

SCIENTIFIC
SECTION

Orthodontic treatment need and self-perception of 11–16-year-old Saudi Arabian children with a sensory impairment attending special schools

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Abstract

Aim: To determine the self-perception and need for orthodontic treatment in young sensory [visual (VI) and hearing (HI)] impaired children attending special schools in Riyadh, Saudi Arabia. Also, to determine if gender and social class background influence the rating and self-perception of malocclusion among the children.

Location: Riyadh, Saudi Arabia.

Design: A prospective study on orthodontic treatment need in sensory impaired children.

Subjects: Seventy-seven VI, 210 HI, and 494 control (C) children aged 11–16 years.

Method: The aesthetic component (AC) of the Index of Orthodontic Treatment Need (IOTN) was determined using the standard 10 pictures for the C group and HI with a modified version (tactile graphic) for VI. The dental health component (DHC) and AC of IOTN were used to allocate each child to no need, borderline need and definite need for treatment subgroups.

Results: Sixty-five per cent of VI, 21.8 per cent HI, and 18.7 per cent of the C were perceived to be in need of orthodontic treatment. However, 55.8 VI, 43 per cent HI and 34 per cent C were rated for treatment need based upon the AC. The difference between the examiner and the child's rating of treatment need was found to be statistically significant among the HI and control children ($P < 0.001$).

Conclusion: The VI children who were scored for treatment by the examiner as having need for treatment had similar perceptions of their treatment need irrespective of their social background. Male VI children had a higher DHC score, but both VI and HI males had a higher normative and self-perceived need based on AC.

Index words:

Malocclusion;
orthodontic treatment
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Introduction

In recent years, the perception of an individual with disability has been slowly evolving from the 'forgotten' person to one who is recognized as needing treatment. One area that typifies this reorganization is dentistry and specifically orthodontic care. Most people undergo orthodontic treatment to improve their dental appearance; indeed, their major concerns are usually related to aesthetics.¹ In relation to facial aesthetics it has been shown that, from the point of view of the patient, teeth

were second in importance only to background facial appearance.² Most individuals who have had orthodontic treatment feel that they have benefited, even though dramatic changes in facial appearance are not always evident.³

A number of studies have suggested that children have developed a perceptual awareness of orthodontic treatment need.^{4–6} Other works have shown that perception of dental attractiveness and treatment needs were similar.⁵ In summary, whilst people seem mostly aware of their malocclusion traits, they do not perceive a need

for treatment to the same extent as a dentist or an orthodontist.⁷

Gender, age, and socio-economic background are also thought to play a role in the self-perception of malocclusion, with females⁸ and higher social class individuals⁹ considered to be more critical of their dental aesthetics.

Recently, occlusal indices have been developed to categorize the treatment of malocclusion into groups according to urgency and need for treatment.¹⁰ One example is the Index of Orthodontic Treatment Need (IOTN), which was developed to rank malocclusion on the basis of the significance of various occlusal traits for dental health and aesthetic components. The index incorporates a dental health component (DHC) based on the recommendations of the Swedish medical board¹¹ and an aesthetic component (AC).¹² The AC comprises a scale of 10 anterior intra-oral photographs showing different levels of dental attractiveness with grade 1 representing the most attractive and grade 10 the least attractive dentition. The need for orthodontic treatment is well documented in the literature using the IOTN, however, very little information is available regarding the aesthetic need for children with sensory impairment.

The present study was designed to record the level of orthodontic treatment need in a sample of sensory impaired children and to compare these with the treatment need in a control group, and to determine if gender and social class background influence the rating and self-perception of malocclusion among the children.

Subjects and methods

Children aged 11–16 years who were attending two special schools in Riyadh, Saudi Arabia, Al-Nour for visually impaired (VI) and Al-Amal for hearing impaired (HI) formed the study group. A control (C) group was established of 494, 11–16-year-old children attending mainstream government education. The latter were selected with the help of the Ministry of Education to ensure a representative sample of the population, accounting for gender and social class variations.

Each child was examined for orthodontic treatment need using the aesthetic component IOTN by a single calibrated examiner (MS). Self-perception of malocclusion was evaluated by asking each child to rate his/her own dental attractiveness using the 10-point AC of IOTN for the C and HI group, whilst four tactile graphics were used for the VI group. These graphics represented photographs 1, 5, 8, and 10. The tactile graphics

were produced and evaluated by the Royal National Institute for the Blind in the United Kingdom.¹³ The thermoform vacuum-forming method was used in order to provide adequate thickness for the anterior-posterior dimension of incisor overjet. It also facilitated the production of several copies as required. The production passes through several stages following the general guidelines for tactile graphic production. The ‘teeth’ were made of vinyl floor tiles equivalent to three-layer paper thickness surrounded by rough textured papers (crepe-paper), which represented the gingivae. The ‘teeth’ and the ‘gingivae’ were adhered to stiff paper. The outcome design was used as a master copy. The master was placed on a perforated metal tray in a vacuum-forming machine to produce the thermoforming copy (tactile graphic). A sheet of plastic of 0.006–0.010-inch thickness called brailon was placed on the top of the master and fastened in place by clamps to produce an airtight seal. The heating unit was set at 392–572°F for approximately 6 seconds. The copy was then peeled from the master and allowed to cool for 5 seconds.

The degree of need that the children perceived for orthodontic treatment was assessed through asking them whether they would like to have orthodontic treatment. The children were also asked, ‘At this time, do you think your teeth are all right as they are, or would you prefer to have them straightened?’

To test reproducibility 30 children were re-examined for AC and DHC.

In countries, which are in transition such as Saudi Arabia, the classification of social class is difficult because of the dramatic changes in culture and infrastructure. Alternatively, the level of income in the Saudi population can act as a factor in classifying the social class of the sample. According to this, the social class in this study was estimated by the father’s occupation.¹⁴ It is divided into three groups: professionals (doctors, dentists) and businessman as upper class; governmental (military, technical workers) as middle class; and manual (tradesmen, farmers) and unskilled (itinerant workers, unemployed) as lower class.

The children were examined under standardized lighting condition using a Daray light. All the data were collected and entered into the SPSS program for statistical analysis. Tests of the association between perception of malocclusion and aesthetic need for treatment, and the variables for gender and social class were tested using non-parametric tests. Significance was set at the 5 per cent level. A Chi-square trend test (producing $P \leq 0.05$) was used for examiner and child comparisons.

Multi-variate analysis was carried out using logistic regression analysis to test the association of various gender, social class, and onset of impairment with outcomes of AC scoring. The odd ratios and 95 per cent confidence intervals were used to compare the relative risk ratio of the studied background factors for the different scoring of AC.

Results

Intra-examiner reproducibility in the use of AC was found (with re-examination of 30 children) with the weighted Kappa value of 0.84 and 95 per cent confidence limits of 0.713.

A total of 77 visually impaired children (38 female and 39 male), 210 hearing impaired children (127 female and 83 male), and 494 control children were examined (258 female and 236 male). The mean age was 12.9 years in the control group, 13.4 in the VI group, and 13.5 in the HI group.

Orthodontic treatment need

Using the IOTN (DHC) index, a 'moderate/borderline' need for orthodontic treatment was found among 13.2 (C), 15.6 (VI), and 16.5 per cent (HI) children, while 9.2, 11.7, and 13.5 per cent of the children, respectively, showed a 'definite need' (Table 1). Although, 30 per cent of HI children and 27.3 per cent of VI children needed treatment compared to 22.4 per cent of the control group, these differences were non-statistically signifi-

cant ($P > 0.05$). The specificity of DHC was 78.60, while sensitivity was 87.50.

Self-perception and aesthetic need for treatment

Table 1 shows the orthodontic treatment need according to the examiner's rating of the dental attractiveness. Most of the children had an appearance where treatment required was either 'moderate or definite' according to the AC. Over 34 per cent of the control, 55.8 per cent of the VI, and 43 per cent of the HI children had a moderate or definite need for treatment, unlike the children's perceived dental attractiveness, where only 18.7 per cent of the control and 21.8 per cent of the HI children perceived a 'moderate or definite' need for orthodontic treatment, but 65 per cent of the VI fell in the same category (Table 1).

From the data, using the chi-square trend test, it was seen that VI children tend to over-score the examiner by 10 per cent in their self-perception compared to under-score of control by 15.3 and 21.2 per cent of HI children ($P < 0.001$).

A chi-square trend between the AC and DHC scores based upon the professional assessment was shown to be highly statistically significant ($P < 0.001$) in the three groups.

The difference between gender to normative child's attractiveness grouped by treatment need categories, reached a statistically significant level in the HI group only ($P < 0.001$). HI Males were graded for treatment needs more than females (Table 2). However, VI and HI boys were found to have less attractive dental appear-

Table 1 Examiner's rating and children's (number with percentage in parentheses) perceived dental attractiveness according to categories of treatment need. Dental Health Component (DHC) scores given by category of treatment need

Treatment need	DHC	Control (C)	Visually (VI)	Hearing (HI)
No need for treatment	1, 2	375 (77.6)	56 (72.7)	145 (70)
Moderate/borderline	3	64 (13.2)	12 (15.6)	34 (16.5)
Need for treatment	4, 5	44 (9.2)	9 (11.7)	28 (13.5)
Examiner's rating level of dental attractiveness (AC) according to treatment need*				
No need for treatment	1-4	293 (60.6)	34 (44.2)	118 (57)
Moderate/borderline	5-7	161 (33.4)	30 (39)	78 (37.7)
Need for treatment	8-10	29 (6)	13 (16.8)	11 (5.3)
Children's perceived dental attractiveness (AC) according to treatment need†				
No need for treatment	1-4	393 (81.3)	27 (35)	161 (78.2)
Moderate/borderline	5-7	49 (10.2)	17 (22)	34 (16.5)
Need for treatment	8-10	41 (8.5)	33 (43)	11 (5.3)

* $P < 0.001$, C v. VI; $P < 0.001$ VI v. HI.

† $P < 0.001$, C v. VI; $P < 0.001$ VI v. HI.

ances and a greater perceived need for orthodontic treatment need than the girls ($P < 0.01$) (Table 2).

The difference between children's perceived level of dental attractiveness according to treatment need and social class, failed to reach a statistically significant level in the three groups when tested using the Chi-square test (Table 3).

Multi-variate analysis was carried out using a stepwise logistic regression to determine the factors which were independently related to the examiner's professional AC scores and the child's self-perception according to treatment need (5–10) when other variables were held constant. A statistical significant difference was found only in the sensory impaired children. Table 4 revealed the factor that remained statistically significant with examiner's normative child dental attractiveness AC scores was being a male (OR = 1.91). The confidence intervals showed that in the case of being male, it might

be as high as 3.5. However, for children's self-perception AC scores, the factor that remained as statistically significant (having been impaired since birth (OR = 2.84)) tend to perceived aesthetics less than having lost the sense after birth (Table 5). The confidence intervals showed that in the case of impaired since birth it might be as high as 6.79.

Children interview

More than half (55.3 per cent) of the children from the control group requested treatment, similarly 61 per cent of VI children and 56.7 per cent of HI children requested treatment. There was no statistically significant difference in the children's responses. Visually impaired children (61 per cent) who thought they needed treatment were objectively rated for treatment based using the examiner's normative assessment (55.8 per cent) and

Table 2 Examiner's rating level of dental attractiveness (AC) and children's self-perception (AC) according to treatment need, by gender

AC	No. (%) of children					
	Control		VI		HI	
	F	M	F	M	F	M
Examiner's rating level of dental attractiveness (AC) by gender*						
1–4	157 (62.1)	136 (59.1)	18 (47.4)	16 (41)	80 (64)	38 (46.3)
5–7	81 (32)	80 (34.8)	13 (34.2)	17 (43.6)	44 (35.2)	34 (41.5)
8–10	15 (5.9)	14 (6.1)	7 (18.4)	6 (15.4)	1 (0.8)	10 (12.2)
Children's perceived level of dental attractiveness (AC) according to treatment need†						
1–4	207 (81.8)	186 (80.8)	15 (39.5)	12 (30.7)	101 (81.5)	60 (73.1)
5–7	24 (9.5)	25 (10.9)	12 (31.6)	5 (12.8)	21 (16.9)	13 (15.9)
8–10	22 (8.7)	19 (8.3)	11 (28.9)	22 (56.5)	2 (1.6)	9 (11)

* $P < 0.001$ for HI.

† $P < 0.01$, VI; $P < 0.01$, HI.

Table 3 Examiner's rating level of dental attractiveness (AC) and children's perceived level of dental attractiveness (AC) by social class of the children

AC	No. (%) of children								
	Control			VI			HI		
	Upper	Middle	Lower	Upper	Middle	Lower	Upper	Middle	Lower
Examiner's rating level of dental attractiveness (AC) by social class									
1–4	73 (61.3)	185 (60.3)	31 (63.3)	4 (44.4)	24 (42.1)	4 (50)	11 (68.8)	67 (54)	21 (63.6)
5–7	37 (31.1)	107 (34.9)	15 (30.6)	5 (55.7)	20 (35.1)	4 (50)	5 (31.3)	49 (39.5)	12 (36.4)
8–10	9 (7.6)	15 (4.9)	3 (6.1)	0.0	13 (22.8)	0.0	0.0	8 (6.5)	0.0
Children's perceived level of dental attractiveness (AC) social class									
1–4	98 (82.4)	249 (81.1)	41 (83.7)	4 (44.4)	20 (35.1)	1 (12.5)	11 (68.8)	101 (81.5)	26 (81.3)
5–7	10 (8.4)	33 (10.7)	5 (10.2)	2 (22.2)	11 (19.3)	4 (50)	5 (31.2)	19 (15.3)	5 (15.6)
8–10	11 (9.2)	25 (8.2)	3 (6.1)	3 (33.4)	26 (45.6)	3 (37.5)	0.0	4 (3.2)	1 (3.1)

Table 4 Result of logistic regression of examiner's rating level of dental attractiveness according to need or no need for treatment when sensory impaired children included: regression coefficient (*b*); standard error (SE); significance (*P*); Odds Ratio (OR) with 95 per cent confidence interval (95% CI) for OR

Variable	<i>b</i>	SE	<i>P</i>	OR	95% CI
Gender	0.65	0.30	0.033	1.91	1.05–3.5

Table 5 Result of logistic regression of children's dental attractiveness (AC) according to need or no need for treatment when sensory impaired children included: regression coefficient (*b*); standard error (SE); significance (*P*); Odds Ratio (OR) with 95 per cent confidence interval (95% CI) for OR

Variables	<i>b</i>	SE	<i>P</i>	OR	95% CI
Onset	1.04	0.44	0.018	2.84	1.19–6.79

their perceived assessment (65 per cent). However, the control (55.3 per cent) and HI (56.7 per cent) children scored over the examiner by 2-fold (39.5 and 43 per cent, respectively) and by 3–4-fold (21.8 and 18.3 per cent, respectively) with their perceived treatment need.

Discussion

Orthodontic treatment need has not been previously investigated in sensory impaired children nor, indeed, the able-bodied population in Saudi Arabia. The present data permit the first comparison with other studies where a similar index has been used.

Our results indicated that 20–30 per cent of 11–16-year-olds had an objective need for orthodontic treatment. Several studies based on British populations found the need for treatment to be around 30 per cent,^{11,15,16} while in a Finnish population, 20 per cent of the samples were in need of treatment based upon DHC.¹⁷

However, other studies have found a higher need for treatment than in the present study. Using the Office of Population Censuses and Surveys IOTN (DHC) 1993 data for children's dental health in the United Kingdom, it was found that 48.5 per cent of the UK sample needed treatment.¹⁸

The proportion of 11–16-year-olds in need of orthodontic treatment in Nigeria was found to be 38.5 per cent.¹⁹ The large variation in results is further exemplified by 14–15-year-old children from schools of Manchester, UK, where it was found that 52 per cent needed treatment.⁷

In the present study there seems to be a discrepancy in the proportion of children needing orthodontic treatment on aesthetic and dental health grounds. Many more children had malocclusions where orthodontic need was considered definite on aesthetic grounds as compared with dental health. This is probably due to the presence of occlusal traits, which have implications on facial attractiveness but do not cause any oral health effect (for example, a diastema). Also, the DHC score is based on a grade assigned to the single most severe occlusal trait which makes it an easy and reliable index to use, but ignores the cumulative effect of a number of less severe occlusal deviations.²⁰ As a result, it may under-estimate the severity of a malocclusion in some individuals.²¹

Assessment of an aesthetic need for orthodontic treatment is complex, and that was clearly seen by the difference in opinion between a professional person and the child. Usually, subjects tended to rate their dental appearance lower on the aesthetic scales compared with the orthodontist's rating.^{1,4} This was true only in the HI and control children. However, for VI children, they tended to have similar self-perception and normative need for treatment. An explanation of this could be their familiarity in the use of the tactile graphics, and the increased awareness and criticism of their perception of dental attractiveness.

The new tactile graphic of the AC of the IOTN may be criticized with regard to its face validity. Despite this criticism, the self-perception of the visually impaired children was highly comparable with their general view on the treatment need.

In terms of treatment need, there was no gender difference in control children, but for the sensory impaired children, males perceived themselves as requiring some treatment need compared to females. This finding is similar to that of Brown *et al.*²² and Otuyemi *et al.*¹⁹ who concluded that males were more likely to seek orthodontic treatment. However, this differs from that of the Roberts *et al.*⁵ and Holmes,¹⁵ where females had a higher level of subjective treatment need and demand than males. This means that awareness of malocclusion and seeking treatment can be explained by an individual's gender.

Meanwhile, the opposite was noted for social class influence, where social background benefits of orthodontic treatment are unlikely to be comparable across different social groups. The fact that no social class differences could be detected in the uptake and delivery of orthodontic treatment in this study is in conflict with

findings of Kenealy and Shaw²³ where higher social class children had received more orthodontic care. However, it is consistent with other findings by Shaw *et al.*,⁸ and Burden and Pine¹ who failed to reveal a relationship between self-perception and social class.

The visual memory of the VI person can be determined by the age of the onset of the impairment.²⁴ Thus, children who lose their sight after birth will invariably find it easier to identify the graphics as diagrams of teeth.

Conclusion

In conclusion, the results have shown that orthodontic treatment need in sensory impaired children in Riyadh is at the same level as that noted in western countries. The data could be used as a baseline when planning orthodontic services. The uptake of orthodontic care may be influenced by child's gender, onset of losing sense, as well as by the children-dentist's complex rating for treatment need.

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