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# The Unmet Orthodontic Treatment Need of Adolescents and Influencing Factors for not Seeking Orthodontic Therapy

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**A B S T R A C T**

*The purpose of this study was to estimate unmet orthodontic treatment needs of adolescents in Zagreb, Croatia, compare normative and self-perceived need and investigate factors influencing the reason why untreated subjects with severe malocclusions have not been treated before. One thousand and forty-two non-orthodontically treated subjects in age groups of 12 and 18 years, from sixteen randomly selected public schools in Zagreb, Croatia were examined. The Dental Aesthetic Index, Aesthetic Component of Index of Orthodontic Treatment Need and a questionnaire concerning self-perceived orthodontic treatment need, perception of aesthetics, function, behaviors and socioeconomic status were used. Around one third of untreated adolescent population had an objective need, less than 20 percent had aesthetic need, and self-perceived need was reported in one third of population. Associations and agreements between objective, aesthetic and self-perceived need were weak ($r=0.27–0.48$; $p<0.001$ and $\kappa$ in range from 0.05 ($p>0.05$) to 0.32 ($p<0.05$), respectively). Satisfaction with personal dental appearance and awareness of malocclusion were better related in persons with no treatment need or minor need ($r=0.53–0.59$) than in those with major need ($r=0.31–0.40$). Multiple logistic regression analyses confirmed that objective, aesthetic and self-perceived needs were better related between themselves than to socioeconomic status of subjects, function, activities of daily living and oral health-related behaviors. It appears that self-perceived treatment need has low role in predicting objective need, but relation between satisfaction and awareness of malocclusion could be one of basic factors in process of making decision to go for treatment and maybe could serve in predicting patient's compliance.*

***Key words:*** *malocclusion, prevalence, orthodontic treatment need, perception*

## Introduction

Orthodontic treatments need indices represent quantitative and qualitative criteria for ranking cases with greater or lesser treatment needs. Many clinical indices are described in the literature[1–3]. Since the patients' opinion regarding orthodontic treatment need does not always agree with the professional appraisal, questionnaires and visual scales that gather perceptions about dento-facial aesthetics, and quality of life psychometric instruments should be applied to evaluate the self-perceived orthodontic treatment need[4]. In fact, a number of studies showed that normative clinical assessment mostly ignores the perceived treatment need standpoint, and that subjective perception and quality of life often poorly correlate with objective need[5–10]. Dental professionals and lay people often detect specific dental esthetic discrepancies at varying levels of deviation[11]. The non-orthodontically treated subjects represent a good population to explore relationship between perception of aesthetics, satisfaction with personal dental appearance, quality of life, self-perceived and normative treatment need. Identifying the factors that play the role in the decision making to seek orthodontic treatment may aid in predicting

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which patients will be the most cooperative and motivated to start orthodontic treatment. This way, the limited resources of public health funds in financing orthodontic treatment could be distributed in the most useful manner.

For purpose of this study we used the unique aspect of the Dental Aesthetic Index (DAI) which links people's perception of aesthetics with anatomic traits measurements by regression analysis and as such offers significant advantages over some other indices of treatment need in epidemiological surveys[12]. The Standardised Continuum of Aesthetic Need (SCAN) based on visual analogue scale reflects the treatment need on the grounds of aesthetic impairment and by implication of the psycho-sociological needs for orthodontic treatment[13]. Because of its confirmed significance SCAN scale is incorporated in the Index of Orthodontic Treatment Need (IOTN), as its Aesthetic Component (IOTN AC), and Index of Complexity, Outcome and Need (ICON)[1,3]. The advantage to using DAI and SCAN is the simplicity of application, the adoption of DAI by the World Health Organization[14] as cross-cultural index, aesthetic component and wide use. DAI shows good overall correlation with the other two often used indices for estimation of treatment needs – ICON and IOTN[15,16]. The aim of the treatment need indices is the identification of children and teenagers mostly in need of orthodontic treatment which will be subsidized by public funds. Previously conducted epidemiological surveys in Croatia collected data based on prevalence of morphological features of malocclusion[17] and IOTN[18], and DAI has never been used in Croatia.

The aim of this study was to assess unmet orthodontic treatment need of untreated adolescents, compare the objective, aesthetic and self-perceived aspects of orthodontic treatment need in 12 and 18 year old subjects. Findings could reveal why untreated subjects with major orthodontic needs have not been treated before.

## Subjects and Methods

Sixteen public schools in different urban and suburban areas in Croatian capital Zagreb were randomly selected in a cluster sampling procedure. Special attention was given to type of school and location. The sample was considered representative of Zagreb in terms of socio-economic status since only small portion of adolescents attended private schools, and different types of schools and city locations were included. Additionally the sample was considered representative in terms of access to care since orthodontic therapy costs in Croatia were at that time fully covered by public fund – Croatian Health Insurance Fund (CHIF) for all children, up to the age of 18 years, regardless malocclusion severity. According to data from CHIF at the time of the study there were 56 contracted orthodontist fully providing orthodontic treatment for 206 thousand insured children and adolescents in Zagreb (up to 18 years), which gives the orthodontist – children ratio of 1:3,700. Additionally there were 10 private orthodontic praxis providing therapy without contract with any insurance agency.

Initially 1648 schoolchildren, 12 and 18 years of age were identified. Around 40 percent (N=606) were previously orthodontically treated or in active treatment during the examination period and were excluded from this analysis. Final sample comprised of 1042 pupils 12 (N=691) and 18 (N=351) years of age and with similar distribution of genders (Table 1).

**TABLE 1**
THE DISTRIBUTION OF GENDERS, DENTITION STAGE AND PARAFUNCTIONAL HABITS IN AGE GROUPS

| Variable | Age 12 (N=691) | Age 18 (N=351) | Total sample (N=1042) |
|---|---|---|---|
| Gender | | | |
| Male | 354 (51.2%) | 160 (45.6%) | 514 (49.3%) |
| Female | 337 (48.8%) | 191 (54.4%) | 528 (50.7%) |
| Dentition | | | |
| Mixed | 134 (19.4%) | 2 (0.6%) | 136 (13.1%) |
| Permanent | 557 (80.6%) | 349 (99.4%) | 906 (86.9%) |
| Parafunctional oral habits* | | | |
| None | 367 (53.1%) | 188 (53.6%) | 555 (53.3%) |
| Finger sucking | 3 (0.4%) | 2 (0.6%) | 5 (0.5%) |
| Mouth breading | 13 (1.9%) | 4 (1.1%) | 17 (1.6%) |
| Tongue-thrust | 58 (8.4%) | 38 (10.8%) | 96 (9.2%) |
| Bruxism | 5 (0.7%) | 3 (0.9%) | 8 (0.8%) |
| Lip/cheek sucking/biting | 100 (14.5%) | 44 (12.5%) | 144 (13.8%) |
| Nail biting | 164 (23.7%) | 67 (19.1%) | 231 (22.2%) |
| Pencil chewing | 9 (1.3%) | 18 (5.1%) | 27 (2.6%) |

* The sum does not correspond to the number of subjects as the answers do not exclude one another

The first group, age 12, represents the subjects in early permanent dentition, age when the therapy with removable appliances mainly finishes and with fixed appliances mainly starts. The second group, age 18, represents the age up to when the government insurance agency CHIF covers all orthodontic therapy costs. According to the 2001 census there were 8,640 12-year-olds and 10,118 18-year-olds in Zagreb and this sample had covered approximately 5 percent of that population. The study was part of epidemiological survey conducted in 2006 and 2007, and was started as pilot in February 2006. It was approved by Croatian Ministry of Science, Education and Sports and the Ethics Committee of the Zagreb University School of Dental Medicine with a written consent provided to each subject or parent. Malocclusions and treatment needs were assessed by using the DAI[2,19] and SCAN[13]. In DAI the number of visible missing teeth, crowding or spacing in incisal segment, midline diastema, largest anterior irregularity, overjet, openbite and buccal segment anteroposterior relationship are used to determine treatment need[2,19]. SCAN consists of a ten-point visual scale illustrated by a series of photographs which were rated for overall ranged dental attractiveness in methodically standardization by Evans and Shaw[13]. SCAN assessment was performed separately by the orthodontist and the adolescent. Examinees were not familiar with the standards of beauty of face and teeth through lectures or presentations before examination.

All subjects completed a questionnaire consisting of 24 simple questions, concerning socioeconomic characteristics, oral health-related behaviors, parafunctional oral habits, functions and activities of daily living, orthodontic awareness, satisfaction with teeth alignment, appearance and health, subjective complaints about teeth appearance, and self-perceived treatment need. Answers concerning subjective assessment, satisfaction, importance and frequency were based on a 5-point Likert scale with the end points »very dissatisfied / completely unimportant / never« (1) and »very satisfied / completely important / very frequently« (5). Socioeconomic characteristics included data on education and employment status of parents, number of household members, siblings, living conditions, number of cars, yearly vacations and self-reported overall financial status.

Four examiners – orthodontic residents in the second year of three-year specialization program, previously trained and calibrated, performed intraoral examinations using the manual World Health Organisation's CPI probe, with markings at 0.5, 3.5, 5.5, 8.5 and 11.5mm[19], mouth mirror and artificial lightning placed on the examiner's head. No radiographs or study casts were used. The inter- and intra-examiner reliability was evaluated by means of repeated measurements on 10 subjects with a 7-day interval from the first examination. The agreement proportion was between 83 percent (Intraclass correlation coefficient, $r=0.87$, Cohen Kappa, $\kappa=0.64$, $p<0.001$) and 99 percent (Intraclass correlation coefficient, $r=0.99$, Cohen Kappa, $\kappa=0.97$, $p<0.001$). All tests showed significant reproducibility and respectable agreement.

Differences in malocclusion prevalence and severity, objective, aesthetic and self-perceived treatment needs and awareness between age groups and genders were analyzed by means of Chi-square and Fisher's test. Spearman correlation coefficient was used as a measure of association between objective, aesthetic and self-perceived treatment need, behavior and function. Kappa was used as a measure of agreement. Associations between factors influencing perception of orthodontic treatment need were estimated by the multiple regression using the logit model with 95 per cent confidence intervals given for the odds ratios, indicating statistically significant relationships if both values were either greater or less than 1. Four multiple logistic regression models of orthodontic treatment needs were created based on: (1) objective need: presence of severe / very severe malocclusion according to DAI; (2) professional aesthetic need: definite need according to SCAN assed by orthodontist; (3) lay person aesthetic need: definite need according to SCAN self-assessed by teenager; and (4) self-perceived need based on question: Do you think you are in need of an orthodontic treatment?. For logistic regression analysis, dummy variables were constructed yielding the categories (0) »minor need / absent / rarely / dissatisfied / unimportant« and (1) »definite need / present / frequently / satisfied / important«. Effects of socioeconomic characteristics, gender and age were also included in the analyses as covariates. The significance of the effects in the model was performed via the Wald statistics and Likelihood-ratio test with Chi-squared statistics.

All analyses were carried out using a commercial software (SPSS Release 10.0; SPSS Inc. Chicago, Illinois, USA), statistical significance preset at $p<0.05$.

## Results

Both genders were equally represented in the sample. Around 20 percent of children at age of 12 had some deciduous teeth still present (Table 1). Less than half of population exhibited some parafunctional habit and they were equally present in both age groups (Table 1). Crowding was the most prevalent trait of malocclusion found in over half of population (Table 2). DAI and a questionnaire detected around 1/3 of population of both age in need of orthodontic treatment, mostly for solving alignment problems. Distribution of orthodontic treatment need in age groups according to DAI is shown in Figure 1. According to orthodontists' assessment by SCAN less than 20 percent of teenagers required treatment or were classified as moderate need according to SCAN. Using the same aesthetic scale less than 10 percent of examinees indicated their need for orthodontic treatment (Figure 2). Senior teenagers had significantly lower orthodontic treatment needs in both objective ($p=0.003$) and aesthetic assessment ($p<0.001$) (Figures 1 and 2). Self-perceived treatment need was reported in one third of population. There were no significant gender differences in treatment needs. Socioeconomic characteristics based on education and employment status of parents, number

**TABLE 2**
DISTRIBUTION OF MALOCCLUSIONS IN AGE GROUPS

| Variable | Age 12 (N=691) | Age 18 (N=351) | p-value between age groups | Total sample (N=1042) |
|---|---|---|---|---|
| Crowding incisal* | | | | |
| Absent | 350 (50.7%) | 168 (47.9%) | | 518 (49.7%) |
| Present in one arch | 213 (30.8%) | 102 (29.1%) | | 315 (30.2%) |
| Present in both arches | 128 (18.5%) | 81 (23.1%) | 0.222 | 209 (20.1%) |
| Spacing incisal* | | | | |
| Absent | 524 (75.8%) | 300 (85.5%) | | 824 (79.1%) |
| Present in one arch | 126 (18.2%) | 39 (11.1%) | | 165 (15.8%) |
| Present in both arches | 41 (5.9%) | 12 (3.4%) | <0.001 | 53 (5.1%) |
| Maxillary midline diastema* | | | | |
| No diastema | 551 (79.7%) | 318 (90.6%) | | 869 (83.4%) |
| 1–3 mm | 135 (19.5%) | 30 (8.5%) | | 165 (15.8%) |
| ≥4 mm | 5 (0.7%) | 3 (0.9%) | <0.001 | 8 (0.8%) |
| Maxillary anterior irregularity* | | | | |
| Absent | 556 (80.5%) | 272 (77.5%) | | 828 (79.5%) |
| 1–3 mm | 126 (18.2%) | 71 (20.2%) | | 197 (18.9%) |
| ≥4 mm | 9 (1.3%) | 8 (2.3%) | 0.348 | 17 (1.6%) |
| Mandibular anterior irregularity* | | | | |
| Absent | 575 (83.2%) | 279 (79.5%) | | 854 (82.0%) |
| 1–3 mm | 110 (15.9%) | 63 (17.9%) | | 173 (16.6%) |
| ≥4 mm | 6 (0.9%) | 9 (2.6%) | 0.060 | 15 (1.4%) |
| Maxillary overjet* | | | | |
| 0 mm | 25 (3.6%) | 16 (4.6%) | | 41 (3.9%) |
| 1–3 mm | 453 (65.6%) | 276 (78.6%) | | 729 (70.0%) |
| 4–6 mm | 169 (24.5%) | 47 (13.4%) | | 216 (20.7%) |
| ≥7 mm | 44 (6.4%) | 12 (3.4%) | 0.001 | 56 (5.4%) |
| Mandibular overjet† | | | | |
| Absent | 685 (99.1%) | 347 (98.9%) | | 1032 (99.0%) |
| 1–3 mm | 6 (0.9%) | 4 (1.1%) | 0.740 | 10 (1.0%) |
| Anterior openbite† | | | | |
| Absent | 674 (97.5%) | 338 (96.3%) | | 1012 (97.1%) |
| 1–3 mm | 17 (2.5%) | 13 (3.7%) | 0.327 | 30 (2.9%) |
| Molar relationship* | | | | |
| Normal | 408 (59.0%) | 208 (59.3%) | | 616 (59.1%) |
| Half cusp | 208 (30.1%) | 101 (28.1%) | | 309 (29.7%) |
| Full cusp | 75 (10.9%) | 42 (12.9%) | 0.820 | 117 (11.2%) |
| Transversal malocclusion* | | | | |
| Absent | 578 (83.8%) | 293 (83.5%) | | 872 (83.7%) |
| Crossbite | 90 (13.0%) | 51 (14.5%) | | 141 (13.5%) |
| Scisors bite | 22 (3.2%) | 7 (2.0%) | 0.455 | 29 (2.8%) |
| Overbite* | | | | |
| 0 mm | 24 (3.5%) | 19 (5.4%) | | 43 (4.1%) |
| 1–3 mm | 296 (42.8%) | 147 (41.9%) | | 443 (42.5%) |
| 4–6 mm | 309 (44.7%) | 160 (45.6%) | | 469 (45.0%) |
| ≥7 mm | 62 (9.0%) | 25 (7.1%) | 0.367 | 87 (8.3%) |
| Angle's dental class* | | | | |
| Class I | 408 (59.0%) | 208 (59.3%) | | 616 (59.1%) |
| Class II | 245 (35.5%) | 114 (32.5%) | | 359 (34.5%) |
| Class III | 38 (5.5%) | 29 (8.3%) | 0.186 | 67 (6.4%) |

* $\chi^2$-test, † Fischer exact test

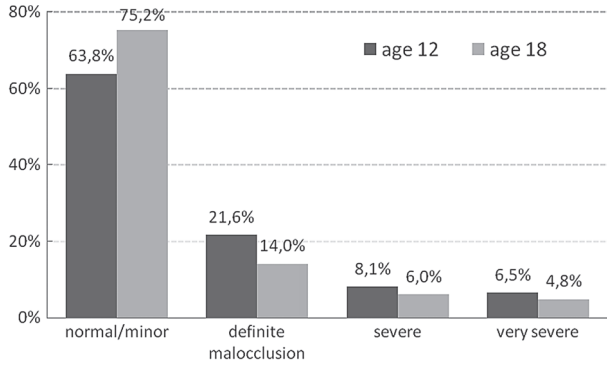


*Fig. 1. Distribution of orthodontic treatment needs according to Dental Aesthetic Index in age groups in percentages.*

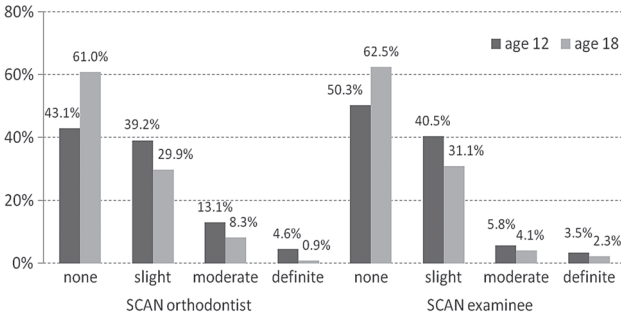


*Fig. 2. Distribution of orthodontic treatment needs according to Standardized Continuum of Aesthetic Needs in age groups in percentages.*

of household members, siblings, living conditions, number of cars, yearly vacations and self-reported overall financial status did not have significant influence on distribution of orthodontic treatment need. Selected socioeconomic variables are presented in Table 3.

Association and agreement in objective, subjective and self-perceived treatment need were weak (r in range 0.27–0.48; $p<0.001$, $\kappa$ in range from 0.05 ($p>0.05$) to 0.32 ($p<0.05$), respectively). DAI and SCAN were better related in professional ($r=0.47$; $\kappa=0.14$) than adolescent's appraisal ($r=0.28$; $\kappa=0.06$).

Although two-third of population of both ages was satisfied with their teeth's position, still half of population would have liked a better alignment, but only 30 percent would seek orthodontic treatment. Fewer girls were satisfied with their teeth appearance (65 percent) than boys (74 percent; $p=0.007$). More than 30 percent of untreated adolescents already visited orthodontist for clinical examination and consultation, mainly advised by their dentist. Distribution of main orthodontic complains is shown in Figure 3.

Severity of malocclusion clinical and aesthetic assessment by the orthodontist and examinee, and self-perceived treatment need were positively related to greater desire for improved teeth alignment, necessary dental changes, visiting orthodontist, higher perception of orthodontic treatment need, difficulties in speech and laughing without shame. It was negatively related to the higher satisfaction with teeth appearance and their

**TABLE 3**
THE DISTRIBUTION OF SOCIOECONOMIC VARIBLES ACCORDING TO OBJECTIVE TREATMENT NEEDS

| Variable | Minor need DAI score ≤30 (N=906) | Major need DAI score ≥31 (N=136) | p-value between groups | Total sample (N=1042) |
|---|---|---|---|---|
| Bedroom* | | | | |
| One's own | 510 (56.3%) | 77 (56.6%) | | 587 (56.3%) |
| Shared with siblings | 358 (39.5%) | 54 (39.7%) | | 412 (39.5%) |
| Shared with adult person | 38 (4.2%) | 5 (3.7%) | 0.976 | 43 (4.1%) |
| Residence* | | | | |
| Private house | 517 (57.1%) | 89 (65.4%) | | 606 (58.2%) |
| Private flat | 303 (33.4%) | 37 (27.2%) | | 340 (32.6%) |
| Rent house | 16 (1.8%) | 0 | | 16 (1.5%) |
| Rent flat | 29 (3.2%) | 5 (3.7%) | | 34 (3.3%) |
| Other | 41 (4.5%) | 5 (3.7%) | 0.876 | 46 (4.4%) |
| No. of cars† | 2.2 ± 0.62 | 2.2 ± 0.73 | 0.866 | 2.2 ± 0.63 |
| No. of vacations yearly† | 2.8 ± 1.04 | 2.8 ± 0.95 | 0.713 | 2.8 ± 1.03 |
| Financial status* | | | | |
| Extremely wealthy | 117 (12.9%) | 14 (10.3%) | | 131 (12.6%) |
| Fairly wealthy | 357 (39.4%) | 56 (41.2%) | | 413 (39.6%) |
| Average wealthy | 351 (38.7%) | 56 (41.2%) | | 407 (39.1%) |
| Under average wealthy | 54 (6.0%) | 0 | | 54 (5.2%) |
| Poor | 27 (3.0%) | 10 (7.4%) | 0.515 | 37 (3.6%) |

* $\chi^2$-test, † Mann-Whitney test,

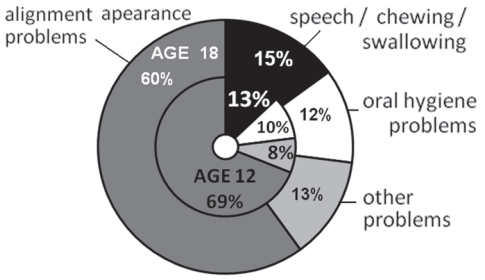


*Fig.3. Distribution of main orthodontic complain in age groups 12 (inner doughnut) and 18 (outer doughnut).*

health as well as with high importance to align teeth for facial appearance. All correlations were poor ($r<0.33$) but statistically significant ($p<0.05$). All correlation coefficients were the highest in self-perceived treatment need. It was not related to daily contacts with other people and frequency of dental visits, check-ups and tooth brushing. Satisfaction with personal dental appearance and awareness of malocclusion were better related in persons with no treatment need or minor need, than in those with major need (Table 4). Multiple logistic regression analyses confirmed that objective, aesthetic and self-perceived treatment needs were better related between themselves than to socioeconomic status of subjects, activities of daily living and behaviors such as those with dental office visits and tooth brushing (Table 5). Patients' view of aesthetic treatment need had lower role in predicting objective definite need OR=7.7 (95% CI: 2.05–29.27). Self-perceived need and patients' view of aesthetic need had higher role in predicting orthodontist's view of definite aesthetic need producing odds ratios of 9.3 (95% CI: 2.47–348.75) and 26.2 (95% CI: 4.46–154.15), respectively. Dissatisfaction with teeth position, treatment need assessed by orthodontist by using SCAN, desire to have more aligned teeth, and willingness to change something on their teeth were significantly related to self-perceived treatment need producing odds ratios of 6.0 (95% CI: 3.87–9.44), 9.4 (95% CI: 2.07–42.35), 7.9 (95% CI: 4.29–14.59) and 2.0 (95% CI: 1.16–3.36), respectively (Table 5).

**TABLE 4**
CORRELATION BETWEEN SUBJECT'S SATISFACTION WITH DENTAL APPEARANCE AND AWARENESS OF TREATMENT NEED ACCORDING TO DAI AND SCAN TREATMENT NEED

| | r* | p |
|---|---|---|
| DAI | | |
| Treatment highly desirable / mandatory | –0.404 | 0.022 |
| No / minor treatment need / treatment elective | –0.531 | <0.001 |
| SCAN orthodontist | | |
| Definite treatment need | –0.341 | 0.131 |
| No / minor treatment need | –0.526 | <0.001 |
| SCAN examinee | | |
| Definite treatment need | –0.310 | 0.124 |
| No / minor treatment need | –0.527 | <0.001 |

* Spearman's correlation coefficient

## Discussion

Occlusal indices are presently widely used, not only to assess the prevalence of malocclusions, but also for determining access to public health orthodontics or the level of co-payment, and also in quality assurance, to evaluate treatment success in achieving overall alignment and occlusion[3]. They play significant role in assessment of the treatment needs and have been used to determine treatment priorities.

According to our results, unmet objective orthodontic treatment need of adolescents in Zagreb was not high. Since the sample was formed after exclusion of orthodontically treated children, it is expected that teenagers with more pronounced malocclusions would be already treated. Still 1/3 of junior and ¼ of senior teenagers were

**TABLE 5**
MULTIPLE LOGISTIC REGRESSION MODELS FOR DIFFERENT ASPECTS OF TREATMENT NEED

| Outcome variable | Explanatory variable | Odds ratio | 95% Confidence Interval | p |
|---|---|---|---|---|
| Definite need SCAN examinee * | Definite need SCAN examinator | 24.1 | 5.85–99.43 | <0.001 |
| | Lower financial status | 2.5 | 1.37–4.68 | 0.003 |
| Definite need SCAN examinator† | No. of cars | 0.3 | 0.01–0.69 | 0.006 |
| | Definite need SCAN examinee | 26.2 | 4.46–154.15 | 0.001 |
| | Age 12 | 9.8 | 2.34–40.62 | 0.002 |
| | Self-perceived definite treatment need | 9.3 | 2.47–34.75 | 0.001 |
| Definite need DAI‡ | Definite need SCAN examinee | 7.7 | 2.05–29.27 | 0.003 |
| | Unsatisfied with teeth position | 2.5 | 1.2–5.34 | 0.015 |
| Self-perceived definite treatment need¶ | Dissatisfaction with teeth position | 6.0 | 3.87–9.44 | <0.001 |
| | Definite need – SCAN examinator | 9.4 | 2.07–42.35 | 0.004 |
| | Would like better teeth alignment | 7.9 | 4.29–14.59 | <0.001 |
| | Would change something on teeth | 2.0 | 1.16–3.36 | 0.012 |

*97.7%, †97.5%, ‡94.3%, ¶81.2% (percentage of correctly classified cases), only significant variables are listed

in need of orthodontic treatment, mostly for solving alignment problems. Higher prevalence of severe and handicapping malocclusions was reported in international surveys based on DAI in children and young adolescents in New Zealand, South Africa, Peru, Brazil and United States[20–24]. Similar treatment needs have been reported in Spanish, Australian, Nigerian and Malaysian children and young adolescents as well as in previous investigations done in Croatia[17,18,25–28].

A quite large proportion of children in Zagreb was previously or at the time of the study orthodontically treated (around 40 percent), which is similar to previous study from Croatia[18]. Although British children demonstrated a similar need for orthodontic therapy fewer were receiving treatment (8–16 percent)[29,30]. It points out to the lack of control of treatment priorities in Croatia at the time. As the therapy was free of charge for all children, up to the age of 18 years, regardless malocclusion severity, there were neither regulation criteria to determine treatment priorities nor control of treatment standards and quality of outcomes. A good example of control of priorities is British National Health Service (NHS) which by using the IOTN allows only those teenagers with the greatest need to qualify for publicly funded orthodontic treatment. This is considered an objective and reliable way for specialists to select those children who will benefit most from treatment and is a fair way to prioritize limited NHS resources[31].

But relying only on objective occlusal indices the treatment has been also often offered to children with poor compliance and minor perceived need which leads to discontinuation and poor outcome of treatment. Therefore treatment needs based on subjective aesthetic perception can maybe serve as predictor of patients motivation and cooperation during treatment. This study showed considerable variations between clinical and aesthetic assessment of treatment needs, as well as professional and lay person's perceptions, which is in concordance with several other studies[18,29,30,32]. It appears that adolescents' view of aesthetic treatment need and self- perceived need had low role in predicting objective definite need. As malocclusion was more severe children were less frequently convinced that align teeth are important for facial appearance. In fact, it seems that subjects' satisfaction with his own dental appearance and awareness of treatment need are better related in subjects with no need or minor need than in those with major need. These are probably some of the reasons for not been treated before. A recent study confirmed that majority of young adults are often satisfied with their dental appearance regardless of objective treatment need of various degrees[33].

The relationship between objective and subjective treatment need is of great interest to providers of orthodontic services. Self-perceived treatment need is also likely to be subjective to some extent but it may or may not be congruent with the subjective perception of dental professional. SCAN is incorporated in IOTN and ICON indices as a measure of subjective treatment need, but SCAN obviously has clear limitations, as it does not provide a direct estimate of perceived treatment need. Instead it has been used as an indirect assessment of need, while in fact it refers to an arbitrarily chosen ranking of different malocclusion traits. The low correlation coefficient between the variable on self-perceived orthodontic treatment need and SCAN of the adolescents (0.32) and absence of SCAN examinee as explanatory variable in multiple logistic regression model of predicting self-perceived definite treatment need are further indications that these variables are measuring distinct concepts. According to our study it seems that self-perceived treatment needs are influenced in greater or lesser degree by many factors and often poorly related to clinically measurable malocclusions. Still, objective, aesthetic and self--perceived treatment needs are better related between themselves than to socioeconomic factors, activities of daily living and health-related behaviors. Similar was reported in previous studies[5,6,32]. This may also be one of the reasons why untreated subjects with severe malocclusions have not been treated before.

Identifying the factors that constitute need for orthodontic treatment is obviously a multidimensional construct. The decision to start orthodontic treatment is primarily influenced by aesthetic concerns and psychosocial well-being than morphological criteria. The lack of concordance between clinicians and patients in assessing orthodontic treatment need, complexity and priority affects treatment success.

Since the demand for orthodontic treatment is increasing, mainly due to aesthetic reasons, it is important to have epidemiological data to estimate the total need for orthodontic care and treatment priorities in order to facilitate resource planning and public funding. DAI, IOTN and ICON indices seem to lead to a reduction of treatment need, especially in borderline cases, and can serve as an instrument to allocate financial resources for public orthodontic services[3,12,15,16]. According to our results it is obvious that the DAI alone is not sufficient instrument for selecting patients for treatment, therefore measures of self-perceived treatment need should be also used in combination in order to cover different dimensions of oral health and quality of life, and predicting patients compliance and treatment success[7,10].

## Conclusions

It appears that self-perceived treatment need has low role in predicting objective need, but relation between satisfaction and awareness of malocclusion could be one of basic factors in process of making decision to go for treatment and maybe could serve in predicting patient's motivation and compliance, therefore affecting outcomes of orthodontic treatment.

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## REFERENCES

1. DANIELS C, RICHMOND S, J Orthod, 27 (2000) 149. DOI:10.1093/ortho/27.2.149. — 2. CONS NC, JENNY J, KOHOUT FJ. DAI: The dental aesthetic index (University of Iowa, Iowa City, 1986). — 3. SHAW WC, RICHMOND S, O'BRIEN KD, Am J Orthod Dentofacial Orthop, 107 (1995) 1. — 4. FLORES–MIR C, MAJOR PW, SALAZAR FR, J Orthod, 31 (2004) 329. DOI:10.1179/146531204225020644. — 5. KOOCHEK AR, YEH MS, ROLFE B, RICHMOND S, Br Dent J, 191 (2001) 325. DOI:10.1038/SJ.BDJ.4801175. — 6. SHUE-TE YEH M, KOOCHEK AR, VLASKALIC V, BOYD R, RICHMOND S, Am J Orthod Dentofacial Orthop, 118 (2000) 421. DOI:10.1067/mod.2000.107008 — 7. DE OLIVEIRA CM, SHEIHAM A, Community Dent Oral Epidemiol, 31 (2003) 426. DOI:10.1046/j.1600-0528.2003.00002.x. — 8. MANDALL NA, WRIGHT J, CONBOY F, KAY E, HARVEY L, O'BRIEN KD, Am J Orthod Dentofacial Orthop, 128 (2005) 703. DOI:10.1016/j.ajodo.2004.10.011. — 9. O'BRIEN K, WRIGHT JL, CONBOY F, MACFARLANE T, MANDALL N, Am J Orthod Dentofacial Orthop, 129 (2006) 536. DOI:10.1016/j.ajodo.2004.10.014. — 10. TSAKOS G, J Dent Educ, 72 (2008) 876. — 11. KOKICH VO JR, KIYAK HA, SHAPIRO PA, J Esthet Dent, 11 (1999) 311. — 12. JENNY J, CONS NC, Am J Orthod Dentofacial Orthop, 110 (1996) 410. doi:10.1016/S0889-5406(96)70044-6. — 13. EVANS R, SHAW W, Eur J Orthod, 9 (1987) 314. — 14. WORLD HEALTH ORGANISATION, International Collaborative Study of Oral Health Outcomes (WHO, Geneva, 1989). — 15. HLONGWA P, BEANE RA, SEEDAT AK, OWEN CP, SADJ, 59 (2004) 421. — 16. ONYEASO CO, BEGOLE EA, Am J Orthod Dentofacial Orthop, 131 (2007) 248. DOI:10.1016/j.ajodo.2005.04.045. — 17. LAUC T, Eur J Orthod, 25 (2003) 273. — 18. RADICA N, Demand of orthodontic treatment using index of orthodontic treatment need. MS Thesis. In Croat (University of Zagreb, Zagreb, 2005). — 19. WORLD HEALTH ORGANISATION, Oral health surveys – basic methods (WHO, Geneva, 1997). — 20. CHI J, JOHNSON M, HARKNESS M, Aust Orthod J, 16 (2000) 150. — 21. VAN WYK PJ, DRUMMOND RJ, South Afric Dent J, 60 (2005) 334. — 22. BERNABE E, FLORES-MIR C, Angle Orthod, 76 (2006) 417. — 23. MARQUES CR, COUTO GB, ORESTES CARDOSO S, Community Dent Health, 24 (2007) 145. — 24. JENNY J, CONS NC, Aust Dent J, 41 (1996) 43. — 25. BACA-GARCIA A, BRAVO M, BACA P, BACA A, JUNCO P, Int Dent J, 54 (2004) 138. — 26. ESTIOKO LJ, WRIGHT FA, MORGAN MV, Community Dent Health, 11 (1994) 147. — 27. OTUYEMI OD, OGUNYINKA A, DOSUMU O, CONS NC, JENNY J, Int Dent J, 49 (1999) 203. — 28. ESA R, RAZAK IA, ALLISTER JH, Community Dent Health, 18 (2001) 31. — 29. CHESTNUTT IG, BURDEN DJ, STEELE JG, PITTS NB, NUTTALL NM, MORRIS AJ, Br Dent J, 200 (2006) 609. DOI:10.1038/sj.bdj.4813640. — 30. ALKHATIB MN, BEDI R, FOSTER C, JOPANPUTRA P, ALLAN S, BMC Oral Health, 5 (2005) 8. DOI:10.1186/1472-6831-5-8. — 31. DE OLIVEIRA CM, Br Dent J, 195 (2003) 704. DOI:10.1038/sj.bdj.4810833. — 32. ONYEASO CO, ADERINOKUN GA, Int J Paed Dent, 13 (2003) 336. DOI: 10.1046/j.1365-263X.2003.00478.x. — 33. LILJA-KARLANDER E, KUROL J, JOSEFSSON E, Swed Dent J, 27 (2003) 143.

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## POTREBA ZA ORTODONTSKIM TRETMANOM U ORTODONTSKI NETRETIRANIH ADOLESCENATA I ČIMBENICI KOJI UTJEČU NA NETRAŽENJE ORTODONTSKE TERAPIJE

## SAŽETAK

Cilj studije je bio procijeniti potrebu za ortodontskim tretmanom u ortodontski netretiranih hrvatskih adolescenata, usporediti normativnu i samoprocijenjenu potrebu za tretmanom te istražiti čimbenike koji utječu na razloge zašto netretirani pacijenti s ozbiljnim malokluzijama nisu bili ranije tretirani. Pregledano je 1042 učenika u dobi 12 i 18 godina, koji nisu bili prethodno ortodontski tretirani, iz šesnaest nasumično odabranih javnih škola u Zagrebu, Hrvatska. Korišteni su Indeks dentalne estetike (DAI), Standardizirani kontinuum estetskih potreba (SCAN) i upitnik koji je sadržavao pitanja o vlastitoj percepciji potrebe za ortodontskim tretmanom, percepciji estetike, funkciji, ponašanjima i socioekonomskom statustu. Trećina netretirane adolescentske populacije imala je objektivnu, manje od 20% estetsku i trećina samoprocijenjenu potrebu za ortodontskim tretmanom. Povezanost i slaganje između objektivne, estetske i samoprocijenje potrebe bili su slabi ($r=0.27–0.48$; $p<0.001$ i $\kappa$ u rasponu od 0.05 ($p>0.05$) do 0.32 ($p<0.05$)). Zadovljstvo izgledom vlastitih zubi i svijest o malokluziji bili su bolje povezani u osoba bez ili s malom potrebom za terapijom ($r=0.53–0.59$) nego u onih s velikom potrebom ($r=0.31–0.40$). Multiple logističke regresijske analize su potvrdile da su objektivna, estetska i samoprocijenjena potreba za tretmanom bolje povezane među sobom nego sa socioekonomskim statusom, funkcijom, dnevnim aktivnostima i ponašanjima vezanima uz oralno zdravlje. Izgleda da samoprocijenjena potreba za tretmanom ima malu ulogu u predikciji objektivne potrebe, no odnos između zadovoljstva i svjesnosti malokluzije mogao bi biti jedan od osnovnih čimbenika u procesu pacijentovog donošenja odluke o ulasku u ortodontsku terapiju te bi mogao služiti u predikciji pacijentove suradnje tijekom terapije.