Factors influencing a patient's decision to choose the type of treatment to improve dental esthetics

Faktori koji utiču na pacijentov izbor terapije za poboljšanje estetike zuba

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Abstract

Background/Aim. Interest in dental esthetics has increased rapidly during the last few decades among both patients and dentists, and the creation of a natural dental appearance has become an important task in all fields of dentistry, especially in prosthodontics and restorative dentistry. The aim of this research was to investigate factors influencing a patient's decision to choose the type of treatment to improve dental esthetics. **Methods.** A total of 700 Caucasian subjects participated in the cross-sectional study (261 men, 439 women, aged 18–86 years, mean age 46.2 ± 18.6). The study included clinical examination and a self-administered questionnaire based on self-perceived esthetics, satisfaction with the appearance of their maxillary anterior teeth and previous dental experience. Multiple logistic regression was used in statistical analysis. **Results.** Hiding teeth during smile was the most important predictor for choosing fixed prosthetic restorations (OR 9.1), followed by self-perceived bad fixed prosthesis, malpositioned teeth and female gender (OR 2.9, 2.4, and 1.5, respectively). The increase in satisfaction with dental appearance and previous orthodontic therapy reduced chances for seeking prosthetic therapy (each OR 0.4). The significant predictors for bleaching choosing were hiding teeth during smiling, already done bleaching, female gender, lower levels of satisfaction with dental appearance and the absence of the previous orthodontic therapy (OR 5.8, 2.4, 1.8, 0.5 and 0.4, respecitively). Hiding teeth during smile, self-perceived malposition and crowding, and lower levels of satisfaction, were significant predictors for choosing orthodontic treatment (OR 3.1, 2.4, 2.2 and 0.6, respectively). None of current dental statuses was statistically significant predictor for choosing prosthodontic, bleeching nor orthodontic therapy. **Conclusion.** The psychological elements and female gender are the main predictors of seeking dental therapy. Understanding the prevalence of dissatisfaction with the present esthetics and desired treatments to improve esthetics can be a guide for strategies for intervention to improve esthetics.

Key words:
patient satisfaction; esthetics, dental; crowns; tooth bleaching; orthodonics.

Apstrakt

Uvod/Cilj. U poslednjih nekoliko decenija značajno se povećava interesovanje za dentalnu estetiku kako ispitanika tako i stomatologa. Postizanje prirodnog izgleda je važan zadatak u svim poljima stomatologije, naročito protetike i restorativne stomatoglogije. Cilj ovog istraživanja bio je da se utvrdi koji faktori utiču na izbor terapije za poboljšanje zubne estetike kod ispitanika. **Metode.** Istraživanjem je bilo obuhvaćeno 700 ispitanika (261 muškarac, 439 žena, prosečne starosti 46,2 ± 18,6 godina, srednje godine 45). Istraživanje je bilo zasnovano na kliničkom pregledu i ispunjavanju upitnika koji je uključivao pitanja zasnovana na samoproceni zadovoljstva pojavnošću gornjih prednjih zuba, te prethodnim dentalnim iskustvima. U statističkoj obradi podataka korišćena je multipla logistička regresija. **Rezultati.** Skrivanje zuba tokom smejanja je najvažniji prediktor za izbor fiksnih protetskih nadomestaka (OR 9,1), potom loše percipirani fiksni protetski nadomesci, loše pozicionirani zubi, te ženski pol (OR 2,9, 2,4, i 1,5 respektivno). Povećanje zadovoljstva dentalnom estetikom i prethodna ortodontska terapija smanjuju šansu za traženjem protetske terapije (svaki OR 0,4). Značajni prediktori za traženje postupka izbeljivanja zuba su: skrivanje zuba tokom smejanja, prethodni postupak izbeljivanja, ženski pol, niže razine zadovoljstva dentalnom estetikom, te odsutnost prethodne ortodontske terapije (OR 5,8, 2,4, 1,8, 0,5 i 0,4 respektivno). Skrivanje zuba tokom osmeha, samopercipirani loše pozicionirani i zbijeni zubi te niža razina zadovoljstva dentalnom estetikom bili su prediktori tra-

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ženja ortodontske terapije (OR 3.1, 2.4, 2.2 i 0.6 respektivno). Niti jedan od postojećih dentalnih statusa nije bio značajan prediktor traženja protetske terapije, izbeljivanja ili ortodontske terapije. **Zaključak.** Psihološki elementi i ženski pol glavni su prediktori traženja dentalne terapije. Razumevanje prevalencije nezadovoljstva dentalnom este-

tikom i željenih tretmana za poboljšanje iste glavni su vodiči strategije za njeno poboljšanje.

Ključne reči:
bolesnik, zadovoljstvo; zub, estetika; ortodoncija; zub, kruna; zub, beljenje.

Introduction

Aesthetics is a primary consideration for patients seeking both orthodontic and prosthodontic treatment [1, 2]. Interest in dental esthetics has increased rapidly during the last few decades among both patients and dentists, and the creation of a natural dental appearance has become an important task in all fields of dentistry, especially in prosthodontics and restorative dentistry [3].

The development of new techniques and dental material has led to a higher number of therapeutic options and consequently to an attractive outcome [1].

Numerous factors are related to dental aesthetic, such as the color, shape and position of teeth and the shape of dental arch. These factors are affected by individual preferences, cultural and sociodemographic factors. The viewer's perception of visual experience could be pleasant and beautiful by one individual and culture, while it could be seen as unpleasant in another [4, 5]. Perception of tooth appearance could be influenced by gender, age and education level. Females are reported to be more sensitive than males to the appearance of teeth and the importance of teeth for quality of life decreases with ageing and higher education levels [6]. Previous dental treatments of anterior teeth also have an impact on dental aesthetic, which is affected by individual preferences and cultures. Unfortunately, in some cases, dentists may develop an aesthetic appearance differing from the patient's concepts, resulting in communication problems and unanticipated difficulties [7].

Nowadays, cosmetic dentistry has become an important aspect of dentistry. Tooth whitening treatments, anterior teeth restoration, labial veneers crowns, and orthodontic treatment are frequently demanded by patients who are interested in improving their dental appearance [8].

Factors that influence patients' decision regarding the choice of a particular type of therapy to improve dental aesthetics are still insufficiently explored. Therefore, the aim of this study was to investigate the predictors influencing a patient's decision to choose prosthetic, orthodontic or bleeching type of treatment to improve dental aesthetics in maxillary anterior region in general population. It was hypothesized that significant predictors are age, gender, educational level, previous dental treatment and self-perceived dental appearance. Older subjects, females, higher educated and less satisfied with their dental appearance could be more prone to seeking crowns in maxillary anterior teeth. We assumed that subjects who want bleaching more often hide teeth during smiling, are dissatisfied with dental appearance and are more often females. Orthodontic therapy will probably choose subjects with self-perceived malpositioned and crowded teeth who are more prone to hide their teeth during smiling.

Methods

A total of 700 Caucasian subjects from Rijeka region, Croatia participated in the cross-sectional study (261 men, 439 women, mean age 46.2 ± 18.6 age, median 45 years). Sampling procedure included a convenient sample – consecutive voluntary blood donors in the Department of Transfusion Medicine, University Hospital Rijeka, subjects at the regular annual check-ups in the Institute for Public Health Rijeka, and patients seeking treatment in the University Dental Clinic Rijeka. All the participants included in the study gave written informed consent to the survey procedures, which were approved by the Ethical Committee of the Rijeka University School of Medicine.

The study included clinical examination and a questionnaire. Inclusion criterion was to have all six anterior teeth present in the upper jaw; while exclusion criteria were the evidence of gingival inflammation or gingival hyperplasia, observable gingival recession, observable occlusal wear, participants without active orthodontic therapy by edgewise appliances, participants with temporary crowns in prosthetic rehabilitation, participants in progressive endodontic therapy, participants with splints for treatment of temporomandibular disorders and participants without craniofacial syndromes. The questionnaire was self-administered and the included questions were based on: self-assessed satisfaction with dental appearance of their maxillary anterior teeth using a three-point scale with possible answers 'dissatisfied', 'moderately satisfied', or 'completely satisfied'. Data on gender, age, educational level and self-reported previous therapy – orthodontic, bleaching, implants, crowns, root canal therapy, root scaling, professional teeth cleaning (dichotomised $0 =$ absent, $1 =$ present) were also included. Self-perceived dental appearance included questions on: crowded, malpositioned, protruded, decayed, fractured teeth and bad fixed teeth prosthesis (dichotomised $0 =$ absent, $1 =$ present). Clinical examination included assessment of dental status of six maxillary anterior teeth using classification: natural teeth without dental treatment, composite fillings, metal ceramic crowns and ceramic crowns / veneers.

The data were analyzed using SPSS 10.0 statistical software package (SPSS 10.0; SPSS Inc., Chicago, IL, USA). The Chi-square test, *t*-test and Fischer exact test were used to compare differences between population choosing and refusing prosthetics, orthodontic or bleeching. Eta Squred and Cramer's V were used to estimate the size of the effect, that is, the share of total variability of dependent variable explained by the factor tested. Multiple logistic regression analysis was used to explore the significance of predictors of choosing the type of treatment for improvement of aesthetics in maxillary anterior region with 95% confidence

intervals given for the odds ratios, indicating statistically significant relationships if both values were either greater or lesser than 1. The significance of the effects in the logistic regression model was performed via the Wald statistics and likelihood ratio test with chi-square statistics. A statistical significance was preset at $p < 0.05$.

Results

The results of univariate analysis considering choosing crowns for improvement of dental aesthetics are presented in Table 1. To identify predictors for choosing crowns while controlling for other variables in multivariate analysis, two

Table 1

Differences in variables between choosing and non-choosing crowns population

Variables	Seeking crowns		Significance	Effect size
	No (n = 308)	Yes (n = 392)		
Age (x̄ ± SD)*, years	43.63 ± 18.52	48.24±18.35	0.001	0.015
Gender**, n (%)				
m	120 (46%)	141 (54%)		
f	188 (42.8%)	251 (57.2%)	0.432	0.001
Education level**, n (%)				
primary / secondary	232 (42.6%)	313 (57.4%)		
college / university	76 (49%)	79 (51%)	0.153	0.003
Satisfaction with dental appearance*	2.52 ± 0.58	1.92 ± 0.78	< 0.001	0.154
crowded teeth**, n (%)				
no	248 (46.9%)	281 (53.1%)		
yes	57 (34.8%)	107 (65.2%)	0.007	0.011
Malpositioned teeth**, n (%)				
no	259 (49.6%)	263 (50.4%)		
yes	48 (27.1%)	129 (72.9%)	< 0.001	0.039
Protrused teeth**, n (%)				
no	258 (45.5%)	309 (54.5%)		
yes	49 (37.1%)	83 (62.9%)	0.098	0.004
Decayed teeth**, n (%)				
no	297 (45.7%)	353 (54.3%)		
yes	10 (20.4%)	39 (79.6%)	< 0.001	0.017
Bad prosthesis**, n (%)				
no	301 (47.8%)	329 (52.2%)		
yes	6 (8.7%)	63 (91.3%)	< 0.001	0.055
Fractured teeth, n (%)				
no	277 (46.6%)	317 (53.4%)		
yes	31 (29.2%)	75 (70.8%)	< 0.001	0.016
Hide teeth during smile**, n (%)				
no	305 (49.3%)	314 (50.7%)		
yes	3 (3.8%)	76 (96.2%)	< 0.001	0.084
Orthodontic th.**, n (%)				
no	225 (40.3%)	333 (59.7%)		
yes	83 (58.5%)	59 (41.5%)	< 0.001	0.022
Bleaching th.**, n (%)				
no	276 (43.7%)	355 (56.3%)		
yes	32 (46.4%)	37 (53.6%)	0.703	0.000
Crowns**, n (%)				
no	240 (50.3%)	237 (49.7%)		
yes	68 (30.6%)	154 (69.4%)	<0.001	0.034
Implants**, n (%)				
no	297 (43.4%)	388 (56.6%)		
yes	11 (73.3%)	4 (26.7%)	0.032	0.008
Root canal th.**, n (%)				
no	217 (54.3%)	183 (45.8%)		
yes	91 (30.3%)	209 (69.7%)	< 0.001	0.057
Professional teeth cleaning**, n (%)				
ne	86 (49.4%)	88 (50.6%)		
da	222 (42.2%)	304 (57.8%)	0.113	0.004
Root scaling**, n (%)				
no	268 (44.9%)	329 (55.1%)		
yes	40 (38.8%)	63 (61.2%)	0.283	0.002
Status MOD***, n (%)				
without therapy	205 (49.5%)	209 (50.5%)		
composite filling	29 (33.7%)	57 (66.3%)		
metal acrylic crowns	33 (32%)	70 (68%)		
ceramic crowns/veneers	41 (42.3%)	56 (57.7%)	0.002	0.021

*t-test and partial eta squared for effect size; **Fischer exact test and Cramer's V for effect size;
***χ^2-test Cramer's V for effect size.

logistic regression models were used. First logistic regression model used age, gender, education level and current satisfaction with dental appearance for prediction of seeking prosthetic restoration. Choosing prosthetic solution was significantly related to advanced age and decreased satisfaction with personal dental appearance producing OR 1.02 and 0.29, respectively ($p < 0.001$) (Table 2). This model correctly classified 66.1% of population.

hiding teeth during smiling, already done bleaching and female gender who increase the chance for seeking bleaching for 5.8, 2.4 and 1.8 times. Searching for bleaching was associated with lower levels of satisfaction with appearance of the teeth and the absence of the previous orthodontic therapy (OR 0.5 and 0.4, respectively; Table 4). The results of univariate analysis considering orthodontics are presented in Table 5. In multivariate logistic regression model the small-

Table 2

Logistic regression models for predicting variables influencing crowns choosing

Variables	B	SE	Wald	Sig.	OR	95% CI
Constant (Model 1)*	2.013	0.364	30.581	< 0.001		
Age	0.019	0.005	16.128	< 0.001	1.019	1.010–1.028
Gender (female)	0.302	0.177	2.918	0.088	1.352	0.956–1.912
Educational level (higher)	-0.291	0.200	2.110	0.146	0.748	0.505–1.107
Satisfaction with dental appearance	-1.235	0.124	99.150	< 0.001	0.291	0.228–0.371
Constant (Model 2)**†	0.961	0.580	2.745	0.098		
Age	0.013	0.006	5.275	0.022	1.013	1.002–1.024
Gender (female)	0.416	0.195	4.521	0.033	1.515	1.033–2.222
Satisfaction with dental appearance	-0.923	0.145	40.351	< 0.001	0.397	0.299–0.528
Previous orthodontic th	-1.028	0.260	15.675	< 0.001	0.358	0.215–0.595
Perceived malposition	0.862	0.284	9.183	0.002	2.367	1.356–4.132
Perceived bad fixed prosthesis	1.066	0.499	4.561	0.033	2.903	1.092–7.718
Hide teeth during smiling	2.209	0.625	12.505	< 0.001	9.104	2.677–30.967

*Negelkerke Pseudo R2 = 0.235; 66.1%; $p < 0.001$. **Negelkerke Pseudo r2 = 0.366, 73.5%, $p < 0.001$.
†Only statistically significant variables are listed.

In the second model variable concerning previous dental therapy, perceived altered dental aesthetics and current dental status were added. For current dental status on maxillary anterior teeth most common restorative solution characteristics were used (mod value). Controlling all other variables in the model the significant predictors for seeking crowns in the maxillary anterior region are: age, female gender, satisfaction with dental appearance, previous orthodontic therapy, perceived malpositioned teeth, perceived bad fixed prosthesis and hiding teeth during smile. Hiding teeth during smile is the most important predictor producing 9.1 fold higher chance respectively for seeking the crowns (OR = 9.1 (95% CI 2.7 – 31.0)) (Table 2). Self-perceived bad fixed prosthesis, malpositioned teeth and female gender produced 2.9, 2.4, and 1.5 fold higher chance respectively, that participants want prosthetic therapy. Advanced age was statistically significant associated with seeking crowns ($p = 0.022$), but odds ratio was very low (OR = 1.02) (Table 2). The increase in satisfaction with dental appearance and previous orthodontic therapy reduced chances for seeking prosthetic therapy with odds ratios (each OR = 0.4) (Table 2). Addition of current dental status as a predictor in a model of logistic regression did not statistically significantly contribute to explanation of variability. None of current dental status (own natural maxillary anterior teeth, composite fillings, metal acrylic crowns and porcelain-fused-to ceramic crowns / ceramic veneers) was statistically significant predictor for seeking fixed prosthodontic restauration.

The results of univariate analysis considering bleeching are presented in Table 3. In multivariate logistic regression model the significant predictors for seeking bleaching were:

est numbers of factors had predictive value in seeking orthodontic treatment. In the first model, only the lower satisfaction with the appearance of the teeth was associated with seeking orthodontic treatment ($p < 0.001$). In the second model, controlling other factors, lower levels of satisfaction, self-perceived crowding, malposition and hiding teeth during smile were significant predictors, producing 2.2, 2.4 and 3.1 times higher chance, respectively, to seek orthodontic treatment (Table 6).

Discussion

For many years clinicians considered aesthetics to be far less important than function, structure and biology. However, nowdays if a treatment plan do not include a clear view of its aesthetics impact on the patient, the outcome could be disastrous [9]. A patient's satisfaction has become an increasingly important factor in dental treatment. Therefore, clinicians should begin a treatment plan with well-defined aesthetics objectives, and then should consider the impact of the planned treatment on function, structure and biology. Such planning requires the clinician to rely on several dental disciplines (namely prosthodontics, periodontics and orthodontics) to deliver the most comprehensive level of dental care to a patient [8].

Therefore, we investigated factors influencing people's decision to choose the type of treatment to improve dental aesthetics. We hypothesised that older subject would prefer prosthetic restoration and younger ones bleaching and orthodontics and that females would be more prone to every type of dental treatment than males. Searching for dental therapy is probably under strong influence of previous dental therapy

Table 3

Differences in variables between bleaching seeking and non-seeking population

Variables	Seeking bleeching		Significance	Effect size
	No (n = 258)	Yes (n = 442)		
Age (x̄ ± SD)*, years	45.28 ± 18.68	46.75 ± 18.48	0.313	0.001
Gender**, n (%)				
m	109 (41.8%)	152 (58.2%)		
f	149 (33.9%)	290 (66.1%)	0.043	0.006
Education level**, n (%)				
primary / secondary	204 (37.4%)	341 (62.6%)		
college / university	54 (34.8%)	101 (65.2%)	0.573	< 0.001
Satisfaction with dental appearance*, x̄ ± SD	2.53 ± 0.58	1.98 ± 0.78	< 0.001	0.125
Crowded teeth**, n (%)				
no	206 (38.9%)	323 (61.1%)		
yes	50 (30.5%)	114 (69.5%)	0.052	0.006
Malpositioned teeth**, n (%)				
no	214 (41.0%)	408 (59.0%)		
yes	44 (24.9%)	133 (75.1%)	< 0.001	0.021
Protruded teeth**, n (%)				
no	220 (38.8%)	347 (61.2%)		
yes	38 (28.8%)	94 (71.2%)	0.035	0.007
Decayed teeth**, n (%)				
no	248 (38.2%)	402 (61.8%)		
yes	10 (20.4%)	39 (79.6%)	0.014	0.009
Bad prosthesis**, n (%)				
no	248 (39.4%)	382 (60.6%)		
yes	10 (14.5%)	59 (85.5%)	< 0.001	0.024
Fractured teeth, n (%)				
no	234 (39.4%)	360 (60.6%)		
yes	24 (22.6%)	82 (77.4%)	< 0.001	0.015
Hide teeth during smile**, n (%)				
no	254 (41.0%)	365 (59.0%)		
yes	4 (5.1%)	75 (94.9%)	< 0.001	0.056
Orthodontic th.**, n (%)				
no	195 (34.9%)	363 (65.1%)		
yes	63 (44.4%)	79 (55.6%)	0.041	0.006
Bleaching th.**, n (%)				
no	241 (38.2%)	390 (61.8%)		
yes	17 (24.6%)	52 (75.4%)	0.026	0.007
Crowns**, n (%)				
no	184 (38.6%)	293 (61.4%)		
yes	74 (33.3%)	148 (66.7%)	0.207	0.003
Implants**, n (%)				
no	248 (36.2%)	437 (63.8%)		
yes	10 (66.7%)	5 (33.3%)	0.027	0.008
Root canal th.** , n (%)				
no	171 (42.8%)	229 (57.3%)		
yes	87 (29.0%)	213 (71.0%)	< 0.001	0.020
Professional teeth cleaning**, n (%)				
no	73 (42.0%)	101 (58.0%)		
yes	185 (35.2%)	341 (64.8%)	0.123	0.004
Root scaling**, n (%)				
no	222 (37.2%)	375 (62.8%)		
yes	36 (35.0%)	67 (65.0%)	0.740	< 0.001
Status MOD***, n (%)				
without therapy	155 (37.4%)	259 (62.6%)		
composite filling	26 (30.2%)	60 (69.8%)		
metal acrylic crowns	36 (35.0%)	67 (65.0%)		
ceramic crowns/veneers	41 (42.3%)	56 (57.7%)	0.382	0.004

*t-test and eta squared for effect size; **Fischer exact test and Cramer's V for effect size; *** χ^2-test Cramer's V for effect size.

Table 4

Logistic regression models for predicting variables influencing bleaching seeking

Variables	B	SE	Wald	Sig.	OR	95% CI
Constant (Model 1)*	2.566	0.409	39.304	0.000		
Age	0.008	0.005	2.724	0.099	1.008	0.999–1.017
Gender (female)	0.499	0.178	7.864	0.005	1.646	1.162–2.333
Education level (higher)	-0.174	0.206	0.707	0.400	0.841	0.561–1.260
Satisfaction with dental appearance	-1.129	0.125	80.963	0.000	0.323	0.253–0.414
Constant (Model 2)**†	1.603	0.574	7.805	0.005		
Gender (female)	0.560	0.188	8.843	0.003	1.750	1.210–2.531
Satisfaction with dental appearance	-0.937	0.145	41.989	0.000	0.392	0.295–0.520
Previous orthodontic th	-0.681	0.243	7.886	0.005	0.506	0.314–0.814
Previous bleaching	0.878	0.336	6.840	0.009	2.405	1.246–4.643
Hide teeth during smiling	1.755	0.547	10.289	0.001	5.784	1.979–16.901

*Negelkerke Pseudo R2 = 0.189, 64.7%, $p < 0.001$; **Negelkerke Pseudo R2 = 0.265, 68%, $p < 0.001$; †Only statistically significant variables are listed.

Table 5

Differences in variables between orthodontic therapy seeking and non-seeking population

Variables	Seeking orthodontics		Significance	Effect size
	No (n = 308)	Yes (n = 392)		
Age ($\bar{x} \pm SD$)*, years	46.89 ± 18.42	45.68 ±18.66	0.393	0.001
Gender**, n (%)				
m	120 (46.0%)	141 (54.0%)		
f	188 (42.8%)	251 (57.2%)	0.432	0.001
Education level**, n (%)				
primary / secondary	241 (44.2%)	304 (55.8%)		
college / university	67 (43.2%)	88 (56.8%)	0.855	< 0.001
Satisfaction with dental appearance*, $\bar{x} \pm SD$	2.44 ± 0.65	1.97 ± 0.78	< 0.001	0.094
Crowded teeth**, n (%)				
no	269 (50.9%)	260 (49.1%)		
yes	34 (20.7%)	130 (79.3%)	< 0.001	0.067
Malpositioned teeth**, n (%)				
no	271 (51.9%)	251 (48.1%)		
yes	36 (20.3%)	141 (79.7%)	< 0.001	0.077
Protruded teeth**, n (%)				
no	267 (47.1%)	300 (52.9%)		
yes	40 (30.3%)	92 (69.7%)	< 0.001	0.017
Decayed teeth**, n (%)				
no	293 (45.1%)	357 (54.9%)		
yes	14 (28.6%)	35 (71.4%)	0.026	0.007
Bad prosthesis**, n (%)				
no	285 (45.2%)	345 (54.8%)		
yes	22 (31.9%)	47 (68.1%)	0.040	0.006
Fractured teeth, n (%)				
no	273 (46.0%)	321 (54.0%)		
yes	35 (33.0%)	71 (67.0%)	0.015	0.009
Hide teeth during smile**, n (%)				
no	297 (48.0%)	322 (52.0%)		
yes	9 (11.4%)	70 (88.6%)	< 0.001	0.055
Orthodontic th.**, n (%)				
no	242 (43.4%)	316 (56.6%)		
yes	66 (46.5%)	76 (53.5%)	0.509	0.001
Bleaching th.**, n (%)				
no	278 (44.1%)	353 (55.9%)		
yes	30 (43.5%)	39 (56.5%)	1.000	< 0.001
Crowns**, n (%)				
no	224 (47.0%)	253 (53.0%)		
yes	83 (37.4%)	139 (62.6%)	0.018	0.008
Implants**, n (%)				
no	298 (43.5%)	387 (56.5%)		
yes	10 (66.7%)	5 (33.3%)	0.112	0.005
Root canal th.**, n (%)				
no	203 (50.8%)	197 (49.3%)		
yes	105 (35.0%)	195 (65.0%)	< 0.001	0.025
Professional teeth cleaning**, n (%)				
no	77 (44.3%)	97 (55.7%)		
yes	231 (43.9%)	295 (56.1%)	1.000	< 0.001
Root scaling**, n (%)				
no	257 (43.0%)	340 (57.0%)		
yes	51 (49.5%)	52 (50.5%)	0.238	0.002
Status MOD***, n (%)				
without therapy	185 (44.7%)	229 (55.3%)		
composite filling	32 (37.2%)	54 (62.8%)		
metal acrylic crowns	44 (42.7%)	59 (57.3%)		
ceramic crowns/veneers	47 (48.5%)	50 (51.5%)	0.468	0.004

*t-test and eta squared for effect size; ** Fischer exact test and Cramer's V for effect size; ***χ^2-test Cramer's V for effect size.

Table 6

Logistic regression models for predicting variables influencing orthodontic therapy seeking

Variables	B	S.E.	Wald	Sig.	OR	95% CI
Constant (Model 1)*	2.176	0.352	38.327	< 0.001		
Age	-0.003	0.004	0.365	0.546	0.997	0.989–1.006
Gender (female)	0.193	0.167	1.326	0.249	1.213	0.873–1.684
Education level (higher)	0.098	0.193	0.258	0.612	1.103	0.755–1.612
Satisfaction with dental appearance	-0.881	0.112	61.985	< 0.001	0.415	0.333–0.516
Constant (Model 2)**†	0.753	0.550	1.875	0.171		
Satisfaction with dental appearance	-0.587	0.134	19.085	< 0.001	0.556	0.427–0.723
Perceived crowding	0.783	0.264	8.774	0.003	2.188	1.303–3.673
Perceived malposition	0.891	0.275	10.476	0.001	2.437	1.421–4.179
Hide teeth during smiling	1.133	0.404	7.871	0.005	3.106	1.407–6.856

*Negelkerke Pseudo R2 = 0.128, 63.5%, $p < 0.001$; **Negelkerke Pseudo R2 = 0.256, 69.8%, $p < 0.001$; †Only statistically significant variables are listed.

and psychological elements, namely dissatisfaction with own teeth, hiding teeth during smile and self perceived altered aesthetic.

We expected that in older individuals their interest in dental appearance would be diminished, together with the lower socio-economic status of the older patients and their lower incomes (they are not able any more to afford themselves very expensive aesthetic restorations). It seems that older people are more satisfied with their dental appearance than younger [10, 11]. But this finding is under strong influence of their dental status – properly made porcelain-fused-to-metal crowns or fixed partial dentures on their upper anterior teeth [11]. Still, according to our study none of current dental status (own natural maxillary anterior teeth, composite fillings, metal acrylic crowns and porcelain-fused-to ceramic crowns / ceramic veneers) is a significant predictor for seeking fixed prosthodontic restorations. It is reported that age has an impact on desiring prosthetic restorations [12]. This is consistent with data obtained from this study. This research showed that beside age and female gender significant predictors of searching fixed prosthetic restorations are lower satisfaction with dental appearance, self-perceived malpositioned teeth, bad fixed prosthesis and hiding teeth during smile.

Age and gender are considered significant factors in predicting the color of the central incisors [13]. On the biological point of view it is known that with increasing age central incisors become darker, more reddish and more yellow, which is more pronounced in men than in women. Our study demonstrated that female gender is a significant predictor for choosing bleaching to improve dental aesthetics, but the age is not. It is commonly thought that women are more interested in their appearance than men. Indeed, female patients were found to be more concerned with their dental appearance than males, as well as to be more critical in judging their dental appearance [13]. Our study identified lower level of satisfaction with tooth appearance and hiding teeth during smiling as predictors for choosing bleaching to improve altered dental esthetics. It has been reported that 28% of adults in the UK are unsatisfied with the appearance of their teeth and 34 % of adult population in the USA is unsatisfied with their current tooth color [14]. In contrast to crowing or veneering whitening of teeth is relatively non-invasive and preserves hard dental tissues, therefore it is the most-desired basic treatment for the improvement of dental aesthetics [15]. This could be explained by the fact that most of the patients are dissatisfied with their tooth color and many of them had not made any attempt toward tooth whitening in the past. In addition, a study of 180 female patients in South London [16] showed that whitened teeth were preferred over teeth with original color with the former associated with greater attractiveness. Still, according to our data previous bleaching and the absence of previous orthodontic treatment are significant predictors for choosing bleaching. Probably the patients who underwent the procedure of tooth bleaching want more because they saw that it was relatively easy and painless procedure which is unfortunately reversible.

A variety of factors, including socio-economic background, education level, age, gender, self-esteem, self-per-

ceived dental aesthetic, social and cultural norms have been suggested as factors affecting orthodontic treatment motives [2, 17, 18]. Females are often more dissatisfied with their teeth than males [12, 14, 18], but it is also reported that there was no significant association between the desire for orthodontic treatment and the variables gender and age [16], which is confirmed by our study. Poor self-perceived aesthetics and better socioeconomic position more significantly influence the decision to seek orthodontic treatment producing odds ratios of 16.7 and 39.1, than severe malocclusion (OR = 3.4) [19].

Generally lower satisfaction with dental appearance is the main predictor of desire to undergo orthodontic therapy, according to our research, accompanied with self-perceived crowding, malposition and hiding teeth during smile. It is reported that the main factor associated with orthodontic treatment seeking is self-perception of psychosocial impact of malocclusion, and not to improve altered masticatory function [18]. The desire for treatment, concern about dental appearance and oral health related quality of life (OHRQoL) are often interrelated. Malocclusion has modest influence on quality of life [20] that is more evident in altered emotional well-being than in masticatory function or social contacts [2]. Still worse OHRQoL produces 3.1 times higher chance to seek orthodontic treatment, although severly compromised aesthetics is a better predictor of worse OHRQoL than seeking orthodontic treatment [21]. It appears that satisfaction with personal dental appearance and awareness of malocclusion are better related in persons with no treatment need or minor need than in those with major need [22]. Although our study did not find any previous dental treatment as a predictor of desire for orthodontic treatment, it is reported that perception of orthodontic treatment need is higher in previously orthodontically treated subjects [2]. It must be kept in mind that the majority of studies concerning orthodontic treatment motives are done in children and adolescents, and not in adult population. Therefore, the results of our study could not be properly related to published data.

Since aesthetics has become an important issue in modern society and the number of elective aesthetic procedures increases, it seems important to have a good communication between a patient and the dentist, incorporating individual patients' and professional differences when planning the treatment and try to visualize treatments results before finalization.

Conclusion

This research indicates that in clinical works we must always consider the following clinical guidelines: females more often want dental treatments, the current dental status does not necessarily affect the choice of desirable dental treatments, but previous dental treatment experience does. Dental treatment to improve dental aesthetics is under strong influence of self-perceived altered aesthetics and the level of dissatisfaction. There are, unfortunately, a very small number of published papers on this issue, therefore further research should be encouraged.

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