Original Article

Is the adolescent's esthetic concern associated with anterior occlusal conditions or the malocclusion severity level?

Kaarlye C. P. Andrade de Melo[a]; Mario Vedovello-Filho[b]; Vivian F. Furletti-Góis[b]; Marcelo de C. Meneghim[c]; Silvia A. S. Vedovello[b]

ABSTRACT

Objectives: To assess the esthetic impact of anterior occlusal conditions and malocclusion severity levels.

Materials and Methods: A population-based cross-sectional study of 700 adolescents aged 15 to 19 years was conducted. The Oral Aesthetic Subjective Impact Scale (OASIS) was used to evaluate the subjective esthetic impact of malocclusion. The Dental Aesthetic Index (DAI) criteria were used to diagnose the anterior occlusal characteristics in isolation and the severity levels of malocclusion. The variables with $P < .20$ in the individual analyses were tested in multiple logistic regression models, and those with $P < .10$ remained in the model. The adjusted odds ratio (OR) was estimated with a 95% confidence interval (CI).

Results: Of the adolescents, 42% showed negative self-perception of malocclusion. In addition, 15.4% of adolescents had severe malocclusion (DAI 3) and 18.9% very severe malocclusion (DAI 4). Crowding and spacing were shown to be 2.90 (CI: 2.06–4.09) and 2.53 (CI: 1.65–3.86) times, respectively, more likely to cause a negative esthetic impact in adolescents ($P < .05$). In addition, adolescents with orthodontic treatment need (DAI 2, 3, and 4) were more likely to report a negative esthetic impact ($P < .05$).

Conclusions: Anterior crowding and spacing are the conditions that most influence the esthetic concern of adolescents. Adolescents with very severe malocclusion and higher orthodontic treatment need are more likely to report a negative esthetic impact. (*Angle Orthod.* 2021;91:496–501.)

KEY WORDS: Self-perception; Adolescents; Malocclusion

INTRODUCTION

Dissatisfaction with dental esthetics is a subjective indicator related to behavioral problems in adolescence.[1–3] At that stage of life, malocclusion can be a trigger for psychological stress[4,5] due to shame, intimidation, and depression.[6–8] Individuals with low self-esteem are more likely to experience malocclusion-related adverse esthetic effects,[9–11] influencing social life,[12–14] and oral health-related quality of life.[8–11,15] Malocclusion can compromise the psychosocial and behavioral aspects of life.[5,16] However, the impact of dental esthetics during adolescence need further understanding, especially regarding the adolescents' expectations toward orthodontic treatment.[3,13,17–19] Self-perceived dissatisfaction with dental esthetics has been reported to significantly influence the demand for orthodontic treatment.[7,10,14,20]

Orthodontic treatment has an immediate, positive impact on the appearance and behavior of adolescents.[21] The esthetic and functional traits of a harmonious face may translate into higher intelligence and leadership skills, contributing to professional and personal growth.[18,22,23]

[a] Graduate Student, Department of Orthodontics, Araras Dental School, University Center of Hermínio Ometto Foudantion (FHO), Araras, São Paulo, Brazil.

[b] Professor, Department of Orthodontics, Araras Dental School, University Center of Hermínio Ometto Foundation (FHO), Araras, São Paulo, Brazil.

[c] Professor, Department of Community Dentistry, Piracicaba Dental School, University of Campinas (UNICAMP), Piracicaba, São Paulo, Brazil.

Corresponding author: Dr Silvia A. S. Vedovello, Department of Orthodontics, University Center of Hermínio Ometto Foundation (FHO), Dr. Maximiliano Baruto Av, 500, Jardim Universitário, Araras, São Paulo 13607-339, Brazil
(e-mail: silviavedovello@gmail.com)

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Adolescents perceive malocclusion in different ways, and one's need for orthodontic treatment may not coincide with their self-perception of dental appearance.[19,21,24,25] Hence, the adolescent's self-perceived esthetics may be negatively affected by the severity levels of malocclusion,[11,17] either remain indifferent, or be slightly affected by some specific occlusal conditions.[4] However, previous studies did not use a perceptual measure of the esthetic impact of malocclusion or did not consider the subjective aspects of the condition that were of most concern to adolescents. It is essential to recognize the network of interrelationships of the adolescent's life to obtain a favorable outcome for each patient and improve the cost-effectiveness of orthodontic treatment.

An individual's decision to seek orthodontic treatment can be affected by factors that may not always be perceived by the orthodontist.[26] In addition, there is limited evidence on whether the correction of malocclusion results in improved oral health.[27] Thus, the hypothesis of this study was that the perception of anterior occlusal conditions might have more impact than the malocclusion severity levels in terms of esthetics. This study aimed to assess the influence of the perceived oral esthetic impact of malocclusion in adolescents.

MATERIALS AND METHODS

Study Design, Participants, and Sample Size

This study was approved by the Human Research Ethics Committee of Brazil (No. 82365917.8.0000.5385). Informed consent was obtained from parents and subjects before data collection.

A population-based cross-sectional study was conducted involving adolescents enrolled in public schools in Serra Talhada, located in the state of Pernambuco in northeast Brazil. Serra Talhada has an estimated population of 86,350 inhabitants and a human development index of 0.661. A representative sample of 15- to 19-year-old adolescents enrolled in all public schools of the city was selected. Initially, a complex stratified sampling was carried out at two levels: schools by neighborhoods and then by students per school.

The sample size was calculated considering a 95% confidence interval, a test power of 80%, and an effect size of 1.5. The minimum sample size was estimated at 560 adolescents. Twenty percent of adolescents were added to compensate for possible nonparticipation. The study included only adolescents with permanent dentition. Current or previous orthodontic treatment, systemic diseases, such as cerebral palsy or Down syndrome, were exclusion criteria. The final sample comprised 700 individuals (323 men and 377 women) aged 15 to 19 years.

Study Instruments and Variables

The outcome variable was the subjective esthetic impact of malocclusion. The self-perceived need for orthodontic treatment was assessed by the Orthodontic Aesthetic Subjective Impact Score (OASIS).[28] The first section of the OASIS consists of a five-question questionnaire in which the adolescent is asked to point out the alternative that best describes their degree of discontent with the teeth using a seven-point Likert-type scale.[29] The second section was the Aesthetic Component (AC) of the Index of Orthodontic Treatment Need (IOTN), which is a continuous descending dental attractiveness scale illustrated by 10 color photographs of the anterior teeth, ranging from the most attractive (image 1) to the least attractive (image 10).[30] Study participants were instructed to point out the photograph they perceived as the most similar to their smile. The final OASIS score was obtained by the sum of the questionnaire answers plus the value of the photograph selected in the IOTN-AC test. The OASIS score on self-perceived orthodontic treatment needs was categorized into lower esthetic concern (OASIS score <14) or higher esthetic concern (OASIS score >14).[10,28]

The Dental Aesthetic Index (DAI) determined the clinical evaluation of the malocclusion.[31,32] The DAI is a numerical index that evaluates the 10 occlusal characteristics selected according to their potential to cause psychosocial incapacity, grouped into three dimensions: dentition, spacing, and occlusion.[31,32] The index is analyzed using the sum of scores of each characteristic evaluated, added to a constant value. This sum leads to a classification that identifies each individual's orthodontic treatment need determined by the severity of the occlusal conditions. Adolescents were classified into grade 1 (DAI <25; normal plus minor malocclusion/no treatment need or slight need), grade 2 (DAI $= 26$–30; definite malocclusion/treatment elective), grade 3 (DAI $= 31$–35; severe malocclusion/treatment highly desirable), and grade 4 (DAI >36; very severe [handicapping] malocclusion/treatment mandatory). The DAI categorization determined the malocclusion severity levels.

The DAI components were also used separately (anterior crowding, anterior spacing, midline diastema, maxillary overjet, and anterior misalignment) to determine the anterior occlusal conditions. Crowding in the anterior segment was defined as an insufficient space between the right and left canines to accommodate the four incisors in the dental arch. The degree of crowding was dichotomized into "absence of crowding" (0) or

"the presence of crowding" (1 and 2). Spacing was defined as an excess of space between the right and left canines to accommodate the four incisors in standard alignment. The variable spacing was dichotomized into "absence of space" (0) or "the presence of space" (1 and 2). Median diastema corresponded to a gap between the two permanent maxillary central incisors in contact and was measured in millimeters. The variable diastema was characterized as "absence of diastema" (=0) or "presence of diastema" (>0). Anterior misalignment consisted of a rotation of all maxillary and mandibular incisors. The variable misalignment was dichotomized into the "presence of aligned teeth" (=0) or "absence of aligned teeth" (> 0). Lastly, anterior maxillary overjet corresponded to the distance between the buccal incisal edge of the most protruding maxillary incisor to the buccal surface of the corresponding mandibular incisor. A periodontal probe was placed in contact with the mandibular incisor buccal surface parallel to the occlusal plane and perpendicular to the arch line. Overjet was measured in millimeters, and the results were dichotomized into "normal maxillary overjet" (0 to 2 mm) or "increased anterior maxillary overjet" (>2 mm).

Calibration

A single examiner, previously trained and calibrated, performed the oral examinations. Training consisted of a theoretical discussion followed by a practical exercise. Calibration resulted in an intraclass correlation coefficient greater than .92, indicating satisfactory inter- and intraexaminer agreement.

Statistical Analysis

The subjective esthetic impact of malocclusion was considered the outcome of interest. The results were dichotomized into lower esthetic concern (OASIS score <14) or higher esthetic concern (OASIS score >14). The independent variables were gender, malocclusion severity levels (DAI), and anterior occlusal conditions (anterior crowding, anterior spacing, midline diastema, maxillary overjet, and anterior misalignment).

Simple logistic regression models were used to identify the variables significantly related to perceived esthetic outcomes. Crude odds ratios were estimated with 95% confidence intervals, and the data were then subjected to multiple logistic regression models. The variables showing a P value <.20 in the simple logistic regression analysis were included in the multiple logistic regression. Then, the variables with a P value ≤.05 were maintained in the final model. The data were analyzed in the R program (R Foundation for Statistical Computing, Vienna, Austria), considering a 5% significance level.

Table 1. Characteristics of the Study Sample

Variable	Category	n (%)
Sex	Male	323 (46.1)
	Female	377 (53.9)
Anterior	No	493 (70.4)
Crowding	Yes	207 (29.6)
Anterior	No	588 (84.0)
Spacing	Yes	112 (16.0)
Median	No	572 (81.7)
Diastema	Yes	128 (18.3)
Maxillary	Normal	329 (47.0)
Overjet	Increased	371 (53.0)
Anterior	No	533 (76.1)
Misalignment	Yes	167 (23.9)
Malocclusion severity levels (DAI)	Normal/minor malocclusion (DAI 1) treatment need or slight need (DAI 1)	288 (41.4)
	Definite malocclusion (DAI 2)	172 (24.6)
	Severe malocclusion (DAI 3)	108 (15.4)
	Very severe malocclusion (DAI 4)	132 (18.9)

RESULTS

The study sample was composed of 700 adolescents, of which 53.9% were females (n = 377) and 46.1% were males (n = 323). A negative self-perceived esthetic impact of occlusal alterations and orthodontic treatment needs was observed in 42% of the sample. For the severity levels of malocclusion, 41.4% of the adolescents had normal/minor malocclusion (DAI 1), 24.6% definite malocclusion (DAI 2), 15.4% severe malocclusion (DAI 3), and 18.9% very severe malocclusion (DAI 4). The following anterior occlusal conditions were observed: increased maxillary overjet (53.0%), crowding (29.6%), misalignment (23.9%), diastema (18.3%), and spacing (16.0%) (Table 1). Figure 1 shows the distribution of OASIS scores in the study sample. The scores ranged from 6 to 23, with a median of 10 and an interquartile range of 3.5.

Table 2 shows the association between the self-perceived esthetic impact of anterior occlusal conditions and the study variables. Adolescents with anterior crowding and spacing were 2.90 and 2.75 times, respectively, more likely to report higher esthetic concerns ($P < .05$). Also, there was no significant difference by sex or age and self-perceived esthetic impact of occlusal conditions.

Table 3 shows the association between self-perceived esthetic impact (OASIS) and malocclusion severity levels (DAI). Adolescents with definite malocclusion, severe or very severe, were 1.50, 2.29, and 2.80 times, respectively, more likely to have esthetic concerns than those with normal plus minor malocclusion ($P < .05$).

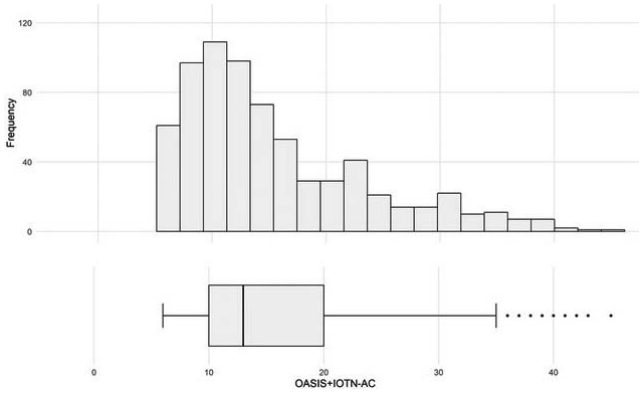

Figure 1. Distribution of the Subjective Aesthetic Orthodontic Impact (OASIS) score of the sample.

DISCUSSION

Adolescent psychosocial behavior may be associated with dissatisfaction with dental appearance.[17,20] Insights about their attractiveness, especially concerning the dentofacial area, associated with the concomitant psychosocial impact play an essential role in adolescence. Better interpersonal relationships and thus greater self-confidence are a direct result of positive social interactions. Hence, there is an increasing interest in studying the relationship between self-perceived malocclusion and orthodontic treatment need at this stage of life.[1–3,16,18,21,33,34] The study hypothesis was that occlusal changes in the smile and malocclusion severity levels would impact adolescents' esthetic concerns.

The findings showed that crowding and spacing were the occlusal conditions with more significant esthetic concerns by adolescents, thus supporting the study hypothesis. Occlusal changes in the anterior segment of the smile negatively influenced esthetic perception. A harmonious smile, with aligned teeth and close interproximal contacts, has been previously shown to influence social acceptance.[8,11,12,14] Concerns related to crowding and spacing may be related to future expectations, since an unpleasant smile may affect adolescents' social and professional lives.[22,23]

On the other hand, occlusal characteristics such as misalignment, a diastema, and overjet did not cause dissatisfaction. Intriguingly, a diastema may be considered to be either unattractive[35] or attractive esthetically.[36] It is also possible that increased maxillary overjet is a more accepted condition among adolescents,[3] and generally, there seems to be cultural and individual variation in the acceptance of some occlusal characteristics.[12] Thus, the current results can be compared with similar studies in different populations, identifying intercultural differences in the esthetic impact of occlusal alterations and orthodontic treatment needs.

This study further showed that gender did not influence the subjective esthetic impact of malocclusion in adolescents. Although most studies previously showed that women were more concerned about the attractiveness of their smiles than were men,[2,8,13,37] a recent study pointed out that concerns about dental appearance have been more prevalent among men.[3] Biological diversity may influence self-perceived esthetics in men and women, suggesting that further studies should consider each population group's cultural background and diversity.

In this study, there was a direct association between self-perceived esthetics and malocclusion severity levels. These findings confirm previous studies,[3,8,11,38–40] suggesting that adolescents relate the psychosocial effects of malocclusion with interest in using orthodontic appliances as an attempt to improve their self-esteem and oral health–related quality of life. The orthodontist must recognize the orthodontic treatment need and

Table 2. Association Between Self-Perceived Esthetic Impact of Occlusal Alterations (OASIS) and the Study Variables[a]

		Esthetic Impact					
Variable	Category	Lower Concern, n (%)	Higher Concern,[b] n (%)	Crude OR (95% CI)	*P* Value	Adjusted OR (95% CI)	*P* Value
Gender	Male	185 (57.3)	138 (42.7)	1.06 (0.78–1.43)	.7192		
	Female	221 (58.6)	156 (41.4)	Ref			
Anterior crowding	No	319 (64.7)	174 (35.3)	Ref		Ref	
	Yes	87 (42.0)	120 (58.0)	2.53 (1.81–3.52)	<.0001	2.90 (2.06–4.09)	<.0001
Anterior spacing	No	357 (60.7)	231 (39.3)	Ref		Ref	
	Yes	49 (43.8)	63 (56.2)	1.99 (1.32–2.99)	.0010	2.53 (1.65–3.86)	<.0001
Median diastema	No	341 (59.6)	231 (40.4)	Ref			
	Yes	65 (50.8)	63 (49.2)	1.43 (0.97–2.10)	.0680		
Maxillary overjet	Normal	200 (60.8)	129 (39.1)	Ref			
	Increased	206 (55.5)	165 (44.5)	1.24 (0.92–1.68)	.1592		
Anterior misalignment	No	312 (58.5)	221 (41.5)	Ref			
	Yes	94 (56.3)	73 (41.7)	1.10 (0.77–1.56)	.6074		

[a] OR indicates odds ratio; CI, confidence interval.
[b] Reference category for the outcome variable.

Table 3. Association Between Self-Perceived Esthetic Impact of Occlusal Alterations (OASIS) and Malocclusion Severity Levels (DAI)

Variable	Category	Esthetic Impact		Crude OR (95% CI)	*P* Value	Final OR (95% CI)	*P* Value
		Lower Concern, *n* (%)	Higher Concern,[b] *n* (%)				
Malocclusion severity levels (DAI)	Normal/minor malocclusion (DAI 1)	196 (68.1)	92 (31.9)	Ref		Ref	
	Definite malocclusion (DAI 2)	101 (58.7)	71 (41.3)	1.50 (1.02–2.22)	.0406	1.50 (1.02–2.22)	.0406
	Severe malocclusion (DAI 3)	52 (48.2)	56 (51.8)	2.29 (1.41–3.60)	.0001	2.29 (1.41–3.60)	.0001
	Very severe malocclusion (DAI 4)	57 (43.2)	75 (56.8)	2.80 (1.83–4.28)	<.0001	2.80 (1.83–4.28)	<.0001

[a] OR indicates odds ratio; CI, confidence interval.
[b] Reference category for the outcome variable.

associate it with the patient's real expectations. The adolescents' perception of dentofacial esthetics is related to the intensity and complexity of the social, emotional, and behavioral relationships being experienced in that moment of life. Thus, the normative clinical assessment and the adolescent's perception must be considered in oral health care.

The results showed that malocclusion in the esthetic zone of the smile was associated with adolescents' esthetic concerns. To complicate matters, a very severe malocclusion is almost three times more likely to have an esthetic impact at this stage of life. A longitudinal study design would strengthen the study to analyze how adolescents' perceptions could change through adulthood due to their psychosocial and professional life.

Finally, subjective and normative analyses provide essential clinical information to the orthodontist, who must assess the occlusal and esthetic changes that cause dissatisfaction to the patient and then establish an orthodontic treatment plan considering the patient's complaint. Although the normative clinical needs are fundamental in planning, the anterior tooth alignment is decisive in the adolescents' esthetic concern and the search for orthodontic treatment. Thus, identifying the psychosocial effect of malocclusion can better guide each patient's therapeutic needs and encourage orthodontic treatment adherence.

CONCLUSIONS

- Anterior crowding and spacing are the conditions that most influence the esthetic concerns of adolescents.
- Adolescents with very severe malocclusion and mandatory orthodontic treatment need are more likely to report a negative esthetic impact.

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