

ORIGINAL ARTICLE



Perception of orthodontic treatment need among Swedish children, adolescents and young adults

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ABSTRACT

Objective: Perceptions of orthodontic treatment need and perceptions of dental aesthetics was investigated among subjects ages 10, 15 and 19.

Materials and methods: A total of 489 subjects completed a questionnaire after inspecting 10 photographs in the Aesthetic Component scale of the Index of Orthodontic Treatment Need to (i) reveal the lower limit for orthodontic treatment need and (ii) rate their dental aesthetics by selecting the most similar photo.

Results: The mean lower limit for orthodontic treatment need was significantly higher (and closer to literature-based standards) among subjects, age 10 (4.2 ± 1.5), than among subjects, age 15 (3.6 ± 1.2) ($p = .0009$), and subjects, age 19 (3.5 ± 1.2) ($p = .00002$). Among subjects ages 15 and 19, the lower limit for orthodontic treatment need was lower in groups with (i) self-perceived orthodontic treatment need ($p = .002$ and $.001$, respectively) and (ii) previous orthodontic treatment ($p = .005$ and $.035$, respectively). Self-perceived orthodontic treatment need was present in more than one-third of subjects, age 19, who had previously received orthodontic treatment. Subjects of foreign origin reported that their dental aesthetics were worse ($p = .002$) and those same subjects, age 19, set the lower limit for orthodontic treatment lower ($p = .047$) than Swedes, age 19.

Conclusions: The lower limit for orthodontic treatment need among subjects, age 10, was higher – compared to subjects, ages 15 and 19 – and closer to literature-based standards. Subjects with self-perceived orthodontic treatment need, subjects with previous orthodontic treatment, and subjects age 19 of foreign origin, have higher aesthetic demands.

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Introduction

Selection of patients for orthodontic treatment consists of both objective and subjective indications. While objective orthodontic treatment need is based on specialists' clinical findings, subjective orthodontic treatment need involves several factors among which self-perception of orthodontic treatment need is one.

Dental aesthetics is a key factor for patients seeking orthodontic treatment – especially among teens and young adults [1]. Even if malocclusions can affect perception of dental aesthetics [2], the child's perception of both dental aesthetics and orthodontic treatment need is important to consider, to obtain cooperation and motivation during the orthodontic treatment [3].

Information about a patient's self-perceived need for orthodontic treatment is an important part of the professional orthodontic treatment plan [4]. Criteria for the definition of attractiveness can vary between different communities and influence the thresholds for orthodontic treatment [5–7].

Most children perceive dental appearance as an important factor in facial appearance or aesthetics [8], and aesthetics

has been found to contribute to psychosocial well-being [9] and correlate with self-esteem among children and teens [10,11].

Previous studies investigated the effect of some factors on self-perceived orthodontic treatment need with diverging results [5,6,9–14]. Studying self-perceived orthodontic treatment need – in different age groups – allows us to determine the age at which children can evaluate aesthetic malocclusion and realize their need for orthodontic treatment. This knowledge benefits patients and helps professionals plan for and allocate resources.

The objective was to examine perception of orthodontic treatment need and perception of dental aesthetics among children, adolescents and young adults.

Materials and methods

Participants for the study were recruited from February to November 2014. The dental staff at four Public Dental Service clinics in the County of Östergötland, Sweden, were instructed to invite patients, who had their 10th, 15th or

19th birthday during the year of the study, to answer a questionnaire in connection with their regular dental check-up visits. The dental staff were instructed to use no other criteria for inclusion and exclusion, but the mentioned patient ages before inviting participants to the study.

Power analysis showed that with 80% power and α -level of 0.05, there was a need for at least 36 subjects in each evaluated subgroup to be able to detect a difference of one unit between the subgroups. The final number of participants in the 10-, 15- and 19-year-old groups were 134 (67M, 65F), 139 (50M, 88F) and 216 (103M, 113F), respectively.

A questionnaire including the Aesthetic Component (AC) scale of the Index of Orthodontic Treatment Need (IOTN) [15–17] was used for the evaluation. The AC-IOTN, consisting of 10 photographs ranked from most positive dental appearance (best dental aesthetics) to most negative dental appearance (worst dental aesthetics), where image 1 represented the best dental appearance and image 10 represented the worst dental appearance. The IOTN also has a dental health component – not used in the present study – which is important for assessment of malocclusion. The participants were asked to complete the questionnaire without interference from parents or others. The patients had the 10 photographs at hand when they made their evaluations. The subjects were asked to identify which of the 10 photographs most closely represented their own dental appearance/aesthetics, without looking in a mirror. The 10 photos were presented on one sheet in the questionnaire in order to represent a continuum of increasing malocclusion. The photographs were placed in two columns with photographs 1–5 in the left column and photograph 6–10 in the right column. The question ‘Needs braces (orthodontic treatment)? Yes/No’ was written below each photograph, and the subjects were asked to answer each question according to their opinion. The lowest number on the photograph with a positive (Yes) answer was regarded as the lower limit for orthodontic treatment need. The subjects’ ranking of lower limit for orthodontic treatment need – as per 10 photographs – was analysed in relation to these variables: age, gender, previous orthodontic treatment, self-perceived orthodontic treatment need, background/origin, expressed dental fear and subjects’ ranking of their own dental aesthetics.

The subjects answered (Yes or No) to questions about if they had had braces, thought they needed braces, were afraid of going to the dentist, or had any parent who had immigrated to Sweden.

The non-parametric Wilcoxon rank-sum test (Mann–Whitney U-test) was used for statistical analyses, including the AC-IOTN variable. The significance level was set at $p < .05$. Spearman's rho test measured dependence degree between the AC-IOTN-ranking of own dental aesthetics and lower limit of orthodontic treatment need. The statistical analyses were performed with Stata/MP 12.1 (StataCorp LP, College Station, TX).

Results

Some of the participants (Table 1) did not respond to all questions. Table 2 displays the mean lower level for perceived orthodontic treatment need within various groups.

Table 1. Characteristics of study participants. Some questions were not answered by all participants.

Variables	Age 10 (N = 134)	Age 15 (N = 139)	Age 19 (N = 216)
Gender			
Male	67	50	103
Female	65	88	113
Previous orthodontic treatment			
Yes	4	21	64
No	130	117	152
Self-perceived orthodontic treatment need			
Yes	37	54	47
No	95	78	165
Foreign origin			
Yes	30	27	32
No	102	103	176
Expressed dental fear			
Yes	16	10	23
No	117	127	192

Table 2. Mean lower level for orthodontic treatment need within various groups – as per the AC-IOTN in various subgroups.

Variables	Total sample Mean $\pm$ SD	Age 10 Mean $\pm$ SD	Age 15 Mean $\pm$ SD	Age 19 Mean $\pm$ SD
Age	3.7 $\pm$ 1.3	4.2 $\pm$ 1.5	3.6 $\pm$ 1.2	3.5 $\pm$ 1.2
Gender				
Male	3.8 $\pm$ 1.4	4.0 $\pm$ 1.6	3.8 $\pm$ 1.3	3.5 $\pm$ 1.2
Female	3.7 $\pm$ 1.3	4.3 $\pm$ 1.4	3.5 $\pm$ 1.0	3.5 $\pm$ 1.2
Previous orthodontic treatment				
With	3.2 $\pm$ 1.2	4.0 $\pm$ 1.8	3.0 $\pm$ 1.0	3.3 $\pm$ 1.2
Without	3.8 $\pm$ 1.3	4.2 $\pm$ 1.5	3.7 $\pm$ 1.2	3.6 $\pm$ 1.2
Self-perceived orthodontic treatment need				
With	3.3 $\pm$ 1.3	3.8 $\pm$ 1.5	3.3 $\pm$ 1.0	3.0 $\pm$ 1.3
Without	3.9 $\pm$ 1.3	4.3 $\pm$ 1.5	3.8 $\pm$ 1.2	3.7 $\pm$ 1.2
Background/origin				
Swedish	3.7 $\pm$ 1.3	4.2 $\pm$ 1.4	3.6 $\pm$ 1.2	3.6 $\pm$ 1.5
Immigrant	3.6 $\pm$ 1.5	4.0 $\pm$ 1.9	3.8 $\pm$ 1.0	3.2 $\pm$ 1.4
Expressed dental fear				
With	3.5 $\pm$ 1.2	3.9 $\pm$ 1.3	3.5 $\pm$ 1.2	3.5 $\pm$ 1.2
Without	3.7 $\pm$ 1.3	4.2 $\pm$ 1.6	3.6 $\pm$ 1.2	3.5 $\pm$ 1.3

ns: not significant.

* $p < .05$.

** $p < .001$.

*** $p < .0001$.

†Too few subjects for statistical analysis.

All results reflect subjects’ opinions regarding the ten AC-IOTN photographs.

The lower limit for orthodontic treatment need was significantly lower in the ages 15 and 19 groups – compared to the age-10 group (Table 2). Figure 1 displays the percentage of subjects in each age group who responded to each photograph; their responses indicate the lower level for perceived orthodontic treatment need.

No significant differences were found regarding the perception of the lower limit for orthodontic treatment need between females and males within the total sample and within age groups (Table 2).

For the age groups, the percentage of subjects who had previously received orthodontic treatment was 3% (age 10), 15% (age 15) and 30% (age 19). Subjects with previous orthodontic treatment ranked the lower limit of orthodontic treatment need significantly lower than those without

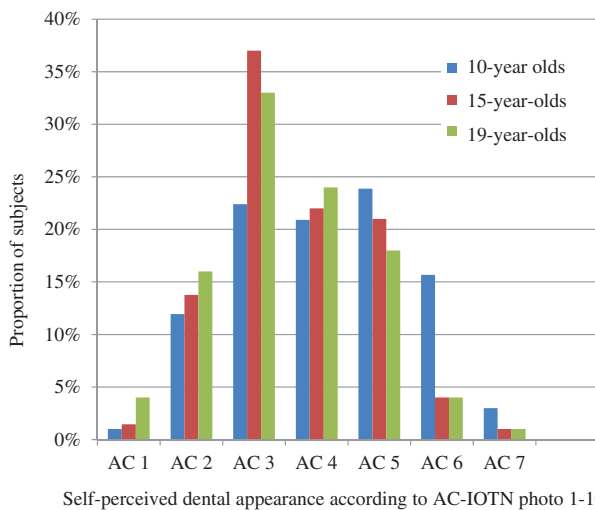


Figure 1. Percentage of subjects (by age) who selected each AC-IOTN photo [15] regarding the lower level for orthodontic treatment need.

previous orthodontic treatment in the ages 15 and 19 groups (Table 2).

The percentage of subjects with self-perceived orthodontic treatment need was 28% (age 10), 39% (age 15) and 22% (age 19) (Table 1). Subjects, ages 15 and 19, with self-perceived need for orthodontic treatment ranked the lower limit for orthodontic treatment need lower than subjects without self-perceived need for orthodontic treatment ($p = .002$ and $.001$, respectively) (Table 2).

Neither foreign origin nor Swedish origin influenced ranking of the lower limit for orthodontic treatment need within: the total sample ($p = .270$); age-10 group ($p = .258$); and age-15 group ($p = .299$). Subjects of foreign origin in the age-19 group ranked ($p = .047$) the lower limit for orthodontic treatment lower than ethnic Swedes (Table 2).

The percentage of subjects who expressed dental fear was as follows: 12% (16 subjects), 7% (10 subjects) and 12% (23 subjects) at ages 10, 15 and 19, respectively (Table 1). Expressed dental fear did not influence the ranking of the lower limit for orthodontic treatment need (Table 2).

Figure 2 and Table 3 display dental appearance ratings (subjects chose a photograph most similar to their appearance). Ranking of dental appearance was significantly correlated with ranking of the lower limit for orthodontic treatment need, regarding the age-10 group ($\rho = 0.15$ and $p = .003$). No significant correlation occurred within the age-15 group ($\rho = .01$ and $p = .88$) and within the age-19 group ($\rho = 0.08$ and $p = .26$).

Subjects with self-perceived need ranked their dental aesthetics as less attractive than those without self-perceived need ($p = .000$) (Table 3). Subjects of foreign origin rated their dental aesthetic lower than Swedes within the total sample ($p = .001$).

Subjects of foreign origin within the total sample reported higher self-perceived orthodontic treatment need (40%) than Swedes (27%) ($p = .010$).

Within the age-19 group, 35% of subjects with previous orthodontic treatment indicated self-perceived orthodontic treatment need. Only 17% of subjects – without previous

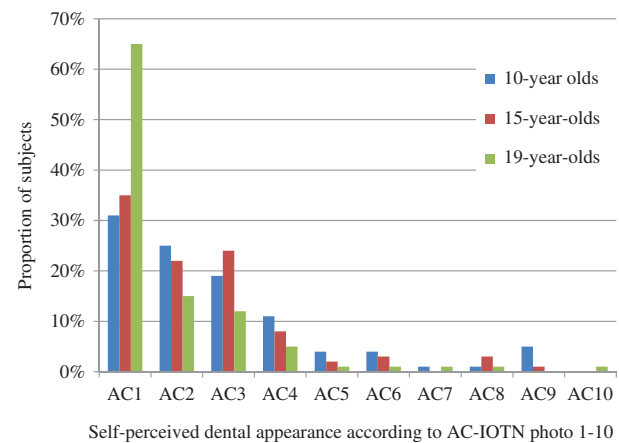


Figure 2. Percentage of subjects (by age) who selected each AC-IOTN photo [15] regarding self-perceived dental appearance.

Table 3. Mean value of self-perceived dental appearance within various groups as per the AC-IOTN.

Variables	Total sample Mean $\pm$ SD	Age 10 Mean $\pm$ SD	Age 15 Mean $\pm$ SD	Age 19 Mean $\pm$ SD
Age	2.2 $\pm$ 1.7	2.8 $\pm$ 2.1	2.4 $\pm$ 1.7 ***	1.7 $\pm$ 1.3
Gender				
Male	2.1 $\pm$ 1.8	2.6 $\pm$ 2.2	2.5 $\pm$ 2.1	1.6 $\pm$ 1.0
Female	2.3 $\pm$ 1.7	3.2 $\pm$ 1.9	2.4 $\pm$ 1.5	1.8 $\pm$ 1.5
Previous orthodontic treatment				
With	1.9 $\pm$ 1.7	4.0 $\pm$ 3.6	2.5 $\pm$ 1.8	1.6 $\pm$ 1.5
Without	2.3 $\pm$ 1.7	2.9 $\pm$ 2.1	2.4 $\pm$ 1.7	1.8 $\pm$ 1.2
Self-perceived orthodontic treatment need				
With	3.3 $\pm$ 2.1	4.2 $\pm$ 2.4	3.4 $\pm$ 1.9	2.4 $\pm$ 1.6
Without	1.8 $\pm$ 1.3	2.4 $\pm$ 1.7	1.7 $\pm$ 1.0	1.5 $\pm$ 1.1
Background/origin				
Swedish	2.1 $\pm$ 1.7	2.8 $\pm$ 2.1	2.4 $\pm$ 1.7	1.6 $\pm$ 1.2
Foreign	2.6 $\pm$ 1.8	3.1 $\pm$ 1.9	2.5 $\pm$ 1.6	2.4 $\pm$ 1.8
Expressed dental fear				
With	2.2 $\pm$ 1.9	2.8 $\pm$ 2.6	2.0 $\pm$ 1.0	2.0 $\pm$ 1.9
Without	2.2 $\pm$ 1.7	2.9 $\pm$ 2.0	2.5 $\pm$ 1.7	1.7 $\pm$ 1.2

ns: not significant.

* $p < .05$.

** $p < .001$.

*** $p < .0001$.

experience of orthodontic treatment – indicated self-perceived orthodontic treatment need.

Discussion

Patients' subjective preferences are crucial during orthodontic treatment decision-making [11,18]. Our finding that lay people set a lower limit for orthodontic treatment than the professional standards is in agreement with others [19–21] and also professionals have set a lower limit [21] than suggested or used in the literature [22,23]. We found that 15- and 19-year-old set a low limit for orthodontic treatment need.

Subjects, ages 15 and 19, perceived need for orthodontic treatment with less marked aesthetic anomalies – compared to assessments from subjects, age 10 which is aligned with previous studies of children and young adults, reporting that older subjects expressed a lower level for orthodontic treatment need when assessing the AC-IOTN photographs [24,25]. The closer evaluation to professionals by subjects ages 10 and 11 is aligned with others [18].

That subjects with previous orthodontic treatment need had higher self-perceived orthodontic treatment need has been reported by others [26]. One of the causes for high aesthetic demands – especially among young adults – is the effect of social media, which has brought aesthetic factors into focus at the expense of other factors [27]. Aesthetics is important to children and young adults and untreated conditions can lead to strategies to hide the teeth [28,29].

The sample size in the present study was aligned with similar studies that have sample sizes up to 379 subjects [4,18,30,31]. The subjects in the age groups in the present study represent about 15% of the total targeted population. The proportion of subjects of foreign origin in the present study was similar to the population mean (21.5%) [32].

There is a risk of bias when comparisons of subjective evaluations are made between age groups with different frames of reference due to, for example, limited life experiences. This limits the possibility to directly apply the results from this study to other geographical and cultural regions. Some subjects, age 10, reported difficulties in evaluating their own treatment needs and in describing their perceptions of their own dental appearance. These difficulties might be due to the fact that the ten AC-IOTN photographs represent young adults' dentition, which might complicate the task of ranking 10-year-olds' aesthetics and limits the reliability of their evaluation. When the 10 AC-IOTN photographs are used, it is the severity of the malocclusion that should be considered and not the possible similarity to the single photographs. This could of course be a difficult task – especially for younger children – when one should evaluate the own appearance. The own appearance was evaluated without access to a mirror in the present study. The important findings in the present study was not related to the evaluation of the own appearance in the younger children.

The AC-IOTN photographs were used because they are internationally recognized and because similar studies used them [18,33]. Professionals evaluating the 10 photographs in one study ordered the photographs slightly different [34], whereas a study using both parents, patients and dentists kept the order of the photographs but ranked some adjacent photographs similarly [21]. The evaluations could possibly have been different if we had placed the AC-IOTN photographs in random order [10] instead of in continuous order. But, since we did not want to confuse the patients, and to enable comparisons with similar studies, we placed the photographs in continuous order. The finding that subjects' gender had no significant influence on perception of the lower limit for orthodontic treatment need was aligned with previous studies [24,35], while other studies found that girls had an increased willingness to receive orthodontic treatment [13,36].

Because Swedish dental care includes orthodontic treatment that during the time of the study was free until the age of 19 years, all subjects, age 19 (except perhaps recent arrivals) had had regular dental check-ups – including orthodontic examinations and orthodontic treatment. Therefore, almost all subjects, age 19, should have been offered treatment for major aesthetic deviations.

Many other study designs made it possible for peers to influence the subjects, why independent answers could not be guaranteed [37], why the value of comparison with such studies is limited.

One further limitation of the present study is that the questionnaire only included one question regarding foreign origin. For more accurate findings, the questionnaire should have covered: (i) both parents' origin, (ii) country of birth and (iii) number of years the respondent has lived in Sweden, as well as family income or socio-economical class. The finding that subjects of foreign origin, age 19, ranked the lower limit for orthodontic treatment need lower than Swedes gives reason to suspect that 19-year-olds have higher aesthetic demands, possibly due to self-perceived higher pressure to fit into the society.

In contrast to our study, where ethnic background did not influence the self-perceived orthodontic treatment need among the 10- and 15-year olds, a Swedish study by Josefsson et al. in 2005 [14] found that ethnic Swedes, ages 12 and 13, had more self-perceived need for orthodontic treatment. In another study in 2010 by the same author [7], subjects of foreign origin, ages 18 and 19, had a higher self-perceived orthodontic treatment need, which is aligned with the present study.

In the present study, a single-item question evaluated dental fear. Using one of the dental anxiety scales might have been more reliable than just stating: Are you afraid to go to the dentist. But because it would be rather difficult and time-consuming for the children and teens to respond to questions on, for example, the Corah Dental Anxiety Scale [38] or the dental subscale of the children's fear survey schedule (CFSS-DS) [39], each child in the present study responded to just one simple question regarding dental fear.

This single-item question can be criticized for being a too superficial, which limits the possibility to objectively evaluate the influence of this variable. Anyhow, single-item questions for dental fear assessment have been used and found reliable previously [40]. In 2003, a study of Swedes, age 15, 13% reported dental fear using three questions to assessed dental fear [41], which is a higher proportion than in our study. In 2004, a study of Swedish patients, age 15, used the dental fear survey to determine dental fear and found that 6.5% had dental fear [42], which is close to our findings. The dental fear prevalence for the total sample in our study was similar to that found in a previous Swedish study from 1999 [43]. Even if undisclosed dental fear was previously reported to influence self-perceived orthodontic treatment need [7], expressed dental fear did not influence perception of the lower limit for orthodontic treatment need in the present study.

Our finding – that subjects, age 19, ranked their dental aesthetics significantly higher than subjects, age 10 – was expected because many subjects, age 19, had received orthodontic treatment, while subjects, age 10, had mixed dentitions and had not started orthodontic treatment. Moreover, in an untreated sample, the AC-IOTN improved slightly from 11 to 19 years of age [22]. Many studies [6,20,26,36] used self-ranking of dental aesthetics as an indication of self-perceived orthodontic treatment need. Further studies –

including normative and self-perceived orthodontic treatment – must be done to identify possible influencing factors and suggest possible measures.

A limitation of the study design was that a study performed at several dental clinics with varying motivation for participation among the dental staff made it impossible to specify the number of patients who were invited for the study and how many of the invited patients abstained from participation. It must be suspected that some patients in the indicated age groups never had the possibility to participate, due to forgetfulness or limited time for the dental personnel. It could be suspected that a lower proportion of patients with immigrant background and language problems were invited and abstained from participation, since they could be expected to not answer questions in Swedish.

Another limitation of the study is that only one of several available instruments for evaluation of dental appearance was used. The use of other instruments and objective clinical examinations of the participants would have opened for studies of several interesting subjects in research fields close to the aim of the present study. Such different study designs had, anyhow, made it harder to motivate the dental staff and the patients at the different dental clinics to participate. More comprehensive questionnaires and further clinical examinations had been advantageous for the quality of the study, but had required a different study design and other resources for funding.

All limitations presented above should be considered when interpreting the results.

Conclusions

Perception of the lower limit for orthodontic treatment need among subjects, age 10 was higher than among those ages 15 and 19 – and closer to standards suggested in the literature. Subjects with self-perceived orthodontic treatment need or with previous orthodontic treatment have higher aesthetic demands. Subjects of foreign origin, age 19, had higher aesthetic demands than Swedes.

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