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Psychosocial well-being of prospective orthognathic-surgical patients

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Abstract

Objective. To compare the psychosocial well-being of prospective orthognathic-surgical patients and controls. ***Materials and methods.*** Sixty patients referred for assessment of orthognathic-surgical treatment need and 29 controls participated. All participants filled in the modified version of Secord and Jourard's Body Image Questionnaire, the Orthognathic Quality of Life Questionnaire, the Rosenberg Self-Esteem scale, the Acceptance and Action Questionnaire II and a structured diary developed by the authors. Patients also filled in the Symptom Checklist 90. Patients assessed their dental appearance on a visual analogue scale modified from the Aesthetic Component (AC) of the Index of Orthodontic Treatment Need. Professional assessment was made from study models with the AC. ***Results.*** Patients rating their dental appearance as AC grades 5–10 suffered from lower orthognathic quality-of-life and poorer body image than the controls, while those with AC grades of 1–4 only had poorer oral function. Self-perceived dental appearance was more important to orthognathic quality-of-life and body image than an orthodontist's assessment. Patients and controls had equal psychological flexibility and self-esteem. In all, 23–57% of patients had significant psychiatric symptoms, which explained the adverse emotions patients felt during the day. Fifteen per cent of the patients had been bullied. ***Conclusions.*** Many orthognathic-surgical patients cope well with their dentofacial deformities, despite functional masticatory problems. It seems that a subjective view of dental appearance may be a key factor in finding patients with psychosocial problems. It should be a major issue when considering psychosocial support and other treatment options.

Key Words: *orthognathic, prospective, quality-of-life*

Introduction

Morphologically deviating occlusion and craniofacial structure may impair occlusal function, cause pain in the temporomandibular joints, in the head and neck muscles [1,2] and may be a co-factor in sleep apnea [3,4]. In the psychosocial domain, patients often suffer from poor orthognathic quality-of-life (OQoL) [5,6]. Patients' reasons for seeking treatment can be divided into functional, social and appearance-related [7]. In non-growing patients, treatment of morphologically deviating occlusion usually includes both orthodontic and surgical procedures. In Finland, the mean duration of surgical-orthodontic treatment has been reported to be 26.8 months [8]. The majority of patients are female, which may be due to temporomandibular joint problems affecting more females than males [1]. Treatment is principally initiated when facial growth has ceased, usually after the age of 20.

It has been suggested that orthognathic-surgical treatment should aim to improve patients' psychosocial well-being [9,10]. Treatment has been shown to affect patients' oral health-related quality-of-life [11,12] and OQoL [13]. This is important in relation to patients' expectations: Patients expect treatment to affect their emotional and psychological well-being and their social lives [14]. In a review article [13] we found that patients' main motives for seeking treatment were improvements in self-confidence,

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appearance and oral function. The most common reasons in a Finnish sample were problems in biting and chewing, dissatisfaction with facial appearance, temporomandibular joint problems and headache [15].

Earlier studies have shown that patients undergoing this type of treatment do not suffer from pre-operative anxiety [16,17] or depression [18,19]. However, patients do suffer from other psychological problems, for example from feelings of hopelessness [7], interpersonal problems, such as bullying [7,20], or avoidance of meeting new people [7]. Also, patients report low self-esteem and lack of self-confidence [7], although on standardized questionnaires patients' self-esteem does not appear lower than the population average [16,21].

The aim of this study was to compare body image, OQoL, self-esteem, psychological flexibility and daily emotions and bullying experiences of patients referred for assessment of orthognathic-surgical treatment need to those of first-year university students who had not been referred to assessment. Also occurrences of psychiatric symptoms were compared to national norms.

Subjects and methods

The patient group consisted of 60 patients (16 male and 44 female, age range = 17–61 years), who were referred to the Department of Oral and Maxillofacial Diseases of Turku University Hospital or to the Oral and Maxillofacial Unit of Tampere University Hospital. Patients with cleft lip or palate, any syndromes or whose Finnish-language skills did not allow them to complete the questionnaires were excluded from the study. The control group consisted of 29 first-year university students (28 female and one male, age range = 19–49 years), who attended a dental examination at the Turku unit of the Finnish Student Health Service. The study protocol was approved by the Ethics Review Committees of the Hospital District of South-West Finland and the Joint Municipal Authority of the Pirkanmaa Hospital District. Informed consent was obtained from all patients and controls before the study. Participation in this study was voluntary.

Patients filled in five questionnaires and a structured diary and controls filled in four questionnaires and a structured diary: (1) The modified version [22] of body image questionnaire [23], which includes 20 items and assesses participants' satisfaction with different body parts. Higher scores indicate greater satisfaction. (2) The Orthognathic Quality-of-Life Questionnaire [24] (OQLQ) consists of 22 items which form sub-scales on oral function, facial aesthetics, awareness of facial aesthetics, and social aspects of dentofacial deformity. The higher the score, the poorer the OQoL is. The reliabilities of the sub-scales range from 0.83–0.93 [24]. (3) The Rosenberg self-esteem scale [25] (RSES), which is a 10-item questionnaire used to assess participants' self-esteem. The higher the score, the higher the self-esteem is. The reliability in a Finnish population has been found to be 0.86 [26]. (4) The Acceptance and Action Questionnaire II [27] (AAQ II) is a seven-item questionnaire for the assessment of psychological flexibility (i.e. the ability to accept and experience current feelings and emotions and, if necessary, to modify behaviour according to values and goals [28]). Higher scores indicate greater psychological flexibility. The mean alpha coefficient of AAQ II is 0.84 [27]. (5) Symptom Checklist 90 [29] (SCL-90) is a self-report questionnaire of psychiatric symptoms and was only filled in by the patients. The SCL-90 has 90 items which form the following scales: somatization, compulsivity, interpersonal sensitivity, depression, hostility, anxiety, phobic anxiety, paranoid ideation and psychoticism. Higher scores indicate a greater number of psychiatric symptoms. The reliability of the Finnish version ranges from 0.77–0.90 [30]. (6) A structured diary developed by the authors (Appendix). The diary includes questions about emotions, negative and positive attention, bullying and name calling. The diary was filled in during one working day and on a day off work, 4-times a day: (A) after waking up or at 8 am, (B) after lunch or at noon, (C) after work or at 4 pm and (D) when going to sleep or at 8 pm.

Patients were asked to assess their own dental appearance on a visual analogue scale ('a modified AC scale'). The scale was anchored at both ends with a colour photograph from the Aesthetic Component (AC) of the Index of Orthodontic Treatment Need [31] (IOTN), with 1 = good, attractive occlusion and 10 = definite need for treatment. An orthodontist who was calibrated in applying the AC also assessed patients' dental appearance using their study models [32].

Before their first appointment at the clinics, patients received the RSES, AAQ II, OQLQ and SCL-90 via mail and returned these at the first appointment. On this occasion patients received the structured diary and the modified body image questionnaire, which were returned at the next appointment. Controls received and returned all questionnaires and the diary via mail.

Statistical analyses

For comparisons between patients' and controls' self-reported emotion variables in the diary, mean scores of workdays and days off were calculated for each variable. Patients' RSES, AAQ II, OQLQ, body image and emotion variables were compared to those of the controls with either Student's independent samples *t*-test or Mann-Whitney U-test depending

on the quality of the data. Patients' SCL-90 sub-scale scores were compared to national norms [30] and the percentages of those whose scores were at or above the national threshold were calculated. The distribution of name calling and bullying according to self-perceived dental appearance was analyzed with Fisher's exact test. Patients' perceptions of their dental appearance were compared to an orthodontist's assessment of appearance with Spearman's rank correlation coefficient.

All respondents were included in all between-groups comparisons, even though only few men participated. However, exclusion of men from comparisons did not produce more differences between patients and controls.

Twenty-two patients returned both diaries. Therefore, comparisons between workdays and days off were performed on this limited sample. Comparisons were carried out with the Wilcoxon signed-rank test. Significance level was set at 0.05. All of the above-mentioned analyses were performed with IBM SPSS Statistics, version 21.

For further analysis the normality of the emotion variables in the diary at time points A–D were evaluated with the Kolmogorov-Smirnov test. The distributions were found to be skewed in both patients and controls. Spearman's correlation coefficients were used to examine the dependence between time points for each variable. Principal Component Analysis yielded support for dimension reduction and combining different time points for each emotion. The mean of all time points was chosen to be used as a response in statistical models. Each mean was found to follow log-normal distribution. Generalized linear mixed models were used with the Restricted Maximum Likelihood estimation method to discover proper arithmetic mean differences between patients and controls. Type III F statistics are presented

Table I. Effects of questionnaires on daily self-reported emotions.

Emotion	Questionnaire	Estimate	*t*-value	*p*-value	95 % CI
Annoyed/irritated/angry/furious	Body image	0.991	−1.98	0.051	0.982–1.000
	GSI	1.261	1.57	0.124	0.936–1.699
	OQLQ sum score	1.008	3.15	0.003	1.003–1.013
	RSES	0.971	−2.95	0.004	0.952–0.991
	AAQ II	0.981	−2.98	0.004	0.969–0.994
Worried/scared	Body image	0.983	−4.09	0.000	0.975–0.991
	GSI	1.539	3.29	0.000	1.181–2.006
	OQLQ sum score	1.011	4.72	0.000	1.006–1.016
	RSES	0.961	−4.50	0.000	0.944–0.978
	AAQ II	0.973	−4.82	0.000	0.962–0.984
Low/sad/depressed	Body image	0.981	−4.48	0.000	0.973–0.999
	GSI	1.472	2.45	0.019	1.070–2.023
	OQLQ sum score	1.013	5.41	0.000	1.008–1.018
	RSES	0.958	−4.35	0.000	0.940–0.977
	AAQ II	0.975	−3.76	0.000	0.962–0.988
Tired	Body image	0.986	−4.34	0.000	0.980–0.992
	GSI	1.451	3.42	0.000	1.165–1.807
	OQLQ sum score	1.010	5.66	0.000	1.007–1.014
	RSES	0.971	−4.00	0.000	0.957–0.985
	AAQ II	0.985	−3.00	0.004	0.974–0.995
Hurried	Body image	0.990	−2.24	0.028	0.981–0.999
	GSI	1.488	3.08	0.004	1.145–1.931
	OQLQ sum score	1.008	3.02	0.004	1.003–1.013
	RSES	0.977	−2.27	0.026	0.958–0.997
	AAQ II	0.990	−1.48	0.142	0.976–1.004
Satisfied/happy	Body image	1.007	2.40	0.019	1.001–1.013
	GSI	0.715	−3.07	0.004	0.574–0.892
	OQLQ sum score	0.992	−4.78	0.000	0.989–0.996
	RSES	1.027	4.25	0.000	1.014–1.040
	AAQ II	1.013	2.73	0.008	1.004–1.023

Table II. Psychological flexibility (AAQ-II [27]), self-esteem [25], body image and facial body image [22] for patients and controls. Means, standard deviations, medians and U-test/*t*-test results for patients and controls.

Measure	Group	*n*	Mean	SD	Median	Test value	*p*-value
Body image	Patients	44	60.38	13.38	59.50	U = 833.00	0.015
	Controls	29	67.43	8.30	68.00		
Facial body image	Patients	44	38.34	8.87	39.25	$t = -3.44$	0.001
	Controls	29	44.81	6.01	45.50		
Self-esteem	Patients	58	22.22	5.89	23.00	$t = -0.25$	0.805
	Controls	28	22.54	4.44	23.50		
Psychological flexibility	Patients	59	41.12	7.69	43.00	U = 803.00	0.064
	Controls	29	40.41	8.17	44.00		

Table III. OQLQ [24]. Results for patients and controls: Means, standard deviations, medians and U-test results for patients and controls.

Measure	Group	*n*	Mean	SD	Median	Mann-Whitney U	*p*-value
Sum score	Patients	57	32.35	20.15	29.00	399.50	0.001
	Controls	26	17.92	15.40	12.50		
Facial aesthetics	Patients	60	9.12	5.82	8.00	561.50	0.012
	Controls	28	5.82	4.75	5.00		
Awareness of dentofacial aesthetics	Patients	60	5.33	4.00	4.50	565.50	0.013
	Controls	28	3.14	3.15	2.50		
Oral function	Patients	57	9.81	5.07	9.00	230.00	0.000
	Controls	29	3.41	3.67	3.00		
Social aspects	Patients	60	8.02	8.20	6.00	755.50	0.447
	Controls	28	5.93	6.45	4.00		

in Table I with corresponding *p*-values. A significance level of 0.05 was used. Analyses were performed with SAS System for Windows, version 9.3.

Results

Body image, OQLQ, RSES, AAQ II, SCL-90 and diaries' self-reported emotion variables

Patients' body image and facial body image were worse than those of the controls (Table II). Patients' OQLQ was poorer than that of the controls with the exception of social aspects of dentofacial deformity (Table III). AAQ II and RSES did not differ between the groups. Fifty-seven per cent of patients had significant somatization symptoms. The percentages of patients with other SCL-90 sub-scale scores on or above the national threshold varied from 23–42 (Table IV).

At time point A patients felt more annoyed/irritated/angry/furious (U = 371.00, p = 0.005), more low/sad/depressed (U = 391.00, p = 0.044), more hurried (U = 371.50, p = 0.015) and less satisfied/happy (U = 827.50, p = 0.018) than controls. At time point C patients felt more hurried (U = 388.50, p = 0.034). Other comparisons at different time points were non-significant.

Seven (12%) of the patients and three (10%) of the controls had been called names at least once, while nine (15%) of the patients and none of the controls had been bullied at least once during the week. At time points A, C and D patients and controls did not differ in how pleasant it was to be with others and

Table IV. Percentage and number of patients with the symptom checklist 90 scores at or above the normal national threshold [30].

Sub-scale	% (*n*)
Somatization	57 (34)
Obsessive-compulsive	42 (25)
Depression	40 (24)
Phobic anxiety	33 (20)
Paranoid ideation	32 (19)
Interpersonal sensitivity	28 (17)
Anxiety	28 (17)
Psychoticism	25 (15)
Hostility	23 (14)
Global severity index	38 (23)

Table V. Means, standard deviations and medians of self-reported variables for patients and controls.

Self-reported variables	Time point	Group	*n*	Mean	SD	Median
Annoyed/irritated/angry/furious	A	Patients	42	1.81	1.36	1.00
		Controls	27	1.63	0.78	1.00
	B	Patients	43	1.90	1.27	1.50
		Controls	27	1.31	0.97	1.00
	C	Patients	42	1.85	1.28	1.25
		Controls	26	1.27	0.43	1.00
	D	Patients	42	1.77	1.44	1.00
		Controls	26	1.56	0.96	1.00
Worried/scared	A	Patients	41	1.57	0.81	1.00
		Controls	27	1.50	1.03	1.00
	B	Patients	42	1.65	1.07	1.00
		Controls	27	1.54	0.88	1.00
	C	Patients	42	1.63	1.13	1.00
		Controls	26	1.46	0.62	1.25
	D	Patients	40	1.71	1.04	1.00
		Controls	26	1.54	0.97	1.00
Low/sad/depressed	A	Patients	42	1.93	1.32	1.50
		Controls	26	1.37	0.56	1.00
	B	Patients	41	1.90	1.28	1.50
		Controls	26	1.27	0.53	1.00
	C	Patients	42	1.79	1.35	1.00
		Controls	26	1.33	0.51	1.00
	D	Patients	41	1.82	1.40	1.00
		Controls	26	1.56	0.95	1.00
Tired	A	Patients	42	3.92	1.61	3.75
		Controls	29	3.40	1.33	3.50
	B	Patients	44	2.67	1.49	2.25
		Controls	27	2.07	0.83	2.00
	C	Patients	42	3.21	1.64	3.00
		Controls	28	2.73	1.04	2.50
	D	Patients	43	4.02	1.87	4.00
		Controls	29	3.36	1.41	3.50
Hurried	A	Patients	43	2.88	1.53	3.00
		Controls	28	2.48	1.28	2.00
	B	Patients	42	3.15	1.56	3.25
		Controls	27	2.22	1.01	2.00
	C	Patients	41	2.60	1.45	2.50
		Controls	27	1.91	1.31	1.50
	D	Patients	41	1.94	1.28	1.50
		Controls	27	1.91	1.02	1.50
Satisfied/happy	A	Patients	42	4.68	1.52	5.00
		Controls	28	5.14	1.14	5.50
	B	Patients	43	4.77	1.52	5.00
		Controls	29	5.55	0.99	6.00
	C	Patients	43	5.02	1.47	5.00
		Controls	28	5.61	0.85	5.75
	D	Patients	40	5.05	1.43	5.25
		Controls	29	5.52	0.93	5.50

Time point A = Morning/8 am, B = Lunch/12 pm, C = After work/4 pm, D = Going to sleep/8 pm.

how much negative or positive attention they got. At time point B patients felt they received less positive attention (U = 615.00, $p = 0.010$) and more negative attention (U = 333.50, $p = 0.027$) than the controls, but did not differ from the controls regarding how pleasant it was to be with others. Detailed comparisons between patients' and controls' diary emotion variables are presented in Table V.

Comparisons between patients with AC grades 1–4, AC grades 5–10 and controls

Fifteen patients (17%) rated their own dental appearance with the modified AC grades of 1–4, suggesting no treatment need and 29 (33%) with the modified grades of 5–10, indicating either borderline or definite need. Those with AC 1–4 and those with AC 5–10 did not differ with respect to RSES or AAQ II or diary emotion variables. Patients with AC 5–10 had poorer body image, facial body image and OQLQ scores, with the exception of oral function, than those with AC 1–4. Those with AC 5–10 had poorer body and facial body image and OQLQ scores than controls. Patients with AC 1–4 only had poorer OQLQ scores in the oral function sub-scale than controls (Tables VI and VII).

Two (13%) of the patients with AC 1–4 and three (10%) with AC 5–10 had been called names ($p = 1.000$). Three (20%) of the patients with AC 1–4 and five (17%) with AC 5–10 had been bullied during the past week ($p = 1.000$).

Patients' subjective evaluation of dental appearance and treatment need were modestly correlated with an orthodontist's objective evaluation ($r = 0.39$, $p = 0.011$). Patients with objective AC 1–4 did not differ from those with AC 5–7 or AC 8–10 with respect to body or facial body image, RSES, AAQ II or OQLQ (Table VIII).

Comparisons between workdays and days off work

On workdays patients felt more tired at time point A and more hurried at time points B and C than on days off (Table IX).

Table VI. Psychological flexibility (AAQ II [27]), self-esteem [25], body image and facial body image [22], OQLQ [24]. Means, standard deviations and medians for controls and patients with lower and higher self-perceived treatment need.

Measure	Group	*n*	Mean	SD	Median
Body image	Controls	29	67.43	13.38	59.50
	Patients, AC 1–4	13	65.58	11.41	64.00
	Patients, AC 5–10	24	56.19	14.04	55.25
Facial body image	Controls	29	44.81	6.01	45.50
	Patients, AC 1–4	13	42.46	7.38	42.50
	Patients, AC 5–10	24	35.25	9.17	35.00
OQLQ Facial aesthetics	Controls	28	5.65	4.89	4.50
	Patients, AC 1–4	15	5.73	5.08	4.00
	Patients, AC 5–10	29	11.66	5.79	11.00
OQLQ Awareness of dentofacial aesthetics	Controls	28	3.42	3.87	2.50
	Patients, AC 1–4	15	3.40	3.60	2.00
	Patients, AC 5–10	29	6.62	4.14	7.00
OQLQ Oral function	Controls	29	3.23	3.24	2.50
	Patients, AC 1–4	14	10.86	5.16	10.00
	Patients, AC 5–10	29	10.48	4.94	10.00
OQLQ Social aspects	Controls	28	5.62	6.38	4.00
	Patients, AC 1–4	15	5.93	8.88	2.00
	Patients, AC 5–10	29	10.48	8.28	8.00
Self-esteem	Controls	28	22.54	4.44	23.50
	Patients, AC 1–4	15	23.40	5.78	25.00
	Patients, AC 5–10	27	20.93	6.31	21.00
Psychological flexibility	Controls	29	40.41	8.17	44.00
	Patients, AC 1–4	15	41.60	9.35	44.00
	Patients, AC 5–10	28	41.29	7.23	42.50

Modified AC-grades 1–4 = no treatment need; AC-grades 5–10 = need for treatment.

Table VII. Patients' and controls' body image, facial body image and OQLQ as a function of self-perceived need of treatment. Results of t-tests and Mann-Whitney U-tests.

	Body image	Facial body image	OQLQ sum score	OQLQ Facial aesthetics	OQLQ Awareness of dentofacial aesthetics	OQLQ Oral function	OQLQ Social aspects
Patients, AC 1–4 (n = 15) vs patients, AC 5–10 (n = 29)	U = 90.00, p = 0.036	U = 85.50, p = 0.025	U = 288.50, p = 0.027	U = 341.50, p = 0.002	U = 312.50, p = 0.018	U = 192.50, p = 0.785	U = 311.00, p = 0.020
Patients, AC 1–4 (n = 15) vs controls (n = 29)	U = 205.50, p = 0.643	U =223.50, p = 0.341	U = 137.50, p = 0.207	U = 214.00, p = 0.919	U = 200.50, p = 0.806	U = 40.50, p = 0.000	U = 252.00, p =0.278
Patients, AC 5–10 (n = 29) vs controls (n = 29)	U = 527.00, p = 0.001	t = −4.56, p = 0.000	U = 135.50, p = 0.000	U = 180.50, p = 0.000	U = 208.00, p = 0.001	U = 90.00, p = 0.000	U = 258.50, p = 0.018

Modified AC-grades 1–4 = no treatment need; AC-grades 5–10 = need for treatment.

Effects of body image, SCL-90, OQLQ, RSES, AAQ II and name-calling experiences on diaries' self-reported emotion variables

Being called names affected patients' and controls' feelings of being annoyed/irritated/angry/furious (F = 3.67, p = 0.031) and worried/scared (F = 4.15, p = 0.020) differently: Patients who reported being called names in both diaries did not feel as annoyed/irritated/angry/furious (t = 2.44, p = 0.017) or worried/scared (t = 2.56, p = 0.013) as the controls. Otherwise patients and controls reacted similarly to body image,

Table VIII. Patients' psychological flexibility (AAQ II [27], self-esteem [25], body image and facial body image [22], OQLQ [24]. Means, standard deviations, medians and Kruskall-Wallis test results for patients with objective lower and higher treatment need.

Measure	Group	n	Mean	SD	Median	Kruskall-Wallis
Body image	AC 1–4	15	60.57	13.92	59.50	$\chi^2(2)$ = 1.38, p = 0.502
	AC 5–7	15	62.33	13.71	58.00	
	AC 8–10	12	55.79	11.53	57.00	
Facial body image	AC 1–4	15	38.47	9.34	39.00	$\chi^2(2)$ = 1.63, p = 0.443
	AC 5–7	15	39.73	8.94	41.50	
	AC 8–10	12	34.83	7.08	35.75	
OQLQ Facial aesthetics	AC 1–4	19	8.79	6.17	8.00	$\chi^2(2)$ = 0.67, p = 0.714
	AC 5–7	16	8.81	6.25	7.00	
	AC 8–10	15	10.47	5.81	8.00	
OQLQ Awareness of dentofacial aesthetics	AC 1–4	19	5.05	4.37	4.00	$\chi^2(2)$ = 1.71, p = 0.425
	AC 5–7	16	4.56	3.88	4.00	
	AC 8–10	15	6.40	3.88	6.00	
OQLQ Oral function	AC 1–4	18	10.61	5.99	10.00	$\chi^2(2)$ = 0.11, p = 0.949
	AC 5–7	15	10.27	5.20	10.00	
	AC 8–10	14	10.07	4.36	9.50	
OQLQ Social aspects	AC 1–4	19	7.58	8.82	3.00	$\chi^2(2)$ = 0.49, p = 0.785
	AC 5–7	16	8.44	8.12	7.50	
	AC 8–10	15	8.93	8.87	8.00	
Self-esteem	AC 1–4	19	22.63	6.13	23.00	$\chi^2(2)$ = 0.30, p = 0.862
	AC 5–7	15	21.87	6.63	24.00	
	AC 8–10	14	23.29	5.98	24.50	
Psychological flexibility	AC 1–4	19	40.37	8.98	41.00	$\chi^2(2)$ = 0.97, p = 0.617
	AC 5–7	16	43.06	6.20	45.00	
	AC 8–10	15	41.93	7.30	43.50	

Objective AC 1–4 = no treatment need; AC 5–7 = borderline; AC 8–10 = definite treatment need.

Table IX. Comparisons of patients' self-reported emotion variables between work days and days off work. Results of Wilcoxon Signed-Rank test.

Emotion	Time point	*n*	Work/off work	Mean	SD	Median	W	*p*-value
Annoyed/irritated/angry/furious	A	19	Work	1.79	1.13	1.00	40.50	0.174
			Off work	1.37	0.83	1.00		
	B	19	Work	1.42	0.69	1.00	38.50	0.593
			Off work	1.32	0.48	1.00		
	C	20	Work	2.00	1.65	1.00	32.50	0.221
			Off work	1.65	1.69	1.00		
	D	19	Work	1.74	1.88	1.00	9.00	0.680
			Off work	1.58	1.43	1.00		
Worried/scared	A	18	Work	1.61	1.04	1.00	22.00	0.161
			Off work	1.22	0.43	1.00		
	B	19	Work	1.68	1.06	1.00	22.00	0.161
			Off work	1.32	0.58	1.00		
	C	18	Work	1.44	0.62	1.00	13.00	0.863
			Off work	1.50	1.10	1.00		
	D	18	Work	1.39	0.61	1.00	1.00	0.144
			Off work	1.83	1.51	1.00		
Low/sad/depressed	A	19	Work	1.79	1.08	1.00	46.00	0.218
			Off work	1.47	0.96	1.00		
	B	19	Work	1.89	1.37	1.00	29.00	0.120
			Off work	1.37	0.83	1.00		
	C	19	Work	1.42	0.96	1.00	6.50	0.783
			Off work	1.47	0.96	1.00		
	D	18	Work	1.94	1.73	1.00	10.00	0.063
			Off work	1.61	1.15	1.00		
Tired	A	17	Work	4.12	2.09	4.00	24.00	0.083
			Off work	3.47	1.42	3.00		
	B	21	Work	3.43	2.06	4.00	87.50	0.025
			Off work	2.48	1.63	2.00		
	C	19	Work	3.68	1.89	4.00	108.00	0.127
			Off work	3.00	1.83	3.00		
	D	20	Work	4.55	1.91	5.00	114.00	0.206
			Off work	4.05	1.88	3.50		
Hurried	A	19	Work	4.32	2.06	4.00	136.00	0.000
			Off work	1.84	1.30	1.00		
	B	19	Work	4.58	1.77	4.00	142.00	0.002
			Off work	2.26	1.63	2.00		
	C	19	Work	3.26	2.28	3.00	88.50	0.003
			Off work	1.32	0.58	1.00		
	D	18	Work	1.78	1.56	1.00	20.50	0.723
			Off work	1.67	1.28	1.00		
Satisfied/happy	A	20	Work	4.50	1.64	4.00	30.00	0.151
			Off work	5.05	1.47	6.00		
	B	20	Work	5.15	1.46	5.00	12.00	0.057
			Off work	5.65	1.23	6.00		
	C	20	Work	5.25	1.12	5.00	56.50	0.837
			Off work	5.25	1.77	5.00		
	D	19	Work	5.11	1.52	5.00	54.50	0.746
			Off work	5.21	1.96	6.00		

Time point A = Morning/8 am, B = Lunch/12 pm, C = After work/4 pm, D = Going to sleep/8 pm.

OQLQ, self-esteem and psychological flexibility. None of the controls had been bullied and, therefore, no comparisons between patients and controls could be made.

Experiencing psychiatric symptoms had an effect on most emotions felt by patients. The more psychiatric symptoms patients had, the more negative emotions they felt and the less satisfied/happy they were. Body image, OQLQ, RSES and AAQ II had significant but clearly lesser effects on emotions (Table I).

Discussion

Our aim was to compare the psychosocial well-being of prospective orthognathic-surgical patients and first-year university students. The questionnaires used in this study are found to be reliable and have been used widely. They assess well-being from different points of view. For example, the body image questionnaire assesses participants' satisfaction with different body parts, including parts of the face. The facial aesthetics sub-scale of the OQLQ, on the other hand, focuses on the impact facial aesthetics has on participants' lives. The structured diary was specifically designed for this study. The focus of the diary was to gather new information about how patients felt during the day. As information was collected four times a day, effects of daily events should be more visible in the diaries than in the questionnaires, which assess participants' well-being during a longer period of time.

According to patients' self-perceived dental appearance, the majority of patients felt they were in need of treatment. Only those patients whose self-perceived dental appearance indicated at least borderline need suffered from problems with facial and body image as well as of poorer OQoL, although functional masticatory problems affected all patients more than controls. The present results are in line with earlier findings showing that a considerable number of patients cope well despite the deformity [33], although severe or very severe functional restrictions affect many patients [34]. As the modified AC of the IOTN reflected patients' self-reported views of their dental appearance, it is not surprising that the scores also differentiate patients with poorer and better body image. Cunningham et al. [35] showed that patient-perceived severity of the malocclusion was a significant explanatory variable of body image. Self-assessed dental appearance also distinguishes between patients with poorer or better OQoL. Patients' view of their own dental appearance was more important to their OQoL and body image than the orthodontist's assessment of their dental appearance. It was recently found [33] that only patients with objectively assessed severe facial deformities, not dental appearance, differed in their psychological status from participants with normal occlusion and harmonious faces. It may be that the difference between our findings and this study relates to the differences in study design: The focus of our study was on dental appearance, not facial aesthetics. Given that one of the main motives to seek orthognathic-surgical treatment is improvement in dental and facial appearance [13], patients' opinion of aesthetics is increasingly emphasized also in current treatment planning [10]. As a group, our patients did not suffer from lower self-esteem, which is in accordance with earlier studies [21,36]. This is understandable because self-esteem is a broad concept reflecting many aspects of social life and performance.

The results indicated that patients' psychological flexibility was as good as that of controls, which suggests that patients were able to accept their emotions. Yet the percentages of patients who had significant psychiatric symptoms were fairly large, ranging from 23–57 depending on symptom areas. Somatization was the most common symptom. As at least one in five patients exceeded the threshold values in every sub-scale, a considerable proportion of patients seem to struggle with their mental health. In relation to the occurrence of specific psychiatric symptoms reported in other studies, it seems that a larger proportion of our patients suffer from these symptoms. For example, the proportion of patients with clinically significant somatization, depression and interpersonal sensitivity were 9.3%, 13.9% and 20.1%, respectively, in the study by Phillips et al. [37], while the respective figures in this study were 57%, 40% and 28%.

According to the diaries, patients experienced more adverse emotions during the day than did controls. This might be due to psychiatric symptoms, as our results suggest that psychiatric symptoms have a substantial effect on the negative emotions patients feel during the day. Another possible explanation might be that patients experienced more bullying than controls, although the number of patients experiencing bullying was modest compared to previous results [20]. The large difference between the results may reflect study design differences between prospective and retrospective studies. Comparisons between patients' diaries on workdays and days off showed that patients felt more hurried and tired on workdays.

Professional opinion may raise awareness of the problem and even cause the patient to become fixated on it [7]. To overcome these problems the data in our study were collected before the patients' first appointments with orthognathic healthcare personnel. Therefore, professional opinion should not have affected the patients' views. However, the current study had some limitations: Our study sample consisted mainly of females and, therefore, generalizability to men may be limited. Also, this was a cross-sectional study. It seems that, although many patients cope well with their dentofacial deformity, a number of patients suffer from its consequences: poorer body image and facial body image, lower quality-of-life, bullying

and psychiatric symptoms. In the future it is interesting to see how treatment affects patients' wellbeing. For example, in the studies by Al-Ahmad et al. [38] and Lee et al. [39], patients' OQoL improved post-treatment, while the results by Schmidt et al. [40] suggest that some patients are still not satisfied with their aesthetic and functional outcomes, suffer from psychological difficulties, and withdraw from social life. Therefore, it is important not to focus solely on group differences between patients and controls, but to also include within-group comparisons to find those patients who do not benefit from treatment as much as they expected.

Conclusions

- Many patients cope well with their dentofacial deformities in spite of functional masticatory problems.
- Patients' perception of their own dental appearance may be a key factor that differentiates patients with only functional problems from those with emotional and social problems.
- Patients' own view of their dental appearance may be a major issue when considering psychosocial support and other treatment options.
- Psychiatric symptoms have a clear association with daily negative emotions.

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Supplementary materials available online

Appendix.