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Evaluation of the aesthetic component of the Index of Orthodontic Treatment Need by Swedish orthodontists

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SUMMARY The aim of the present study was to evaluate if the majority of orthodontists in Sweden agree with the ranking of the photographs in the aesthetic component (AC) of the Index of Orthodontic Treatment Need (IOTN), and its treatment need classification. Ten separate colour photographs (originals from the AC) and two questionnaires were sent to 272 orthodontists in Sweden. Eighty-one per cent (219) returned one or both questionnaires. One hundred and ninety-four orthodontists answered the AC 'grading of dental attractiveness' and 217 the AC 'need for orthodontic treatment' (nine of the integrated questions had to be excluded because more than one alternative had been chosen). The aesthetic ranking by the orthodontists was compared with the original AC and the deviation was estimated.

The results showed that the grading of photographs 2–9 varied greatly among the orthodontists, but the agreement was almost complete for photographs 1 and 10. The establishment of treatment need for each photograph had good agreement with the original index for photographs 1, 2, and 8–10, while the majority of the orthodontists considered that photographs 5 and 7 should be treated and that photograph 6 showed a borderline case. The participating Swedish orthodontists' aesthetic ranking of the photographs was: 1, 2, 3, 4, 6, 5, 7, 9, 8, and 10. Regarding treatment need, no need for treatment was set for photographs 1–4, borderline for photograph 6 and a need for treatment for photographs 5, 7–10. Further studies are needed to evaluate if laymen in Sweden make the same judgements as Swedish orthodontists.

Introduction

Attempts have been made to find a way to define dental attractiveness. One method is to use photographs. A 10-point rating scale (Standardized Continuum of Aesthetic Need; SCAN), illustrated by representative dental photographs across the range of values, has been developed (Evans and Shaw, 1987; Brook and Shaw, 1989). The scale can be used as a tool in patient counselling or to help the subjects to gain a realistic impression of their relative dental attractiveness. It can also be used to determine treatment priority, and to generate reproducible measures in various areas of orthodontic research (Evans and Shaw, 1987). The judgements of dental attractiveness are complex and vary greatly between individuals and different cultures. What is an acceptable dental appearance for one person may not be acceptable for another. The use of an index to determine treatment priority may be of more interest when treatment resources are limited. It is important to take into consideration the patient's point of view of his/her dental attractiveness before treatment is decided. Another important factor is in what respect the patient will benefit from treatment (Shaw *et al.*, 1991). Evans and Shaw (1987) asked orthodontists, independent of one another, to view the occlusion of a sample of newly referred patients and to find a representative photograph which appealed as much in dental attractiveness as the child's occlusion. When they found that individual orthodontists could use the scale in a reproducible manner and in agreement with other orthodontists, they went on to examine to what extent the orthodontist would agree with patients and parents.

Mohlin *et al.* (2002) found that the majority of 12-year-old children judged their dental appearance as average, while dentists more often judged their dental appearance as nicer than average. Mohlin and Kurol (2003) recently carried out a study in which orthodontists and postgraduate students were divided into different groups and each group had to judge eight orthodontic cases according to different indices. The cases were divided into two groups, level A representing moderately severe cases and level B more severe cases. When the different groups ranked the cases according to the aesthetic component (AC) of the Index of Orthodontic Treatment Need (IOTN), their ranking differed more for cases at level A than for level B.

The aesthetic ranking system has also been tested on dentists with and without specialist orthodontic qualifications (Richmond *et al.*, 1995a). The results showed that most dentists can successfully apply the SCAN scale. Attempts have been made to make it easier to use the AC scale, as those involved in teaching the IOTN have found that it is more difficult for a novice to learn how to handle the AC of the IOTN than the dental health component (DHC). The reason is thought to be due to the more subjective nature of the

AC and the trainee's tendency to try to match a subject's malocclusion with a photograph using morphological similarities rather than equivalence on a continuum of attractiveness (Burden, 1995). That author therefore reduced the number of photographs in the AC of the IOTN to determine if fewer illustrations allowed greater calibration of the judgement of dentists, i.e. to evaluate if fewer photographs could act as 'anchor' photographs to rank dental attractiveness. He found that there was a tendency to underscore when the number of photographs was reduced to two, and the agreement with the 'gold standard' scores was also less.

Ranking dental attractiveness is subjective and may be systematically related to the judge's demographic background. Howells and Shaw (1985) found that laymen as a group ranked photographs for dental and facial attractiveness systematically according to their own demographic background. The age of the judges and their social class were highly significant factors in determining ratings of dental attractiveness. The validity of the AC of the IOTN has been tested in the UK with good agreement (Shaw *et al.*, 1995). During recent years, the use of occlusal indices has become more common in Europe. However, no study has been undertaken to determine whether the ranking of the photographs in the AC of the IOTN will be the same for dentists in different countries in Europe.

The aims of the present study were: (1) to evaluate if orthodontists in Sweden agree with the ranking of the photographs in the dental attractiveness scale (AC); (2) to evaluate if they have the same opinion about which subjects, according to the scale, should be treated, not treated or who are borderline; and (3) to eventually suggest a Swedish scale.

Materials and methods

Two questionnaires and a set of 10 colour photographs showing different levels of dental attractiveness were sent to 272 orthodontists in Sweden (listed as active members of the Swedish Association of Orthodontists). In the first questionnaire, the orthodontists were asked about their background (such as year of birth, gender, where and the year they became a licensed orthodontist, their years working as an orthodontist, if they presently worked as an orthodontist and, if they did, was it in the private, community or university sector). They were asked about their personal use of treatment need indices and if they had been trained in their use. Finally, there was also room for comments.

In the second questionnaire, the orthodontists were asked about the AC of the IOTN. The 10 photographs were copies of the originals used by Evans and Shaw (1987) (Figure 1), but they were marked with symbols instead of figures and each participant had 10 separate photographs to look at. The order in which each photograph's symbol was presented in the questionnaire was randomized. The orthodontist was asked to state their opinion on, where on the aesthetic scale from 1 (most aesthetic) to 10 (least aesthetic) the photograph should be placed ('dental attractiveness'), as well as the treatment priority (need for treatment, borderline, or no treatment need). The orthodontists were then asked to return the material to one of the authors (AJ) who processed all the answers.

Results

The questionnaires were sent to 272 orthodontists. Thirty-six did not respond and 17 indicated that they did not want to participate. In total, 53 (19 per cent) did not participate in the study (21 females and 32 males). Two hundred and nineteen (81 per cent) orthodontists, 91 females and 128 males, answered one or both questionnaires (Table 1). All but one, who was retired, were currently working as orthodontists, and five had been trained to become orthodontists in a country other than Sweden. None had been trained in the use of the IOTN.

The majority of the 219 orthodontists (186, i.e. 85 per cent) used treatment priority indices regularly (seven did not answer the question). The treatment priority index of the Swedish National Board of Health and Welfare (Linder-Aronson, 1974), or a modified form, was used by 133 orthodontists (72 per cent). Fifty-two used the IOTN or a modified form, and 43 used other types of indices. Thirty-eight (20 per cent) answered that they used more than one index and six used more than two indices (Table 2). Eighty-two chose to write comments and 76 of them said that they used an index in their daily work.

Two hundred and thirteen orthodontists (97 per cent) graded the AC of the IOTN regarding dental attractiveness. Nineteen answers were excluded because they were not graded according to the instructions (the same figure was used more than once or the ranking was reversed), so 194 questionnaires were processed (91 per cent).

Two hundred and seventeen orthodontists (99 per cent) graded the AC of the IOTN regarding 'need for orthodontic treatment'. In nine of the questionnaires, one or two of the integrated questions had to be excluded because two or no alternatives had been chosen. The answers were compared with the grades of the IOTN and the deviation from the IOTN was estimated.

Concerning dental attractiveness, the consensus was almost complete for photographs 1 and 10 (98 and 92 per cent, respectively, had the same ranking). The rankings for photographs 2–9 varied greatly among the orthodontists. Photograph 2 was correctly ranked by 82 per cent and 11 per cent ranked it as number 3. Photograph 3 was correctly ranked by 55 per cent,

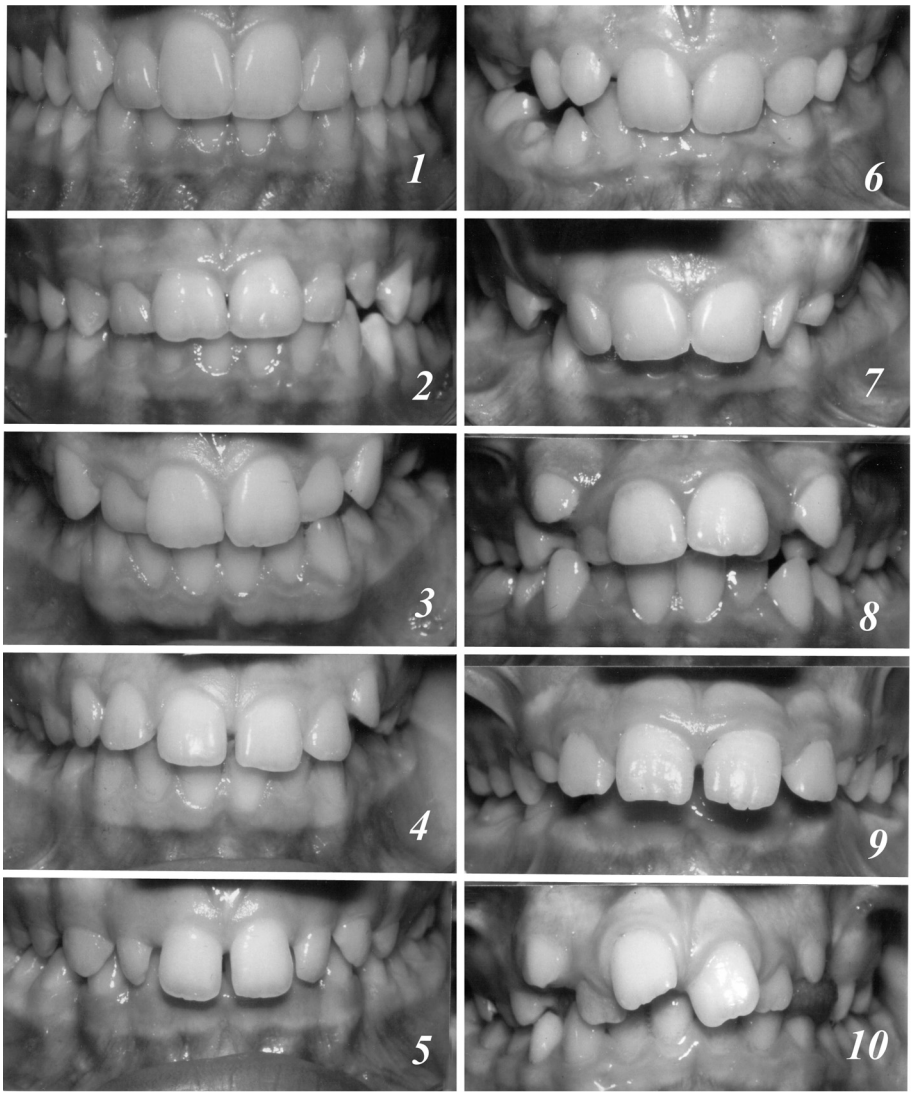

Figure 1 The 10 photographs used in this study and their original order of ranking in the aesthetic component of the Index of Orthodontic Treatment Need. 1–4, no need for treatment; 5–7, borderline/moderate need; 8–10, need for treatment. Reproduced with permission from Brook and Shaw (1989).

Table 1 The number of orthodontists to whom the questionnaires were sent in relation to age.

Year of birth	Number of participating orthodontists	Number of orthodontists who did not participate
1930–1939	50	10
1940–1949	111	28
1950–1959	55	14
1960–	3	1
Total	219	53

28 per cent ranked it as number 4, and 12 per cent as number 2. Photograph 4 was correctly ranked by 47 per cent, 13 per cent ranked it as number 5, and 32 per cent as number 3. Only 11 per cent gave photograph 5 the correct ranking, with 40 per cent ranking it as number 6, 31 per cent as number 7, and 14 per cent as number 8. The majority of the orthodontists thought that photograph 6 should have a lower ranking; 63 per cent thought it should be number 5 and 16 per cent number 4. Only 15 per cent gave the correct ranking. The ranking of photograph 7 was agreed upon by 43 per cent of the orthodontists, 11 per cent thought it should be number 8, and 36 per cent number 6. Only 21 per cent ranked photograph 8 correctly, the majority thought it should be number 9 (73 per cent). Photograph 9 was ranked by 56 per cent as number 8 and by 19 per cent as number 7. Fifteen per cent ranked it correctly (Figure 2, Table 3). Only four of those who answered the questionnaire had the same ranking of the photographs as in the IOTN and only one of them had some kind of training in the

Table 2 Replies from the 217 active orthodontists in relation to the number of years in practice (two did not answer the question), gender, and the use of an index (four did not answer, and two did not include information on which index they used).

Years in practice	Number of orthodontists	Gender		Use of an index	Gender		Index used			
		Female	Male		Female	Male	A	B	C	D
0–5	21	12	9	18	10	8	12	7	5	5
6–10	30	14	16	24	10	14	16	6	7	5
11–15	37	23	14	30	20	10	23	11	5	7
16–20	40	15	25	33	13	20	29	8	4	8
21–	89	26	63	81	26	55	53	20	22	13
Total	217	90	127	186	79	107	133	52	43	38

A, the treatment priority index of the Swedish National Board of Health and Welfare or a modified version; B, the Index of Orthodontic Treatment Need or a modified version; C, indices other than A and B; D, more than one index.

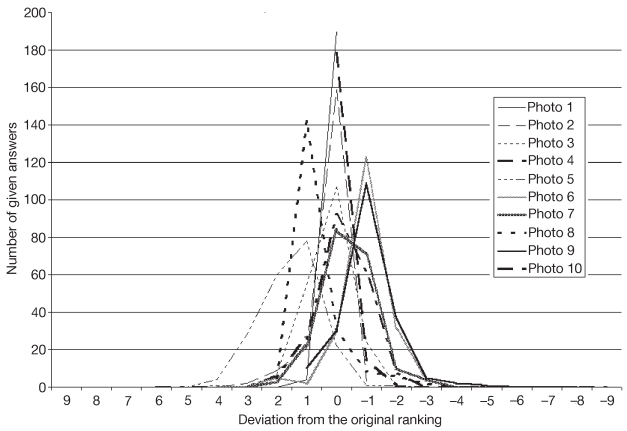

Figure 2 The Swedish orthodontists' ranking of the photographs.

use of the IOTN. The Swedish orthodontists' ranking list originating from the results of this study would be photographs 1, 2, 3, 4, 6, 5, 7, 9, 8, 10 (Figure 3).

Concerning orthodontic treatment need, there was good agreement with the original index for photographs 1, 2, 8, 9 and 10 (99.5, 91, 100, 99 and 100 per cent, respectively).

For photograph 3, 62 per cent agreed with no treatment, 33 per cent answered borderline and 5 per cent thought it should be treated. For photograph 4, 70 per cent agreed with the index that it should not be treated, while 27 per cent thought it was a borderline case. The majority suggested that the subject in photograph 5 should be treated (72 per cent) and only 24 per cent agreed that it was a borderline case. Twenty-seven per cent thought that the subject in photograph 6 should be treated, while the majority agreed with the borderline classification (63 per cent) and 10 per cent suggested no treatment. Photograph 7 was classified by the majority as in need of treatment (76 per cent) and only 24 per cent agreed that it was a borderline case (Figure 4, Table 4). The Swedish orthodontists in this study thought that there was no need for treatment for photographs 1, 2, 3 and 4, a borderline need for photograph 6 and a need for treatment for the rest, i.e. 5, 7, 8, 9 and 10.

Discussion

The majority of the orthodontists in this study had been in practice for a number of years and they often used

Table 3 The Swedish orthodontists' ranking of the 10 photographs.

Photograph	Deviation from the original ranking										
	5	4	3	2	1	0	–1	–2	–3	–4	–5
1	0	0	0	0	4	190					
2	0	0	2	9	21	159	3				
3	0	1	0	7	55	107	24	0			
4	0	0	0	6	26	92	62	8	0		
5	0	4	28	60	78	22	1	1	0	0	
6		0	0	5	2	29	123	31	4	0	0
7			0	3	22	84	71	10	4	0	0
8				5	142	30	9	6	2	0	0
9					10	30	109	37	5	2	1
10						178	15	1	0	0	0

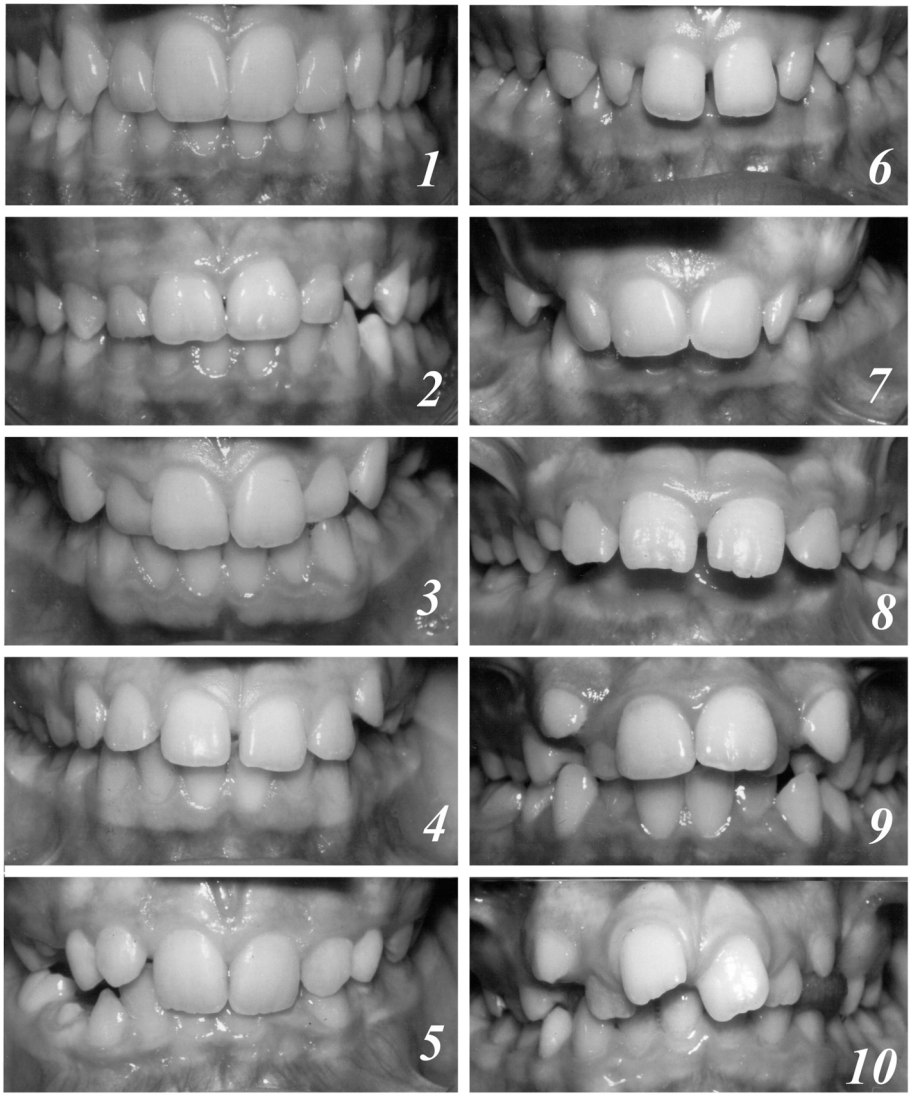

Figure 3 The Swedish orthodontists' aesthetic ranking list.

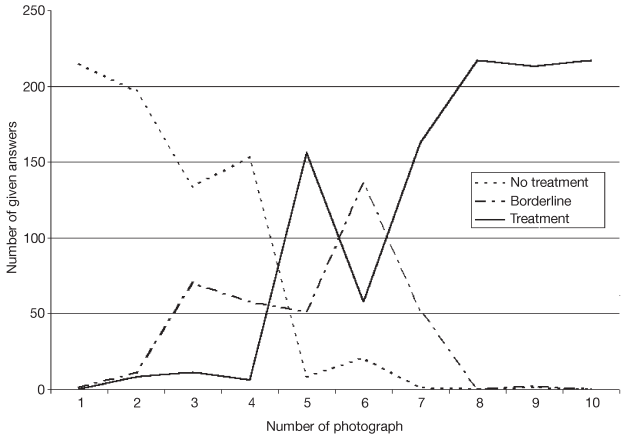

Figure 4 The Swedish orthodontists' evaluation of treatment need.

an index in their daily work. The most commonly used index was the treatment priority index of the Swedish National Board of Health and Welfare, or a modified form of it. When that index is used, the aesthetic and/or functional and oral health aspects of the dentition should be taken into consideration, but as there are no clear cut-off points, the index has to be used with common sense based upon knowledge and experience. The IOTN, or a modified form, was used by 28 per cent of the participants in this study. It is not known if they used both the AC and the DHC of the index. Use of an aesthetic index in Sweden, such as the AC of the IOTN, is probably low, and the users have not been systematically calibrated. It might thus be the individual orthodontist's view on the level of attraction that is shown in this study, or it might be how attractive they find different

Table 4 The Swedish orthodontists' judgement of treatment need.

Photograph	Deviation				
	2	1	0	–1	–2
1	0	1	215		
2	8	11	197		
3	11	70	134		
4	6	58	153		
5		156	51	8	
6		58	136	21	
7		163	51	1	
8			217	0	0
9			213	2	1
10			217	0	0

malocclusions compared with one another. There is a risk that an orthodontist who is not trained in using the scale judges the malocclusion instead of the dentition's grade of attractiveness. Nineteen of the 213 orthodontists (9 per cent) who had answered the questions about the AC of the IOTN were excluded from the study because they had not answered according to the instructions. Instead they had given some photographs the same number or used a different scale. It could be interpreted that they did not agree with this kind of grading or that there was a lack of experience in judging treatment need by looking only at photographs with frontal views of the dentitions. It has been suggested that incorporation of side views of the dentitions should make it easier to assess large overjets (Brook and Shaw, 1989).

In the photographs of the 12-year-old children, the dental development differs and that might influence the judgements. If the index is to be used in patient counselling, it might also be considered that earlier studies have shown that younger children, in general, are not fully aware of their dental arrangement (Shaw, 1981; Espeland *et al.*, 1992). It has been suggested that discussions of treatment chiefly for aesthetic reasons should not take place until the permanent dentition has developed and the child is psychologically mature (Mohlin *et al.*, 2002).

The second task for the orthodontists in the present study was to evaluate treatment need. The results show that orthodontists in Sweden lower the cut-off point for treatment need and have a more distinct border between no need and a need for treatment. It means that more children are judged to need treatment for aesthetic reasons. Richmond *et al.* (1995b) looked at the relationship between the two components of the IOTN in relation to peer assessment of dental health and aesthetic need. Aesthetics were regarded as a greater need for treatment than dental health by the panel of 74 dentists. In a study of 12-year-old schoolchildren in Poland using the IOTN, Grzywacz (2003) found that the borderline need category should be moved two grades lower, or the no need category should be split into two (e.g. 1–2, no need; 3–4, slight need), to make the correlation between dental concern and the AC higher. Stenvik *et al.* (1997), also using the IOTN, studied attitudes towards dental appearance and the need for orthodontic treatment among children and their parents, together with young adults in Norway. They suggested that photographs 5 and 6 represented a borderline need, while photographs 7–10 represented a need for treatment.

The definition of the treatment categories for the photographs in the AC of the IOTN varies in the literature. Richmond *et al.* (1994) stated the definition for treatment need as no/slight need (photographs 1, 2, 3 and 4), moderate/borderline need for treatment (photographs 5, 6 and 7) and need for orthodontic treatment (photographs 8, 9 and 10). In the guidelines, however, the first category is changed to no need for treatment. As both definitions are used in the literature, there has been some confusion. If one grading for treatment need in this study was slight need, the Swedish orthodontists might have placed photographs 3 and 4 in that category. The use of slightly different definitions might explain the different judgement between the Swedes and English. However, it is a disadvantage to have such a diffuse changeover to the borderline grading. In daily practice, the patients with a slight need would fall into the no need for treatment or borderline group.

Some of the orthodontists who made comments on the questionnaires considered that some type of index is needed, to be as objective as possible, and to separate those children who receive their treatment free of charge from those who do not. Several of them pointed out that a good cut-off point is hard to set and that the orthodontists in a geographical area often jointly discuss borderline cases. Some lacked extraoral photographs for the evaluation of lip dysfunction and some were negative to the AC index and the suggested use.

One of the intentions of the AC is to help patients grade their own dental attractiveness relative to an accepted standard in order to make their treatment decision on a more realistic basis (Espeland *et al.*, 1992). It is therefore important to determine if the standard in the AC scale reflects the views of lay people and orthodontists in different countries, i.e. where on the scale the cut-off points for no treatment, borderline, and need for treatment should be. This investigation has shown that the orthodontists in Sweden, as a group, do not agree with the standard in the present scale, nor do they agree with one of the cut-off points. However, further studies are required to determine whether these findings also reflect the views of lay people in Sweden.

Conclusions

In this study, a majority of the orthodontists in Sweden were asked to rank 10 photographs from 1 to 10 according to their dental attractiveness and to decide for each photograph the need for orthodontic treatment. The main findings were:

1. Swedish orthodontics do not agree with the ranking of the 10 photographs in the AC of the IOTN. Their ranking was 1, 2, 3, 4, 6, 5, 7, 9, 8, 10.
2. The borderline levels should be lowered, meaning that more people are considered to need treatment.
3. The dividing line between no need for treatment and need for treatment should be more distinct.

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