Original Article

Patient Compliance: A Determinant of Patient Satisfaction?

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Abstract: Recent studies have shown that there is a distinct relationship between patient satisfaction and patient compliance in orthodontic treatment. The aim of this study was to investigate whether patient compliance, as noticed and recorded by the orthodontist during treatment, can be used as a determinant of patient's satisfaction in the long run. Documentation of 100 patients who completed active orthodontic treatment in the year 2000 at the Academic Centre of Dentistry Amsterdam was analyzed, and compliance scores for patients were computed. Three years after completion of active orthodontic treatment, a questionnaire about satisfaction was sent to all subjects. Items were divided over six subscales on the basis of item content. Compliance and satisfaction scores of both sexes were compared, and correlations between compliance and satisfaction were explored. Regression analyses were done to examine the predictive value of sex and compliance on patient satisfaction. No significant correlations between compliance and satisfaction scores were found. Sex, but not compliance, predicted the patient's satisfaction with the doctor-patient relationship and the situational aspects of the treatment. Compliance, as noticed and recorded by the orthodontist during treatment, is not a decisive determinant of patient satisfaction in the long run. Sex, however, is a predictor of patient satisfaction with regard to the doctor-patient relationship and the situational aspects of the orthodontic treatment. (*Angle Orthod* 2005; 75:526–531.)

Key Words: Compliance; Patient satisfaction; Orthodontic treatment

INTRODUCTION

One possible factor related to patient compliance in orthodontics is the patient's satisfaction with the treatment process and the treatment outcome. In a previous study, it has been stated that orthodontic patients expect that the doctor-patient relationship is comfortable and warm, with a doctor who is technically competent and provides adequate information about the orthodontic problem and the procedures he or she will perform.[1] When these expectations are not met, patients may be dissatisfied. This dissatisfaction may reduce patient compliance and eventually lead to a less-than-optimal orthodontic result.

An acknowledgement of the patient's perspective of orthodontic treatment is critical in ensuring the development of a comfortable doctor-patient relationship[2] and may help improve the quality of orthodontic care.[3] Although in many patient-centered evaluations of the effectiveness of orthodontic treatment the term ''patient satisfaction'' is used, this concept is in itself ambiguous.[4] Little is known about the validity of this concept.[5] Stated differently, the term patient satisfaction may have different underlying constructs.

In a previous study in the Netherlands, it was found that patients were satisfied with the result of orthodontic treatment they had received.[5] Regarding the process of treatment, they positively evaluated aspects that dealt with the consideration and attention that have been given to them, but they evaluated the communication about the treatment process as quite negative. In another study, high levels of general satisfaction were found, but greater dissatisfaction was expressed in response to questions of a more detailed and specific nature.[6]

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It has also been suggested that sex and satisfaction are correlated. Women have been found to express greater levels of satisfaction with dental care than men.[7] This may be due to their greater exposure to dental services that would likely moderate their expectations which in turn are more likely to be met.[7] Orthodontically treated women, to a higher extent than men, have been found to believe that they receive appropriate information during the course of treatment and that there is a positive atmosphere in the treatment room.[6]

In the present study, we examine the issue of patient satisfaction from a different angle. One could argue that a possible determinant of patient satisfaction after treatment is the level of compliance shown by the patient during treatment. To illustrate, suppose an orthodontist observes that a patient does not comply very well, and he or she consequently criticizes this patient's behavior. This may cause the patient to begin to be dissatisfied about the orthodontic treatment. The orthodontist in turn may lose the motivation to do his or her job as good as possible. Instead, he or she may feel the need to compromise and choose an easier but technically less satisfying treatment, leading to a less-than-optimal treatment result. This less-than-optimal treatment result may lead to more dissatisfaction of the patient.

The aim of this study, therefore, was to examine whether indeed the level of compliance, as noticed and recorded by the orthodontist during treatment, can be considered a determinant of patient satisfaction approximately three years after treatment. To explore the relationship between compliance and patient satisfaction, the patient's satisfaction with the course of treatment and the treatment result were compared with the orthodontist's perspectives on the compliance of the patient during treatment. It was expected that patients who were rated less compliant by the orthodontist during treatment would express more dissatisfaction with the treatment process and the treatment result compared with patients who were considered more compliant by the orthodontist during treatment.

MATERIALS AND METHODS

Subjects

All patients who completed orthodontic treatment at Academic Centre of Dentistry Amsterdam (ACTA) in the year 2000 were selected. Of the total of 114 patients listed, 10 patients were older than 30 years of age (and therefore not representative of regular orthodontic patients who are often much younger), and four patients had cleft lip and palate (and therefore had a different history compared with regular orthodontic patients). These 14 patients were excluded from this study. The mean age of the subjects (n = 100) was 15.81 years (SD 1.81, range 13, 56% female subjects).

Patient documentation

All patients who completed treatment in the year 2000 were treated by one of the five residents in the orthodontic program of ACTA. All documentation of each patient was analyzed. Besides technical notes, the documents contained information about the expected treatment time and the actual treatment time of the patient. Furthermore, scores in the patients' documentation were used to indicate the level of patient compliance concerning oral hygiene and the wearing of braces. Scores used were −, insufficient cooperation; ±, moderate cooperation; and +, good cooperation. Scores were counted, and each negative score (−) was multiplied with a weighting factor of 1, each moderate score (±) was multiplied with 2, and for each positive score (+), a weighting factor of 3 was used. Two mean scores of compliance were computed: with respect to oral hygiene and the wearing of braces. For example, a patient who had received three negative scores, two moderate scores, and one positive score with respect to oral hygiene received an oral hygiene compliance score of $(3 \times 1) + (2 \times 2) + (1 \times 3)/6 = 1.67$. For each patient, the minimum weighted compliance score was 1 and the maximum weighted compliance score was 3.

Satisfaction questionnaire

In a study of psychosocial vs clinical responses to orthognathic surgery at the University of North Carolina, a questionnaire containing 38 items was developed to measure the patient's perspective on treatment outcomes.[3] In 2003, this questionnaire was translated in Dutch, and 20 questions about patient satisfaction were added. The questionnaire was sent to all subjects in our sample. After a reminder, 63 questionnaires were completed and returned. A telephone call was made to subjects who did not respond. Reasons for not responding were ''no time,'' ''loss of the questionnaire,'' or change of address. Seven subjects returned the questionnaire after this phone call, bringing the response rate to 70%.

The total scale was divided into six subscales on the basis of item content (Table 1). The first subscale contained 11 items about the satisfaction of patients with the doctor-patient relationship, and the second subscale consisted of 15 items about the patients' satisfaction with the situational aspects of the orthodontic clinic. The third subscale was formed by nine items about patients' satisfaction with their dentofacial improvement. The fourth subscale was based on nine

TABLE 1. Items on the Patient Satisfaction Questionnaire, Divided Over Six Subscales[a]

Factor 1. Doctor-patient relationship	
7.	I personally liked the orthodontist(s) who treated me
8.	Greater efforts should have been made to reduce the pain from braces (+)
9.	The orthodontist(s) always checked their work carefully
18.	The orthodontic care I received could have been better (+)
20.	The orthodontist(s) was gentle when treating me
21.	Before treatment began, my orthodontist(s) carefully explained what treatment would be like
25.	I liked the orthodontist(s) who treated me
29.	Questions I had about my treatment were answered promptly
31.	The assistants were gentle when treating me
33.	The orthodontic staff (assistants and office personnel) treated me with respect
38.	The orthodontist(s) treated me with respect
Factor 2. Situational aspects	
1.	Orthodontic treatment was a good value for the money
2.	My treatment took about as long as I expected it would
3.	I missed too much school for orthodontic appointments (+)
5.	Even though some appointments were short, each was necessary for my treatment to be successful
11.	Problems that arose during treatment were quickly taken care of
12.	The treatment area was modern and up to date
14.	The orthodontic treatment fees were too high (+)
15.	The orthodontist's office was conveniently located
17.	I was satisfied with the selection of days and times when I could be seen for orthodontic appointments
24.	Plenty of time was spent with me during each appointment
27.	I was rarely kept waiting for appointments
35.	The waiting area was comfortable
37.	The treatment area was clean and sanitary
41.	I had to travel far to reach the orthodontic clinic (+)
42.	The treatment took much too long (+)
Factor 3. Dentofacial improvement	
19.	Now that orthodontic treatment is complete, my teeth are straighter
32.	Now that orthodontic treatment is complete, I have a better bite
34.	Now that orthodontic treatment is complete, I think I have a more attractive face
45.	I really thought that my appearance would improve better than it actually did
48.	My appearance has changed exactly like I expected
50.	My teeth fit very well since I have been treated
51.	When I look in the mirror, I feel very satisfied about the way my appearance is improved since orthodontic treatment
56.	After my orthodontic treatment, I feel really happy when I took in the mirror
58.	I feel very happy because I look so much better since I have been treated
Factor 4. Psychosocial improvement	
4.	I feel better about myself because of orthodontic treatment
10.	I believe I will have better career opportunities because of my orthodontic treatment
16.	I believe my school performance is better because of orthodontic treatment
22.	I feel more outgoing because of orthodontic treatment
26.	I feel more confident because of orthodontic treatment
30.	I think I will be able to get a better job once out of school because of orthodontic treatment
36.	I feel more popular because of orthodontic treatment
44.	Even people who do not know me very well have made positive remarks about my appearance after I have been treated
54.	When I meet people for the first time, they react much more positively to me since I have been treated
Factor 5. Dental function	
43.	Eating is more easy since I have been treated
47.	Chewing is easier since I have been treated
53.	I can bite food more easily since I have been treated
55.	I would recommend orthodontic treatment to everyone who has difficulties chewing food
Factor 6. Residual category	
6.	My orthodontic treatment was inconvenient for me (+)
13.	I take better care of my teeth since having braces
23.	I am satisfied with the results of my orthodontic treatment
28.	If I had it to do over again, I would still want orthodontic treatment
39.	My braces gave me a lot of discomfort (+)
40.	It was difficult for me to wear my headgear or activator (or both) (+)
46.	If I had to do it all over again, I would do it

TABLE 1. Continued

49. I would recommend orthodontic treatment to others
52. I am dissatisfied with the treatment result (+)
57. Generally speaking, I have bad experiences with orthodontic treatment (+)

[a] Each item that is negatively correlated with the scale construct is rescored (+), so that a high item score is in agreement with the scale construct.

TABLE 2. Minimum, Maximum, Mean, and Standard Deviations of Compliance Scores Concerning the Wearing of Appliances and Oral Hygiene

	Wearing of Appliances				Oral Hygiene			
	Minimum	Maximum	Mean	SD	Minimum	Maximum	Mean	SD
Amount of scores	0.00	32.00	9.95	7.01	0.00	32.00	10.75	7.57
Sum score	0.00	96.00	26.69	20.56	0.00	85.00	25.53	18.78
Weighted sum score	1.00	3.00	2.64	0.49	1.17	3.00	2.38	0.54

items about patients' satisfaction with their psychosocial improvement, the fifth subscale consisted of four items about patients' satisfaction with dental function, and the sixth subscale contained 10 items that formed a residual category.

Items were answered on a six-point scale with endpoints 1 (completely disagree) and 6 (completely agree) and no neutral point. Eleven items that were formulated negatively were rescored, so that a high score indicated a high level of satisfaction.

Statistical analysis

Using SPSS 11.0, the data provided by the residents in the orthodontic program first were analyzed. Differences between estimated and real treatment time were tested, using a paired sample *t*-test, and differences between male and female patients were tested, using independent sample *t*-tests. Also, correlations between age, sex, and compliance scores were examined. Furthermore, the reliability of the satisfaction questionnaire and of the six subscales was tested using Cronbach's alpha.[8] Mean scores of male and female subjects on each scale were computed and compared, using independent sample *t*-tests. Correlations between compliance scores, satisfaction scores, and sex were analyzed. Finally, regression analyses were done, with the six subscales of the satisfaction questionnaire, as well as the sum score of satisfaction, as criterion variables and sex and both weighted compliance scores as predictors.

RESULTS

Male subjects in this study were slightly older than female subjects (mean age [males] 16.09, SD 1.65, range 8; mean age 15.59 [females], SD 1.90, range 13). At the start of treatment, the orthodontic professionals estimated the treatment duration in months, (M), for each patient (M 28.53, SD 6.36, range 30). After treatment, the real treatment time in months was measured (M 32.14, SD 7.08, range 44). The expected treatment time was significantly lower ($t = 3.04$, $P < .01$) than the real treatment duration. A moderate correlation was found between sex and estimated treatment duration ($r = .332$, $P < .05$) but not between sex and real treatment duration. A longer treatment time for female subjects than for male subjects was expected (females M 30.81, SD 5.97; males M 26.43, SD 6.73), and this difference was significant ($t = -2.44$, $P < .05$).

In Table 2, the minimum, maximum, mean, and standard deviation of compliance scores concerning the wearing of appliances and oral hygiene are presented. As can be seen in Table 2, the mean weighted sum score for compliance concerning the wearing of appliances is 2.64, indicating that patients in general are rated as good compliers. Also, with respect to oral hygiene, the mean compliance score of patients is >2, implying that patients are considered to be moderate to good compliers. No significant differences in compliance scores between male and female subjects were found. Also, no differences were found between patients who returned the satisfaction questionnaire and nonresponders.

The internal consistency of the total scale and the six subscales of the satisfaction questionnaire was satisfactory. Cronbach's alpha for the total scale was 0.87, and for the subscales was 0.81, 0.70, 0.76, 0.91, 0.78, and 0.71, respectively.

In Table 3, mean scores and standard deviations of male and female subjects on the six subscales and the total scale are presented. Independent sample *t*-tests revealed no significant differences ($P < .05$) in mean scale scores of male and female subjects. Respondents scored highest on items about the satisfaction with the doctor-patient relationship (mean item

TABLE 3. Mean Scale Scores of Male and Female Subjects for Six Subscales

Satisfaction With	Males		Females	
	Mean	SD	Mean	SD
Doctor-patient relationship (11 items)	52.12	8.40	55.66	6.10
Situational aspects (15 items)	62.52	9.60	64.44	8.11
Dentofacial improvement (9 items)	41.84	5.56	40.42	5.93
Psychosocial improvement (9 items)	28.33	10.49	27.53	10.90
Dental function (4 items)	15.19	5.09	15.05	4.60
Residual category (10 items)	41.64	7.49	43.62	6.91
Sum score satisfaction (58 items)	241.55	28.63	244.19	24.62

TABLE 4. Correlations Between Compliance Scores, Satisfaction Scores, and Sex

	1	2	3	4	5	6	7	8	9	10
1. Gender	1.00									
2. Compliance braces	.06	1.00								
3. Compliance oral hygiene	−.01	.48**	1.00							
4. Doctor-patient relationship	.24	−.07	.17	1.00						
5. Situational aspects	.11	−.20	−.09	.57**	1.00					
6. Dentofacial improvement	−.12	.00	−.04	.01	.26	1.00				
7. Psychosocial improvement	−.04	−.09	−.25	−.08	.26*	.68**	1.00			
8. Dental function	−.02	−.25	−.09	−.02	.22	.50*	.68**	1.00		
9. Residual category	.14	−.03	.14	.63**	.47**	−.01	−.10	−.04	1.00	
10. Sum score satisfaction	.05	−.09	.04	.48**	.69**	.71**	.64**	.53**	.38**	1.00

* $P < .05$; ** $P < .01$.

TABLE 5. Results of Regression Analyses

Predictor	Gender		Compliance Braces		Compliance Oral Hygiene		
	β	*P*	β	*P*	β	*P*	R^2
Criterion variable							
Doctor-patient relationship	.39	.01*	−.21	.17	.26	.09	.20
Situational aspects	.31	.04*	−.22	.15	−.05	.74	.14
Dentofacial improvement	−.13	.40	.06	.73	−.08	.61	.02
Psychosocial improvement	.05	.76	−.02	.93	−.27	.09	.08
Dental function	.06	.67	−.25	.12	−.02	.88	.07
Residual category	.30	.05	−.15	.36	.18	.25	.11
Sum score satisfaction	.11	.54	−.10	.55	.00	1.00	.02

* $P < .05$.

score 4.92, mean item SD 0.67) and lowest on items with regard to their satisfaction with psychosocial improvement (mean item score 3.10, mean item SD 1.18).

Correlations between compliance scores, satisfaction scores, and sex are presented in Table 4. In Table 4, it is shown that both compliance scores are significantly correlated. Also, satisfaction with dentofacial improvement, psychosocial improvement, and dental function are interrelated. Furthermore, satisfaction with the patient-doctor relationship and satisfaction with the situational aspects of the orthodontic practice are correlated. No significant correlations between compliance scores, satisfaction scores, and sex were found.

The results of the regression analyses, presented in Table 5, confirm that the level of compliance as indicated by orthodontists during treatment did not predict patient satisfaction in the long run. Only sex was found to be a significant determinant for the patients' satisfaction with the doctor-patient relationship and the situational aspects of the treatment.

DISCUSSION

The results show that the level of compliance, as indicated by orthodontic specialists during treatment, is not a determinant of patient satisfaction in the long run. In a previous study,[2] it was stated that professional evaluations of appearance can be thought of as one source of data that influences patient perceptions, whereas patient perceptions influence professional evaluations. Both perspectives are thought to be es-

sential to the understanding of the treatment process and to the achievement of successful treatment outcomes.[2] The results of our study, however, indicate that although an orthodontist may judge a patient to be noncompliant, this judgment does not seem to affect the satisfaction of the patient with the treatment process and outcome in the long run.

This finding is quite surprising because in many studies, it is believed that patients need to invest in the ultimate treatment outcome and that they do so by showing compliant behavior. However, our results indicate that even when patients, in the eyes of the orthodontist, do not invest optimally in the treatment outcome, they may still be satisfied about the treatment process and the treatment results. Therefore, considering that a major aim of orthodontic treatment is to have a satisfied patient, it seems more important to provide a comfortable doctor-patient relationship than to focus on the compliant behavior of the patient.

Moreover, it was found that the most important factor contributing to patient satisfaction was the patient's satisfaction with the doctor-patient relationship. This corresponds well with earlier findings.[1,9]

Furthermore, sex was found to be a significant predictor of the patient's satisfaction with the doctor-patient relationship and the situational aspects of the treatment. This result also has been found previously.[6] A previous study stated that satisfaction with dentofacial appearance is influenced by sex.[10] In the present study, female subjects indeed indicated dissatisfaction with their dentofacial improvement more often than male subjects, but this difference was not significant.

Orthodontic specialists in this study expected that treatment time for female subjects would be longer than for male subjects, even though actual treatment time showed no differences. These different expectations may be explained by the fact that female patients often are at somewhat younger age when they start treatment.

Some limitations of our results must be noted. First, our findings reflect the responses of residents in the orthodontic program of ACTA. Therefore, the results cannot be generalized to orthodontists in general. Second, although the reliability of the satisfaction questionnaire was highly satisfactory, the reliability of the compliance scores is unknown because no calibration exercises before evaluation were done.

Furthermore, it should be noted that respondents have evaluated their treatment three years after receiving it. The interval between the treatment and the completion of the questionnaire may have affected answers. Therefore, it is recommended, in future studies, not only to train orthodontists in the evaluation of patient compliance, but also to measure patient satisfaction at different time intervals after treatment.

CONCLUSIONS

The results of this study suggest that compliance is not related to patient satisfaction in the long run. Only sex is a significant predictor for patient satisfaction regarding the doctor-patient relationship and the situational aspects of the treatment. It is recommended, in future studies, to train orthodontists in the evaluation of patient compliance and to measure patient satisfaction more than once.

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