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Assessment of the relationship between perceptions of dental aesthetics and demand for orthodontic treatment in 10 – 11 year old school children in Birmingham, UK.

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Objective: To examine the relationship between perceptions of dental aesthetics and demand for orthodontic treatment, and to determine whether the former can be used to predict the latter. ***Method:*** A prospective cross sectional epidemiological survey of a random and representative sample of comprehensive primary schools in South Birmingham, UK. Participants were 389 randomly selected school children aged 10–11 years from 7 primary schools in South Birmingham. Their perceptions of dental aesthetics were determined using the Aesthetic Component (AC) of the Index of Orthodontic Treatment Need (IOTN). Demand for treatment was assessed by asking subjects if they wanted treatment with braces to correct their teeth. ***Results:*** Only 2% of subjects assessed their dentition in the "definite need" for orthodontic treatment category. Demand for treatment was significantly greater in girls than boys (49% and 37% respectively, $p<0.05$). Total demand (41%) was considerably greater than self assessed aesthetics in the "definite need" and "borderline need" categories combined (14%). Demand was accurately reflected in patients who perceived their dentition as having moderate to severe (AC 6–9) and very mild aesthetic impairment (AC 1). ***Conclusions:*** Perceptions of dental aesthetics using the AC of IOTN were able to predict demand for orthodontic treatment in patients with malocclusions of moderate to severe (AC 6–9) aesthetic impairment.

Key words: Perceptions of dental aesthetics, treatment demand, IOTN

Introduction

Although some patients who seek orthodontic treatment may have a dental health complaint, the majority of patients presenting for treatment will do so for aesthetic concerns (Bernabe *et al.*, 2006; Brook and Shaw, 1989). Mandall *et al.* (1999) showed that seekers of orthodontic treatment placed higher value on aesthetic tooth appearance than non seekers. It is therefore of great importance to take patients' perceptions of aesthetic treatment need into consideration when planning for the provision of orthodontic treatment, since they are the ones who will receive treatment and need to gain satisfaction from improved aesthetics and function (Yeh *et al.*, 2000).

A patient's perception of aesthetic treatment need is not always translated into demand. Some patients may perceive that they have an aesthetic impairment; however, they may not wish to act on it and seek treatment. Furthermore, O'Brien *et al.* (1996) found that some referred patients rejected orthodontic treatment for professionally perceived handicapping malocclusions while others sought treatment for minor deviations. The provision for orthodontic treatment is therefore influenced more by demand than need (Hamdan, 2004; Mandall *et al.*, 2001). Hence, measurement of normative need may not be a useful indicator for the prediction of demand or for manpower planning.

The IOTN is a method for defining the severity of occlusal traits that may constitute a threat to the longevity of the dentition. Traits are allocated into grades, which define 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 are illustrated in the original paper by Brook and Shaw (1989).

In the United Kingdom, National Health Service regulations state that orthodontic treatment should be limited to patients with an IOTN DHC of 4 or 5 and DHC of 3 combined with an AC of 6 or more (DH, 2006). While this system aims at providing treatment to those who need it most, it reflects only the professional viewpoint and it is not always relevant to patients' perceptions and the effects that orthodontic care may have on their daily lives (O'Brien *et al.*, 2006). This arguably, may lead to denial of treatment to patients with a genuine socio-dental need. Hence, a method incorporating patient's values into an evaluation of treatment need is required (de Oliveira *et al.*, 2008)

The two aims of this study are to compare the relationship between perceptions of dental aesthetics using the AC of IOTN with demand for orthodontic treatment in 10–11 year old children attending primary schools in South Birmingham and to determine whether perceptions of dental aesthetics can be used to predict treatment demand.

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Method

Ethical approval was obtained from the East Birmingham Local Research Ethics Committee prior to data collection (REC reference number: 06/Q2703/119) and included approval of the participation/consent forms.

The local education authority was contacted to obtain basic epidemiological data needed for sample selection. There were 82 primary schools in South Birmingham and year 6 was selected to best represent the 10–11 year old age group required for the present study. The total number of school children attending year 6 classes in South Birmingham was 3,691. For the purposes of the present study, a sample size of around 10% was considered representative of this target population. The local education authority also provided a booklet entitled 'Starting your child at school' which included contact details of all the schools in Birmingham. The list was used to select every third South Birmingham school for inclusion in the study giving a total of 29 schools.

Selected schools were contacted by telephone and an appointment sought with the head teacher to obtain permission to conduct the study. Of the 29 schools contacted; 5 were not interested and declined to arrange an appointment, 16 schools asked for additional information about the study stating they would be in contact if they were interested. Eight schools showed an immediate interest and an appointment was arranged. A detailed explanation of the study was outlined at the initial appointment and if the head teacher agreed for the school to participate in the study, a date was arranged for data collection.

All 8 schools visited agreed to participate in the study, however it was not possible for data to be collected from one of the schools since no mutually convenient date was available within the time constraints of the present study (i.e. before the summer holidays). Subjects with previous experience of orthodontic treatment or whose teacher identified them as having learning difficulties were excluded from the study. Consent/participation forms were given to each school's head teacher for distribution to all year 6 children 2 weeks prior to data collection. Children were asked to return the signed form if they and their parent/guardian agreed to take part in the study. One of the authors (VS) was available on the day of the study to collect these forms.

A simple data collection sheet was designed for subjects to record their age in years and months, gender, perceptions of dental aesthetics, assessment of treatment demand and the reasons for demand (Figure 1). Pictures showing the grades for the AC of IOTN were used to aid subjects in the self-assessment of dental aesthetics. Using a data projector the AC pictures were projected onto one of the walls of the classroom. Subjects were shown all 10 photographs and told that photo 1 represented the 'most attractive' or 'nicest' looking set of teeth and photograph 10 represented the 'worst'. They were then asked to select where they thought their own teeth should lie on the 10 point scale and to record their answer on the data collection sheet.

Subjects were then asked to answer the question 'Do you want treatment with braces to correct your teeth?' If their answer was 'Yes'; they were asked to give the reason(s) why they wanted treatment. Data collection was carried out in the classroom by one of the authors (VS) with the teacher present. Exam conditions were maintained so that individual opinions were recorded without bias from peers or teachers.

Statistical analysis was carried out using the SPSS statistical package (SPSS Release 12.0.1 for Windows 2003. SPSS Inc., Chicago, Illinois 60606, USA). Differences between boys' and girls' responses were examined using a Mann-Whitney Test and significance level was set at $p<0.05$. Associations between perceptions of dental aesthetics and demand were studied using Spearman's correlation coefficient.

Results

A total of 389 year 6 primary school children participated in the study: 10.4% of the target population. Data were collected from 18 classes in 7 schools. Excluded from the study were 13 subjects (8 boys and 5 girls) who did not complete the questionnaire fully. This resulted in a final sample size of 371 subjects with a mean age of 11.3 years (sd 0.3 years), almost equally divided according to gender (185 boys, 186 girls).

Table 1 shows the distribution of scores for perceptions of dental aesthetics using the AC of IOTN. A Mann-Whitney Test showed no significant gender differences

Age: _____ Years _____ Months

Gender: Male Female *(Please circle correct answer)*

Please answer the following questions:

1. If photograph number **1** represented the 'most attractive' or 'nicest' looking set of teeth and photograph number **10** represented the 'worst'. Please select where you think ***your own teeth*** should be on the 10 point scale and write it in the adjacent space. _____
2. Do you want treatment with braces to correct your teeth? **Yes** **No** *(please circle correct answer)*
3. If your answer to question 2 was 'Yes', why do you want treatment?

Figure 1. *Data collection sheet*

(p>0.05). The majority of subjects (86%) assessed their dentition as having "little/no need" for treatment (AC grades 1–4), while 12% found they had a "borderline need" (AC grades 5–7) and only 2% a "definite need" for treatment (AC grades 8–10) (Table 1).

The total demand for both boys and girls was 41%. Demand for orthodontic treatment was greater among girls than boys; 49 and 37% respectively (p<0.05). Table 2 lists the reason given by subjects who demanded orthodontic treatment according to gender. The most common reason for demand was "over crowding/crowding". This was selected by 33% of subjects followed by a desire to have "straight teeth" (24%). Having "gaps" was the third most common reason for treatment demand (12%).

Figure 2 illustrates the percentage distribution of treatment demand according to self-assessed AC grade. All subjects who rated their teeth AC 7–9 demanded orthodontic treatment. In addition, 81% of subjects who assessed their dentition as AC 6 demanded treatment. Conversely, the majority of subjects who assessed their teeth as AC 1 did not want orthodontic treatment.

Table 1. Boys and girls self-assessed rating on the AC of IOTN scale

IOTN(AC)	Boys (n=185) (%)	Girls (n=186) (%)	Total (n=371) (%)
1	22	23	22
2	32	34	33
3	22	22	22
4	12	7	9
5	6	4	5
6	4	4	4
7	2	3	2
8	0	2	1
9	1	1	1
10	0	0	0

The association between perceptions of dental aesthetics and treatment demand were studied using the Spearman's correlation coefficient. The cut-off point between need/no need was selected at AC 8 as advocated by the original authors of the AC of IOTN (Evans and Shaw 1987). The correlation between perceptions of dental aesthetics and treatment demand was 0.18. The data were analysed further by changing the cut-off point between need/no need to include subjects with a self-assessed "borderline need" for treatment (AC grades 5–7). The correlation with treatment demand when AC grade 4 was the cut off point was 0.36.

Discussion

The elective nature of orthodontic treatment necessitates assessments of both children's and parents' commitment, desire and demand for orthodontic treatment before treatment is commenced (Chew and Aw, 2002). The present study examined the relationship between perceptions of dental aesthetics and treatment demand in 10–11 year old schoolchildren in Birmingham, and to determine whether the former accurately reflects the latter. This age range was selected because previous research into decision making suggested that children below the age of 10 years have difficulty in making decisions on aesthetic improvement (Shaw, 1981). Furthermore, participants in the present study were at an age that they were unlikely to have experienced orthodontic treatment.

There were no significant gender differences in perceptions of dental aesthetics (Table 1). This finding is in agreement with previous studies (Mandall *et al.*, 1999; Ngom *et al.*, 2007). However, other investigations have shown gender differences with girls being more critical of their dental aesthetics than boys (Christopherson *et al.*, 2009a; Shaw *et al.*, 1991)

Only 2% of subjects selected AC photos 8–10, which represented a "definite need" for treatment, as being closest to their own teeth. Similar findings have been demonstrated in previous investigations, indicating that children are less critical of their own malocclusions than clinicians, lay persons and parents (Hamdan, 2004; Mandall *et al.*, 2001). One study alone has suggested

Table 2. Reasons given for treatment demand according to gender

Reason	Boys (n=63)	Girls (n=90)	Total (%)
Over crowding / crowding	20	31	33%
Want straight teeth	16	21	24%
Gaps	10	8	12%
Top teeth stick out / top jaw forward	5	8	9%
Dentist says I need a brace	4	8	8%
Teeth wrong way round / bottom teeth forward	2	2	2%
Teeth growing out the wrong way	-	3	2%
My mother says I need a brace	-	1	1%
Cannot eat properly	1	-	1%
People make fun of my bent teeth	1	-	1%
Cannot brush my teeth properly	1	-	1%
Lost many teeth	1	-	1%
I suck my thumb	-	1	17%
No reason given	2	7	6%

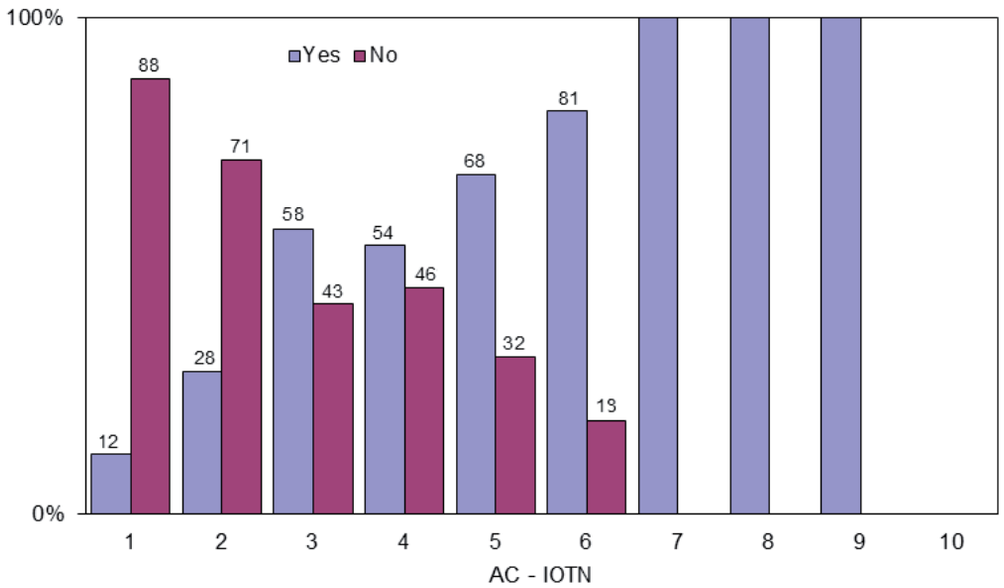

Figure 2. *Percentage distribution of demand for orthodontic treatment according to self-assessed AC - IOTN*

that children were more concerned about their facial and dental appearance than their parents; this was in Nigeria (Kolawole *et al.*, 2008).

Demand for orthodontic treatment among South Birmingham school children was 41%, similar to that reported by O'Brien *et al.* (2006) with 39% demand among 11–12 year old Greater Manchester children. Abu Alhaija *et al.* (2004) found that 49% of north Jordanian school children were willing to have orthodontic treatment if necessary. Demand by girls was significantly greater than amongst boys (49% and 37% respectively, $p<0.05$). Kerosuo *et al.* (2002) found that girls were more likely to pursue orthodontic treatment than boys and concluded that most societies considered that an attractive physical appearance was more important for girls than for boys. O'Brien *et al.* (2006) studied the impact of malocclusion on quality of life and found that girls reported higher impacts on quality of life than boys. However, Ngom *et al.* (2007) found no significant gender differences in the demand among Senegalese school children.

Perceptions of dental aesthetics using the AC of IOTN were not good at predicting demand for orthodontic treatment when AC categories were combined as advocated by the original authors of the IOTN (Evans and Shaw, 1986). Only a few subjects assessed their teeth as having a "definite need" for treatment compared to a high demand of about 40%. Similarly, only 14% of subjects assessed their dentition in the "definite" and "borderline need" categories. Statistical analysis of the association between perceptions of dental aesthetics and demand for orthodontic treatment confirmed this finding. A weak correlation was demonstrated when AC 8 was used as the cut off point between need and no need, and even when the cut off point was changes to include to include "borderline need", the correlation was still a modest one.

Similar findings were reported by Marques *et al.* (2009) when they investigated the factors associated with desire for orthodontic treatment among Brazilin adolescents. Self-perception of dental appearance was measured using the Oral Aesthetic Subjective Impact Scale (OASIS). Results showed that 63% of subjects with a positive OASIS score wanted orthodontic treatment (Marques *et al.*, 2009). Christopherson *et al.* (2009b) explored the relationship between preadolescents' smile-related quality of life and desire for braces. They found that even though 94% of subjects thought they had a nice smile, 92% were happy with their teeth and 88% liked their teeth, almost half (47%) indicated that wanted braces for their teeth

However, analysis of the data on an individual AC grade basis showed that perceptions of dental aesthetics were able to predict demand in children who assessed their dentitions as AC 6–9 (moderate to severe aesthetic impairment) and AC 1 (very mild aesthetic impairment). However, perceptions of dental aesthetics did not accurately reflect demand in children who assessed their dentitions as AC 2–5 (mild to moderate aesthetic impairment).

Demand for orthodontic treatment is governed by many factors including, emotional and social wellbeing (O'Brien *et al.*, 2006) and other psychosocial factors. Self perceived dental aesthetics using AC of IOTN may be a useful tool in assessing demand for treatment. Used in conjunction with the DHC the clinician, patient and parent can come to a realistic understanding of the risks and benefits of orthodontic treatment. Further studies are required to increase our understanding of what drives the demand for orthodontic treatment among those seeking orthodontic care.

The conclusions of this study are:

- Self assessed treatment need was low with only 2% of subjects selecting AC photos that represented a "definite need" for treatment. Demand for orthodontic treatment among girls was significantly greater than boys.
- Total demand for orthodontic treatment was considerably greater than self assessed "definite" and "borderline need".

- Perceptions of dental aesthetics were good at predicting demand for malocclusions of moderate to severe (AC 6–9) and very mild aesthetic impairment (AC 1). However, they were less accurate at predicting demand for subjects with mild to moderate self assessed aesthetic impairment (AC 2–5).

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