587.18 (705.43)	720.12 (714.22)	1180.22 (542.82)	.	918.71 (681.59)	863.18 (1179.43)	712.12 (1064.02)	603.33 (214.53)	.	627.85 (575.40)	73.19 (25.20)
IOTN 1 MALE MIDDLE AGE ADULTS	943.33 (1374.19)	990.28 (847.99)	1278.8 (520.84)	1698 (85.12)	983.25 (856.52)	1399 (2423.13)	1759.85 (1312.92)	1326.2 (1180.16)	2098 (2098.00)	1364.5 (761.55)	71.00 (30.37)
IOTN 1 MALE ELDERS	660.71 (562.61)	1222.85 (1508.70)	1506.25 (1168.00)	233 (1009.86)	135 (642.37)	1875.14 (1835.53)	204.57 (266.79)	458.25 (413.14)	1699 (1699.00)	732 (732.00)	69.00 (27.95)
SIG	0.321	0.103	0.370	0.425	0.099	0.611	0.201	0.766	0.317	0.532	0.748
B. Kruskal-Wallis test regarding different age groups and IOTN 5											
	Complete fixation time at eye	Complete fixation time at nose	Complete fixation time at upper lip with piercing	Complete fixation time at upper lip without piercing	Complete fixation time at mouth	Time until 1 fixation in eye	Time until 1 fixation in nose	Time until 1 fixation in upper lip with piercing	Time until 1 fixation in upper lip without piercing	Time until 1 fixation in mouth	VAS
	Mean (SD)										
IOTN 5 FEMALE YOUNG ADULTS	889.57 (878.75)	1521.66 (1509.09)	400 (136.68)	699.75 (697.38)	1071.33 (722.75)	1593.85 (1704.31)	1953.66 (1863.98)	1324.5 (1363.22)	2281.25 (1545.41)	852.25 (1016.68)	38.91 (20.78)
IOTN 5 FEMALE MIDDLE AGE	911.33 (801.52)	267.66 (58.60)	781.5 (918.53)	700 (700.00)	982 (642.37)	1898.33 (1744.48)	1997 (1290.79)	2131.5 (3014.39)	2798 (2798.00)	738 (825.91)	45.53 (21.14)
IOTN 5 FEMALE ELDERS	1255.42 (1617.23)	992.4 (664.45)	632 (231.22)	.	1705 (1374.71)	1085.14 (1473.36)	1766.2 (1573.99)	1355.33 (876.38)	.	621.5 (979.93)	49.42 (25.98)
IOTN 5 MALE YOUNG ADULTS	949.5 (416.30)	840.2 (741.02)	912.4 (781.60)	294.66 (85.12)	885.9 (674.33)	1515.5 (1371.32)	1412.2 (1532.41)	1099.2 (1075.76)	72 (176.36)	1445.3 (1440.52)	41.02 (21.75)
IOTN 5 MALE MIDDLE AGE	441.5 (362.63)	523.75 (417.61)	316.5 (164.75)	764.33 (1009.86)	710.5 (396.33)	1831.25 (1743.39)	1640.75 (1915.94)	1748.5 (1106.62)	1665 (2278.73)	1760.16 (1164.69)	40.68 (19.93)
IOTN 5 MALE ELDERS	527.16 (351.95)	644 (430.51)	574 (361.98)	1323.25 (1725.47)	1651.2 (958.32)	2647.83 (603.36)	649.33 (971.21)	2015 (843.40)	1299.25 (1283.89)	926.2 (1377.04)	48.92 (21.88)
SIG	0.870	0.147	0.537	0.480	0.681	0.712	0.976	0.934	0.480	0.837	0.167
C. Kruskal-Wallis test regarding different age groups and IOTN 8											
	Complete fixation time at eye	Complete fixation time at nose	Complete fixation time at upper lip with piercing	Complete fixation time at upper lip without piercing	Complete fixation time at mouth	Time until 1 fixation in eye	Time until 1 fixation in nose	Time until 1 fixation in upper lip with piercing	Time until 1 fixation in upper lip without piercing	Time until 1 fixation in mouth	VAS
	Mean (SD)										
IOTN 8 FEMALE YOUNG ADULTS	322.7 (142.58)	1038.33 (1722.40)	925 (589.22)	217 (70.71)	1102.63 (669.15)	1483 (1642.33)	744 (1664.16)	1973.25 (1376.66)	50 (70.71)	853.73 (762.86)	37.38 (20.77)
IOTN 8 FEMALE MIDDLE AGE	777.1 (1122.22)	857.75 (503.38)	166 (623.64)	.	795.5 (774.85)	1221.33 (1487.86)	799.5 (559.10)	2998 (2998.00)	.	1045.12 (1042.26)	36.10 (19.79)
IOTN 8 FEMALE ELDERS	932 (1179.21)	1905 (529.76)	274.25 (78.97)	299.66 (120.09)	1037.66 (839.69)	300 (600)	606.2 (510.45)	1299.25 (1869.16)	1287.66 (1064.29)	888.33 (1606.51)	47.57 (22.76)
IOTN 8 MALE YOUNG ADULTS	765.5 (725.65)	233 (141.42)	349.33 (144.79)	1082.5 (447.59)	814.31 (760.04)	1087 (1411.37)	1565 (1930.40)	1909.66 (1758.63)	1548.5 (823.77)	1032.62 (1361.75)	34.30 (21.16)
IOTN 8 MALE MIDDLE AGE	1415 (1530.17)	1725.8 (1506.99)	483 (353.55)	983.5 (778.52)	713.14 (741.00)	1981.5 (2802.26)	249.25 (287.81)	2381.5 (1672.30)	1431.5 (754.48)	656.71 (701.69)	31.42 (17.26)
IOTN 8 MALE ELDERS	1156.75 (1142.45)	986 (841.54)	1192.6 (1016.21)	1564.66 (1633.07)	2390.8 (1333.30)	233.17 (1436.63)	1152.4 (1986.36)	1465.6 (1650.54)	3020.33 (2254.60)	153.6 (210.63)	38.88 (21.29)
SIG	0.658	0.123	0.194	0.988	0.126	0.166	0.661	0.671	0.699	0.370	0.475

In the multivariate regression analysis (Table 2), it was observed that the variables “hiring”, “intelligence” and “meet the obligations” influenced the VAS response ( $p < 0.05$ ), while “honest” did not ( $p > 0.05$ ). The education of raters did not influence the VAS response ( $p > 0.05$ ).

Table 2. Multivariate regression to assess the influence that education, employability, honesty and intelligence factors exert on the VAS variable

	Coefficients	Standard Error	t Stat	P-value
Schooling	-3,804	2,016	-1,887	0,060
Hiring	19,499	2,409	8,096	< 0,000*
Honest	-2,696	2,277	-1,184	0,237
Intelligent	18,998	2,343	8,109	< 0,000*
Meet obligation in time	-5,125	2,247	-2,280	0,023*
(*) $p < 0,05$				

When raters were asked about the variables “hiring,” “honesty,” “intelligence,” and “obligation,” “yes” or “no” answers were obtained for each image. They were grouped by age and divided by IOTN in Table 3 for the absolute numbers of answers and in Table 4 for the percentage of “yes” responses.

Table 3. Absolute numbers of YES and NO responses (with percentage) from each age group divided by IOTN and employability, honesty, intelligence, and meets obligations variables

	Número YES	Número NO	Número YES	Número NO	Número YES	Número NO	Número YES	Número NO
Age - IOTN	Hiring	Hiring	Honest	Honest	Intelligent	Intelligent	Obligation	Obligation
Young - 1	90 (95.7%)	4 (4.3%)	48 (51.1%)	46 (48.9%)	54 (57.4%)	40 (42.6%)	36 (38.3%)	58 (61.7%)
Young - 5	56 (59.6)	38 (40.4%)	32 (34.0%)	62 (66.0%)	18 (19.1%)	76 (80.9%)	65 (69.1%)	29 (30.9%)
Young - 8	54 (57.4%)	40 (42.6%)	34 (36.2)	60 (63.8%)	15 (16.0%)	79 (84.0%)	68 (72.3%)	26 (27.7%)
Middle - 1	34 (89.5%)	4 (10.5%)	9 (23.7%)	29 (76.3%)	20 (52.6%)	18 (47.4%)	23 (60.5%)	15 (39.5%)
Middle - 5	22 (57.9%)	16 (42.1%)	8 (21.1%)	30 (78.9%)	11 (28.9%)	27 (71.1%)	28 (73.7%)	10 (26.3%)
Middle - 8	21 (55.3%)	17 (44.7%)	9 (23.7%)	29 (76.3%)	6 (15.8%)	32 (84.2%)	29 (76.3%)	9 (23.7%)
Elder - 1	39 (81.3%)	9 (18.7%)	11 (22.9%)	37 (77.1%)	24 (50.0%)	24 (50.0%)	36 (75.0%)	12 (25.0%)
Elder - 5	32 (66.7%)	16 (33.3%)	11 (22.9%)	37 (77.1%)	11 (22.9%)	37 (77.1%)	39 (81.3%)	9 (18.7%)
Elder - 8	22 (45.8%)	26 (54.2%)	10 (20.8%)	38 (79.2%)	8 (16.7%)	40 (83.3%)	40 (83.3%)	8 (16.7%)
Total	370 (68.5%)	170 (31.5%)	172 (31.9%)	368 (68.1%)	167 (30.9%)	373 (69.1%)	364 (67.4%)	176 (32.6%)

The Pearson’s chi-square was statistically significant for the question “Would you consider hiring this person?” ( $p = 0.000$ ) IOTN grade 1 compared with grades 5 and 8 for both genders, favoring IOTN grade 1 for hiring consideration (Fig. 5A).

The question “Would you judge this person intelligent?” showed no difference ( $p = 0.053$ ), and all the images were considered by the majority as not intelligent (Fig. 5B).

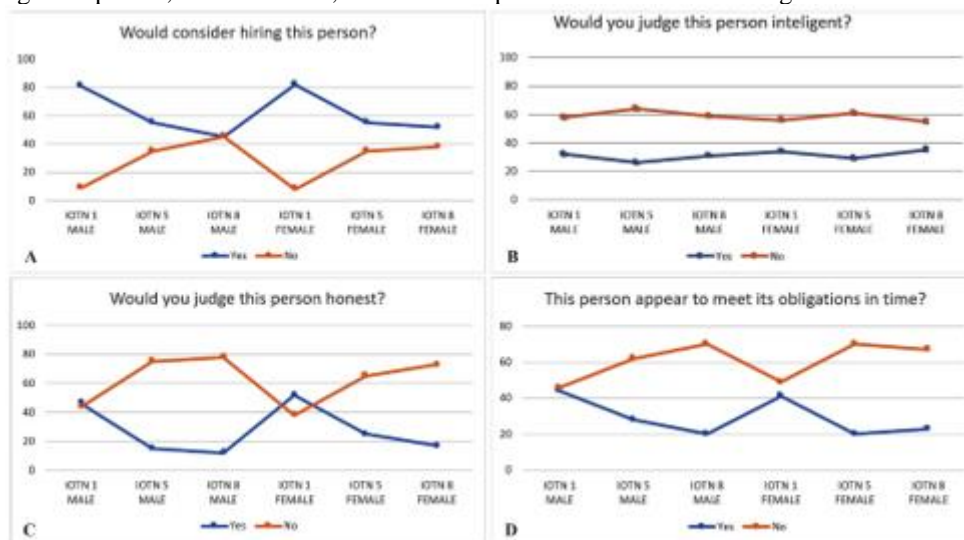


Table 4. Percentage of YES responses from each age group divided by IOTN and employability, honesty, intelligence, and meets obligations variables

Age - IOTN	Hiring	Honest	Intelligent	Obligation
Young - 1	95,7	51,1	57,4	38,3
Young -5	59,6	34,0	19,1	69,1
Young - 8	57,4	36,2	16,0	72,3
Middle - 1	89,5	23,7	52,6	60,5
Middle -5	57,9	21,1	28,9	73,7
Middle - 8	55,3	23,7	15,8	76,3
Elder - 1	81,3	22,9	50,0	75,0
Elder -5	66,7	22,9	22,9	81,3
Elder - 8	45,8	20,8	16,7	83,3

The questions “Would you judge this person to be honest?” (Fig. 5C) and “Does this person meet his or her obligations on time?” (Fig. 5D) presented statistical differences between IOTN grade 1 compared to grades 5 and 8 for both genders, also favoring IOTN grade 1 for both cases (p= 0.000).

Fig 5. Cross-Tab and IOTNs. A. "Would you consider hiring this person?"; B. "Would you judge this person to be intelligent?"; C. "Would you judge this person, to be honest?"; D. "Does this person meet his or her obligation on time?".



## 6 DISCUSSION

During an interpersonal interaction, an individual’s focus is concentrated primarily on the eyes and mouth of the other person, with little time spent on other facial features.<sup>16</sup>

In recent years, an increasing number of adolescents and young adults have acquired body piercings, which continue to grow in popularity. They are used as a method of self-expression and a sign of independence.<sup>17</sup> Thus, the perception of this phenomenon when associated with malocclusion of the teeth is worthy of analysis.

The present study used eye-tracking technology to analyze the perceptions of laypeople aged 18 to 76 years old regarding facial aesthetics and the attractiveness of smiles with different malocclusions

alongside lip piercings. This is the first study to examine the parameters of the smile with the use of piercings, concerning age.

We have considered the normal amount of gingiva exposed in a smile in a vertical aspect<sup>18</sup> because Valverde-Montana et al.<sup>19</sup> found that upward or straight upper-lip curvature shapes have a positive impact on the perception of smile aesthetics. Laypeople's perception of malocclusions in all the smiles except the male with IOTN grade 1, in which the piercing area was perceived ( $p < 0.05$ ), can be explained by the fact that oral/perioral piercings are 4 times more common in females than in males,<sup>20</sup> such that the male's piercing may have appeared more unusual to raters. Consequently, without apparent malocclusion, the laypeople's eyes were drawn to the piercing area when they evaluated the male with IOTN grade 1.

Hulsey<sup>21</sup> has assessed the upper-lip curvature shapes in smile aesthetics with different types of gingival exposure, combined with many other characteristics; however, the curvature shape of the upper lip can be influenced by multiple components and generate bias. Thus, our research used only the modification of the teeth by adding the IOTN grades 1, 5, and 8, and the presence of the piercing in the lip did not cause an initial focus in the piercing area, regardless of age, sex, and IOTN grades.

Despite undesirable consequences from the use of piercings in the perioral region, resulting in perforation of the skin and mucosa,<sup>3</sup> and associated problems of gingival recession and trauma related to piercings in the lip, the present study found no statistical difference in a first fixation on AOIs—neither in the time of first fixation, independent of the evaluator's age nor the presence of malocclusion. In other words, the presence of a piercing in the lip did not cause the area to be perceived to a greater or lesser degree by laypeople.

Overall, this study broadens our knowledge and understanding of how people in different age groups perceive malocclusions and piercings, and the results can help clinicians design treatment plans and optimize dentofacial aesthetics, while meeting other treatment goals, with the presence of the piercing.

VAS analysis<sup>13</sup> showed that both males and females were considered more attractive with IOTN grade 1 in comparison to IOTN grades 5 and 8. This finding suggests that aligned teeth cause people to appear more attractive than those without aligned teeth. VAS was influenced by the variables “hiring”, “intelligence” and “meet the obligations” while it was not affected by “honesty” The VAS responses were independent of the education of the raters in the subject of the present study.

Both “Would you judge this person, to be honest?” and “Does this person appear to meet his or her obligations on time?” presented statistical differences between IOTN grade 1 in comparison to grades 5 and 8 for both genders, also favoring IOTN grade 1 in both cases. This demonstrates that a person with more aligned teeth gives a greater impression of honesty and the ability to meet his or her obligations on time. The people considered more honest were those with aligned teeth, indicating that dentofacial appearance influences the evaluation of honesty.<sup>22</sup>

The results show that when both male and female subjects had aligned incisors (IOTN grade 1), they were more positively evaluated by raters for hiring consideration compared to those with IOTN grades

5 and 8 smiles. These results suggest that people with an aligned smile have a better chance of being selected for a job.

Shaw et al.<sup>22</sup> have evaluated the influence of dentofacial appearance concerning social characteristics, finding that the people considered more honest were those with prominent incisors. In the present study, we found that for male and female models, the presence of aligned incisors (IOTN grade 1) was associated with being the most honest.

The current study also demonstrated that the older the raters were, the less intelligent they considered the person in the image. For IOTNs grades 1 and 5, said “yes” in young adults, middle-aged adults and elder groups for IOTN grade 1, respectively said “yes” in young adults, middle-aged adults and elders’ groups for IOTN grade 5. Pithon et al.<sup>8</sup> suggest that younger people are more influenced by the media, which dictates a certain standard of beauty and may even influence their opinion about a person’s intelligence, which agrees with this study.

“Meets the obligations” showed a significant difference between IOTN grade 1 compared to grades 5 and 8, while “intelligence” showed no significant difference in the evaluations of all IOTN grades. This shows that questions related to responsibility and intelligence cannot be measured utilizing only an image.

If the results of this study are judiciously applied for accurate diagnosis and treatment planning, we believe that treatment results will be healthier, longer-lasting, and aesthetically more appealing, despite the presence of piercings. Since our results show that the perception of laypeople from different age groups is not focused on the piercing area, treatment objectives must prioritize patients’ chief complaints and their specific considerations.

## 7 CONCLUSIONS

Young adults consider people with aligned teeth (IOTN grade 1) more intelligent than do middle-aged and elder adults, independent of the presence of lip piercings and consider these people to have a greater chance of successful employment when compared with people with a clear need for orthodontic treatment (IOTN grades 5 or 8).

Piercings did not obscure the malocclusion. Employability, honesty, ability to meet obligations on time, and attractiveness may all be influenced by malocclusion in the perception of laypeople.

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