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Association between normative and self-perceived orthodontic treatment need among 12- to 15-year-old students in Shiraz, Iran

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SUMMARY Self-perception of dental attractiveness is an important factor affecting orthodontic treatment need. The purpose of this study was to investigate the association between normative and self-perceived orthodontic treatment need and to evaluate the influence of gender and socioeconomic background such as family size, parental education and father's employment. The subjects were 900 male and female junior high school students (450 males, 450 females) aged 12–15 years, from four districts in the city of Shiraz, Iran. The participants were asked to complete a questionnaire and then underwent a dental examination. Normative treatment need was assessed clinically using the Dental Aesthetic Index (DAI) according to the World Health Organization guidelines. Statistical analysis was undertaken using *t*- and chi-squared tests.

There was no statistically significant correlation between DAI scores and demographics. The results showed a significant correlation between DAI scores and a subject's awareness of malocclusion and their satisfaction with dental appearance. There were no differences between genders concerning the questionnaire data. The results suggest that the DAI score might reflect a self-perceived need for orthodontic treatment.

Introduction

Aesthetics is an important factor in seeking orthodontic treatment. The need for orthodontic treatment is influenced by a number of factors including parental, peer and self-perception of dental beauty (Mugonzibwa *et al.,* 2004a).

Parents may choose orthodontic treatment for their children to improve dentofacial aesthetics, or oral function, or to diminish future psychological problems. Inappropriate reactions of peers to various dental conditions may also carry a negative status. Appearance can and does make a difference in others' expectations and, therefore, in progress at school, in work, and in competition for a mate. It has been reported that individuals with facial disfigurements are subjected to teasing, nickname calling, and social discrimination (Graber and Vanarsdall, 2000). Moreover, people behave differently towards attractive people than towards those who are unattractive (Graber and Vanarsdall, 2000). It is believed that attractive individuals are looked at longer by others (Kleck and Rubenstein, 1975) and some personal characteristics such as honesty, morals and intelligence are said to be related to dentofacial appearance (Secord and Backman, 1959; Macgregor, 1970).

The most important factor determining the need for orthodontic treatment is self-perception of one's own beauty. Such perception may be influenced by cultural and ethnic characteristics, as well as by norms for dental attractiveness and individual psychological characteristics. Unattractive individuals may view themselves as less effective in social situations than their attractive counterparts (Mugonzibwa *et al.,* 2004b).

There are many orthodontic indices that combine physical and visual elements to provide a measure of the extent of a malocclusion. The Dental Aesthetic Index (DAI) links clinical and aesthetic components mathematically to produce a single score (Jenny and Cons, 1996). The DAI outlines criteria for the assessment of dentofacial anomalies including missing teeth, crowding, spacing, diastemas, overjet, reverse overjet, openbite and molar relationship [World Health Organization (WHO) 1997]. Relative to other scoring system used for the determination of malocclusion severity, the DAI has a high reliability and validity and is relatively quick to use (Otuyemi and Noar, 1996). The DAI scoring system has been advocated by the WHO to study orthodontic malocclusions in various communities and cultures, and it can be used by dentists and/or dental assistants (Cons *et al.,* 1989, 1994; Jenny and Cons, 1996). It assists in decision making about where to allocate government resources for the treatment of malocclusions (Danyluk *et al.,* 1999; Kuijpers-Jagtman and Kiekens, 2005).

There is no organized plan to routinely monitor Iranian students for orthodontic malocclusion. Moreover, there are few studies on the epidemiology of malocclusion

among students in that country. Therefore, the present investigation was designed to examine the relationship between self-perceived and expert-reported need for orthodontic treatment using the DAI among junior high school students in the city of Shiraz, Iran. The findings may be of value for providing orthodontic and human resource training, treatment facilities, and resource planning.

Subjects and methods

The investigation included 990 (492 males, 498 females) junior high school students aged 12–15 years. It was performed according to the university ethical guidelines. Approval for the study was obtained from the district boards of education and from the school authorities.

The subjects were recruited from junior high schools in the city of Shiraz, Iran, between March and May 2006. The city's secondary education is divided into four districts and two boys and two girls school were selected from each district using random sampling. The objectives of the study were discussed with the students, and those who agreed were invited to participate. Approximately 8 per cent (n = 79) were excluded due to previous orthodontic treatment. Parental approval was sought by sending a consent form to the parents of those who agreed to participate in the study. The parents of 11 students refused permission, and thus, they were excluded. Hence 900 students (450 males, 450 females) were eligible to participate.

The participants were asked to complete a modified version of a questionnaire on self-perceived treatment need and satisfaction with dental appearance adapted from that used by Shue-Te Yeh *et al.* (2000) and Kerosuo *et al.* (2004). The modified version included two additional questions that concerned being anxious during smiling and being subjected to teasing and/or nickname calling. Questions were also included relating to gender, demographics and socioeconomic status (such as family size, parental education and father's employment). The questions were worded in the colloquial language to determine accurate opinions about dental appearance, beauty, function, etc. In order to ensure the validity of the questionnaire, it was translated into Persian by an expert in English and the Persian version was then translated into English by another expert in English. The agreement between the original and translated versions was checked by a third expert in English. The face validity of the questionnaire was then determined by asking 10 colleagues to comment on the questionnaire. Their comments and suggestions were incorporated into the final questionnaire.

Orthodontic need was assessed using the DAI according to the WHO (1997) guidelines. All 10 components of the DAI were measured (Table 1). The assessments were performed under natural light using disposable gloves, tongue depressors and mouth mirrors. A periodontal probe was used for millimetric measurements. Scoring for the DAI was performed by two practicing dentists trained by one of the authors (SMD). During the study, intra- and inter-examiner reliability was calculated by asking the raters to score 45 subjects twice within a 2-week period. The within- and between-subject reliability for all components of the DAI are shown in Table 2.

The data were analyzed using a Student's t-test**,** 2 × 4 contingency tables and chi-square tests. A P value of 0.05 was considered statistically significant.

Results

Intra-examiner agreement for the two examiners was 89 and 92 per cent. Inter-examiner agreement for the first and second examinations was 84 and 87 per cent, respectively. Intra- and inter-examiner reliability for all components of the DAI at the first and second pilot examinations is shown in Table 2.

The mean DAI score for all subjects was 23.5 ± 5.7. The percentage of subjects with a normal/minor malocclusion, definite malocclusion, severe malocclusion or handicapping malocclusion was 70.1 (631/900), 17.7 (160/900), 7.8 (71/900) and 4.2 (38/900) per cent, respectively. Not all respondents answered all the questions on self-perceived treatment need.

The number and percentage of responders stratified based on DAI scores are shown in Tables 3–5.

Table 1 The standard Dental Aesthetic Index (DAI) regression equation.

DAI components		Weights
1	Number of missing visible teeth (incisors, canines and premolars in the maxillary and mandibular arches)	6
2	Crowding in the incisal segments: 0 = no segment crowded, 1 = 1 segment crowded, 2 = 2 segments crowded	1
3	Spacing in the incisal segments: 0 = no spacing, 1 = 1 segment spaced, 2 = 2 segments spaced	1
4	Midline diastema in millimeters	3
5	Largest anterior irregularity in the maxilla in millimeters	1
6	Largest anterior irregularity in the mandible in millimeters	1
7	Anterior maxillary overjet in millimeters	2
8	Anterior mandibular overjet in millimeters	4
9	Vertical anterior openbite in millimeters	4
10	Antero-posterior molar relation; largest deviation from normal either left or right: 0 = normal, 1 = 1/2 cusp either mesial or distal, 2 = one full cusp or more either mesial or distal	3
11	Constant	13
Total		DAI score

Table 2 Intra- and inter-examiner agreement (%) at the start and end of the pilot study for the Dental Aesthetic Index (DAI) components.

DAI components										
Agreement		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Intra-examiner	First occasion	100	86	96	91	82	92	77	95	91	81
	Second occasion	100	91	95	100	88	82	77	100	91	95
Inter-examiner	First occasion	95	92	91	86	76	73	72	96	78	78
	Second occasion	95	87	95	95	84	79	73	100	86	76

Table 3 Answers to Questions 1: Sense of need for treatment; 2: Tooth arrangement and 3: Smile compared with peers [stratified based on the Dental Aesthetic Index (DAI) score].

DAI score (within group)	Q1			Q2				Q3			
	Yes (*n*)	No (*n*)	Total (*n*)	Happy (*n*)	Normal (*n*)	Unhappy (*n*)	Total	Happy (*n*)	Normal (*n*)	Unhappy (*n*)	Total
<25%	152 (40)	222 (59)	347 (99)	86 (25)	190 (55)	68 (20)	344 (100)	171 (46)	177 (47)	21 (5)	369 (98)
26–30%	170 (60)	111 (39)	281 (99)	41 (14)	156 (54)	87 (30)	284 (98)	83 (29)	183 (63)	24 (8)	290 (100)
31–35%	118 (77)	35 (22)	153 (99)	14 (8)	89 (52)	66 (39)	169 (99)	28 (17)	116 (73)	14 (9)	158 (99)
>36%	62 (72)	24 (27)	86 (99)	7 (7)	49 (50)	41 (42)	97 (99)	22 (27)	48 (60)	10 (12)	80 (99)
Total	502 (56)	392 (43)	894 (99)	148 (16)	484 (54)	262 (29)	894 (99)	304 (33)	524 (58)	69 (7)	897 (98)

Table 4 Answers to Questions 4: Difficulty in chewing and 5: Difficulty in speaking [stratified based on the Dental Aesthetic Index (DAI) score].

DAI score (within group)	Q4				Q5			
	No (*n*)	Sometimes (*n*)	Yes (*n*)	Total (*n*)	No (*n*)	Sometimes (*n*)	Yes (*n*)	Total
<25%	334 (82)	56 (13)	15 (3)	405 (98)	383 (95)	11 (3)	8 (1)	402 (99)
26–30%	209 (74)	63 (22)	8 (2)	280 (98)	234 (82)	44 (15)	7 (2)	285 (99)
31–35%	98 (74)	31 (23)	2 (1)	131 (98)	110 (82)	22 (16)	2 (1)	134 (99)
>36%	56 (70)	19 (24)	4 (5)	79 (99)	64 (83)	11 (14)	2 (2)	77 (99)
Total	697 (78)	169 (18)	29 (3)	895 (99)	791 (88)	88 (9)	19 (2)	898 (99)

Table 5 Answers to Questions 6: Anxiety during smiling and 7: Subjected to teasing and/or nicknaming [stratified based on the Dental Aesthetic Index (DAI) score].

DAI score (within group)	Q6				Q7			
	No (*n*)	Sometimes (*n*)	Yes (*n*)	Total (*n*)	No (*n*)	Sometimes (*n*)	Yes (*n*)	Total
<25%	228 (58)	150 (38)	14 (3)	392 (99)	381 (94)	23 (5)	—	404 (99)
26–30%	125 (44)	118 (42)	36 (13)	279 (99)	234 (88)	23 (8)	9 (3)	266 (99)
31–35%	52 (38)	52 (38)	31 (22)	135 (98)	103 (76)	23 (17)	9 (6)	135 (99)
>36%	33 (44)	28 (37)	13 (17)	74 (98)	60 (64)	33 (35)	—	93 (99)
Total	438 (49)	348 (40)	94 (10)	880 (99)	778 (86)	102 (11)	18 (2)	898 (99)

Discussion

The findings of the present study indicate that there is an association between expert-reported and patient-perceived orthodontic treatment need.

The mean DAI score for subjects in the present study was 23.5 ± 5.7, which is well within the ranges reported in other countries (Katoh *et al.,* 1998; Otuyemi *et al.,* 1999; Chi *et al.,* 2000; Abdullah and Rock, 2001; Rashida *et al.,* 2001; Baca-Garcia *et al.,* 2004). The results show that self-perceived orthodontic treatment need may reflect that of the experts, in agreement with Rashida *et al.* (2001) and Otuyemi *et al.* (1999). The findings indicate that those who answered that they did not have an orthodontic treatment need, did actually have a lower need for treatment. Such a finding indicates that students' views of their dental aesthetics could potentially be used for dental health planning.

The findings also show that those who had a lower orthodontic treatment need were happy with the arrangement of their teeth, whilst those who had a greater need were unhappy. These results are in agreement with Mandall *et al.* (2000) and Shue-Te Yeh *et al.* (2000), but are not supported by the findings of Onyeaso and Sanu (2005) in a Nigerian population, or Lilja-Karlander *et al.* (2003) in a Swedish population. The percentage of subjects who were happy and/or somewhat happy with the arrangement of their teeth were comparable with the percentage of those (70.1 per cent) who were assessed as having 'little' or 'no' orthodontic treatment need. These findings indicate that the feeling of happiness towards dental aesthetics could potentially be useful in dental health care planning. The percentage of subjects who were unhappy with the arrangement of their teeth and needed orthodontic treatment according to the DAI (> 30), was 11 per cent; therefore, the study failed to demonstrate that those who were unhappy with the arrangement of their teeth were in need of orthodontic treatment. However, the findings showed that those who were happy with the appearance of their teeth did not need orthodontic treatment. Such an inconsistency may reflect that being unhappy with dental appearance does not necessarily reflect a need for orthodontic treatment. This is in agreement with the findings of Onyeaso and Aderinokun (2003), who reported a significant but weak correlation between DAI and children's perceptions of the appearance of their teeth, but in contrast to those of Burden (1995) and Burden and Pine (1995) who found that the role of peer groups is more important in determining orthodontic treatment need than social class or gender. McGuinness (2008) also confirmed that social gains, such as a greater willingness to smile, feeling good about oneself and satisfaction with dental appearance are now becoming more important as consumer-related outcomes of orthodontic treatment.

The present study also showed that there was no association between difficulty in chewing or speaking and the need for orthodontic treatment. Thus, subjects' views on difficulty in chewing or speaking are unlikely to be useful in planning decisions. It also appears that difficulty with chewing or speaking are not sensitive predictors for orthodontic treatment need. Such findings are similar to those of Shue-Te Yeh *et al.* (2000) who showed no association between chewing and orthodontic treatment need. In contrast, other studies (Brandt, 1976; Ngom *et al.,* 2007) suggested that improving a patient's masticatory function by improving occlusal relationships could be an indication for orthodontic treatment. Onyeaso and Aderinokun (2003) found a statistically significant correlation between dental appearance and speech ($r = 0.148$; $P < 0.01$) and between biting/chewing and speech.

No association was found in the present study between those who answered 'yes' to the question concerning anxiety when smiling or being subjected to teasing or nickname calling and the need for orthodontic treatment. This is similar to the findings reported by Abu Alhaija *et al.* (2005) but in contrast to Azuma *et al.* (2008) who reported that patients with malocclusions had a lower health-related quality of life and higher anxiety. This may be due to the fact that DAI is mostly concerned with physical factors and not the appearance of people's smiles or their looks in general. The study also showed that those who were not anxious when smiling or who were not subjected to teasing or nickname calling were not in need of orthodontic treatment.

Interpretation of the answers to questions 3–7 depends on which responses are taken into account. While, difficulty or anxiety or being subjected to teasing does not reflect a need for orthodontic treatment, having no difficulty, anxiety or not being subject to teasing was associated with no need for orthodontic treatment. With regard to such inconsistency, a number of speculations may be made. First, such indices might not necessarily reflect the need for orthodontic treatment, or they may not be sufficiently sensitive. Secondly, it might be due to the inadequacies in the internal consistencies of the inventory.

The present research shows that awareness of different types of malocclusion should be promoted and aesthetics should receive more attention in orthodontic treatment planning. In the case of camouflage treatment, orthodontists should be cautious in cases that may lead to good occlusion but may not be considered as enhancing aesthetics.

Conclusions

The findings of this study showed that there were significant positive correlations between DAI score and awareness of orthodontic treatment need and the student's satisfaction with their own dental appearance, concern with their smile, and their opinion about their dental appearance in comparison with their peers. The findings suggest that the DAI score might predict self-perceived orthodontic treatment need among adolescents.

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