

Evaluation of long-term satisfaction with orthodontic treatment for skeletal class III individuals

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Abstract: The aim of this study was to investigate the long-term satisfaction rate among skeletal class III patients following orthodontic treatment. Questionnaires were sent to 315 post-retention (between 5 to 22.5 years) patients who had received orthodontic treatment without any type of surgery for the correction of skeletal class III malocclusion. The questionnaire contained 28 questions: 10 regarding orthodontic treatment, 13 regarding satisfaction with orthodontic treatment outcomes, and five regarding psychosocial benefits of orthodontic treatment. The frequency of each variable was calculated and chi-squared test was used to determine gender correlations. The survey response rate was 15.8% (n = 40). Most patients were satisfied with their facial appearance (92.5%) and final esthetic profile (95%). Of the 5% who were dissatisfied with their final profiles, prognathic mandible was given as the reason. Most patients (90%) were satisfied with the overall treatment results. Moreover, patient perceptions of psychosocial benefits of treatment were mainly positive, with the majority (72.5%) stating their social communication had improved following orthodontic treatment. Chi-squared test indicated almost no variations in response by gender. In conclusion, the majority of skeletal class III patients in the long-term post-retention period who had received orthodontic treatment were satisfied with the overall treatment outcome. (*J. Oral Sci.* 49, 31-39, 2007)

Keywords: long-term; satisfaction; skeletal class III; orthodontics.

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Introduction

Improved dento-facial appearance is the major motivation behind orthodontic treatment (1,2). The non-esthetic profile resulting from skeletal class III malocclusion involves not only the dental arches, but also the skeletal pattern, making this one of the most challenging treatment areas in the field of orthodontics. One of three major treatment strategies is utilized for patients with skeletal class III malocclusions, depending upon skeletal maturation and severity of the problem. The first is a functional/orthopedic approach employing a functional appliance such as a class III activator, chin-cap or face mask. The second involves orthodontic camouflage and relies on orthodontic tooth movement achieved by using fixed appliances, generally with the extraction of the lower first premolars, to improve dental occlusion and facial esthetics without correcting the underlying skeletal problem. The third uses orthognathic surgery to reposition the mandible, the maxilla, or both.

Since it was first employed in the early 20th century, the most important objective of orthognathic surgical treatment of mandibular prognathism has been to ensure that patients are satisfied with the treatment outcome (3). This is also true of orthodontic treatment objectives, although it should be noted that despite their similarities of purpose, deciding between orthodontic and surgical approaches in the treatment of skeletal class III malocclusion can sometimes present a challenge. Even if orthodontic patients do not undergo surgery, their dento-facial appearance still changes to some extent. Thus, along with objective changes measured through cephalograms and other dental records, patient perceptions must be taken into consideration when evaluating treatment outcome.

Most reported data on patient perceptions relate to surgical patients (3). There is still a lack of information on long-term satisfaction among skeletal class III malocclusion patients treated by orthodontics alone.

Table 1 Orthodontic questionnaire

About orthodontic treatment

1. Who referred you or suggested orthodontic treatment?
 - (a) Dentist/dental specialist
 - (b) Self/parents
 - (c) Television
 - (d) Internet
 - (e) Friends/relatives
 - (f) Other
2. Why did you prefer University Clinic for orthodontic treatment?
 - (a) Official dispatch
 - (b) Confidence in academic facilities
 - (c) Expensive in private clinics
 - (d) Other
3. Which was the most important issue for you concerning orthodontic treatment?
 - (a) Straightening of my teeth
 - (b) Having a better facial/profile appearance
 - (c) Having a better chewing function
 - (d) Having a better speech quality
 - (e) Other
4. Were you satisfied with your doctor?
 - (a) Very satisfied (b) Satisfied (c) Dissatisfied (d) Very dissatisfied
5. Did your friends or relatives react negatively or teased your treatment appliances?
 - (a) Yes, absolutely (b) Sometimes (c) No, absolutely not
6. Did you use other material for oral hygiene apart from tooth-brush, during treatment?
 - (a) Yes (b) No
7. Which was the most unfavorable condition for you during the orthodontic treatment?
 - (a) Long treatment time
 - (b) Unesthetic intraoral appliances
 - (c) Unesthetic extraoral appliances
 - (d) Difficulty in pursuing orderly controls
 - (e) Pain in my teeth/jaws
 - (f) Difficulty in speech
 - (g) Problems with my doctor
 - (h) Expensive
 - (i) Other
8. How do you think that orthodontic treatment is an important health problem for you?
(Score 1 to 10, in which 1 indicates maximum and 10 minimum concern)
 - (1) (2) (3) (4) (5) (6) (7) (8) (9) (10)
9. Do you think that one can get satisfactory information about orthodontic treatment via media (radio, t.v., newspaper, magazines)?
 - (a) Yes
 - (b) No
 - (c) I have no idea
10. How do you think public should be informed about orthodontic treatments?
 - (a) Dentists/physicians should inform more
 - (b) By radio and t.v. programmes
 - (c) By internet
 - (d) University dental hospitals should organize public seminars
 - (e) Other

Orthodontic treatment results

11. Are you satisfied with the arrangement of your teeth?
(a) Very satisfied (b) Satisfied (c) Dissatisfied (d) Very dissatisfied
12. How satisfied are you with the overall results of the treatment?
(a) Very satisfied (b) Satisfied (c) Dissatisfied (d) Very dissatisfied
13. If you are dissatisfied, what is the reason?
(a) The arrangement of my teeth did not become as I expected
(b) There have been changes in the arrangement of my teeth after treatment
(c) The arrangement of my teeth was better before treatment
(d) I did not use the appliances prescribed
(e) Other
14. How satisfied are you with your final esthetic profile?
(a) Very satisfied (b) Satisfied (c) Dissatisfied (d) Very dissatisfied
15. If you are not satisfied with your final esthetic profile, what is the reason?
(a) I have a prognathic mandible
(b) I have a retruded maxilla
(c) Both
(d) I have a facial asymmetry
(e) Esthetic position of my lips is not satisfactory
(f) Other
16. How satisfied are you with your final smile esthetics?
(a) Very satisfied (b) Satisfied (c) Dissatisfied (d) Very dissatisfied
17. How satisfied are you with your general facial appearance?
(a) Very satisfied (b) Satisfied (c) Dissatisfied (d) Very dissatisfied
18. Did you have pain or click in your temporomandibular joint (tmj) region, after the treatment?
(a) Yes, absolutely (b) Yes, I think so (c) No, I don't think so (d) No, absolutely not
19. Did you have a restriction during mouth opening, after the treatment?
(a) Yes, absolutely (b) Yes, I think so (c) No, I don't think so (d) No, absolutely not
20. Did you have an increase in dental caries and/or gingival problems, after the treatment?
(a) Yes, absolutely (b) Yes, I think so (c) No, I don't think so (d) No, absolutely not
21. Did you have spots in your teeth, after the treatment?
(a) Yes, absolutely (b) Yes, I think so (c) No, I don't think so (d) No, absolutely not
22. Did you have a decrease in your speech quality, after the treatment?
(a) Yes, absolutely (b) Yes, I think so (c) No, I don't think so (d) No, absolutely not
23. Do you feel that the treatment has improved your chewing/biting ability?
(a) Yes, absolutely (b) Yes, I think so (c) No, I don't think so (d) No, absolutely not

Psychosocial benefits

24. Consider your pre-treatment condition. If you were in the same situation today, would you have chosen to go through the same treatment?
(a) Yes, absolutely (b) Yes, I think so (c) No, I don't think so (d) No, absolutely not
 25. Has the orthodontic correction of your teeth had a positive influence on your self-confidence?
(a) Yes, absolutely (b) Yes, I think so (c) No, I don't think so (d) No, absolutely not
 26. Has the result of orthodontic treatment had a positive influence on finding mate and/or career?
(a) Yes, absolutely (b) Yes, I think so (c) No, I don't think so (d) No, absolutely not
 27. Has the result of orthodontic treatment had a positive influence on the performance of your work or school?
(a) Yes, absolutely (b) Yes, I think so (c) No, I don't think so (d) No, absolutely not
 28. Has the result of orthodontic treatment had a positive influence on your social communication?
(a) Yes, absolutely (b) Yes, I think so (c) No, I don't think so (d) No, absolutely not
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Consequently, the aim of the present study was to investigate the rates of long-term satisfaction with orthodontic treatment among skeletal class III patients with regard to dento-facial esthetics, oral functions and psychosocial interactions.

Materials and Methods

A survey questionnaire (Table 1), stamp and return envelope, as well as a survey consent form indicating the confidentiality of respondents were mailed to 315 patients who had consecutively undergone orthodontic treatment for the correction of skeletal class III dento-facial anomaly, who had not undergone any surgical intervention, and whose retention phase had been complete for at least five years (range between 5-22.5 years). Pre- and post-treatment cephalometric values for the patients are provided in Table 2. Patients with any type of syndromes, cleft lip and palate, or mental retardation, as well as patients who had undergone psychological treatment or who had any severe medical problem that might disrupt their ability to participate were

excluded from the study. Of the 40 patients who responded to the questionnaire, 14 had been treated with functional (class III activator) and fixed appliances, 22 with a chin cap and fixed appliances, and four with a face mask and fixed appliances. The questionnaire included 10 questions about orthodontic treatment, 13 questions about satisfaction with treatment outcome (seven concerning dento-facial aesthetics and six concerning oral functions) and five questions about the psychosocial benefits of orthodontic treatment. Subjects were asked to select one or more of the answers provided to each question, and each question included among the possible responses the option 'other', along with a space to provide additional written comments.

Statistical procedures

The distributions of response frequencies were calculated, and chi-squared tests were used to determine if there were any differences in responses between genders. Statistical analysis was performed using the software SPSS (Statistical Package for the Social Sciences, Version 11.0, Chicago, IL) for Windows.

Table 2 Distribution of study sample (n = 40)

Female (n)	Male (n)	Pre-tx age Mean \pm SD (years)	Tx time Mean \pm SD (years)	Post-retention time Mean \pm SD (years)
27	13	13.4 \pm 4.1	2.4 \pm 1.4	10.2 \pm 4.1
		Pre-treatment Mean \pm SD (deg.)		Post-treatment Mean \pm SD (deg.)
SNA		76.6 \pm 4.2		77.7 \pm 4.6
SNB		80.6 \pm 4.9		78.3 \pm 4.5
ANB ($^{\circ}$)		4.1 \pm 2.4		0.9 \pm 1.5
GoGn/SN		34.1 \pm 3.6		36.5 \pm 4.1

Results

Of the 315 questionnaires mailed, 62 were returned by the post office because the address was incomplete/incorrect, 40 were returned after being completed by the recipients (response rate: 15.8%) and 213 were not returned. Table 2 provides information about the 40 patients who comprised the study sample, and Tables 3-5 provide information about the distribution of responses to each of the survey questions.

Table 3 Percentage distribution of answers regarding dento-facial orthodontic treatment results

Orthodontic treatment results (Dento-facial)	<i>Very satisfied</i>		<i>Satisfied</i>		<i>Dissatisfied</i>		<i>Very dissatisfied</i>	
	n	%	n	%	n	%	n	%
Are you satisfied with the arrangement of your teeth?	22	55	16	40	1	2.5	1	2.5
How satisfied are you with the overall results of the treatment?	22	55	14	35	4	10	0	0
How satisfied are you with your final esthetic profile?	24	60	14	35	1	2.5	1	2.5
How satisfied are you with your final smile esthetics?	23	57	14	35	3	7.5	0	0
How satisfied are you with your general facial appearance?	22	55	15	37.5	2	5	1	2.5

Orthodontic treatment

The majority (82.5%) of subjects said they and/or their parents had noticed their orthodontic problem. When asked why they chose to attend a university clinic, 32.5% said it was because they had government insurance, 32.5% said they had confidence in university clinics, and 5% said it was because treatment in a private clinic was expensive. When asked what they felt was the most

important issue concerning orthodontic treatment, 62.5% said it was improving their facial profile/appearance, 57% said it was straightening their teeth, 27.5% said improving their chewing ability and 27.5% said improving their speech quality. All of the patients were either satisfied (27.5%) or very satisfied (72.5%) with their doctors. Nearly half of the patients (45%) said they had sometimes experienced negative reactions or had been teased by

Table 4 Percent distribution of the answers regarding oral functions after orthodontic treatment

<i>Orthodontic treatment results (Oral functions)</i>	<i>Yes, absolutely</i>		<i>Yes, I think so</i>		<i>No, I don't think so</i>		<i>No, absolutely not</i>	
	n	%	n	%	n	%	n	%
Did you have pain or click in your tmj region, after the treatment?	20	50	15	37	4	10	1	2.5
Did you have a restriction during mouth opening, after the treatment?	0	0	11	27.5	0	0	29	72.5
Did you have an increase in dental caries and/or gingival problems, after the treatment?	3	7.5	8	20	20	50	9	22.5
Did you have spots in your teeth, after the treatment?	4	10	3	7.5	14	35	19	47.5
Did you have a decrease in your speech quality, after the treatment?	1	2.5	1	2.5	12	30	26	65
Do you feel that the treatment has improved your chewing/biting ability?	31	77.5	8	20	1	2.5	0	0

Table 5 Percent distribution of the answers regarding psychosocial benefit

<i>Psychosocial benefits</i>	<i>Yes, absolutely</i>		<i>Yes, I think so</i>		<i>No, I don't think so</i>		<i>No, absolutely not</i>	
	n	%	n	%	n	%	n	%
Consider your pre-treatment condition. If you were in the same situation today, would you have chosen to go through the same treatment?	37	92.5	3	7.5	0	0	0	0
Has the orthodontic correction of your teeth had a positive influence on your self-confidence?	24	60	9	22.5	7	17.5	0	0
Has the result of orthodontic treatment had a positive influence on finding mate and/or career?	15	37	11	27	13	32.5	1	2.5
Has the result of orthodontic treatment had a positive influence on the performance of your work or school?	16	40	9	22	14	35	1	2.5
Has the result of orthodontic treatment had a positive influence on your social communication?	21	52.5	8	20	11	27.5	0	0

friends/relatives during their treatment, 22.5% said they always had such experiences and 32.5% said they had never had such experiences. Regarding oral hygiene, only 17.5% said they used any equipment other than a toothbrush and toothpaste. Fig. 1 shows the distribution of patient perceptions regarding the most unfavorable aspects of orthodontic treatment (Question 7). As Fig. 1 shows, the lengthy duration of treatment, the difficulty in attending regular monthly appointments, and the use of unesthetic extra-oral appliances were considered to be the most problematic aspects of treatment. Patients were also asked to rate their level of concern over orthodontics as a health problem by marking a scale (from 1 to 10) where level 1 indicated maximum concern and 10 indicated minimum concern (Fig. 2, Question 8), in other words, patients who marked '1' implied that they themselves perceived orthodontic problems as the most important health concern. In response, half of the patients (50%) gave a rating of '1', indicating maximum concern. Furthermore, the majority (85%) of subjects said they did not believe that the media provided satisfactory information regarding orthodontic treatment, 75% said information should be provided to the public via radio/television, 45% said dentists/physicians

should provide information, 42.5% said public seminars would be helpful in disseminating information, and 15% said the internet could be a source of information regarding orthodontic treatment.

Orthodontic treatment results

Dento-facial (Table 3)

A high rate of satisfaction with teeth alignment (95%) and overall orthodontic treatment (90%) was observed. Among the 10% who were dissatisfied with their overall treatment, 25% said their teeth alignment did not conform to their expectations, and 50% indicated they had undergone 'relapse'. The majority of subjects said their final esthetic profile and smile esthetics were improved (95% and 92.5%, respectively). Those subjects who were dissatisfied with their final esthetic profile (5%, n: 2) said this was due to the continued existence of a prognathic mandible. Changes in cephalometric values (pre-treatment to post-treatment) in dissatisfied subjects by orthodontic treatment were as follows:

Subject 1; SNA 71.8° to 72.6°; SNB 76.7° to 76.5°; ANB -4.9° to -3.9°, GoGn/SN 38.9° to 39.0°.

Subject 2; SNA 77.2° to 78.1v; SNB 81.0° to 80.0°; ANB -3.8° to -1.9°, GoGn/SN 33.4° to 34.5°

Oral functions (Table 4)

A high proportion of subjects experienced pain or clicking in the temporomandibular joint (TMJ) after treatment (50% were absolutely certain in this regard, whereas 37% said they believed this was so). Restriction of mouth opening was recorded in 27.5% of subjects, an increase in dental caries and/or gingival problems in 27.5%, and white spots in 17.5%. Two particularly interesting findings were a decrease in speech quality following treatment in 5% of subjects and an improvement in chewing/biting ability in 97.5% of subjects.

Psychosocial benefits (Table 5)

A total of 92.5% of the subjects said they would, under similar circumstances, choose to undergo orthodontic treatment again. While 82.5% of subjects said orthodontic treatment had a positive influence on his/her self-confidence, the remaining 17.5% said it had no effect. The majority (64%) stated that orthodontic treatment had a positive influence on finding a mate and/or their career, 62% said it had a positive influence on their work/school performance, and 72.5% said their social communication had improved as a result of treatment.

Chi-squared test

In general, no significant differences in responses were

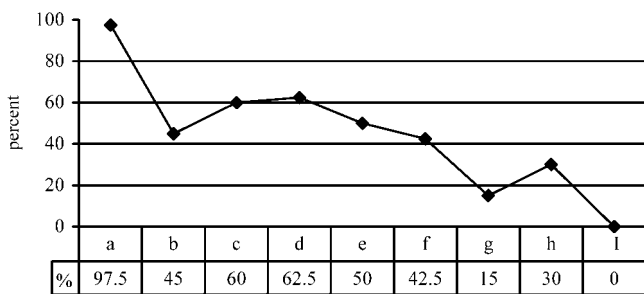


Fig. 1 The rate of unfavorable conditions (Question 7). (a) Long treatment time (b) Unesthetic intraoral appliances (c) Unesthetic extraoral appliances (d) Difficulty in pursuing orderly controls (e) Pain in teeth/jaws (f) Difficulty in speech (g) Problems with my doctor (h) Expensive (i) Other

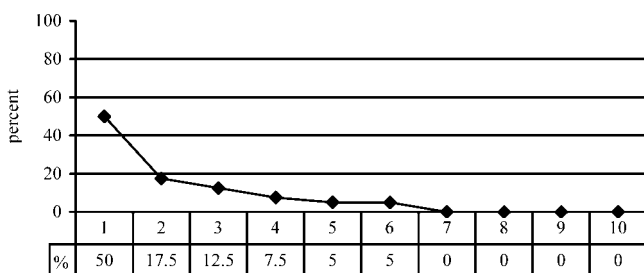


Fig. 2 The importance of orthodontic anomaly as a health problem.

observed between male and female subjects. There was no correlation between gender and either satisfaction with the final esthetic profile or a desire for straightening the teeth. However, gender was found to be a factor affecting the level of satisfaction with general facial appearance after treatment (Question 17). There were statistically significant differences in the rates at which women said they were 'very satisfied' or 'satisfied' with their general facial appearance in comparison with men ($P < 0.001$). Whereas 70.4% of females said they were 'very satisfied' with their general facial appearance, only 23.1% of males gave the same response.

Discussion

Although the response rate for the present study was rather low (15.8%), it should be noted that the subjects were in their long-term post-retention periods, having completed retention anywhere between 5 and 22.5 years prior to the study. Changes in correspondence address as a result of the significant lapse of time between treatment completion and the survey may have been one factor contributing to the low response rate, along with a lack of interest in the study, or some type of medical problem that may have prevented them from completing the survey. This is an indication that clinicians need to be vigilant in maintaining up-to-date contact information on patients in the long-term post-treatment period. Al-Omiri and Alhaija (4) reported a response rate of 84% for orthodontic patients in the retention stage (6-12 months), compared with Zhou et al. (3), who reported a response rate of 67% for 140 skeletal class III follow-up patients 24 months after surgery, possibly indicating an increase in the drop-out rate over time.

In the present study, the male-to-female ratio of the sample was almost 1:2. Al Omiri and Alhaija (4), who reported a 2:3 male-female ratio, interpreted this as an indication that women are more concerned with esthetic appearance than men, thus raising the question of whether esthetic concerns play a larger role in women's motivation to undergo orthodontic treatment than is the case in men. While there are numerous aspects to this subject, our observations indicate that despite the fact that female patients outnumbered male patients, male as well as female patients have considerable concern regarding their esthetic appearance. Moreover, in the present study, 50% of all subjects indicated maximum concern with orthodontic treatment as a health problem, and chi-squared testing revealed no differences between genders in this regard.

In general, high levels of satisfaction with dentition following orthodontic treatment have been reported (4,5). The present study found that 55% of subjects were 'very

satisfied' and 40% were 'satisfied' with the alignment of their teeth after treatment. Al-Omiri and Alhaija (4) reported that 34% of subjects were totally satisfied, whereas Larsson and Bergsröm (6) reported a satisfaction rate of 74%. Birkeland et al. (7) reported a high degree of satisfaction with orthodontic treatment results (95.4%) among subjects treated with both removable and fixed appliances. Al-Omiri and Alhaija (4) found that only 4% of patients treated with a fixed appliance were dissatisfied with their dentition after treatment, and the present study found that only 5% of patients were dissatisfied with their dentition. Here, it should be noted that the rates of dissatisfaction were nearly identical, despite the different treatment mechanics.

Whereas some studies have reported that gender is not a factor in dental satisfaction (4,6,8) others have shown (1,9,10) females to be more concerned about their appearance and thus to perceive a greater need for treatment than males. Moreover, Phillips et al. (11) found that the expectations of orthodontic treatment among males differed from those among females. The present study found gender to be a factor only in the level of satisfaction with general facial appearance.

Tulloch et al. (12) found that from the patient's perspective, the most important factor in deciding on orthodontic treatment was an improvement in appearance. Similarly, the majority of the subjects (62.5%) in the present study stated that their main concern was improving their facial appearance and profile. The literature shows that most individuals who have undergone orthodontic treatment feel they have benefited from such treatment, even if dramatic changes in facial appearance are not always evident (13). The present study found that a high proportion (over 90%) of patients was satisfied with their final esthetic profiles, smile esthetics and general facial appearance. This fairly high rate of satisfaction with orthodontic treatment might have been related to the correction of cephalometric values, i.e. the ANB angle. Moreover, with regard to the age factor, improved patient self-esteem in connection with a more esthetic facial appearance probably accounted for patient satisfaction in the adolescent period, when some esthetic problems can still be corrected skeletally by an orthopedic approach.

On the other hand, the cephalometric values of the subjects who were dissatisfied with their final esthetic profile should also be considered, as they may help to clarify the reason for this attitude. At the end of the treatment, even though class I occlusion was achieved, cephalometric values were not idealized, and still showed a negative ANB angle (-3.9 and -1.9). Consequently, it can be suggested that patient satisfaction, which is dependent on

perceptive assessment, might be correlated with cephalometric improvement, although this remains to be verified in further studies.

In the last decade, much effort has been made to clarify the relationship between orthodontic treatment and temporomandibular joint dysfunction (TMD). In 1987, Wyatt (14) demonstrated that chin cups displaced the disk-condyle complex posteriorly, initiating pathological processes in the joint. Dibbets and van der Weele (15) found no relationship between the presence of TMD signs and symptoms and orthodontic techniques or extractions. Henrikson et al. (16) studied the prevalence of TMD in 65 females treated with or without extraction, where the prevalence of TMD signs and symptoms was detected using an anamnestic questionnaire and clinical evaluation before, during, and immediately after treatment and one year after the third follow-up examination. They found that the prevalence of TMD symptoms that were noted during treatment decreased after the treatment had been completed. Arat et al. (17) investigated the issue of TMD in 32 class III patients (mean 5.6 years after treatment) during follow-up after treatment with a chin-cap appliance and found that 75% of them were asymptomatic. As a result of these findings, they concluded that chin-cap treatment is neither a risk factor for TMD nor does it prevent TMD. In the present study, 50% of the 22 patients treated with a chin cap said they experienced definite pain or clicking in their TMJ region after orthodontic treatment.

Another noticeable finding of the present study was that 97.5% of patients experienced an improvement in their chewing/biting ability after treatment. This rate is higher than the 73% improvement in chewing ability reported by Zhou et al. in patients who had undergone orthognathic surgery for correction of class III malocclusion (3).

Bos et al. (8) found that patients who had undergone orthodontic treatment had a more positive view of the treatment than subjects who had not undergone it. Birkeland et al. (7) reported that 80% of children would undergo orthodontic treatment again. Similarly, 92.5% of subjects in the present study stated that if they had to make the decision again, they would unquestionably choose to undergo orthodontic treatment.

Whereas the dental profession has traditionally considered oral health and function to be the principal goals of orthodontic treatment (18), patient expectations from orthodontic treatment are primarily concerned with improvements in appearance (19). Some patients report markedly improved self-confidence related to their appearance after orthodontic treatment (5,20). In recent years, there has been growing acceptance among dental

professionals that esthetics and their psychosocial impact are an important benefit of treatment (21,22). In the present study, a high proportion (82.5%) of subjects stated that orthodontic treatment had a positive influence on their self-confidence levels. Al-Omiri and Alhaija (4) pointed out the importance of psychological assessments of patients undergoing orthodontic treatment and suggested that satisfaction levels could be correlated with personality traits. Recently, some newly developed psychometric instruments for investigating orthodontic-related changes in a patient's well-being during treatment have been reported (18).

In conclusion, the low response rate of 15.8% is an indication that patient records must be vigilantly maintained and updated over the long term to ensure the possibility of future evaluations. Responses to the questionnaire revealed that, in general, skeletal class III subjects remained satisfied with their facial esthetics in the long-term period following orthodontic treatment, suggesting that improved cephalometric values contribute patient satisfaction. There was no evidence of a marked difference in satisfaction rates by gender. In addition to cephalometric and other objective records, subjective patient perceptions should be recorded in order to improve clinician-patient communication.

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