Acta Odontologica Scandinavica, 2010; 68: 249–260

informa
healthcare

REVIEW ARTICLE

Patients' perceptions of orthognathic treatment, well-being, and psychological or psychiatric status: a systematic review

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Abstract

Objective. To conduct a systematic review of studies concerning the psychosocial well-being of surgical–orthodontic patients. ***Material and methods.*** Articles published between 2001 and 2009 were searched using PubMed, Web of Science, and PsycInfo. Only articles written in English were included. Articles on methodological issues or on patients with clefts or syndromes or studies in which treatment had included surgically assisted maxillary expansion or intermaxillary fixation were excluded. The exclusion of articles was carried out in collaboration with two reviewers. To find new relevant articles, references from all the obtained review articles were hand-searched. Thirty-five articles fulfilled the selection criteria and were included in this review. ***Results.*** The main motives for seeking treatment were improvements in self-confidence, appearance, and oral function. Patients were not found to suffer from psychiatric problems. Treatment resulted in self-reported improvements in well-being, even though these improvements were not found with current assessment methods. Changes in well-being were most often registered using measures designed for evaluation of the impact of oral health on quality of life (e.g. the Orthognathic Quality of Life Questionnaire and the Oral Health Impact Profile). ***Conclusions.*** Surgical–orthodontic patients do not experience psychiatric problems related to their dentofacial disharmony in general. However, subgroups of patients may still experience problems, such as anxiety or depression, as many studies only report patients' mean problem scores and compare them to controls' scores or population norms. New assessment methods focusing on day-to-day changes in mood and well-being, as well as prospective studies with controls, are needed.

Key Words: *Psychological, quality of life, social*

Introduction

People with dentofacial deformities suffer from both functional and esthetic impairments. Those with an abnormal facial appearance are seen as less employable, less intelligent, and less effective than people with a normal appearance [1]. Moreover, a significant proportion of disfigured people have been reported to suffer from psychological problems [2]. Also, functional issues, such as temporomandibular joint disorders, have a negative effect on quality of life [3]. Skeletal discrepancies are commonly treated with combined surgical–orthodontic (orthognathic) treatment. The aim of this treatment is to achieve a more harmonious relationship between the upper and lower jaws, and to improve occlusal function. However, treatment should also be aimed at improving patients' psychosocial well-being [4].

Quality-of-life issues have been of increasing interest to many researchers. Quality of life has been defined as a sense of well-being that is associated with satisfaction or dissatisfaction with those aspects of life that a person feels to be important [5]. Thus, it is a broader analysis of patients' well-being compared with emotional or social aspects alone. When psychological issues have been studied, researchers have focused on psychological distress, depression, anxiety, body dysmorphic disorder, self-esteem, self-confidence, and body image. While body image can be defined as an individual's self-concept of his or her physical being [6], body dysmorphic disorder is characterized as a patient's excessive concern with a

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(Received 29 September 2009; accepted 10 May 2010)

ISSN 0001-6357 print/ISSN 1502-3850 online
DOI: 10.3109/00016357.2010.494618

specific body part, a concern which affects his or her functioning [7]. Further, self-esteem can be defined as a judgment of self-worth [8]. Social issues, such as bullying and interpersonal relations, and the daily lives of patients have not been studied as extensively as psychiatric problems, self-esteem, self-confidence, and body image.

The purpose of this review was to evaluate studies examining the well-being of patients before, during, and after orthognathic treatment. The aim was to answer the following questions: (1) which factors motivate patients to seek treatment? (2) does dentofacial disharmony affect patients' psychological status? and, furthermore, is that status affected by orthognathic treatment? (3) are patients satisfied with the treatment outcome? and (4) do dentofacial disharmony and its correction have an effect on patients' quality of life?

Material and methods

Articles were searched from PubMed, Web of Science, and PsycInfo with the search terms listed in Table I. No restrictions were imposed when searching the databases. Articles published from January 2001 to the end of June 2009 and written in English were selected from the search results and included in this review. No case reports, letters to the editor, congress abstracts, or review articles were included. However, the reference lists of all retrieved review articles were checked for further relevant articles.

To reduce heterogeneity, articles in which treatment included surgically assisted rapid maxillary expansions, genioplasties, rhinoplasties combined with orthognathic surgery or treatment that included intermaxillary fixation were excluded. Moreover, articles concerning clefts, syndromes, traumas, nerve injuries, tumors, cephalometric measures, surgical techniques, assessment methods, comparisons between teaching curriculums, dental service systems, or the history or future of orthognathic treatment were also excluded. The exclusion of articles was carried out in collaboration with two reviewers.

Table I. Search terms used[a].

Database	Search terms
PubMed	Orthognathic, surgery, surgical, psycholog*, social*, psychosocial*, body image, self-esteem, reason*, motivation*, BDD, expectation*, emotion*, daily life, satisfaction
Web of Science	Orthognathic, surg*, psycholog*, social*, psychosocial*, body image, self-esteem, reason*, motivation*, BDD, expectation*, emotion*, daily life, satisfaction
PsycInfo	Orthognathic

[a]The Boolean operator AND was used between search terms.
*Used to truncate search terms.

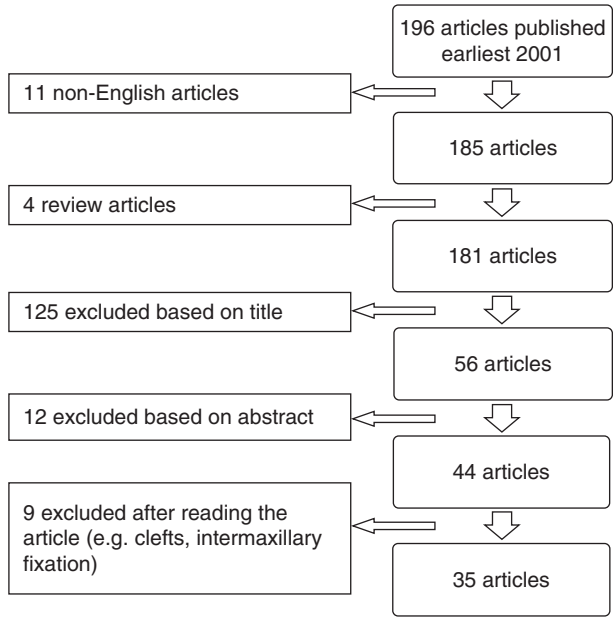

Figure 1. A flow chart presenting the selection of articles included in this review. The numbers of excluded articles (together with the reasons for exclusion) are shown in the left-hand column.

One hundred and ninety-six articles published between 1 January 2001 and 30 June 2009 were retrieved. Of these, 190 were obtained through PubMed, a further five through Web of Science, and one through PsycInfo. No new articles were found from the reference lists of review articles. Of the retrieved articles (Figure 1), 35 fulfilled the inclusion criteria (Table II). These were further divided under six headings: motivation to seek treatment; general psychological status; self-esteem and self-confidence; body image; social activity and daily life; and satisfaction with treatment outcome.

Results

Motivation to seek orthognathic treatment

In general, 33–60% of patients reported a functional reason as a motive to seek treatment [9,10]. In most studies, the motivating factor was occlusion (71–94% of patients) [11,12], followed by such reasons as improvements in chewing and eating (23–81%) [11–15], prevention of future oral health problems (27–70%) [13,16], general health (3–44%) [11,12], speech (12–68%) [11,12,14], and temporomandibular joint problems (27–30%) [12,15]. Although in most studies the percentages of patients with functional problems were large and showed great variation, in one study [17] <5% of patients had functional problems. Pain in the head region was reported as a motivating factor for 5–43% of patients [11,15]. Esthetic reasons were the main motive for 30–96%

Table II. Studies reviewed[a].

Type of study	Authors	Year	Sample size	Data collection methods
Prospective with controls	Williams et al.	2008	30 patients 30 controls	HAD RSES The Physical Appearance Comparison Scale Sociocultural Attitudes Towards Appearance Questionnaire The Self-Concept Clarity Scale
Prospective without controls	Lee et al.	2008	36 patients	SF-36 OHIP-14 OQLQ
	Nicodemo et al.	2008	29 patients	RSES SRQ-20
	Nicodemo et al.	2008	29 patients	SF-36
	Türker et al.	2008	30 patients	Questionnaire
	Pahkala & Kellokoski	2007	82 patients	Questionnaire
	Phillips et al.	2007	146 patients	Postsurgical Perceptions Problems with Facial Sensation
	Sadek & Salem	2007	120 patients	Questionnaire Derriford Appearance Scale
	Modig et al.	2006	42 patients	Interview Questionnaire OHIP-14
	Rispoli et al.	2004	30 patients	BDDE STAI Self-Rating Depression Scale Oral Health Status Questionnaire Postsurgical Satisfaction Questionnaire
	Phillips et al.	2004	184	SCL-90-R Short-term Expectations Postsurgical Perceptions Satisfaction with Treatment
	Baig	2004	96 patients	Interview
	Chen et al.	2002	108 patients	Interview Questionnaire MMPI SCL-90
	Gerzanic et al.	2002	100 patients	Body Image Assessment Questionnaire
	Cunningham et al.	2001	65 patients	STAI BDI RSES Modified version of Body Cathexis Scale
	Phillips et al.	2001	164 patients	SCL-90-R Short-term expectations Long-term expectations
Cross-sectional with controls	Al-Ahmad et al.	2009	36+35+35 patients 37 controls	SF-36 OQLQ
	Williams et al.	2009	30 patients 30 controls	BSS The Physical Appearance Comparison Scale Sociocultural Attitudes Towards Appearance Questionnaire The Self-Concept Clarity Scale HADS RSES

Table II. (*Continued*).

Type of study	Authors	Year	Sample size	Data collection methods
	Lee L. et al.	2007	74 patients 124 controls	The Overall Appearance Rating The Satisfaction with facial areas The Multidimensional Body-Self Relations Questionnaire Stigma of Deformity Stigma of Surgery The Body Image Quality of Life Inventory
	Lee S. et al.	2007	76 patients 76 controls	SF-36 OHIP-14 OQLQ
	Nardi et al.	2003	20 patients 20 controls	BDDE Symptom Questionnaire Quality of Life Enjoyment and Satisfaction Questionnaire
Cross-sectional without controls	Al-Bitar et al.	2009	38 patients	SF-36 OQLQ
	Vulink et al.	2008	160 patients	BDD questionnaire
	Stirling et al.	2007	61 patients	Interview STAI Y-6 item RSES BSS Questionnaire
	Espeland et al.	2008	516 patients	Questionnaire
	Palumbo et al.	2006	30 patients	Interview Questionnaire
	Vargo et al.	2003	57 patients	Questionnaire
Retrospective with controls	Narayanan et al.	2008	21 patients 21 controls	Problems Questionnaire
	Lazaridou-Terzoudi et al.	2003	117 patients 92+39 controls	Problems Questionnaire Fitts Tennessee Department of Mental Health Self-Concept Scale Modified version of Body Cathexis Scale
Retrospective without controls	Williams et al.	2005	326 patients	Questionnaire
	Williams et al.	2004	327 patients	Questionnaire
	Derwent et al.	2003	50 patients	Questionnaire
	Zhou et al.	2002	94 patients	Questionnaire
	Zhou et al.	2001a	94 patients	Questionnaire
	Zhou et al.	2001b	94 patients	Questionnaire

[a]Some of the studies used mixed methods (e.g. a primarily cross-sectional study might have used retrospective questions in questionnaires). This categorization has been made according to the primary method. However, when referring to the studies in the text, references are based on how that particular aspect was measured.

of patients [9–12,14,16,18,19]. Improvements in facial appearance (11–95%) [13,15,17], in dental appearance (11–89%) [11–13,15,16], and in smile (65%) [16] were all mentioned as a motive for seeking treatment.

Social motives or motives related to improving self-confidence and self-esteem have not been investigated as much as functional and esthetic motives. Improvements in self-esteem (38%) [11] and in self-confidence (68–85%) [12,16] were reported as a motive for seeking orthognathic treatment. Patients who expected treatment to have a great impact on their self-consciousness were more motivated than patients who expected treatment to have a smaller impact on it [20]. Other social reasons included psychological disturbance, being seen as different, improvement in social interaction, social opportunities, social dining, popularity, and finally, career-related issues. The proportions of patients reporting these motives varied from 5% to 69% [11,12,18].

Psychological distress

The studies reviewed in this article used the Symptom Checklist (SCL-90 or SCL-90R) [21] and the Minnesota Multiphasic Personality Inventory (MMPI) [22] to measure general psychological distress. Preoperatively the psychological profiles of patients were generally normal [19]. Despite the wide variation in patients' scores, it has not been reported how many, if any, of the patients had scores outside the normal range. In the studies by Phillips and co-workers [23,24], 20% of patients were distressed preoperatively. Although only 13% of patients were distressed both before and after surgery, the total number of distressed patients did not change after surgery [24]: some of the patients were distressed only before and some only after surgery.

Body dysmorphic disorder. In the included articles, occurrence of body dysmorphic disorder (BDD) was mainly measured using the Body Dysmorphic Disorder Examination (BDDE), but combinations of different assessment methods were also used. The BDDE is a semi-structured interview for diagnosing BDD which measures symptoms of negative body image [25]. In a recent study, Vulink et al. [26] reported that 10% of their 160 preoperative patients screened positive for BDD. In the only prospective study concerning BDD [27], patients' mean scores did not fulfill the criteria for BDD either pre- or postoperatively. Also postoperatively, patients' total BDD scores did not differ from those of the control group [28]. However, the total score of body dysmorphic symptoms decreased after surgery [27]. It should be noted that only Vulink et al. [26] measured the occurrence of BDD at the individual level, i.e. whether or not individual patients screened positive for BDD, while others focused on the occurrence of BDD symptoms at group level.

Depression. Five questionnaires were used to measure depression: the Self-Report Questionnaire-20 (SRQ-20) [29], the Beck Depression Inventory (BDI) [30], the Hospital Anxiety and Depression Scale (HADS) [31], the Self-Rating Depression Scale [32], and the Symptom Questionnaire [33]. In general, surgical–orthodontic patients did not have depressive disorders preoperatively [27,34]. The finding of occurrence of depressive disorders seemed to differ depending on the method that was used. For example, Chen et al. [19] found in their preoperative study that patients' depressive scores were within the normal range when analyzed with the MMPI, whereas, according to the SCL-90, patients had elevated scores for depression. In a cross-sectional study of patients who were undergoing or had recently undergone orthognathic treatment, the patients' depressive scores did not differ from those of the controls [35]. Postoperatively, patients did not have depressive disorders [28,34].

In addition, the Postsurgical Perceptions Questionnaire [36] and questionnaires developed by other researchers [10,37,38] were used to evaluate the occurrence of low mood. In these studies, the results differed from those presented above. In the study by Phillips et al. [24] regarding post-surgical perceptions at 4–6 weeks after surgery, 52% of the patients reported feeling at least a little depressed. In three retrospective studies [10,37,38], 17–40% of patients reported feeling depressed after surgery. In these studies, the post-surgical periods ranged from 6 months to 9 years.

Anxiety. Anxiety levels were measured using the previously mentioned SCL-90, HADS, and Symptom Questionnaire. The most frequently used standardized questionnaire was the State-Trait Anxiety Inventory (STAI). It consists of two scales: the Trait scale, where respondents are asked to answer on the basis of how they feel generally; and the State scale, in which respondents should answer based on how they feel at that moment [39]. On standardized questionnaires, the anxiety levels of surgical–orthodontic patients did not differ from norm scores for the population [11,19] or controls [28,35]. In studies using researcher-developed questionnaires, the results were different: the figure for preoperatively distressed or anxious patients was 40% [40]. In the study by Palumbo et al. [10], 33% of the patients had not experienced any anxiety either pre- or postoperatively. Thirty-seven per cent of patients had experienced anxiety only preoperatively, 20% only postoperatively, and 7% both pre- and postoperatively. These results indicate that patients were more anxious before than after surgery, which is in accordance with the results that showed decreased state anxiety scores postoperatively, while trait anxiety was not affected by surgery [27].

Self-esteem and self-confidence

The Rosenberg Self-Esteem Scale (RSES) was often used to assess self-esteem in the included articles. The RSES consists of 10 statements regarding participants' feelings about themselves [41]. In general, surgical–orthodontic patients' self-esteem did not differ from that of the general population [11,35]. Results regarding postoperative changes in self-esteem are, however, controversial. The concepts of self-esteem and self-confidence are not well defined, a fact which may complicate comparisons. Nicodemo et al. [34] found no improvements in self-esteem with the RSES. When patients were asked directly how they felt about their self-esteem after surgery, the majority of patients

responded that their self-esteem had improved [10]. All five included studies concerning self-confidence applied researcher-made questionnaires: in these studies, 45–81% of patients felt that their self-confidence had improved after surgery [15,37,38,40,42].

Body image

Several methods were used to measure body image. The Body Satisfaction Scale is a version of Secord and Jourard's Body Cathexis Scale (BCS) modified by Slade et al. [43] that measures satisfaction with 16 body parts. Kiyak et al. [6] have modified the BCS to consist of 20 items (e.g. different body parts, overall evaluation of facial and body appearance). Respondents were asked to rate each item on a five-point scale ranging from "Wish I could change it" to "Consider myself very fortunate in this area". The Body Image Assessment Questionnaire evaluates patients' feelings about their attractiveness or self-confidence, accentuation of body appearance, insecurity or concern, and sexual dissatisfaction [44]. Two scales from the Multidimensional Body-Self Relations Questionnaire were used in the study of Lee et al. [18], namely, Appearance Orientation, which measures the importance of appearance to the individual, and Appearance Evaluation, which measures satisfaction with appearance.

Appearance orientation. Before orthognathic surgery, appearance was more important to patients than to controls [18], with 43% of patients paying more attention to their own appearance than they thought was normal [14]. Attention to body appearance was affected by surgery and related to the type of malocclusion [44]: before surgery, Class II and Class III patients had equally high scores on attention to body appearance but, at 6 weeks after surgery, Class III patients had higher scores. However, at 6 months after surgery, Class II and Class III patients again had equally high scores.

Evaluation of appearance. On a Likert-type scale, preoperative patients rated themselves as less attractive than controls [18]. However, when satisfaction was measured with the Overall Appearance Rating subscale of the Multidimensional Body-Self Relations Questionnaire, patients did not feel less satisfied with their appearance [18]. Furthermore, no differences were found between future patients, adults who were not seeking treatment, and those who had undergone orthognathic treatment when overall body image was measured with the modified BCS [45]. This result was supported by Stirling et al. [11], who reported that patients' scores on body dissatisfaction were close to population means. After surgery, 90% of patients were very satisfied with their body image [40].

Most of the findings on facial appearance differed from those on general appearance. Patients who were about to make a treatment decision, or had done so recently, rated their facial appearance negatively when asked to compare it to that of others [11]. With regard to pretreatment results, surgical–orthodontic patients were less satisfied with their facial appearance [18] and facial profile [45] than controls. Moreover, patients who were undergoing or had undergone orthognathic treatment were less satisfied with their facial appearance than controls [46]. In a retrospective study, 63% of the patients described their own facial appearance as neither attractive nor unattractive, while the same number of patients described their own dental appearance as unattractive or very unattractive before surgery [37].

Patients' views on their own facial appearance improved after starting treatment [11]. After surgery, 82–99% of patients noticed changes in their own facial appearance [10,13–15,38,42], and >90% noticed changes in their own dental appearance [13,42]. However, there were conflicting views about whether or not patients' facial body image reached normal limits. In the study by Lazaridou-Terzoudi et al. [45], patients' facial body image scores were postoperatively lower than those of controls, while in the study of Stirling et al. [11] the scores were close to population means. Furthermore, postoperative patients were more satisfied with their facial profile than those anticipating surgery, although they were still less satisfied than controls [45]. Twenty per cent of the patients were disappointed because the facial change was not as great as expected [42]. However, 85% of the patients described their own facial and dental appearance as attractive or very attractive, indicating a greater improvement in satisfaction with dental than facial appearance [37]. The vast majority (70–98%) of patients did not have difficulties adapting to their new facial appearance [10,15,40].

The type of malocclusion was related to patients' perceptions of their own attractiveness. Cunningham et al. [47] reported that patient-perceived malocclusion was a significant predictor of body image. Preoperative patients with a skeletal Class III malocclusion had more negative opinions of their own attractiveness or self-confidence than patients with a skeletal Class II malocclusion [44]. After surgery, both Class II and Class III patients' reports on their own attractiveness or self-confidence improved, with the reports of Class III patients improving more; differences in attractiveness or self-confidence were no longer found post-operatively. These differences regarding improvements in appearance between Class II and Class III malocclusion patients were reported for both dental and facial appearance [13].

Everyday-life satisfaction and quality of life

Everyday-life satisfaction has been studied with various methods, often using a retrospective study design (Table III). After surgery, patients reported improvements in different areas of everyday life.

Generic health: Short Form Health Survey. The Short Form Health Survey (SF-36) measures respondents' health status in the following domains: mental health, emotional and social aspects, vitality, physical aspects, functional capacity, pain, and general health [48]. Before surgery, orthognathic patients did not differ

Table III. Results of everyday-life satisfaction[a].

Area of everyday life	Type of study	Time-point	Main result	Reference
Eating	Prospective	One week after surgery	96% of patients did not notice food particles on their chin or mouth and 79% had problems with drooling	[59]
	Prospective	6 months after surgery	54% of patients did not notice food particles on their chin or mouth and 42% had problems with drooling	[59]
	Retrospective	Before surgery	Half of the patients had eating difficulties	[16]
	Retrospective	After surgery, not specified	Two out of three had at least some eating difficulties. 70% felt less embarrassed than before when eating with others	[42]
	Retrospective	On the ward after surgery	46% of the patients reported eating difficulties	[38]
	Retrospective	At the moment of filling in the questionnaire	7% had problems with eating as a residual problem. 58% reported improvements in eating	[38]
Self-consciousness	Retrospective	Before surgery	75% of patients felt self-conscious about their teeth. 70% of patients felt self-conscious about facial appearance. Two out of three patients avoided smiling in photographs	[16]
	Cross-sectional	Before surgery	13% were embarrassed by their smile, 13% by their facial appearance and 7% by their facial profile	[10]
Social situations	Prospective	Before surgery	12–26% of patients had problems with social situations. They also felt different from other people because of their jaw	[14]
	Prospective	4–6 weeks after surgery	Half of the patients felt at least a little discomfort with appearing in public, but less than half with work performance, interpersonal relations, and socializing	[24]
	Retrospective	After surgery, not specified	69% reported a positive influence on social activity. Two out of three patients claimed that orthognathic surgery had had at least a little influence on their lifestyle and a positive influence on relationships with the opposite sex. Less than half felt it had had a positive effect on their marriage and on getting a better job	[42]
	Prospective	1 year after surgery	57% reported at least a partial improvement in social adjustment after surgery	[40]
	Retrospective	After surgery, not specified	33% reported improvements in social life	[38]
	Cross-sectional	3 years after surgery	20% of patients felt that the treatment had had a great impact on their relationships with family, friends and colleagues	[13]
Bullying	Retrospective	Before surgery	One in two patients had been given a nickname related to his or her dentofacial problems	[12,60]
	Retrospective	Before surgery	61% had been teased about their appearance	[16]
	Prospective	After treatment	More than half of the patients reported that bullying decreased after surgery. Two out of three patients reported feeling more secure in the company of others	[14]

[a]Phillips et al. [24] used the Postsurgical Perceptions questionnaire and the PAF questionnaire [57]. Others used questionnaires developed themselves.

in their health-related quality of life from controls [49,50], or from those who had refused surgery [49]. At 6 weeks after surgery, both psychological and physical components of quality of life were lower than before surgery [51]. At 6 months after surgery, functional capacity, pain, general health, and mental health had reached the presurgical level [51,52]. However, Nicodemo et al. [53] found improvements in physical and social aspects, whereas Lee et al. [51] found no differences compared with pre-treatment status. On the other hand, Lee et al. [51] found that, 6 months after surgery, emotional aspects interfered less with daily domestic activities or work. Lee et al. [51] did not report any changes in vitality between pre- and post-treatment results. In a comparison between pretreatment surgical–orthodontic patients and patients who had undergone surgery on average 21 months earlier, postoperative patients had better scores on general health, mental health, and vitality; the vitality score was even better than the mean vitality score of the control group [49]. In no other domain did postoperative patients differ from controls or those who had refused surgery [49].

Generic oral health: Oral Health Impact Profile. The Oral Health Impact Profile (OHIP) measures effects of oral health on well-being in seven domains: functional limitations, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap [54]. Lee et al. [18] found that, before surgery, oral health affected the quality of life more for surgical–orthodontic patients than for the controls. The affected domains were functional limitations, psychological discomfort, psychological disability, and handicap. There was no change in overall quality of life from pre-surgery levels to 6 weeks after surgery although, at this time-point, functional limitations affected patients' quality of life more than before surgery, whereas psychological discomfort and psychological disability affected it less. At 6 months after surgery, overall oral health affected patients less than before surgery [51]. Modig et al. [14] found that patients had postoperative problems only with physical pain, physical disability, and psychological discomfort.

Condition-specific measures: Orthognathic Quality of Life Questionnaire. The Orthognathic Quality of Life Questionnaire (OQLQ) was developed to measure surgical–orthodontic patients' quality of life [55]. It has four dimensions consisting of 22 statements altogether. The dimensions are social aspects of dentofacial deformity, facial esthetics, oral function, and awareness of dentofacial esthetics.

In all domains, preoperative patients had lower quality of life than controls [49,50] and those who had refused surgery [49]. In the study by Lee et al. [51], OQLQ scores had changed only in the facial esthetics domain at 6 weeks after surgery. At 6 months, the overall quality of life was better than before surgery. Improvements were found in esthetic, social and oral function domains, whereas no changes were noted in awareness. In the study by Al-Ahmad et al. [49], patients who had undergone surgery on average 21 months earlier had a better overall quality-of-life score than preoperative patients. The only domain showing no difference was oral function. Postoperatively, patients did not differ from controls or those who had declined surgery, in any domain.

Other measures. Before surgery, surgical–orthodontic patients' quality of life, in relation to body image, seemed to be lower than that of controls [18]. In their prospective study, Rispoli et al. [27] used the Oral Health Status Questionnaire by Kiyak, and found that patients' overall quality of life and its domains (oral health, work or social activity, esthetics, pain or sensitivity, and function) improved from 2 months pre- to 3 months post-surgery.

Two studies dealing with patients' retrospective views of problems in functional, health, appearance, and interpersonal domains were included in this review. Narayanan et al. [56] found that, before surgery, patients experienced more problems than untreated adults with severe skeletal disharmony in all other domains but the functional domain. The results of Lazaridou-Terzoudi et al. [45] indicated that patients who had undergone surgery 10–14 years previously reported having fewer problems with oral function and health before surgery than those on the waiting list, yet they reported more problems than adults who were not seeking treatment. However, in the appearance and interpersonal domains, those who had undergone surgery reported more problems before surgery than those on the waiting list or those not seeking treatment. Soon after surgery, patients reported fewer problems with all four areas than before surgery [45]. At 10–14 years postoperatively, patients reported even fewer problems [45]. Both Narayanan et al. [56] and Lazaridou-Terzoudi et al. [45] also found that patients perceived fewer problems postoperatively than controls in the functional, interpersonal, and appearance domains. However, only Lazaridou-Terzoudi et al. [45] found that patients had fewer problems with health than controls.

Satisfaction with outcome

More than 70% of all patients (72–100%) were satisfied with the surgical outcome [9,10,15,17,19,40,42], 63–88% would be prepared to undergo the procedure again [10,13,15,19,37,40,42], and 70–95% would recommend surgery to others [19,40,42,51]. The number of those prepared to recommend surgery to others

increased during the postoperative period [51], and further changes in the number of overall satisfied patients were recorded [10,27]. Those who had undergone mandibular advancement were less satisfied than those who had undergone mandibular setback [13,15], but the degree of advancement or setback did not correlate with satisfaction [15]. The severity of defects was associated with satisfaction, as expected: patients with more severe defects preoperatively were more satisfied than those with milder defects [17,19].

Satisfaction with treatment outcome was associated with patients' reports of changes in self-confidence and chewing ability [15]. Patients with unrealistic expectations of surgery, those who were very sensitive regarding interpersonal issues, those who accepted surgery passively, and those whose significant others did not support their decision to undergo surgery were more likely to be dissatisfied [19]. Satisfaction was not associated with psychological distress in general [24]. However, increased preoperative depression and a lower level of BDD symptoms were associated with higher levels of satisfaction [27].

The main results of this review are summarized in Table IV.

Table IV. Main results of the review.

Domain	Main results
Motivation	Several factors motivated patients to have orthognathic surgery. No single motivation seemed to be common to all patients. Those mentioned most often were improvements in self-confidence, appearance, and function
Psychological distress	In general, patients were not distressed and did not suffer from BDD. According to standardized questionnaires, patients were not depressed or anxious. However, a number of patients reported depression and anxiety
Self-esteem and self-confidence	Patients' self-esteem did not differ from that of others. After surgery, patients reported having higher self-esteem and self-confidence than before
Body image	Patients were less satisfied with their facial appearance than others. Satisfaction improved after surgery, but it is not clear whether or not it reached normal limits
Everyday life satisfaction	There were few studies regarding these issues. Patients experienced problems with eating and bullying. Social issues improved after surgery
Quality of life	According to the SF-36, patients' quality of life before surgery was not different from that of others and there were no improvements in quality of life after surgery. In the OHIP-14 and OQOL, patients had lower quality of life before surgery but it improved from pre-surgery levels at 6 months after surgery
Satisfaction with outcome	Patients were satisfied with treatment outcome

Discussion

Patients' motivation to seek orthognathic treatment can be divided into three categories, namely functional or esthetic reasons, and reasons related to self-esteem and self-confidence. There were large differences in the percentages of patients reporting these motives. This may partly be due to the different criteria used for referral for orthognathic treatment. Although most studies mentioned functional and esthetic reasons as the main motives, social reasons may have been equally important. There were, however, only a few studies considering bullying and teasing.

According to different questionnaires, surgical–orthodontic patients did not seem to suffer from psychological distress in general, or from depression or anxiety. The only exception to these results was reported by Chen et al. [19], who recorded depression using the SCL-90. This may depend on the sensitivity of the SCL-90 as a psychometric measure [21]. When patients were asked directly about their psychological well-being, a considerable number reported being depressed after surgery. This difference may be accounted for by the fact that some patients report being depressed when their mood is low. However, to be mildly depressive, for example on the BDI [30], requires that patients obtain a score of at least 10 on the inventory. As it is only possible to get a score of zero to three points from low mood, patients also need to have other symptoms, such as sleep problems or feelings of guilt, to reach a clinically significant result. Therefore, low mood alone is not depression, although patients may experience it as such.

The differences in results regarding anxiety may be due to both different methods and assessment times. The most common measure of anxiety was the STAI. Stirling et al. [11] measured only state anxiety in patients who were making their treatment decision and in patients who had made it up to 4 years earlier. As state anxiety is defined as "a transitory emotional state or condition" that refers to "an empirical process or reaction taking place at a particular moment in time" [39], it is natural that patients' scores were within the normal range. If they had been outside the normal range, then both patient groups should have been reacting to a stressful situation. This situation cannot be created by the disharmony itself, because it has been present more or less all their life. A lifelong situation should not, by definition, affect state anxiety. Yet, in researcher-developed questionnaires, the percentage of preoperatively distressed or anxious patients was high [40]. It is possible that this anxiety was related to the operation itself, which would account for the reports of anxiety and its higher occurrence before than after surgery in other studies [10]. This interpretation is supported by the study of Rispoli et al. [27], where the state anxiety

score was higher 1 week before than 3 months after surgery. As expected, trait anxiety was not affected by surgery, as it "refers to relatively stable individual differences in anxiety proneness". However, it has been suggested that state anxiety is created by the interaction of trait anxiety and the situation the person is facing [57]. Therefore, trait and state anxiety are probably interdependent concepts, and patients who are anxious before surgery might be more prone than others to anxiety in general.

It must also be borne in mind that many of the included articles report patients' mean scores and compare them to controls' scores or population norms. Thus, it is possible that individual patients may experience problems which are not detectable when analyzing mean scores only. This phenomenon may explain some of the seeming controversies between the results obtained from standardized questionnaires and patients' self-reports. In retrospective studies, it is also possible that patients feel a need to emphasize the negative effects of dentofacial disharmony and the positive effects of orthognathic treatment on their lives. Otherwise, the burden and costs of the time-consuming treatment might not feel justifiable.

Although most patients are satisfied with treatment outcome, there are still some who are not. Dissatisfaction may be related to patients' expectations of surgery. In the study of Chen et al. [19], patients who had unrealistic expectations of surgery were more likely to be dissatisfied than others. Also, Williams et al. [16] noted that patients who wanted to improve their social life by undergoing orthognathic treatment were not as satisfied as patients with other motivations. It seems plausible that patients who believe that treatment can cure all their problems are easily dissatisfied. Other factors may include dissatisfaction with changes in appearance or functional reasons: Zhou et al. [42] stated that 8% of patients regretted undergoing surgery, mainly because there were no apparent facial changes, whereas Bock et al. [58] found that patients who had temporomandibular disorders (TMDs) were less satisfied than patients without these problems. In accordance with the above-mentioned results, Espeland et al. [13] found that dissatisfaction with treatment outcome (8% of patients) was related to both TMDs and appearance, but also to impaired nerve function and relapse.

Throughout the reviewing process, comparisons of the reported results were hampered by the wide variation in both assessment times and applied methods. Furthermore, a number of studies were conducted with small groups and, in some cases, all the necessary statistical information was not reported, or the statistical data and text were incongruent.

In conclusion, the main findings of this systematic review were as follows. (1) The main motivating factors for seeking orthognathic treatment are improvements in self-confidence, esthetics, and functional status. (2) Surgical–orthodontic patients do not have psychiatric problems or are not psychologically distressed in general. Although patients feel that orthognathic treatment has had a positive effect on their life, changes have not been found with standardized questionnaires. (3) The vast majority of patients are satisfied with the treatment outcome. (4) Improvements in patients' quality of life are evident at 6 months after surgery. However, there is a lack of prospective studies with controls, and the need for new assessment methods focusing on day-to-day changes in mood and well-being is obvious.

Declaration of interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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