

## Correlation of the Need for Orthodontic Treatment between the self-perception of Chilean adolescents aged 14 to 18 years and the dentist's diagnosis.

Correlación de la Necesidad de Tratamiento Ortodóncico entre la autopercepción de adolescentes Chilenos de 14 a 18 años con la observación del Odontólogo.

Claudia Acevedo-Atala.<sup>1,2</sup>

José María Montiel-Company.<sup>3</sup>

Claudia Atala-Acevedo.<sup>1</sup>

Gilda Corsini-Muñoz.<sup>1,2</sup>

Víctor Beltrán-Varas.<sup>1,2</sup>

Alejandra Jans-Muñoz.<sup>1,2</sup>

### Affiliations:

<sup>1</sup>Facultad de Odontología. Universidad de La Frontera, Temuco, Chile.

<sup>2</sup>CIDIC Research Center, Facultad de Odontología. Universidad de La Frontera, Temuco, Chile.

<sup>3</sup>Departamento de Estomatología, Facultad de Odontología y Medicina. Universidad de Valencia, España.

**Corresponding author:** Alejandra Jans-Muñoz. Universidad de La Frontera, Facultad de Odontología, Francisco Salazar # 1145, Temuco, Chile. **E-mail:** [alejandra.jans@ufrontera.cl](mailto:alejandra.jans@ufrontera.cl)

**Receipt** : 07/24/2020 **Revised:** 12/30/2020  
**Acceptance:** 02/28/2021

**Abstract: Background:** To correlate the need for orthodontic treatment between the self-perception of Chilean adolescents from 14 to 18 years old with the observation of a dentist using the same assessment scale, as well as to determine if covariates such as gender, age and type of school influence the self-perception of the adolescent and the examiner. **Material and Methods:** Cross-sectional descriptive study of adolescents aged 14 to 18 years from public, subsidized and private schools in Temuco, Chile. The probability sample is stratified by course, from first to fourth year, a total of 414 students participated, according to the eligibility criteria. The photographic score of the aesthetic component (AC) of the Index of Orthodontic Treatment Need (IOTN) was used. The statistical analysis of the data was performed with the SPSS Statistics program v.23. **Results:** 94.9% of the adolescents perceived themselves as having good aesthetics. The examiner considered that 77% presented this condition,  $p < 0.00$ . Males perceived themselves better than females. At age 15, 1.7% of students considered themselves to have poor aesthetics,  $p < 0.01$ . From the examiner's perspective, aesthetics are related to type of school,  $p < 0.00$ . **Conclusion:** Adolescents perceive themselves better aesthetically than do the evaluators. The school type factor, according to the IOTN-AC examiner, shows a higher proportion of students with no need for orthodontic treatment in private schools, and a threshold need in municipal and subsidized institutions.

**Keywords:** Esthetics, dental; perception; index of orthodontic treatment need; malocclusion; orthodontics, corrective; adolescent; self concept.

**Cite as:** Acevedo-Atala C, Montiel-Company JM, Atala-Acevedo C, Corsini-Muñoz G, Beltrán-Varas V & Jans-Muñoz A. Correlation of the Need for Orthodontic Treatment between the self-perception of Chilean adolescents aged 14 to 18 years and the dentist's diagnosis. *J Oral Res* 2021; 10(1):1-9  
**Doi:**[10.17126/joralres.2021.004](https://doi.org/10.17126/joralres.2021.004)

**Resumen: Objetivo:** Correlacionar la necesidad de tratamiento ortodóncico, entre la autopercepción de adolescentes con el diagnóstico de un evaluador odontólogo, utilizando la misma escala de valoración, así también determinar si las variables como el género, la edad y la dependencia educacional influyen en la autopercepción del adolescente y la observación del examinador. **Material y Métodos:** Estudio descriptivo de corte transversal, en adolescentes de 14 a

18 años de escuelas públicas, subvencionadas y privadas de Temuco-Chile. Muestreo probabilístico estratificado por cursos, de primero a cuarto medio con una muestra de 414 estudiantes, según los criterios de elegibilidad. Se utilizó el score fotográfico del componente estético (AC) del Índice de Necesidad de Tratamiento de Ortodoncia (INTO). El análisis estadístico de los datos fue realizado con el programa SPSS Statistics v.23. **Resultados:** El 94,9% de los adolescentes se autoperciben con una buena estética, el examinador considera que un 77% presenta esta condición,  $p < 0,00$ . Los varones se perciben mejor que las damas. Los adolescentes de 15 años un 1,7% considera

tener mala estética,  $p < 0,01$ . Desde la perspectiva del examinador la estética se relaciona con la dependencia educacional,  $p < 0,01$ . **Conclusión:** Los adolescentes se autoperciben mejor estéticamente que lo diagnosticado por evaluadores odontólogos. El factor dependencia educacional según INTO-AC examinador, muestra mayor proporción de estudiantes sin necesidad de tratamiento ortodóncico en los establecimientos privados, y necesidad límite en los públicos y subvencionados.

**Palabra Clave:** Estética dental; percepción; índice de necesidad de tratamiento ortodóncico; maloclusión; ortodoncia correctiva; adolescente; autoimagen.

## INTRODUCTION.

Malocclusions are alterations in dental development, described clinically as variations of the normal traits of tooth growth and development. These anomalies are currently considered a real public health issue due to their high prevalence, treatment demand and associated high costs. Like other oral conditions, they are not life-threatening, but they clearly affect oral function, aesthetic and an individual's social behavior, compromising their quality of life. It is evidenced in the literature that people with malocclusions can develop feelings of shame and be more withdrawn in their social encounters, affecting self-esteem, confidence, self-image, etc.<sup>1</sup>

The clinical interventions of these alterations are basically centered around cause and effect, and the specific etiological factors that can cause structural and physiological changes in the stomatognathic system, focused mainly on reparative treatment in its biological aspect, improving the indices of oral health, function and aesthetics often without considering the patient's perception of the treatments, expectations and perceptions.<sup>2</sup>

There is no doubt that in order to understand the multifactor phenomenon of malocclusions, the social background and myriad of stimuli must be integrated that can be interpreted by the diversity of individuals influenced by behavioral, emotional and psychosocial aspects that have been gaining in relevance in society, in particular due to their aesthetic implications and the self-perception of image.

In this context, we found in the literature that some patients with severe malocclusion are satisfied or

indifferent to their aesthetic, while others with smaller irregularities are very worried about their aesthetic. This is to say, the individual's normative and subjective need can vary in terms of orthodontic treatment.<sup>1</sup>

Thus, researchers emphasize that there are significant differences among patient perceptions and the professional diagnosis on the aesthetic effect and the need for orthodontic treatment,<sup>3</sup> and that it is relevant to consider that the psychosocial effects that can arise for the patient as a result of alterations in dental development are a subjective criterion of an individual's perception of their state of health and the impact of the disease on their quality of life. Therefore, perception must be considered an important element of diagnosis in clinical assessments performed by health professionals. Clinical measurements are important to determining a patient's normative need for treatment, and it is useful to associate them with information on the impact of oral changes in a person's daily life.<sup>4</sup> The literature indicates that in addition to quality of life or psychosocial well-being, improving the dental aesthetic is one of the main motivations patients undergo orthodontic treatment, an aspiration that is apparently influenced by factors such as demography, severity of the malocclusion, dental care, self-perception of the facial aesthetic and the demands of the high standards of beauty in the modern world.<sup>5</sup>

In European countries in the last few years, dental care has inclined broadly towards dento-maxillary anomalies, and thus so-called "malocclusion or need-for-treatment indices" have arisen, which provide the tools to facilitate diagnosis and prioritize dental plans and programs for care in orthodontics.<sup>6</sup>

Among these instruments and for the purposes of this study is the Index of Orthodontic Treatment Need (IOTN),<sup>7</sup> developed by Evans and Shaw, the aim of which is to classify the malocclusion on the basis of characteristics of dental health and aesthetic deterioration. This method serves to determine the degree of malocclusion that a patient may have and this patient's self-perception of their own dental alteration.

The aesthetic component (AC, Aesthetic Component) IOTN-AC is mainly used in epidemiological or prevalence studies, and is the most used in Europe<sup>8</sup>, since unlike the other indices reported in the literature it incorporates a sociopsychological indicator of need for treatment.

The aim of this study was to correlate the need for orthodontic treatment between the self-perception of Chilean adolescents aged 14 to 18 years with the diagnosis of a dentist using the same assessment scale, thus also to determine if covariates such as gender, age and type of school influence the adolescent's self-perception and the dentist's observation.

## MATERIALS AND METHODS.

Ethics approval was obtained from the Scientific Ethics Committee of the Universidad de La Frontera, Chile, file n° 063/18. The study was designed as a cross-sectional descriptive study, using stratified probability sampling of adolescents aged 14 to 18 years residing in the commune of urban Temuco, Chile and who were enrolled in public, subsidized and private high schools. A total number of 13,236 adolescents are in secondary education in urban Temuco and considering that the prevalence of the perception of aesthetic appearance in this population is unknown, a prevalence of 50% was assumed, calculating the sample size with an error of 5% and a 95% confidence interval, with the sample size being estimated as 408 adolescents, including the non-responses.

Eighteen of 36 schools were selected that fulfilled the selection criteria of the sample and which also voluntarily agreed to participate through formal request letters for the intervention. Then, probability sampling was done, stratified by grade, from first to fourth year, making up a sample of 414 adolescents. Those who did not give the informed consent, had or had had orthodontic treatment, anterior teeth with visible caries lesions or dental hypoplasia were excluded.

For data collection, the Index of Orthodontic Treatment Need was used. The index consists of two components:

dental health (DHC, Dental Health Component), which observes the patient's dental health and the indications of orthodontic treatment from a functional point of view; and an aesthetic component (AC, Aesthetic Component), which is the patient's subjective appreciation of their aesthetic. For the purposes of this study, only the aesthetic component of the IOTN was considered.

The IOTN-AC consists of 10 photographs of a frontal view of teeth with varying degrees of malocclusion. The photos are in black and white to prevent the color of the teeth, gums or lack of hygiene from influencing the identification and score by the patients, and therefore the aesthetic perception of the frontal view of the teeth.

The photos are numbered from one to ten (Figure 1), with one being the best aesthetic and ten showing the greatest deterioration. The 10 photos (IOTN-AC) are grouped into three categories: 1-4 degrees, 5-7 degrees and 8-10 degrees. The graduations of the photos categorize the need for treatment and the degree of the aesthetic in: photos from 1 to 4 show a good aesthetic with little or no need for orthodontic treatment, photos 5 to 7 indicate average aesthetic and a threshold need for orthodontic treatment, and finally the third group of photos from 8 to 10 indicate a poor aesthetic and a strong need for orthodontic treatment. (Figure 1)

### Phase prior to data collection

A stage prior to data collection involved the calibration of two examiners (dentists). This calibration was carried out in 2 phases:

First stage: The examiners received theoretical training on the study protocol, diagnostic criteria, filling in the record card, systematic training in the aesthetic examination in frontal view (photographic score), and indices existing in the literature. Next, practical sessions took place, where six adolescents were examined, discussing the diagnostic findings, use of codes and errors on the record card in order to achieve maximum agreement.

Second phase: The real calibration exercise was done in a group of 15 adolescents in the Dentistry Teaching Clinic (CODA) at the Universidad de La Frontera, Temuco, Chile. For the intra-examiner calibration, each investigator assessed the adolescents on two occasions, with a one-week interval between each examination.

The intra-examiner interclass correlation coefficient (ICC) revealed 98% agreement.

For the inter-examiner calibration, the investigators assessed 15 adolescents different from those designated for the intra-examiner calibration, performed at different times, each exam with an interval of 15 days, evaluating the degree of agreement using the ICC between the examiners, with the degree of agreement being 94%.

### Data collection

The field work was carried out in October and December 2018. The adolescents were given an 8.5" x 11" sheet of paper, the photographs in black and white and a mirror and a pencil. Then, the oral instructions were given collectively with the following indication: "The ten photographs that you see show different degrees of dental attractiveness.

Photo number 1 indicates that the teeth are pretty and photo number 10 indicates that the teeth are in very bad condition. Now, looking at your teeth in the mirror, and looking at the photographs, which number do you think matches your teeth?" Once the young people, individually, identified and made their annotation, the examiner evaluated the frontal view of the adolescent's occlusion using the same photographic score, and recorded their observation discreetly so that the study subject could not see the examiner's score. (Figure 1)

### Statistical analysis

The statistical analysis of the data was performed using SPSS Statistics v.23. A descriptive analysis was done with the sociodemographic and clinical characteristics of the sample. The sociodemographic characteristics and the adolescents' scores for aesthetic

self-perception on the index were compared (IOTN-AC) using parametric or nonparametric tests according to the distribution of the continuous variables and using the chi square test for categorical variables. To evaluate the intra- and inter-examiner correlation, the means were compared through the ICC.

## RESULTS.

Distribution of frequency and percentages were used to describe the total sample of N= 414 adolescents, as well as the variables gender, age and socioeconomic level/type of school.

According to gender, females were more represented (55.1%) than males 44.9%. With respect to the variable age, 13.8% of the students were 14 years old, 12.3% were 15, 20.3% were 16, 26.8% were 17 and 26.8% were 18. For the variable socioeconomic/type of school, the low socioeconomic level is represented by public schools, which is 51.0% of the sample, the medium level is represented by subsidized schools, 26.6% of the sample, and private schools were 22.5%. (Table 1)

### Adolescents' self-perception according to the IOTN-AC

To determine the correlation of the perception of aesthetic and the need for orthodontic treatment in adolescents measured through IOTN-AC and its correlation among the variables gender, age and socioeconomic level/school type, the chi-square statistics test was applied.

Figure 1. Index of Orthodontic Treatment Need, aesthetic component (IOTN-AC).

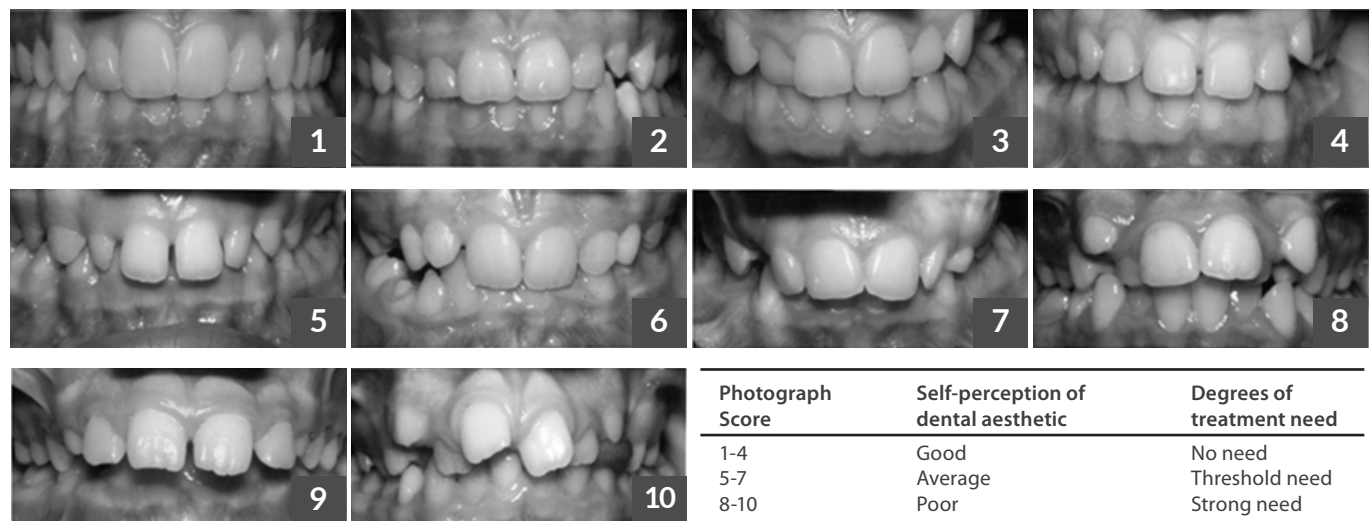


Figure 2. Index of Orthodontic Treatment Need, aesthetic component (IOTN-AC).

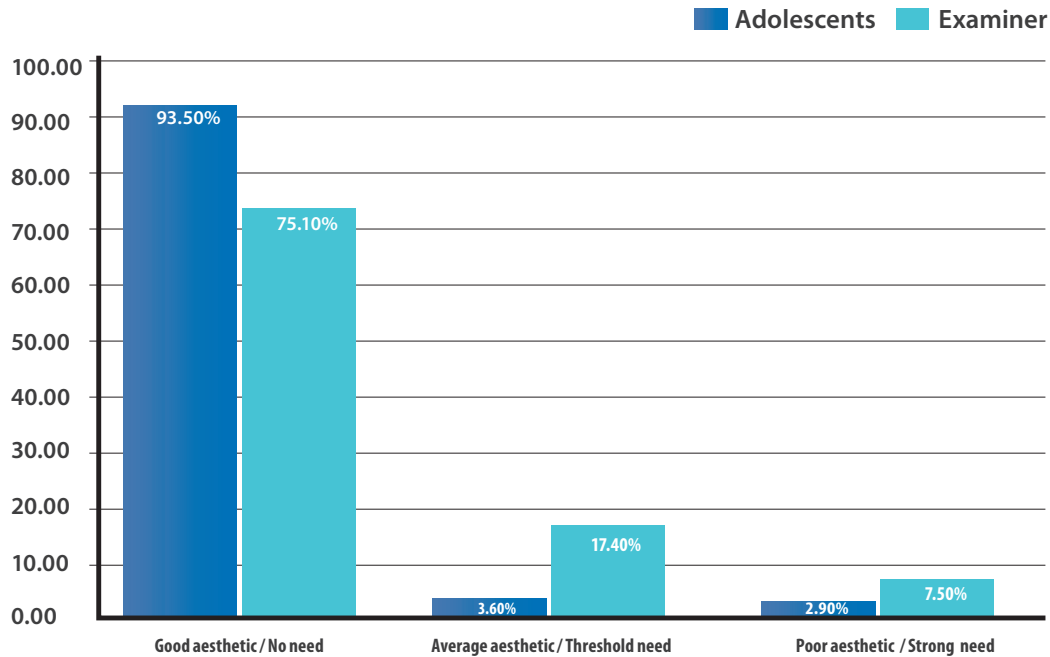


Tabla 1. Distribution of the sample of adolescents.

Variables		N=414	%
Gender	Male	228	44.9
	Female	186	55.1
Age (years)	14	57	13.8
	15	51	12.3
	16	84	20.3
	17	111	26.8
	18	111	26.8
Type of School	Private	93	22.5
	Subsidized	110	26.6
	Public	211	51.0

Tabla 2. Aesthetic self-perception of the sample of adolescents according to the INTO-AC.

Photograph Score (INTO-AC)	N=416	Gender(%)		Age(%)					Type of School (%)		
		M	F	14	15	16	17	18	Private schools	Subsidized schools	Public schools
Good aesthetic/ No need (Photos 1-4)	93.5	51.7	41.8	13.5	10.6	20.3	20.3	24.4	23.3	25.6	47.8
Average aesthetic/ threshold need (Photos 5-7)	3.6	1.9	1.7	0.2	0.0%	0.0	0.0	1.9	1.4	1.7	1.7
Poor aesthetic / Strong need (Photos 8-10)	2.9	1.4	1.4	0.0%	0.0	0.0	0.0	0.5	0.5	1.0	1.4
p-value		p> 0.927		p<0.00					p>0.32		

**Tabla 3.** Adolescents' Need for Orthodontic Treatment (INTO-AC) according to the examiner.

Photograph Score (INTO-AC)	N=416	Gender(%)		Age(%)					Type of School (%)		
		M	F	14	15	16	17	18	Private schools	Subsidized schools	Public schools
Good aesthetic/ No need (Photos 1-4)	75.1	33.8	41.3	13.5	10.6	20.3	20.3	24.4	20.0	18.6	36.5
Average aesthetic/ threshold need (Photos 5-7)	17.4	6.8	10.6	0.2	0.0	0.0	1.4	1.9	1.7	6.5	9.2
Poor aesthetic / Strong need (Photos 8-10)	7.5	4.3	3.1	0.0	1.7	0.0	0.5	0.7	0.7	1.4	5.3
p-value		p> 0.19		p<0.00					p>0.02		

93.5% of the adolescents perceived themselves as having a good aesthetic, *i.e.*, little or no need for orthodontic treatment, 3.6% perceived themselves as having an average aesthetic and 2.9% self-defined with a poor aesthetic or strong need for orthodontic treatment. The males had a better self-perception than the females; however, there was no relation between aesthetic self-perception and the variable gender, with a value of  $p>0.927$ . According to age, they were mainly classified with a good aesthetic, with very low percentages of average aesthetic. What stands out are the 15-year-olds with 1.7% with a poor aesthetic,  $p<0.00$ , deducing that there is a relation between age and aesthetic perception. According to the socioeconomic variable, the adolescents perceived themselves with an average to good aesthetic in private schools and better than the municipal and subsidized schools; however, there were no statistically significant differences,  $p>0.326$ . (Table 2)

#### Analysis of the IOTN-AC examiner observation.

75.1% of the adolescents examined were categorized as not needing orthodontic treatment, followed by 17.4% at the threshold of needing it and 7.5% with a strong need for treatment.

Regarding the gender and the need for orthodontic treatment, there was no statistically significant relation ( $p>0.19$ ).

With respect to age, the examiners classified adolescents mainly as having a good aesthetic and having no need for treatment: 13.5% for 14-year-olds, 10.6% for 15-year-olds, 20.3% for 16-year-olds, 24.6% for 17-year-olds and 24.4% for 18-year-olds.

The threshold need had the highest percentage: 18-year-olds with 1.9% and 17-year-olds with 1.4%. Regarding having a strong need for treatment, 1.7% of the 15-year-olds were put into this category, followed by 0.7% of 17-year-olds and 0.5% of 18-year-olds, and there was a relationship between age and need for treatment,  $p<0.00$ . According to type of school, there were statistically significant differences between socioeconomic level and the variable need for treatment observed by the examiners,  $p<0.02$ .

The greatest percentage of strong need and threshold need appeared in public and subsidized schools, a situation that was less pronounced in private schools. (Table 3)

#### IOTN-AC correlation between adolescent and examiner

The adolescents' perception according to the need for treatment grouped as no need, threshold need and strong need present percentage values of 93.5%, 3.6% and 2.9%, respectively. The observation by the examiners was 75.1% with no need, 17.4% with threshold need, and 7.5% with a strong need. There are statistically significant differences with a  $p$ -value $<0.00$  between the adolescents' self-perception and the evaluators; *i.e.*, the adolescents perceived themselves as better aesthetically than the examiners indicated. (Figura 2).

#### DISCUSSION.

The IOTN was used as the data collection instrument in its dental aesthetic version (IOTN-AC). This index is the one most commonly used for epidemiological or

prevalence studies and is the most used index in Europe 2-8 to measure the perception of the oral aesthetic. It must be noted that few studies address this topic, using the INTO-AC as the only instrument.

In general, the studies found in the scientific literature compare several indices to relate the functional aspects and the patient's perspective. A systematic review indicates that of 27 articles selected, there was an upward trend in publications, concentrating almost 60% of them related to people's perception of the reasons for orthodontic treatment, of the aesthetic and psychosocial impact of malocclusion or orthodontic treatment, and the implications of these factors in their quality of life in the last four years. Most of the studies were from Europe, in particular the United Kingdom, concluding that qualitative research offers new opportunities for orthodontics studies and can be used exclusively or as a complement in relation to quantitative methods.<sup>2</sup>

The validity and reliability of the instrument (IOTN-AC) according to the bibliography shows an inter-examiner correlation of 86.4% and an intra-examiner correlation of 93% , which shows very good agreement,<sup>9-10</sup> results similar to those observed in the calibration of the present study, indicative of the reliability of the instrument applied.

When evaluating the correlation between the IOTN-AC from the adolescent's self-perception and the examiner's observation (dentist), we found that the adolescents perceive themselves better than the examiners observe, with this result being statistically significant and consistent with what was reported in the literature, indicating that if the dentist's assessment is compared with the self-perception of the patients, these tend to be more optimistic than the professional's.<sup>11-12</sup>

Furthermore, it has been highlighted in the scientific evidence that there are differences between the professional's diagnosis and the adolescent's self-perception regarding the aesthetic effect and the need for orthodontic treatment, and these differences are important to consider when commencing treatments.<sup>13</sup>

From an objective point of view, the signs of a malocclusion are not fully defined, since this alteration does not constitute a pathology, but rather a variation of the normal anatomy, which is why discrepancies arise among the opinion of the orthodontists, general dentists and the public's perception.<sup>14</sup>

In the present study, most of the subjects indicated that they self-perceived as having a good aesthetic,

and thus with no need for orthodontic treatment, *i.e.*, most self-classified between photos 1 and 4. In relation to these results, the studies reviewed conclude that generally in most of the cases, almost no patient places their teeth among the group of "strong need for orthodontic treatment" photos.<sup>8-10</sup> It is also considered that it is not an easy task for a patient to determine which of the ten photos they most resemble, especially when they are very young.

However, it has been stressed that even for adults self-identifying with some of the photos is difficult and that for practical and epidemiological purposes, they only consider two categories, those who need treatment are identified with photos 8 to 10 and subjects that do not need treatment are the patients who identify with photos 1 to 7.<sup>9</sup>

On the other hand, the results of adolescents' aesthetic self-perception in relation to variables such as gender, age and socioeconomic level (school) show that there are no significant differences in relation to gender or type of school; however, with the variable age we found statistically significant differences mainly associated with 15-year-olds who show a greater need for orthodontic treatment. From the observation of the examiners, we found statistically significant differences in the variables age and economic level represented by the schools, where the greatest percentage of strong need and threshold need for treatment appears in public and subsidized schools, but not in the private schools, which have the highest economic income.

The literature also describes that the demand for treatment is significantly associated with the orthodontist's evaluation and the subject's perception; however, the variables of association like age, gender and education level are statistically insignificant in influencing the subject's perception and the orthodontist's evaluation. In spite of this, it has been stated that the patient's self-perception must take on the same importance when planning orthodontic treatment.<sup>16</sup>

It is worth noting that a study conducted on children in a public school found that the great majority of them had a threshold need for orthodontic treatment;<sup>17</sup> another similar study concluded that adolescents do not self-perceive the need for orthodontic treatment.<sup>18</sup>

In 2018 a meta-analysis was performed that revealed that the need for orthodontic treatment was low in the Iranian population. This same study confirmed that

there are differences in the prevalence of the need for orthodontic treatment based on the normative index and the self-perception index.<sup>19</sup>

It also acknowledged that the threshold between acceptable and unacceptable occlusion as well as the decisions about when orthodontic treatment is desirable are influenced by dental appearance, which is often self-assessed, and the differences in self-perceived dentofacial aesthetic are due to subjective considerations of self-esteem, according to sex, age group and socioeconomic background.<sup>20</sup>

Another meta-analysis indicates that the link between malocclusion and the patients' self-perception has been evaluated mainly in cross-sectional studies and that most of these studies conclude that the children perceive a slight impact of the malocclusions and their modifiable social development according to the child's age and cultural surroundings.<sup>21</sup>

## CONCLUSION.

The evaluation of the dental aesthetic through the Index of Orthodontic Treatment Need in its aesthetic component (INTO-AC) differs according to adolescents' self-perception and the diagnosis made by the professionals using the same evaluation instrument.

The factor type of school according to the INTO-AC shows a greater proportion of students with no need for orthodontic treatment in private schools and a threshold need in public and subsidized schools.

**Conflict of interests:** All authors declare no conflict of interest.

**Ethics approval:** The study was approved by the Science Ethics Committee of the Universidad de La Frontera, Chile, in document 063/18. All the participants included in the research provided the informed consent of their guardians, as well as the informed assent of the adolescents under 18 years of age.

**Funding:** This study was funded by the DIUFRO DFP18-0030 project of the Universidad de la Frontera - Temuco, Chile. The research was also funded by the Faculty of Dentistry of the Universidad de La Frontera, Chile.

**Authors' contributions:** CA and AJ contributed to the design and development of the study in Chilean adolescents and obtained the authorization of the Scientific Ethics Committee of the University of La Frontera-Chile. CA, JMM, GC and performed or interpreted the statistical data analysis. CA and AJ wrote the first draft of the manuscript, which was reviewed by the other members of the research team. All authors read and approved the final manuscript.

**Acknowledgements:** We thank Universidad de la Frontera - Temuco, Chile.



## REFERENCES.

1. Sharma A, Mathur A, Batra M, Makkar DK, Aggarwal VP, Goyal N, Kaur P. Objective and subjective evaluation of adolescent's orthodontic treatment needs and their impact on self-esteem. *Rev Paul Pediatr*. 2017;35(1):86-91
2. Almeida AB, Leite ICG, Silva GAD. Evidence in Orthodontics related to qualitative research. *Dental Press J Orthod*. 2018 1;23(4):64-71.
3. Klages U, Claus N, Wehrbein H, Zentner A. Development of a questionnaire for assessment of the psychosocial impact of dental aesthetics in young adults. *Eur J Orthod*. 2006;28(2):103-11.
4. Dutra SR, Pretti H, Martins MT, Bendo CB, Vale MP. Impact of malocclusion on the quality of life of children aged 8 to 10 years. *Dental Press J Orthod*. 2018 ;23(2):46-53
5. Yi S, Zhang C, Ni C, Qian Y, Zhang J. Psychosocial impact of dental aesthetics and desire for orthodontic treatment among Chinese undergraduate students. *Patient Prefer Adherence*. 2016;10:1037-42.
6. Kerosuo H, Hausen H, Laine T, Shaw WC. The influence of incisal malocclusion on the social attractiveness of young adults in Finland. *Eur J Orthod*. 1995;17(6):505-512
7. Evans R, Shaw W. Preliminary evaluation of an illustrated scale for rating dental attractiveness. *Eur J Orthod*. 1987;9(4):314-318.
8. Bellot-Arcís C, Montiel-Company JM, Almerich-Silla JM, Paredes-Gallardo V, Gandía-Franco JL. The use of occlusal indices in high-impact literature. *Community Dent Health*. 2012;29(1):45-8.
9. Boronat-Catalá M, Bellot-Arcís C, Montiel-Company JM, Catalá-Pizarro M, Almerich-Silla JM. Orthodontic treatment need of 9, 12 and 15 year-old children according to the Index of Orthodontic Treatment Need and the Dental Aesthetic Index. *J Orthod*. 2016;43(2):130-6.
10. Brook PH, Shaw WC. The development of an index of orthodontic treatment priority. *Eur J Orthod*. 1989;11(3):309-20.
11. Holmes A. The prevalence of orthodontic treatment need. *Br J Orthod*.1992; 19:177-82.
12. Boronat-Catalá M, Bellot-Arcís C, Montiel-Company JM, Catalá-Pizarro M, Almerich-Silla JM. Orthodontic treatment need of 9, 12 and 15 year-old children according to the Index of Orthodontic Treatment Need and the Dental Aesthetic Index. *J Orthod*. 2016;43(2):130-6.
13. Klages U, Bruckner A, Zentner A. Dental aesthetics, self-awareness, and oral health-related quality of life in young adults. *Eur J Orthod*. 2004;26(5):507-14.
14. Khan M, Fida M. Assessment of psychosocial impact of dental aesthetics. *J Coll Physicians Surg Pak*. 2008;18(9):559-64.
15. Singh VP, Sharma A, Roy DK. Assessment of the Self-Perception of Dental Appearance, Its Comparison with Orthodontist's Assessment and Demand for Treatment in Eastern Nepalese Patients. *Adv Med*. 2014;2014:547625.
16. Castillo M y col. Necesidad de Tto. Ortodoncico según Índice IOTN, en niños escolares de la unidad educativa "Maribel Caballero". *Rev Venez Invest Odont*. 2016; 4 (1): 40-9.
17. Guerrero-Luzuriaga J, Villavicencio-Caparó E, González-Campoverde L. Autopercepción de necesidad de tratamiento ortodóntico en escolares de 12 años en la Parroquia El Sagrario del Cantón Cuenca-Ecuador. *Rev Estomatol Herediana*. 2017; 27(2): 67-73.
18. Eslamipour F, Afshari Z, Najimi A. Prevalence of orthodontic treatment need in permanent dentition of Iranian population: A systematic review and meta-analysis of observational studies. *Dent Res J*. 2018 ;15(1):1-10.
19. Santos P, Gonçalves A, Marega T. Validity of the Psychosocial Impact of Dental Aesthetics Questionnaire for use on Brazilian adolescents. *Dental Press J Orthod*. 2016;21(3):67-72.
20. Kragt L, Dharmo B, Wolvius EB, Ongkosuwito EM. The impact of malocclusions on oral health-related quality of life in children-a systematic review and meta-analysis. *Clin Oral Investig*. 2016 ;20(8):1881-94