AESTHETIC PERCEPTION OF THE SMILE RELATED TO THE VERTICAL POSITION OF THE LOWER ANTERIOR TEETH BY AFRO-DESCENDENT LAYPEOPLE

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Palavras-chave: Tratamento Ortodôntico. Sorriso. Estética.

RESUMO

Introdução: Avaliar a influência da posição vertical dos dentes anteriores inferiores na percepção estética do sorriso de leigos afrodescendentes de diferentes faixas etárias. **Materiais e Métodos:** Um sorriso padrão foi construído a partir de fotografias intraorais de um indivíduo afro-descendente. A posição vertical dos dentes anteriores inferiores foi gradualmente alterada, movendo os dentes para cima e para baixo dentro da moldura do lábio em incrementos de 0,5 mm variando de -1,5 mm a 2,0 mm, em relação ao ponto zero. Utilizando uma escala analógica visual, 150 indivíduos leigos afrodescendentes brasileiros de três diferentes faixas etárias (15-19, 35-44 e 65-74) classificaram a atratividade em relação a 8 sorrisos com exposição gengival alterada. **Resultados:** Não houve diferenças significativas ($p > 0,05$) entre os avaliadores masculino e feminino para os três grupos. Todos os grupos etários atribuíram pontuações mais altas para os sorrisos com cobertura de 0,5 mm do lábio inferior nos incisivos centrais inferiores. No entanto, para os sorrisos menos atraentes, houve diferenças nas opiniões dos grupos etários ($p < 0,05$). **Conclusão:** os grupos etários compartilhavam preferências semelhantes quanto ao sorriso mais agradável em relação às posições verticais dos dentes anteriores inferiores.

Keywords: Orthodontic Treatment. Smile. Esthetics.

ABSTRACT

Introduction: To evaluate the influence of the vertical position of the lower anterior teeth in the aesthetic perception of the smile of Afro-descendent laypeople from different age groups. **Materials and Methods:** A standard smile was constructed from intraoral photographs of an afro-descendent individual. The vertical position of the lower anterior teeth was gradually changed by moving the teeth up and down within the lip frame in 0.5 mm increments ranging from -1.5 mm to 2.0 mm, regarding point zero. Using a visual analog scale, 150 Afro-descendent Brazilian lay individuals from three different age groups (15-19, 35-44 and 65-74) rated the attractiveness in relation to 8 smiles with altered gingival exposure. **Results:** There were no significant differences ($p > 0.05$) between male and female raters for the three groups. All the age groups assigned higher scores for the smiles with 0.5 mm coverage of the lower lip on the lower central incisors. However, for the less attractive smiles, there were differences in the opinions of the age groups ($p < 0,05$). **Conclusions:** the age groups shared similar preferences regarding the most pleasant smile regarding the vertical positions of the lower anterior teeth.

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INTRODUCTION

One of the facial expressions that arises more interest in people and composes the beauty of it is the smile.[1-3] Therefore, studies have been conducted in order to reach a desired set of common characteristics for an optimal aesthetic smile. This goal is without successful perspective, since culture and ethnicity, values on what is beautiful and ugly or right and wrong vary on different continents, being illusory the idea of reaching a common denominator on this aspect.[4]

It is noticed that the influence of the lower lip and lower anterior teeth on the aesthetics of the smile is little studied compared with the upper lip and the vertical position of the maxillary incisors and canines. However, upper and lower lip work together in order to position the lip frame, as well as the upper and lower front teeth to create an aesthetic smile. Thus, for a smile to be considered aesthetic, it is necessary to observe the interaction between the various components of the smile.[5]

Teeth and gum exposure are important factors regarding the assessment of the aesthetic smile, and their perception varies in different societies.[1] According to Peck and Peck (1972),[6] when aging the upper teeth exposure decreases with consequently an increased exposure of the lower teeth. Despite such evidence, little is known about the impact of reduced upper teeth exposure and higher exposure of the lower teeth in the perception of people in different age groups, and much less in Afro-descendent individuals of different age groups.

Following this line of reasoning this study aimed to assess the degree of perception of aesthetic variations in gingival exposure of lower anterior teeth by African descendent laypeople, from different age groups.

MATERIALS AND METHODS

This study was conducted in order to Comply CNS 466/2012 resolution, covering any area of research involving human beings. The research protocol was approved by the Ethics Committee in Research of the State University of Southwest Bahia under CAAE number: 17333113.1.0000.0055.

Sample size

The sample size calculation was performed using nQueryAdviser (version 6.01, statistical Solutions, Cork, Ireland). According to the pilot study, the effect size was estimated to be 0.975. Based on the alpha significance level of 0.05, the sample size was calculated to be able to achieve 80%. The sample size calculation showed that the sample should be between 45 to 90 individuals. For this reason, we used 50 subjects per group.

Construction of a series of images

A standard smile was constructed from intra–oral photographs of a female individual, 25 years of age, of Afro-descendent ethnicity. This standard smile had the following characteristics: ideally aligned teeth, exposing up to the first molar; lips smiling in an aesthetic way, and harmonization of the curvature of the lower lip relative to the curvature of the incisal edges of maxillary incisors and canines. When the lower lip was positioned in the lower gingival margin of the lower central incisors the level was defined as point zero (0 mm). The vertical position of the lower anterior teeth was gradually changed by moving the teeth upward and downward within the lip frame in increments of 0.5 mm from -1.5 mm to 2.0 mm, relative to point zero. These image modifications were performed using software for image manipulation (Adobe Photoshop CS4, San Jose, CA, USA). A positive value was assigned when a continuous strip of gum was revealed. A negative value was assigned when the lower lip inferior covered the mandibular central incisors.

The evaluation was performed in two stages, in the first stage all images were presented in groups to the evaluators (Figure 1). It was requested to select the image they liked most and their least favorite. In a second sheet the same images had their orders changed randomly and the same inquiries were made (Figure 2). This second evaluation aimed to assess the reliability of the answers given in the first image (Figure 1). In the second phase of the questionnaire, the images were presented individually in random order, in this stage it was requested from the evaluators to punctuate the images from 0-100 points; where 0 represented not very attractive, 50 attractive and 100 very attractive, with the aid of a 100 mm long visual analog scale (VAS).

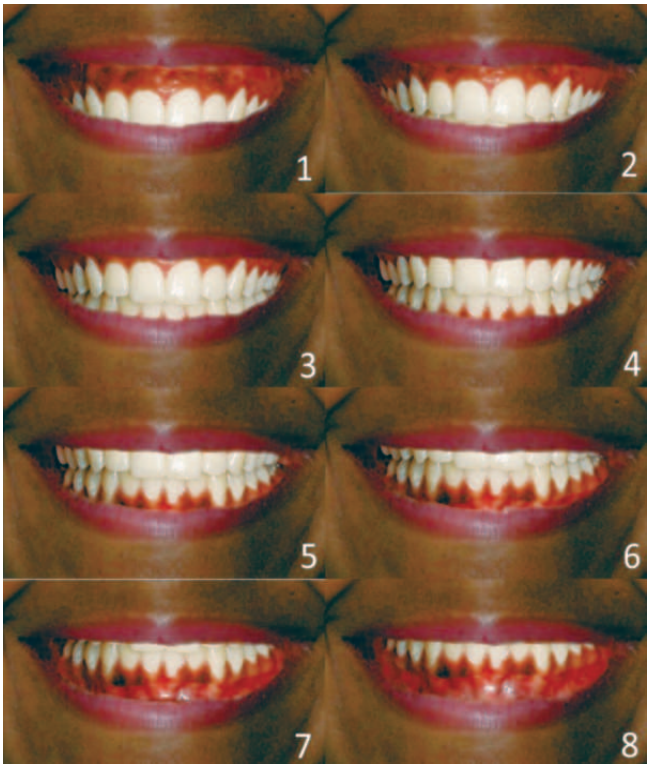

Figure 1: *Series of 8 generated images illustrating the range of vertical positions of the anterior teeth: 1; -1.5 mm (1.5 mm coverage of the lower lip on the lower central incisors) 2; -1.0 mm; 3; -0.5 mm, 4; 0mm (standard smile: the lower lip touches the gingival margin of the mandibular central incisors), 5; 0.5 mm (0.5 mm gingival exposure below the lower central incisors), 6; 1.0 mm; 7; 1, 5mm, 8; 2mm.*

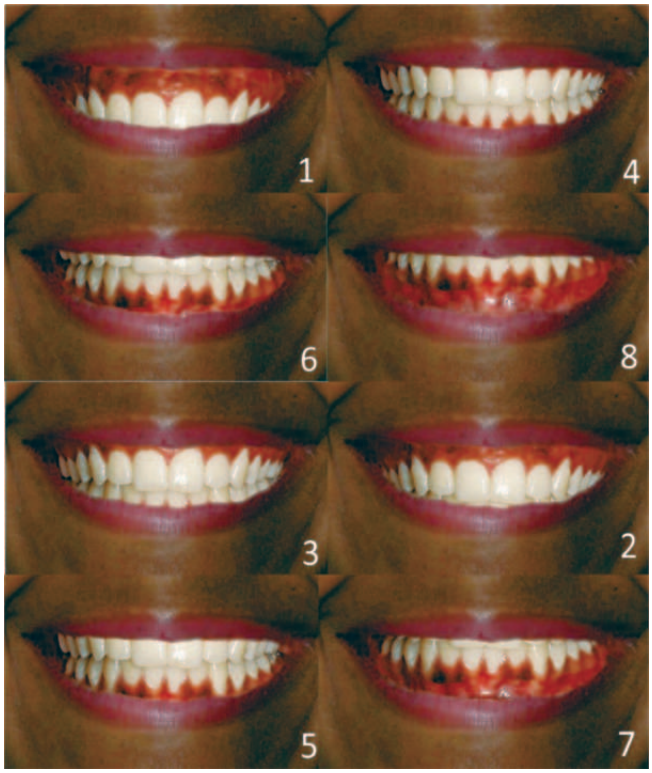

Figure 2: *Series of 8 randomized generated images illustrating the range of vertical positions of the anterior teeth: 1; -1.5 mm (1.5 mm coverage of the lower lip on the lower central incisors); 4; 0mm (standard smile: lower lip touches the gingival margin of the mandibular central incisors), 6; 1.0 mm; 8; 2mm, 3; -0.5 mm; 2; -1.0 mm; 5; 0.5 mm (0.5 mm of gingival exposure below the lower central incisors), 7; 1.5 mm.*

Evaluators

The assessors were Afro-descendent laypeople of three age groups: 15-19, 35-44 and 65-74, of both genders.

Statistical analysis of data

To compare the distribution of the median scores between male and female evaluators, the Mann-Whitney test was used. The significance level was set at 5 % (α = 0.05).

Visual analogue scales are commonly used in research to assess pain and usually a minimal difference on the scale, ranging from 9% to 13%, is adopted as clinically significant.[7,8] In orthodontic research a more conservative criterion has been used, and a 15% difference in the visual analog scale was used by other authors as clinically significant for differentiating the smile's aesthetics.[9,10] In this study, a 15% difference in the visual analog scale was adopted to determine the clinical significance of aesthetic scores. Data were tabulated and analyzed with SPSS Statistics for Windows (IBM SPSS. 21.0, 2012, Armonk, NY: IBM Corp.).

RESULTS

There was no significant difference (p>0.05) between male (n=73) and female (n=77) evaluators in assessing the effect of the vertical positions of the lower anterior teeth on the attractiveness of the smile. Therefore, data from male and female evaluators were pooled for the following analyzes. Median values and ranges of the aesthetic scores for each vertical position of the anterior teeth, according to the evaluation of the three age groups are shown in Figure 3.

The younger age groups (15-19 and 35-44) assigned similar scores in relation to aesthetics of the smile. These scores increased gradually as labial movement occurred in relation to the lower anterior teeth, from -1.5 mm (image 1) to -0.5 mm (Image3). The same groups reduced the scores progressively when the lower lip moved down, revealing growing parts of gingival display, from 0mm (image 4) to +2 mm (Image 8). 0mm was considered as the standard smile (lower lip touches the cervical border of the lower anterior teeth) and positive aesthetic scores (0.5, 1.0, 1.5 and 2.0 mm) when the gums were exposed by lip retraction.

The 65-74 age group shared the same opinion than the previous groups regarding the most attractive smiles. However, for the less attractive smiles, clinically significant decline in their score attribution was observed only from +0.5 mm (Image 5) of mandibular gingival exposure.

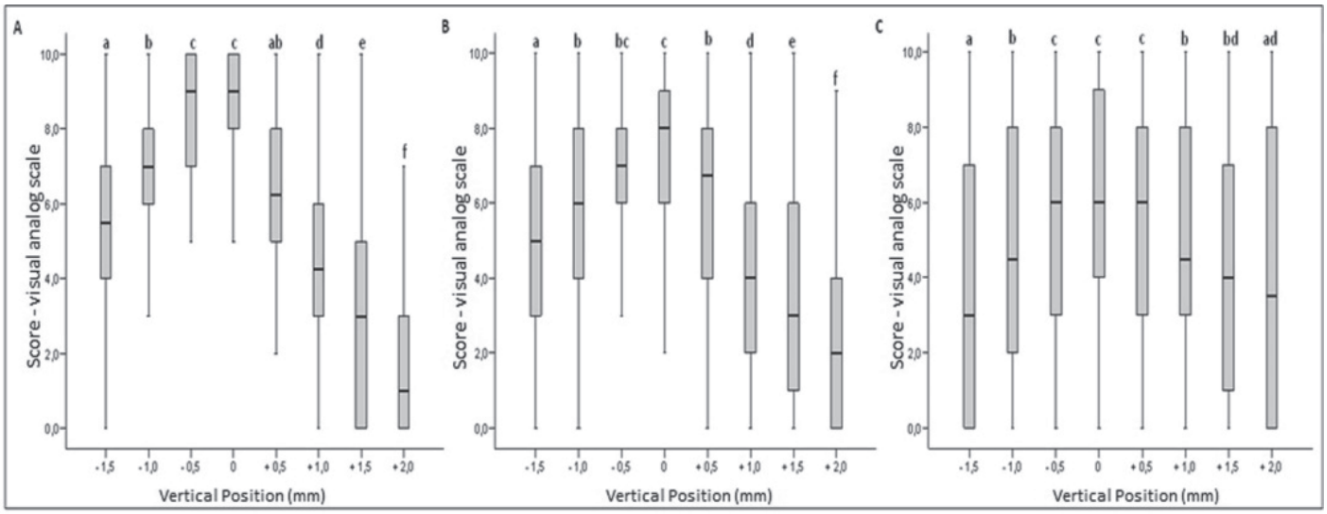

Figure 3: *Median values and ranges of the aesthetic scores for each vertical position of the lower anterior teeth. A; evaluators of the 15-19 age group; B; evaluators of the 35-44 age group; C; evaluators of the 65-74 age group. a, b, c, d, e, f Different letters indicate clinically significant diference.*

DISCUSSION

Obtaining an aesthetic smile that gives satisfaction to the patient is one of the major goals of dental treatment. However, beauty is a concept loaded with subjectivity, thus is it indispensable that there should be tools for the study of society, in order to decrease the existing disparities when classifying the appearance of something as pleasant.

Several studies are found in literature dealing with the determination of an aesthetic smile, with emphasis on the perception of individuals about the influence of superior gingival exposure in this process.[9-11] However, there are few studies on the perception of an aesthetic smile with variations in exposure of the lower incisors. Based on this premise, the aim of the authors of the present study was to evaluate the perception of individuals about the aesthetic smile, when it suffered variations in lower incisor exposure.

Gingival exhibitions, mostly, are not accepted as attractive in a smile. Studies show that the limit of acceptability for aesthetic smiles may vary, finding values as 0 mm, or ranges of acceptability, 0 mm to 1 mm 2,11 or 0 mm to 2mm[10, 11] of gingival exposure for the maxilla and 0mm for the mandíbula.[9] In the present study, young and old lay individuals showed preference to those smiles without gingival exposure or with a small strip of 0.5 mm of mandibular gingival exposure. It can be said that the limit of acceptability for an aesthetic smile, based on the analysis of the mandibular arch in the smile's composition, can range between 0 mm and 0.5 mm of exposure; which is still considered attractive.

An important factor that influences the perception of individuals about the aesthetics of the smile is the ethnic one. This study evaluated the perception of smile aesthetics of a group, Afro-descendents, by laypeople of the same ethnicity. The results of the survey revealed that the groups preferred smiles that showed no lower gingival exposure as mentioned previously: Ahmad (1998)[12] reports in his study that black individuals tend to exhibit less their upper teeth and gums, probably because of the shape and volume of their labial muscles. This fact justifies the data found in this study. In their study, Owens and collaborators (2002)[13] evaluated six clinical variables, including gingival exposure, in 253 patients, which included six different ethnic groups, among which black people showed greater gingival exposure. Differing perceptions appear in literature about the range of gingival exposure related to black people; one of the reasons may be the mixing of races, because an individual considered as a black person can display characteristics of other ethnic groups, thus varying the ranges of exposure of teeth and gum while talking or smiling. Given the premise, to achieve an esthetic and functional occlusion it will be necessary to consider the individual characteristics of each person besides their ethnicity.

Another influential factor in height and aesthetics of the smile is age. Older people tend to have a low smile, while younger people's smiles are generally high, and, with age, medium to low. A gingival smile autocorrects itself with age, except for low smiles.[14] The exposure of teeth undergoes changes during talking and smiling. Thus, compared to older individuals, young people expose more teeth when performing those actions; insofar the lip coverage on the teeth may suffer an increase of 4mm.[15, 16]

The greater compliance for lower smile expressed by the older individuals in the present study confirms that this

trend influences their aesthetic perception, showing greater attractiveness for smiles that cover the lip on the maxillary anterior teeth and lower teeth exposure till exhibiting a small gingival strip. It also evinces the tendency of the young subjects, who consider high smiles more attractive – those exposing the entire crown of the upper anterior teeth - and partly the crown of the lower anterior teeth. Thus, age is a crucial factor to be noted in orthodontic planning.

This study evaluated perception of smile esthetics by individuals of three age groups, 15-19, 35-44 and 65-74, revealing results that demonstrated similarities between their perceptions of the aesthetics of the smile and physiological factors favored by age. In general, all age groups considered smiles with lower lip coverage from 0.5 mm to 1.5 mm on the lower anterior teeth more attractive. They differed minimally solely on strips of gingival exposure which were less attractive. Younger age groups showed less tolerance to lower gingival smile than the older age group. The 15-19 and 35-44 groups considered smiles with 0mm coverage of the lower lip over the lower teeth till 2mm lower gingival exposure less attractive while the scores of the 65-74 group began to decline from 0.5mm of lower gingival exposure.

In recent years, there has been an increase of older patients seeking orthodontic treatment. As it is a recent event, information about the aesthetic preference of individuals from this age group are still scarce,[16] thus justifying this study.

An attractive smile is a key element for patient satisfaction and its analysis is very important for orthodontic diagnosis and treatment planning.[17,18] This study suggests that professionals should recognize the ethnic and age differences in preference and perceptions of patients regarding an aesthetic smile, with more or less lip coverage on the lower anterior teeth, in order to trace, with effectiveness, the orthodontic treatment's goals.

CONCLUSION

It can be concluded with the completion of this study that:

- The age groups shared similar preferences regarding the most pleasant smile;

- The younger age groups show less preference for smiles with lower gingival exposure, revealing less attractiveness to those with ranges 0mm to 2mm of gingival exposure;

- The 65-74 age group has less preference for smiles with 0.5 mm to 2 mm of gingival exposure on the lower anterior teeth.

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