Original Research

Correlation between the attractiveness of the facial components and the smiling face in males and females

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ABSTRACT

Objectives: Esthetics is the main reason for seeking orthodontic treatment, demonstrating the importance of smile attractiveness in human relations. Therefore, this study aimed to quantify the influence of the smile and other facial components on overall facial attractiveness.

Methods: Eight laypersons evaluated the attractiveness of 60 adults (30 men, 30 women) before orthodontic treatment using a visual analog scale. Pearson and stepwise correlations were carried out between the smiling face's attractiveness and the attractiveness of the facial components: upper two-thirds, lower third, and smile.

Results: For the entire sample, strong to moderate correlations were found between facial attractiveness and the smile ($r = 0.71$), the lower third ($r = 0.70$), and the upper two-thirds of the face ($r = 0.42$). When divided by gender, the facial parts' correlation values were moderate and similar among each other in men, while in women, the face showed strong correlations with the smile ($r = 0.83$) and the attractiveness of the face's lower third ($r = 0.75$).

Conclusions: In general, correlations were found between the attractiveness of the smiling face and the components. In males, the lower third of the face accounted for 66% of the variation in facial attractiveness. In females, 83% of the variance in facial attractiveness could be ascribed to smile, with the value increasing only to 86% when the upper two-thirds were added. (Rev Port Estomatol Med Dent Cir Maxilofac. 2021;62(1):23-28)

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Correlação entre atratividade da face a sorrir e dos seus componentes, em homens e mulheres

R E S U M O

Palavras-chave:
Atratividade
Estética facial
Componentes da face
Leigos
Sorriso

Objetivos: A estética é o principal motivo para procurar tratamento ortodôntico, o que demonstra a importância da atratividade do sorriso nas relações humanas. O objetivo deste estudo foi quantificar a contribuição do sorriso e de outros componentes da face para a atratividade facial.

Métodos: Antes do tratamento ortodôntico, a atratividade de 60 indivíduos (30 homens, 30 mulheres) foi avaliada por oito leigos usando uma Escala Visual Analógica. Foram realizadas correlações de Pearson e *stepwise*, entre a atratividade da face a sorrir e a atratividade dos componentes faciais: o sorriso, os dois terços superiores e o terço inferior da face.

Resultados: Para toda a amostra, foram encontradas correlações fortes a moderadas entre a atratividade facial e o sorriso (r = 0,71), o terço inferior (r = 0,70) e os dois terços superiores da face (r = 0,42). Quando divididos por género, os valores de correlação dos componentes faciais eram moderados e semelhantes entre si, para os homens. Para as mulheres, a face mostrou fortes correlações com o sorriso (r = 0,83) e a atratividade do terço inferior (r = 0,75).

Conclusões: Em geral, foram encontradas correlações entre a atratividade da face a sorrir e os componentes. Para os homens, o terço inferior da face foi responsável por 66% da variação da atratividade facial. No caso das mulheres, 83% da variação da atratividade facial pode ser atribuída ao sorriso, aumentando o valor para 86% quando os dois terços superiores são adicionados. (Rev Port Estomatol Med Dent Cir Maxilofac. 2021;62(1):23-28)

Introduction

The face is the most important factor when judging overall attractiveness, with the eyes, teeth, and skin having a significant role.[1] An attractive face with an unattractive smile has been shown to lead to better social judgments than an unpleasant face with beautiful teeth.[2,3] Although overall facial attractiveness seems more important than normally positioned incisors, a severe malocclusion in a very good-looking face draws more attention to the oral area. Orthodontic treatment is more demanding in these cases.[4]

When looking at a face, laypersons' attention disperses to all the facial components,[5] decreasing the focus on teeth's little imperfections. Malocclusions seen in the context of a whole face are considered more attractive than the same teeth in a close-up circum-oral view.[6] Chang et al. demonstrated that smile variables that are evaluated independently of the face, like gingival height, are not affected by facial attractiveness.[7] On the other hand, smile variables evaluated in relation to the face, such as the smile arch, the gingival exposure, or the upper midline, are influenced by facial attractiveness.

The importance given to smile aesthetics depends on age and gender, assuming greater relevance in women and young adults, while children are only concerned with their smiles when it motivates teasing by their peers.[8,9] Dental appearance has been suggested to be the fourth reason for harassment between young children, only preceded by height, weight, and hair.[9] Another study even showed that teeth were the most relevant target for bullying in children between 11 and 12 years of age, followed by strength and weight.[10] The dentofacial features most commonly bullied were spaced or missing frontal teeth, tooth color and shape, and prominent maxillary incisors.

According to a systematic review, anterior malocclusions have a negative social and emotional impact on children and adolescents.[11] Severe dental malocclusions can limit young adults' social capacities, and orthodontic correction can increase self-esteem significantly.[12,13] In a longitudinal study where a group of individuals was evaluated during adolescence and then adulthood, 11% reported that teeth were the body component that most worried them.[14] Almost all the respondents in this group had a malocclusion. The dental appearance was the third characteristic most cited by laypersons, only preceded by body build and skin.

In the literature, some studies have assessed the preferences between males and females for the opposite gender, based on measurements of different facial components.[15,16] The hypothesis of multiple motives for attractiveness was formulated. Males preferred feminine faces with some neonate features like large eyes and forehead, small nose and chin, and protruded lips;[15] maturity features like prominent zygomatic bones and narrow cheeks; and expressive features like a large smile, large pupils, and high eyebrows. Women also preferred masculine faces with a mix of features: neonate characteristics like large eyes; mature features such as prominent cheekbones, a large mandible, strong and pronounced chin, large eyebrows, and thin lips; and expressive features such as a large smile and high arched eyebrows.[16]

Some individuals with minor malocclusions are not happy with their dental appearance, but the contrary is also true.[17] Thus, orthodontists and laypersons may disagree when evaluating the necessity and/or the improvement with orthodontic treatment. Since no single element is responsible for the whole face's attractiveness, knowing each component's weight to the overall evaluation by laypersons is significant, especially the smile, to quantify the influence of orthodontic treatment on facial beauty.[18]

This study aimed to evaluate the impact of different facial components on the frontal assessment of smiling facial attractiveness. Its secondary objective was to test the influence of gender on the correlation between attractiveness of the upper two-thirds, the lower third, and the smile and facial attractiveness when smiling.

Material and methods

The present study was accepted by the Faculty of Dental Medicine of the University of Lisbon's (FMDUL) Ethics Review Board. Individuals for this study were recruited from the Orthodontics Department of FMDUL. Inclusion criteria were having 18 to 35 years old (mean 23.7 years), European ancestry, and upper incisors and canines of normal size and shape. Patients with cavities or fillings on the anterior upper teeth, periodontal disease or gingivitis obvious when smiling, and craniofacial anomalies were excluded. Sixty individuals were included in the study, 30 of each gender. The selected individuals were requested to sign an informed consent form.

Photographs of the participant's smiling faces were obtained with a natural head position and a standard background. They were standing up, undisturbed, and looking into the horizon. When their head was considerably tilted, the clinician guided it toward the correct oriented position.[19] A posed smile was registered. The face was free of distractions like jewelry, glasses, or make-up. The camera was kept at a standardized distance of 1.5 meters and aligned with the patient's head. The photographic equipment consisted of a digital single-lens reflex camera (D80; Nikon, Tokyo, Japan).

Different face segments were isolated from the original smiling face photograph, namely, the upper two-thirds, the lower third, and the smile (Figure 1), using the Adobe Photoshop application (Adobe Systems, San Jose, CA). Afterward, all images were assembled in a PowerPoint slideshow (Microsoft Corp, Redmond, WA), preserving their proportion and relative size, using a neutral background. A visual analog scale was displayed on every slide, with the anchors 'very attractive' and 'unattractive' on the right and left sides, respectively.[20] A total of 300 images (60 facial smile photographs, 180 component images, and 60 replications) were subdivided into three PowerPoint presentations for evaluation, with the macro function enabled (Figure 2) and no time limitations for each assessment.

Eight laypersons selected from the university campus, four of each gender, evaluated the photographs. Inclusion criteria were having European ancestry and 18 to 35 years old, and their participation was voluntary. The evaluation consisted of three sessions: two with all 300 images, and a third with 15 repeated images from each type (45 in total) to evaluate the

Figure 1. Example of facial components isolated from the smiling frontal photographs.
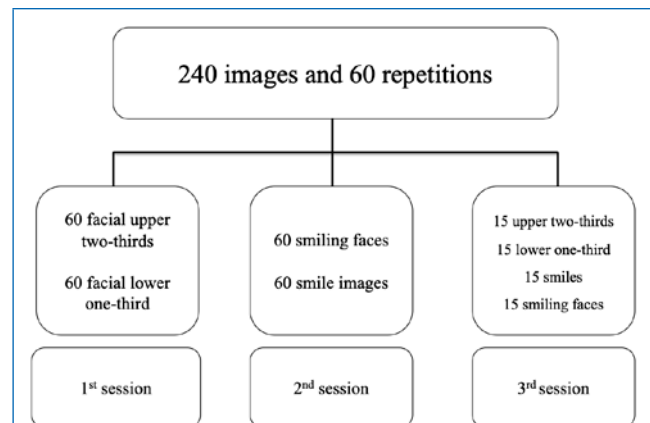

Figure 2. Distribution of the variables through the slide show presentations.

method error. The evaluators received the PowerPoint files by email. One researcher (JG) coordinated the schedules and sent the emails.

Table 1. Descriptive statistics and results of the Shapiro-Wilk tests for the attractiveness of the face, upper two-thirds, lower third, and smile, in the whole sample and distributed by gender.

Variable	Mean	SD	Range	P	Mean	SD	Range	P	Mean	SD	Range	P
	Men and women (n=60)				Men (n=30)				Women (n=30)			
Face	49.4	9.1	29.1/68.3	0.71	50.1	9.4	29.1/68.3	0.17	48.6	8.9	33.9/66.6	0.31
Upper 2/3	45.4	8.8	24.1/62.8	0.80	43.7	9.3	24.1/62.0	0.97	47.2	8.1	32.5/62.8	0.70
Lower 1/3	39.6	11.3	18.1/67.5	0.42	40.8	12.4	18.1/67.5	0.87	38.5	10.3	20.8/57.2	0.36
Smile	43.6	8.4	26.2/60.9	0.59	43.7	8.4	26.2/56.9	0.50	43.5	8.5	28.1/60.9	0.64

SD: standard deviation; P values from the Shapiro-Wilk test

Table 2. Pearson correlation's results between the smiling face's and the components' attractiveness, for the whole sample and distributed by gender.

	SMILING FACE					
	Men and women (n =60)		Men (n =30)		Women (n =30)	
Variable	Pearson r	r²	Pearson r	r²	Pearson r	r²
Upper 2/3	0.42*	0.18	0.56*	0.31	0.32	0.10
Lower 1/3	0.70*	0.49	0.66*	0.44	0.75*	0.56*
Smile	0.71*	0.50	0.59*	0.35	0.83*	0.69*

* P < 0.01

Statistical analysis was performed with SPSS version 20.0 for Macintosh. The mean, standard deviation, and range were computed. The normality of the sample distribution was assessed with the Shapiro-Wilk test. The intra-class correlation was used to calculate random errors. The correlation between the smiling face's attractiveness and the components' attractiveness was calculated by a Pearson correlation test, with the level of significance set at 0.05, complemented by stepwise regression. The results were also analyzed by gender to verify whether the correlations between the smiling face's attractiveness and the elements' attractiveness were similar in men and women.

Results

Intra-class correlation values varied between 0.84 and 0.96, representing good intra-observer agreement. Descriptive statistics (mean, standard deviation, and range) and the Shapiro-Wilk test results for the whole sample and distributed by gender are shown in Table 1. Normal distribution was confirmed for the attractiveness of the smiling face and the segments evaluated.

The Pearson correlation between the smiling face's attractiveness and the components' attractiveness was significant for all variables (Table 2). The stepwise regression model showed that the smile and the upper two-thirds were significant predicting variables ($r^2 = 0.67$).

When stratified by gender, Pearson correlations (Table 2) between the attractiveness of the components and the smiling face were significant for all the components for men (upper

two-thirds, r = 0.56; lower third, r = 0.66; smile, r = 0.59), while in women, significant correlation (P < 0.01) was verified only between the attractiveness of the smiling face and the smile (r = 0.83) and the lower third of the face (r = 0.75). This gender difference was noticeable in the stepwise regression (Table 3). In males, the upper two-thirds and the lower third were predictive elements. Combined r^2 values were 0.66 for the lower third and 0.88 when the upper two-thirds were added. In females, the smile was a predictive variable for facial attractiveness, with an r^2 value of 0.83. When the attractiveness of the upper two-thirds was added, the r^2 value increased to 0.86.

Table 3. Stepwise regression by gender.

Variables	r	r² cumulative	p value
Men (n = 30)			
Lower 1/3	0.66	0.43	<0.001
Lower 1/3 + Upper 2/3	0.88	0.77	<0.001
Women (n = 30)			
Smile	0.83	0.69	<0.001
Smile + Upper 2/3	0.86	0.74	0.03

Discussion

Orthodontic treatment has the ability to improve smile aesthetics, with its impact depending on the initial malocclusion and the selected treatment plan. Although the literature presents evidence on the smile's importance for facial attractiveness, few studies have been published about each facial part's contri-

bution to the complete evaluation.[1,18,21] The present study uses the smiling facial photographs of orthodontic patients before treatment, with complete and natural dentitions, divided into parts, since smaller components have already been evaluated and could be more difficult for laypersons to judge.

The smile explained 50% of the variance in the smiling face's attractiveness, which, clinically, is very significant. The correlation between the smile and the face and between the lower one-third and the facial attractiveness was similar, meaning that lips and teeth are much more relevant than the chin when judging the face's inferior part. Different results could have been found with other perspectives of the face. Namely, Michels and Sather,[22] using profile pictures, concluded that the most important parts for the evaluators were the chin, the upper lip, and the nose.

Other studies have shown that the smile assumes high importance when judging facial attractiveness.[1,5] Lerner and Karabenick[1] demonstrated that, for both men and women, teeth are considered very important in judging attractiveness, coming in fourth and fifth place in 24 body features' evaluation. The eyes, hair, and nose, all present in the upper two-thirds of the face, were less important than the teeth, which is in agreement with the present study. Another investigation using frontal smiling photographs also concluded that facial balance and tooth alignment were more important for laymen and orthodontists than eyes, hair, skin, and lips.[5]

However, another study with 45-degree smiling facial photographs showed a different result. The teeth were less important for attractiveness than other facial features like the cheekbones, chin, eyes, hair, lips, nose, and skin.[18] The facial perspective showed probably had some influence on the judgment because, in social interaction, we look to each other in frontal or slightly oblique views.[23] Considering the eyes, for instance, an oblique view emphasizes them more than the smile. A recent study using eye-tracking evaluated the hierarchy of visual attention and showed that fixations in the eyes had the largest number and duration, followed by the mouth.[4] However, in severe malocclusions, the visual attention to the mouth increased, approaching the focus on the eyes. Nonetheless, it is important to notice that being the first focused area in the face is different from being the most important. In the study by Lerner and Karabenick,[1] people stated in questionnaires that the mouth was an important area for judging facial attractiveness. Different investigations use different facial perspectives and different evaluation methods to measure the importance of single elements for facial attractiveness, making the results difficult to compare.

When stratified by gender, differences between men and women were found. In males, similar correlation values were obtained for the different facial parts, but the highest correlation was found for the lower third of the face, suggesting importance given to the chin. Accordingly, some studies have shown that a slightly more prominent chin in males is considered more esthetic.[24,25] In females, a high percentage of the variance found in women's smiling face's attractiveness (69%) could be explained by the smile only, showing the importance of the smile for women's attractiveness. A similar result was found by other authors who concluded that the smile makes women more attractive but did not verify that for men.[18] In this study, the smile was not a predictive variable for the variance in men's facial attractiveness. Since aesthetics is the main reason for people to look for treatment, these results are in agreement with the fact that more women search for orthodontic treatment.[25,26] In women, the upper two-thirds of the face was not a predictive variable when judging global facial attractiveness.

When judging the parts, evaluators might have noticed that individuals were smiling. The orbicularis oculi muscle has a positive effect on the face during the smile.[27] The importance of the smile is evident. Some studies have shown that the evaluation of the smile's attractiveness is the same in a close-up view and a whole-face view.[28,29] It has also been demonstrated that facial attractiveness improves when the teeth are aligned, showing the importance of dental medicine for facial attractiveness.[5] Orthodontic treatment is one of dentistry's most conservative ways to improve the smile and can especially benefit women's attractiveness.

Conclusions

Laypersons' judgment showed a significant correlation between the attractiveness of the smiling face and that of the smile (r = 0.71), the lower one-third of the face (r = 0.70), and the upper two-thirds of the face (r = 0.42). In males, smiling face's attractiveness correlated moderately with the attractiveness of the facial components. The lower third of the face explained 43% of the variance in the smiling face's attractiveness and 77% when the upper two-thirds were added. In females, a robust correlation was found between the attractiveness of the smiling face and the lower third of the face and the smile. No correlation was found between the upper two-thirds of the face and the facial attractiveness. The smile could explain 69% of the variation in the smiling face's attractiveness and 74% when the upper two-thirds were added.

Ethical disclosures

Protection of human and animal subjects. The authors declare that no experiments were performed on humans or animals for this study.

Confidentiality of data. The authors declare that no patient data appear in this article.

Right to privacy and informed consent. The authors have obtained the written informed consent of the patients or subjects mentioned in the article. The corresponding author is in possession of this document.

Conflict of interest

The authors have no conflicts of interest to declare.

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