# The relationship between patient, parent and clinician perceived need and normative orthodontic treatment need

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SUMMARY The aim of the present study was to compare patient, parent and clinician perceived need for orthodontic treatment in relation to normative orthodontic treatment need as measured by the Index of Orthodontic Treatment Need (IOTN). A prospective cross-sectional study was designed to address this aim. The sample comprised 103 patients attending the 'new' patient clinic at the Jordan University Hospital. The patients' mean age was 15.3 years (standard deviation 3.8 years); 33 per cent were males and 67 per cent females. One clinician scored the patients' normative orthodontic treatment need using the IOTN, then determined perceived need using a 10 cm visual analogue scale (VAS). The subjects then assessed their own perceived need and aesthetic component (AC) score and the parents carried out similar assessments for their children. All scoring was carried out blind.

The parents had the highest average perceived need scores, followed by patient and clinician scores (6.6, 6.1 and 5.4 cm, respectively). A significant difference was found between the parents and the clinician (P < 0.05). When the relationship between perceived need and clinician-measured normative orthodontic treatment need was investigated, significant differences were found with the dental health component (DHC) for all three groups (P < 0.05). Differences between AC and perceived need scores were also significant for the patients and parents, but not for the clinician (P > 0.05). The present study has shown that perceptions of orthodontic treatment need are multifactorial and influenced by elements other than health measures of normative orthodontic treatment need and perceptions of aesthetics.

### Introduction

Orthodontic treatment need has been one of the main reasons for the development of many occlusal indices (Sclare, 1945; Moore, 1948; Poulton and Aaronson, 1961; Grainger, 1967; Salzmann, 1968; Linder-Aronson, 1974; Brook and Shaw, 1989). In addition, occlusal indices devised for other purposes have been used to assess treatment need (Björk *et al.*, 1964; Summers, 1971; Pickering and Vig, 1975). Use of such indices allows individuals with the greatest need to be assigned priority when orthodontic resources are limited and when treatment availability is unevenly spread. Similarly, individuals with little need for treatment can be safeguarded from the potential risks of unnecessary treatment.

The Index of Orthodontic Treatment Need (IOTN) is essentially a method of defining the severity or degree of occlusal traits that may constitute a threat to the longevity of the dentition. These traits are then allocated into grades, which define the priority of treatment need. The index incorporates both a dental health component (DHC) (Brook and Shaw, 1989) and an aesthetic component (AC) (Evans and Shaw, 1987). Details of the DHC and representative photographs of the AC have been published (Brook and Shaw, 1989). The validity and reliability of the IOTN have been established by several researchers (Richmond, 1990;

Richmond *et al.*, 1995; Younis *et al.*, 1997). The index has also been modified to ensure greater reliability, especially when used by non-specialists in oral health surveys (Burden *et al.*, 2001).

Occlusal indices define orthodontic treatment need from a clinician's point of view (normative need). However, no consideration is given to the concepts of perceptual, functional and social need. The importance of patients' perceptions regarding orthodontic treatment cannot be underestimated, as it is the patients who receive treatment and need to gain satisfaction from improved aesthetics and function (Yeh *et al.*, 2000). In addition, the desire for orthodontic treatment is primarily influenced by demand and not always by need (Mandall *et al.*, 2001). As a result, simply measuring normative need may not be useful for predicting demand or for manpower planning.

Several studies have investigated the relationship between normative orthodontic treatment need (clinician measured) and more subjective patient perception of malocclusion (Burden and Pine, 1995; Pietilä and Pietilä, 1996; Mandall *et al.*, 1999; Yeh *et al.*, 2000). Few studies have considered parents' perceptions of orthodontic treatment need (Espeland *et al.*, 1992; Birkeland *et al.*, 1996). Ultimately parents make the final decision about treatment, and may have different motives than their children (Baldwin, 1980). It has also been reported that parents are the most powerful single factor in the motivation for treatment (Lewit and Virolainen, 1968).

Espeland et al. (1992) investigated the relationship between a newly introduced Norwegian IOTN and orthodontic concern among potential patients and their parents. A composite measure of child and parent satisfaction with dental appearance and treatment need was used. No attempt was made to compare patient and parent assessments. The results showed that orthodontic concern was significantly related to index group. Birkeland et al. (1996) compared the IOTN with orthodontic concern among 11-year-old children and their parents and found that parental dissatisfaction with their child's dental arrangement and the desire for treatment was greater than the child's own assessments. However, a meaningful association between orthodontic concern and the IOTN was found for both groups.

The aims of this cross-sectional prospective study were to:

- 1. Investigate patient attitudes towards their malocclusion and orthodontic treatment including the motivation for seeking treatment, and attitudes towards different treatment modalities and treatment duration.
- 2. Compare clinician-measured normative aesthetic treatment need (IOTN-AC) with the patient's own and parents' AC scores.
- 3. Compare patient, parent and clinician perceived need for orthodontic treatment.
- 4. Study the relationship between perceived need and clinician-measured normative orthodontic treatment need (IOTN–DHC and AC).

The following null hypotheses were tested:

- 1. There is no difference between patient-, parentand clinician-measured AC, or perceived need for orthodontic treatment.
- 2. There is no difference between patient-, parent- and clinician-measured perceived need and normative orthodontic treatment need.

### Subjects and methods

### Sample selection

The study sample comprised 103 patients attending the 'new' patient orthodontic clinic at the Jordan University Hospital. It was not possible to select a consecutive sample due to the time constraints of the clinical session where attending patients were provided with an orthodontic diagnosis and treatment plan. Hence, every third patient was selected for inclusion in the investigation.

### Interviews and clinical examinations

The study was divided into two parts: an interview of patients and parents or guardians carried out by AMH and RO (an intern at the Jordan University Hospital) and a clinical examination carried out by AMH.

The patients were asked five questions (Figure 1). In questions (2) and (4) more than one possible answer was acceptable. The interviewer prompted patients by presenting each possible answer for a response (Figure 1). A removable appliance and photographs of fixed appliances and a patient wearing headgear were used as visual aids in question (4). In question (5) the patients were first asked if they were willing to wear a brace for over 2 years. If the response was negative, 1–2 years was offered and then finally 0–6 months.

Once the interview was complete, normative orthodontic treatment need (DHC and AC of the IOTN) was scored by AMH (an orthodontist trained and calibrated in the use of the IOTN). The perceived need for orthodontic treatment was then measured using a 10 cm visual analogue scale (VAS) anchored by the phrase 'No need for treatment' at the 0 cm end and 'Very great need for treatment' at the other end. A vertical line was drawn to intersect the scale where appropriate.

With patients and parents kept apart, the former were asked to choose the photograph they thought 'best

- Y/N 1. Have you ever been teased about the appearance of your teeth? What is / are the reason(s) for seeking orthodontic treatment? Aesthetics a. b. Speech с. Mastication d. TMJ problems Referral from dentist f. Other reasons e. 3. Who initiated the appointment with the orthodontist? General dentist а School dentist b. Medical doctor с. d. Patient Parent f. Other e. What type of treatment would you be happy with to have straight teeth? 4 a. Extractions Removable appliances b. Fixed appliances с.
  - d. Headgear
  - e. Orthognathic surgery
- 5. How long would you be happy to wear a brace full-time (except headgear)?

a.	0 - 6 months	b. 1 -2 years	<li>c. Over 2 years</li>
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Figure 1 Patient interview.

looked like' their teeth from the AC of the IOTN (Evans and Shaw, 1987). This was carried out from memory and no self-examination was allowed. The patients were then asked to determine their perceived need for orthodontic treatment using the VAS. Similarly, the parents were asked to score the AC of the IOTN and perceived need for their child. All scoring was carried out blind and patients and parents were not allowed to see each other's scores.

### Statistical analyses

Associations between variables were tested using Spearman's correlation coefficient (rho). Parametric data (perceived need measurements) were analysed using one-way ANOVA with a Tukey's honestly significant difference test and a Bonferroni correction, while non-parametric data were analysed using a Wilcoxon matched-pairs signed-ranks test. Data were analysed using the SPSS (version 10.1) for Windows (SPSS, Chicago, Illinois, USA) statistical package and significance levels were set at 0.05.

### Results

The subjects were aged 9–30 years (mean 15.3 years, standard deviation 3.8). Thirty-three per cent were males and 67 per cent females. Only 14 patients (13.6 per cent) were adults (above 18 years).

### Reliability

Twenty patients (20 per cent of the sample) covering the full range of DHC and AC scores were invited for a second examination at least 4 weeks later to assess intra-examiner reproducibility. The reproducibility of non-parametric data (DHC and AC of the IOTN) was assessed using the kappa statistic, while the reproducibility of parametric data (perceived need scores) was determined using a *t*-test for paired samples.

Kappa scores of 0.85 [95 per cent confidence interval (95% CI) 0.73–0.98] and 0.78 (95% CI 0.64–0.95) showed reliability to be satisfactory for the DHC and AC, respectively (Landis and Koch, 1977). However, patient and parent AC scores showed only moderate agreement, with kappa scores of 0.40 (95% CI 0.18–0.82) and 0.42 (95% CI 0.21–0.88), respectively. Differences between perceived need scores were not statistically significant (P > 0.05) for all three groups.

# Patients' attitudes towards malocclusion and orthodontic treatment

Forty per cent of the sample had been teased about the appearance of their teeth (71 per cent of females and 29 per cent of males). The majority of patients (93 per

cent) reported aesthetics as being a reason for seeking treatment, with only seven patients attending for other reasons, including; referrals, problems with mastication, general check-ups and to 'please' parents.

One-fifth of patients reported a second reason in addition to aesthetics; masticatory difficulties were reported in 11 per cent and an equal number of patients reported temporomandibular joint problems and difficulties in speech (7 per cent each).

The patients were the main initiators of orthodontic appointments (43 per cent) followed by parents (30 per cent). General dental practitioners referred 18 per cent of patients and paediatric dentists 9 per cent.

Figure 2 illustrates the patients' willingness to comply with different orthodontic treatment modalities. Fixed appliances were most popular, with 88 per cent of patients willing to wear them as part of their treatment, followed by removable appliances (82.5 per cent). Around three-quarters of the patients were happy to have extractions, whereas orthognathic surgery and headgear wear were least acceptable (45 and 41 per cent of patients, respectively; Figure 2). Only 18 per cent of the subjects were willing to undergo all types of treatment to have straight teeth.

Over half of the sample (58 per cent) were happy to wear appliances for over 2 years if necessary, 34 per cent would wear them for 1–2 years and 9 per cent only for up to 6 months.

### Normative orthodontic treatment need

Tables 1 and 2 illustrate the distribution of normative orthodontic treatment need according to the DHC and AC of the IOTN, respectively. A definite need for orthodontic treatment (DHC grades 4 and 5) was recorded in 71 per cent, borderline need (grade 3) in 22 per cent and little need in only 7 per cent of the sample (Table 1). Around one-fifth of the sample (21 per cent) exhibited a clear need for treatment on aesthetic grounds (AC grades 8–10). A borderline need (grades 5–7) was recorded in 31 per cent, while around half the sample (48 per cent) showed little or no need for treatment (grades 1–4) (Table 2).



Figure 2 Willingness of patients to comply with orthodontic treatment modalities.

**Table 1** Percentage distribution of normative orthodontictreatment need: the dental health component (DHC) of theIndex of Orthodontic Treatment Need.

DHC grade	1	2	3	4	5
Distribution	0	7	22	60	11

**Table 2** Percentage distribution of normative orthodontictreatment need: the aesthetic component (AC) of the Indexof Orthodontic Treatment Need (SCAN index).

AC grade	1	2	3	4	5	6	7	8	9	10
Distribution	2	7	24	15	18	8	5	15	2	4

### Comparison of AC scores

Figure 3 provides a comparison between clinician, patient and parent AC scores. The majority of patients (73.3 per cent) scored their malocclusions between grades 1 and 4, indicating little aesthetic impairment. The parents allocated around 60 per cent of their children to AC grades 1–4, while the clinician scored 48 per cent in this category.

There was considerable variation in identifying borderline aesthetic need malocclusions (grades 5–7). Only 10 per cent of patients designated their malocclusions to this category, while the clinician and parents allocated 31 and 23.5 per cent of patients, respectively (Figure 3). The allocation of patients to AC grades 8–10 (definite need) was similar among the three groups, with the clinician being more critical of a patient's malocclusion (Figure 3).

Statistical analysis for AC scores showed that differences between the clinician and patient were statistically significant (P < 0.05). Both clinician/parent and patient/parent AC score differences were not statistically significant at the 5 per cent level.

It must be noted that for the 18 adult subjects in the sample, parent or guardian AC and perceived need



Figure 3 Comparison of SCAN scores.

scores could not be obtained. This did not adversely affect the statistical analysis of the data.

### Comparison of perceived need measurements

Descriptive statistics of perceived need measurements for the clinician, patients and parents are illustrated in Table 3. The parents had the highest average perceived need scores followed by the patients' own and clinician scores (Table 3). A significant difference of 1.2 cm (P < 0.05) was found between parent and clinician scores.

### The relationship between normative orthodontic treatment need and perceived need

When the relationship between clinician-measured DHC and patient, parent and clinician perceived need scores was investigated, significant differences were found for all three groups (P < 0.05). Differences between clinician-measured AC and patient, parent and clinician perceived need were also significant for patients and parents but not for the clinician (P > 0.05). Furthermore, when patients' and parents' AC scores were compared with their corresponding perceived need scores, significant differences were found for both groups (P < 0.05).

### Discussion

The Jordan University Hospital is a referral centre for the whole Kingdom; in addition, patients can book appointments directly without a referral letter. This makes the present study sample different to some European countries where referral from a practitioner is required. Consequently, it may be expected that the present sample would include a smaller proportion of patients with a 'definite need' for treatment on dental health grounds (DHC–IOTN). This was not the case, as 71 per cent of the sample exhibited such a need.

In the present study, twice as many females presented for orthodontic consultation than males. This finding is supported by previous studies. Shaw (1981) and Pietilä

**Table 3** Comparison of perceived orthodontic treatmentneed.

	Mean	SD	Range	Mean difference
Clinician (C)	5.4 cm	3.4	9.8	(C–Pt) –0.7
Patient (Pt)	6.1 cm	2.6	9.9	(Pt–Pa) –0.5
Parent (Par)	6.6 cm	2.6	9.6	(Par–C) 1.2*

\*Significant at P < 0.05 (one-way ANOVA and Tukey's honestly significant difference test). SD, standard deviation. and Pietilä (1996) showed that dissatisfaction with dental appearance was more common among girls than boys. Roberts *et al.* (1989a) found that girls were more frequently treated than boys. Holmes (1992) suggested that a greater proportion of females perceived themselves as having less attractive dentitions despite any objective evidence to support this view.

# Patients' attitudes towards malocclusion and orthodontic treatment

In the present study, 40 per cent of the sample had been teased about the appearance of their teeth. Of those who had been teased, 63 per cent initiated the orthodontic appointment, indicating that teasing may have played a role in the uptake of orthodontic treatment. However, there was only a weak association between teasing and patient AC and perceived need scores (rho = 0.26 and 0.30, respectively). Weak associations were also found between teasing and treatment need (clinician measured) according to the DHC and AC of the IOTN (rho = 0.18 and 0.35, respectively). It seems that teasing about the appearance of a subject's teeth was influenced by a variety of factors and that severity played only a minor role. Mandall et al. (1999) found that despite increased teasing reported in more socially deprived children, it is not known whether teasing is related to social deprivation or if teasing about teeth is dependent on the severity of dental aesthetics. Shaw et al. (1980) reported that approximately 60 per cent of children teased about their teeth disliked it. They found that dental features provided a significant target for teasing in particular and the more deviant the dental arrangement the more salient it was (Shaw et al., 1980).

The subjects in the present study had a very positive attitude towards orthodontic appliances (Figure 2). Both fixed and removable appliances were acceptable (88 and 82.5 per cent, respectively), even extractions were regarded as satisfactory by three-quarters of the subjects. It was not surprising that headgear and orthognathic surgery were the least popular, because of aesthetic considerations of the former and possible post-operative complications and a general fear of operations of the latter. Attitudes towards treatment duration were also positive, with 92 per cent of subjects willing to have treatment for 1–2 years.

### Normative orthodontic treatment need

Seventy-one per cent of the subjects exhibited a definite need for orthodontic treatment according to the DHC of the IOTN (Table 1). Because around one-quarter of the present sample was referred, it is expected that DHC figures were skewed compared with the published epidemiological figure of 28 per cent (Hamdan, 2001). Conversely, a clear need for treatment on aesthetic grounds was only found in around one-fifth of the sample (Table 2).

In the present study, patient AC and perceived need scores were pooled, irrespective of gender or social class; this was in concordance with recent studies (Burden and Pine, 1995; Mandall *et al.*, 1999). Mandall *et al.* (1999) showed that ethnicity, social deprivation and gender did not influence a child's orthodontic self-perceived AC score or self-perceived need for orthodontic treatment. Burden and Pine (1995) found that adolescents scored by a trained examiner using the IOTN as having similar dental aesthetics have similar perceptions of their malocclusion irrespective of their gender or social background. Cons and Jenny (1994) also found no ethnic differences in the perceptions of dental aesthetics when comparing the Dental Aesthetic Index scores of 11 ethnic groups with American subjects.

In contrast, some earlier studies investigating selfperception of malocclusion have shown gender and social class differences, with females (Shaw *et al.*, 1991; Holmes, 1992) and higher social class individuals (Jenkins *et al.*, 1984) considered more critical of their dental aesthetics.

### Comparison of AC scores

Comparison of clinician-measured normative aesthetic treatment need (AC-IOTN) with patients' own and parents' scores showed the former to be most critical of malocclusions (Figure 3). The clinician allocated more subjects to the borderline and definite need categories (52 per cent) than patients or parents (Figure 3). Power calculations indicated that a one grade AC difference between any two groups would be detected with a power of 0.97 (alpha = 0.05) for the present sample size. Significant differences were found between the clinician and patients (P < 0.05). The latter finding is supported by other studies where orthodontist ratings for treatment need were more critical than child or lay opinion (Shaw et al., 1975; Prahl-Andersen et al., 1979; Lindsay and Hodgkins, 1983; Stenvik et al., 1997; Mandall et al., 2001).

Figure 3 also shows that the proportion of subjects allocated to the clear need for treatment category were similar among the three groups. This may indicate that cases with more severe aesthetic impairment were more easily identified by all groups. This finding requires further investigation.

### Comparison of perceived need measurements

Comparison of perceived need measurements showed that parents had the highest scores (Table 3). A difference of 1.5 cm between any of the three groups would be detected with a power of 0.89 (alpha = 0.05) for the present sample size. A significant difference was found

between the parents' and clinician's scores (P < 0.05). Possible explanations for this finding could be that parents overscored treatment need because they felt a sense of obligation to provide the best care for their children, or so that they would not be held accountable by their children in future for not providing treatment. Birkeland *et al.* (1996) found that the parents' desire for their child to have treatment was greater than the child's own assessment. Roberts *et al.* (1989b) found that children, parents and dental practitioners did not respond to similar degrees of malocclusion with equal degrees of concern.

# *The relationship between perceived need and normative orthodontic treatment need*

When the relationship between perceived need and clinician-measured normative orthodontic treatment need was investigated, significant differences were found between the DHC and the former for all three groups (P < 0.05). Differences with the AC were also significant for patients and parents but not for the clinician's perceived need scores (P > 0.05). These findings have several implications: the null hypothesis that there was no difference between perceived need and normative orthodontic treatment need as measured by the DHC was rejected. This suggests that in the present study, the DHC may not be a good predictor of perceived need. Similarly, the AC did not reflect patient and parent perceived need. Alternatively, it may be that patients and parents overscored perceived need in the hope that they could secure treatment.

On the other hand, the AC may have influenced the clinician's perceived need as there were no significant differences between the two measurements. This finding is not surprising as the clinician is experienced in the use of the IOTN and this may have influenced his perceived need score. Parents and patients had no previous knowledge of the IOTN, so this was less likely to happen. Hence, when AC and corresponding perceived need measurements for patients and parents were compared, significant differences were found for both groups (P < 0.05).

Yeh *et al.* (2000) studied the relationship between the IOTN and patients' perceptions of aesthetics, function, speech and treatment need. They found that the AC was the only predictive variable of perceived need for treatment. Weak associations were found between all variables tested and the DHC of the IOTN. Other investigations have found meaningful relationships between the AC of the IOTN and self-perception of malocclusion (Burden and Pine, 1995), satisfaction with dental appearance (Pietilä and Pietilä, 1996), orthodontic concern (Birkeland *et al.*, 1996) and aesthetic self-perception and treatment experience (OASIS) (Mandall *et al.*, 1999).

### Conclusions

The present study has shown that perceptions of need for orthodontic treatment are multifactorial and influenced by elements other than measures of normative orthodontic treatment need and perceptions of aesthetics. While patients seem mostly aware of their malocclusion traits, they do not perceive a need for treatment to the same extent as the dentist or orthodontist (Kerr and O'Donnell, 1990; Espeland and Stenvik, 1991; Phillips et al., 1992; Mandall et al., 1999). Factors that may contribute to these differences are social class, economic considerations, individual perceptions of psychosocial benefits, and attitudes to appliances (Birkeland et al., 1996). Care must be taken not to generalize these findings, as cultural differences between various study samples may influence perceptions of aesthetics and treatment need. Further work is required to help quantify factors that influence patient and parent perceived need for orthodontic treatment and perhaps incorporate them into indices of treatment need such as the IOTN.

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