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Evaluation of the Dental Health 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 orthodontists in Sweden agree with the grading in the Dental Health Component (DHC) of the Index of Orthodontic Treatment Need, to analyze if certain malocclusions are graded differently, and to determine if there are any background factors among Swedish orthodontists that could be related to their judgements.

Two questionnaires were sent to 272 orthodontists in Sweden. In one questionnaire, they were asked to grade different malocclusions (defined in the DHC) according to the need for orthodontic treatment and in the other to provide details of their background. Eighty-one per cent (219) answered one or both questionnaires and 216 answered the questions concerning the need for orthodontic treatment. The Swedish orthodontists' judgements were then compared with the gradings in the DHC. Statistical analysis was undertaken using chi-square, likelihood ratio chi-square, phi coefficient, contingency coefficient, and Cramer's *V* tests.

The result showed that almost all participating orthodontists agreed that grade 1 of the index indicated no need for treatment. For grade 2 (little need), the opinions differed, but still the majority were in agreement with the index. The judgements for malocclusions in grade 3 (borderline need) were widespread, but the majority considered 3a, 3c, and 3f to have a need or a great treatment need. The only statistical correlation with background factors was that female orthodontists graded 3f higher than borderline. For grades 4 and 5 (need and great need), the Swedish orthodontists thought that all the malocclusions required treatment except 4x, which the majority considered to be borderline.

The participating Swedish orthodontists in this study graded fewer malocclusions in grade 3 and the majority were of the opinion that compared with the DHC, more malocclusions needed treatment.

Introduction

In United Kingdom (UK), Norway, The Netherlands, and Sweden, treatment priority indices are commonly used to determine the level of public health payment the patient may be entitled to or to select which patients will be treated free of charge (Shaw *et al.*, 1995). Deviations from what is considered the ideal occlusion are common; approximately 75 per cent of the population has some type of malocclusion, but not all of them require treatment (Helm, 1970; Proffit, 1993). Many indices have been developed to divide malocclusions into different groups according to severity and need for treatment, so that individuals with the greatest need for treatment may then be given priority if resources are limited (Brook and Shaw, 1989).

The Index of Orthodontic Treatment Need (IOTN), developed in the UK (Evans and Shaw, 1987; Brook and Shaw, 1989) consists of two parts: estimation of aesthetics [Aesthetic Component, (AC)] and estimation of the severity of the malocclusion [Dental Health Component, (DHC)]. The DHC was developed to reduce the subjectivity in measurement, by using well-defined cut-off points (Figure 1). The malocclusions are divided into five different groups ranging from very great need to no treatment need, to try to establish meaningful values for cut-off points between grades for each occlusal trait that represents a quantifiable feature of the dentitions (Brook and Shaw, 1989). Only the malocclusion with the highest grading is classified. Various studies have shown that the index is both easy to learn and use (Burden, 1995a; Richmond *et al.*, 1995).

The DHC is based on the Treatment Priority Index (TPI), developed by the Swedish Medical Health Board (Linder-Aronson, 1974). The use of the DHC has increased among orthodontists in the UK (Holmes and Willmot, 1996). The most commonly used index in Sweden has been the TPI (Linder-Aronson, 1974). It has, however, been considered invalid (Swedish Council of Technology Assessment in Health Care, 2005) and thus there has been a growing interest among Swedish orthodontists in the use of the DHC of the IOTN.

The aims of the present study were to (1) evaluate if orthodontists in Sweden agree with the gradings in the DHC; (2) analyze if there are certain malocclusions that they grade differently, and (3) determine if there are any background factors within Swedish orthodontists that can be related to their judgements.

Materials and methods

Two questionnaires were sent to 272 orthodontist in Sweden listed as active members of the Swedish Association of

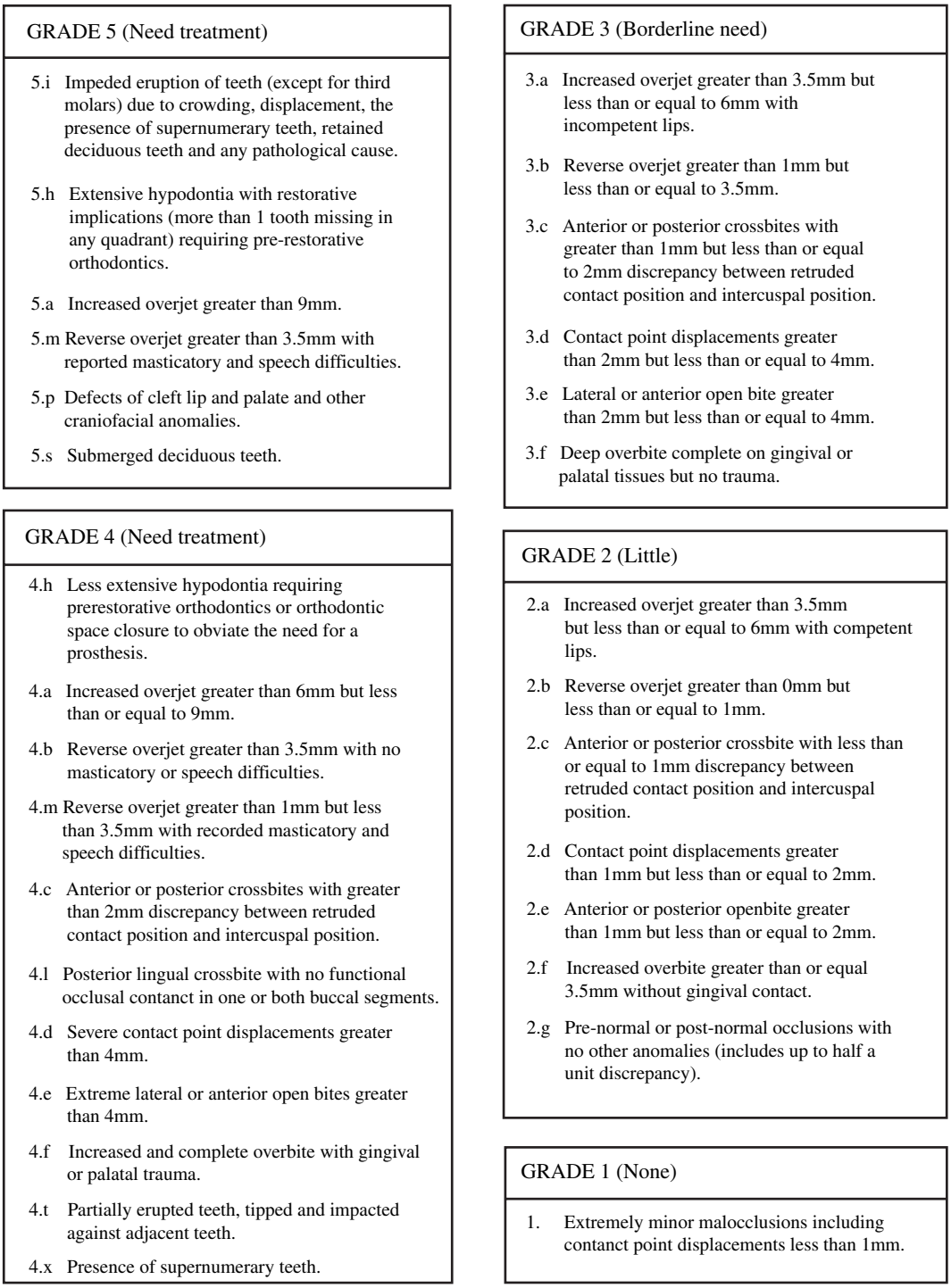

Figure 1 The Dental Health Component of the Index of Orthodontic Treatment Need. Reproduced from Brook P H, Show W C 1989 The development of an index of treatment priority. European Journal of Orthodontics 11: 309–320, with permission from Oxford University Press.

Orthodontists. In one questionnaire, the orthodontists were asked about their background (i.e. year of birth, gender, where, and the year they became licenced orthodontists, if they presently worked as orthodontists, and if they did, was it in the private, community, or university sector). They were also asked about their personal use of treatment need indices, which ones they used, and if they had been trained in the use of those indices. There was also space for comments. The other questionnaire related to the DHC of the IOTN. The DHC was translated into Swedish, the

grading was removed, and each description of a malocclusion was in a randomized order. The orthodontists were asked to classify each malocclusion into one of the following treatment needs: great need for treatment, need for treatment, borderline, and little or no need for treatment.

The orthodontists were then asked to return the material to one author (AJ) who processed all the answers.

Statistical analyses were performed (chi-square, likelihood ratio chi-square, phi coefficient, contingency coefficient, and Cramer's *V* test) to determine if there was any correlation between the Swedish orthodontists' judgements of the need for treatment of different malocclusions and their own background.

Results

Two hundred and nineteen (81 per cent), 91 females and 128 males, answered one or both questionnaires. Fifty-three orthodontists (19 per cent), 21 female and 32 males, did not participate in the study. Thirty six of those did not respond and 17 did not want to participate.

The majority 186 (85 per cent) of the 219 orthodontists used treatment priority indices regularly in clinical practice. Seven did not answer the question. The TPI of the Swedish National Board of Health and Welfare (Linder-Aronson, 1974) or a modified form was used by 133 (72 per cent). Fifty two used the IOTN or a modification and 43 other types of indices. Thirty eight (20 per cent) answered that they used more than one index and six more than two indices. No respondent had been calibrated in the use of the IOTN. All except one, who was retired, were working as orthodontists. The majority of the orthodontists had been trained in Sweden. Experience in the use of indices showed no correlation with the ratings, and the only statistical correlation with background factors was that females, as a group, rated a deep overbite complete on the gingival or palatal tissues but no trauma, 3f, as requiring treatment, instead of borderline (chi-square $P = 0.0092$).

Two hundred and sixteen orthodontists (99 per cent) answered the questions on the DHC. Although 56 had not selected a need for orthodontic treatment for one or more of the listed malocclusions, they were included in the study. The mean for the given answers was 208 (range 192–214).

Almost all the participating orthodontists agreed with the DHC grade 1, no need for treatment. For DHC grade 2, little need for treatment, the opinions were divided, but the majority considered that the malocclusions had no or little treatment need. Twenty per cent considered that anterior or posterior crossbites, 2c, should be treated (grades 4 and 5) and 23 per cent judged anterior or posterior open bites, 2e, as having a borderline need (grade 3).

For malocclusions in DHC grade 3, borderline need, the judgements differed significantly, but the majority were of the opinion that overjet, 3a, anterior and posterior crossbites, 3c, and deep overbite, 3f, had a need or a great need for treatment (grades 4 and 5).

For malocclusions in DHC grade 4, the majority of the orthodontists agreed there was a treatment need, except for 4x, the presence of supernumerary teeth, which the majority considered had a borderline need. On the other hand they rated 4e, anterior and posterior open bites, 4f, overbite, and 4m, reverse overjet with masticatory difficulties, as a great need for treatment (grade 5). The rating of posterior crossbite, 4l, was evenly distributed.

For submerged primary teeth, 5s, the judgements differed considerably, but the majority still considered there was a great or need for treatment. For all the other malocclusions in grade 5, the Swedish orthodontists' judgements were in agreement with the DHC (Table 1).

Discussion

In general, orthodontists in the UK are calibrated in the use of the DHC of the IOTN. At the time of the present study, the responding Swedish orthodontists had some training in the use of the indices, but no calibration in the use of the DHC according to British standards. This might explain some of the results. The presence of supernumerary teeth (4x), for example, might not have been considered as an orthodontic treatment need, as treatment does not necessarily include orthodontic appliances (40 per cent considered this as a borderline need for treatment, 12 per cent as little need, and 11 per cent as no need for treatment.) In all, 63 per cent did not consider treatment was required.

DHC grades 4l and 5s could have been misunderstood as there are some differences in the terminology between the languages. In Sweden, the most common way to estimate crowding or spacing is to measure the available space in relation to the space required. This may explain the diverging opinions regarding treatment need for contact point displacements (2d, 3d, and 4d), as this definition is not commonly known.

The Swedish orthodontists considered 3a, an overjet of more than 3.5–6 mm with incompetent lips, to have a great need and that it should be treated. The functional aspects are not mentioned in the written definition of grades 4a and 5a (Brook and Shaw, 1989), but could have been implied by the Swedish orthodontists (Forsberg and Tedestam, 1993; Burden, 1995b).

For reverse overjet without functional problems (2b, 3b, and 4b), the results were widespread, but when there were functional problems (4m and 5m), almost all the orthodontists were of the opinion that there was a need or a great need for treatment. Regarding an open bite (3e and 4e), there was a tendency for Swedish orthodontists to increase the need for treatment which is supported by Abu Alhaija and Al-Khateeb (2005) who found that dental professionals assessed a mild anterior open bite or reversed overjet as less acceptable than lay people.

Table 1 Swedish orthodontists treatment need grading of the malocclusions according to the Dental Health Component of the Index of Orthodontic Treatment Need (IOTN). Each figure indicates the number of orthodontists that grade a specific malocclusion in terms of treatment need and those that agree with the original IOTN grading are in bold type. The percentages of the orthodontists are in parenthesis.

Grade	Great need	Need	Borderline	Little need	No need	Total
Hypodontia						
5h	**167 (80%)**	38 (18%)	1 (0.5%)	1 (0.5%)	1 (0.5%)	208
4h	36 (17%)	**143 (69%)**	24 (12%)	5 (2%)	0	208
Impeded eruption						
5i	**158 (76%)**	44 (21%)	5 (2%)	0	1 (0.5%)	208
Overjet						
5a	**170 (79%)**	41 (19%)	3 (1%)	0	0	214
4a	22 (10%)	**151 (72%)**	34 (16%)	3 (1%)	0	210
3a	20 (9%)	116 (55%)	**65 (31%)**	10 (5%)	0	211
2a	0	5 (2%)	49 (23%)	**95 (45%)**	62 (29%)	211
Reversed overjet						
5m	**173 (82%)**	38 (18%)	0	0	0	211
4m	113 (53%)	**96 (45%)**	5 (2%)	0	0	214
4b	20 (10%)	**92 (45%)**	61 (30%)	26 (13%)	6 (3%)	205
3b	7 (3%)	55 (27%)	**91 (44%)**	38 (18%)	14 (7%)	205
2b	0	10 (5%)	42 (20%)	**90 (43%)**	66 (32%)	208
Craniofacial anomalies						
5p	**213 (99.5%)**	1 (0.5%)	0	0	0	214
Submerged primary teeth primary						
5s	**81 (40%)**	67 (33%)	25 (12%)	12 (6%)	17 (8%)	202
Crossbite						
4l	67 (32%)	**87 (41%)**	30 (14%)	17 (8%)	9 (4%)	210
4c	93 (44%)	**104 (49%)**	12 (6%)	3 (1%)	1 (0.5%)	213
3c	22 (10%)	106 (51%)	**61 (29%)**	19 (9%)	1 (0.5%)	209
2c	3 (1.5%)	39 (19%)	56 (27%)	**86 (42%)**	21 (10%)	205
Displacement of teeth						
4d	32 (16%)	**117 (57%)**	40 (20%)	13 (6%)	2 (1%)	204
3d	2 (1%)	34 (17%)	**89 (44%)**	65 (32%)	14 (7%)	204
2d	0	3 (1.5%)	36 (18%)	**93 (46%)**	70 (35%)	202
Overbite						
4f	167 (78%)	**45 (21%)**	2 (1%)	0	0	214
3f	21 (10%)	96 (46%)	**71 (34%)**	21(10%)	0	209
2f	0	2 (1%)	25 (12%)	**99 (47%)**	85 (40%)	211
Open bite						
4e	121 (58%)	**79 (38%)**	7 (3%)	1 (0.5%)	0	208
3e	13 (6%)	71 (34%)	**81 (39%)**	38 (18%)	6 (3%)	209
2e	2 (1%)	18 (9%)	47 (23%)	**99 (48%)**	41 (20%)	207
Class II or III occlusions						
2g	0	3 (1%)	23 (11%)	**59 (28%)**	127 (60%)	212
Supernumerary teeth						
4x	11 (6%)	**60 (31%)**	76 (40%)	24 (12%)	21 (11%)	192
Partially erupted teeth						
4t	89 (43%)	**111 (53%)**	9 (4%)	1 (0.5%)	0	210
Minor malocclusions						
1	0	0	1 (0.5%)	25 (12%)	**186 (88%)**	212

In this investigation, the orthodontists increased the need for treatment of anterior or posterior crossbites, when the discrepancy exceeded 1 mm between retruded contact position and intercuspal position, 3c to 4c, thus emphasizing the functional aspect of the malocclusion.

The majority of the Swedish orthodontists increased the rating of a deep overbite complete on the gingival or palatal tissues but no trauma (3f), to a need (4f), or a great need for treatment (5f). One reason could be that children with a short face and a skeletal deep bite Class II malocclusion require treatment to enhance mandibular vertical growth (Proffit, 2000). Another reason might be anticipation of problems in the future, i.e. it is more difficult to treat a deep overbite in adults than in children.

Not surprisingly, for one malocclusion, clefts of the lip and palate and other craniofacial anomalies (5p), the consensus for great need for treatment was almost complete.

In this study, Swedish orthodontists, in general, had more distinct cut-off points between different malocclusions than the DHC of the IOTN, and if DHC is used, fewer patients will receive treatment. The diversity of answers for some definitions emphasizes the importance of using well-defined definitions as well as calibrating the user of the index (Jones *et al.*, 1996). O'Brien *et al.* (1993)

showed a great variation in IOTN assessment. In comparison with traditional screening methods, a study by Burden and Mitropolous (1992) showed that the use of the IOTN would increase the number of patients who would be selected for treatment. Swedström-Oristo *et al.* (2002) found several dental criteria that differ between Finnish professionals and the DHC. The use of the DHC would therefore result in treating 50 per cent of the cases that they had rated as being acceptable (no treatment). Younis *et al.* (1997), in a study in the United States of 18 orthodontists and three different treatment need indices, agreed with the recommended cut-off points in the DHC for grade 4. The Health Service Executive in Ireland recently stated that only DHCs 4 and 5 are to be treated (European Federation of Orthodontic Specialists Associations, 2007).

If the DHC is used on dental casts, the instruction is to grade according to the 'worse case scenario' (Richmond *et al.*, 1994). This means that the patient might be graded differently depending on whether the judgement is carried out clinically or on dental casts.

The limited public financial resources for orthodontic treatment is one reason for the increased focus in Sweden on orthodontic treatment and another is the report from the Swedish Council on Technology Assessment in Health Care (2005) in which malocclusions and orthodontics are considered in relation to health. If the present study had been undertaken today, the results might be different.

Conclusions

1. Participating Swedish orthodontists graded fewer malocclusions as borderline (DHC grade 3).
2. They considered that the majority of the malocclusions in DHC grade 3 should be classified as 'need for treatment' (DHC grade 4).
3. Females classified 3f as more severe than males.

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