Predicting Patient Compliance in Orthodontic Treatment

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This article reviews the current knowledge regarding prediction of patient compliance during orthodontic treatment. Relevant literature dealing with this and other related aspects of patient compliance is discussed, and an attempt is made to structure and summarize available information. The multifaceted nature of this issue is emphasized, existing controversies highlighted, and where appropriate, practical suggestions are made. (Semin Orthod 2000;6:231-236.) Copyright © 2000 by W.B. Saunders Company

Consciously or intuitively, orthodontists always attempt at the beginning of treatment to estimate the level of compliance attainable for each individual patient during subsequent treatment stages. They are usually guided by the general impression gained from the first encounter with the patient and his or her family. A survey of orthodontic practices showed that 39% of practitioners predicted patients' compliance on the basis of the general impression with respect to the child's behavior, receptiveness and intelligence; 36% estimated future cooperation using their impression of the parents, 25% considered the child's interest, 33% considered the parents' interest in orthodontics as valuable information, and 12% used the level of patient's oral hygiene in predicting future cooperation.

To ensure efficient clinical management of orthodontic patients, it is desirable to identify factors which would enable the orthodontist at the early stages of treatment to predict the patient's subsequent behavior and compliance. It would be preferable to develop reliable methods of predicting the level of future compliance at the diagnostic stage, which could be appropriately considered during planning of individual treatment strategies. There are certain unique aspects of this issue which stem from the intricacy of the relationships between the patient, parents, and orthodontist; the typical coincidence of timing of orthodontic treatment with the patient's adolescent development, and from the challenge imposed on the patient to comply with the tasks dictated by the specific features of orthodontic appliances and treatment.

Progress of compliance research has been impeded by the previously mentioned complexity and methodologic difficulties; few relevant studies have been published. The inconsistency of the reported findings has led to the establishment of varying views, ranging from the abandonment of the prediction of compliance problems altogether, on the one hand, to the suggestions that compliance may be predicted by means of professional psychologic counseling or using specifically designed psychologic tests, on the other. In this respect, attempts to use standard psychologic diagnostic tests have as yet not proven to be feasible, and reliable and valid tests especially designed for assessing prospective orthodontic patients still remain to be developed.

This review focuses on several psychologic and psychosocial issues shown by recent research to be relevant for assessing compliance, and attempt to elucidate those factors which, on scientific basis, might serve as potential reliable predictors of patient compliance during orthodontic treatment.
Perspectives on Predicting Patient Compliance

Demographic Aspects

In the search for potential predictors of treatment compliance, considerable attention has been directed toward evaluation of patients' demographic characteristics. In one study, the patient's age was found to be the best predictor of cooperation.\textsuperscript{8} Further, it was reported that higher levels of compliance may be expected from 12-year-old and younger orthodontic patients compared with adolescent patients.\textsuperscript{9,10} It is generally assumed that children 4 years of age are sufficiently receptive to permit successful orthodontic treatment.\textsuperscript{11,12} In contrast, other studies have revealed no correlation between patients' age and the level of compliance,\textsuperscript{13-15} which is probably attributable to confounding effects of children's individual psychologic maturation. As orthodontic treatment is frequently concurrent with the period of adolescence, a potential influence of age on the compliance of this group of patients might at first appear to be meaningful. However, for this patient group, the age is not considered as an explicit and reliable predictor of treatment compliance.\textsuperscript{13,14} It has been shown that adolescent development might have different effects on individual patients leading either to adoption of a healthy lifestyle and enhancement of self-responsibility or, on the contrary, to establishment of health-risking behavioral patterns.\textsuperscript{13,14,16}

Some investigators have emphasized that the patient's gender might help predict treatment compliance demonstrating that female patients tend to show better cooperation compared with males.\textsuperscript{17-20} However, other more recent reports have either failed to confirm these findings or have revealed only a moderate influence of patient's gender on compliance.\textsuperscript{14,15,21,22} In contrast to boys, girls tend to express lower body image satisfaction\textsuperscript{23} and are more likely to be displeased with their dental appearance.\textsuperscript{24} Whereas these characteristics might strengthen the motivation of girls to seek and accept orthodontic treatment, they might also prevent the same patients from wearing overtly visible appliances in public, such as removable appliances or headgear, and thus reduce compliance.\textsuperscript{14}

The results of some studies suggest that age and gender of orthodontic patients might be associated with the level of treatment compliance. However, because of the inconsistency of reported results and the complexity of the entire issue of compliance prediction, these factors cannot be considered as distinct reliable predictors of patient's compliance-related behavior.

Several investigations have addressed the issue of potential influence of patients' socioeconomic status on their compliance with orthodontic treatment. It has been proposed that offsprings from families belonging to higher socioeconomic groups tend to develop better treatment compliance,\textsuperscript{25} possibly based on the perception that attractive dentofacial appearance is a valuable asset for social and occupational success.\textsuperscript{26} Cucalon and Smith\textsuperscript{27} reported that female patients from higher socioeconomic groups show the highest compliance levels. It appears from the results of other studies, however, that patients from lower middle class families show a higher appreciation of orthodontic treatment than those from the upper middle class,\textsuperscript{28} and that orthodontic patients from moderate and lower socioeconomic groups might develop better compliance.\textsuperscript{18} This has been attributed to a greater need for social acceptance and higher social aspirations as well as better child-parent relationships frequently found in these families.\textsuperscript{28} Other studies have indicated superior compliance shown either by children of civil servants compared with those of working class and self-employed parents,\textsuperscript{29} or by children of factory workers in contrast to offsprings of intellectuals.\textsuperscript{30} In contrast to these reports, no evidence of potential effects of parental occupational status on children’s compliance was disclosed in the study by Sergl et al.\textsuperscript{14} It has been proposed that in contrast to third-party financing, private payment for orthodontic treatment may have beneficial effects on compliance.\textsuperscript{31} However, this suggestion was not supported by the results of a study devoted to this issue.\textsuperscript{32}

Considering the inconsistency of the previously mentioned findings, and taking into account the dynamics of social and economic development in modern Western societies, any attempt to identify a single reliable compliance predictor among patients' demographic characteristics is likely to be overly simplistic and is, therefore, bound to fail. Nevertheless, the importance of the knowledge of the patient's so-
cioeconomic and cultural background should not be undervalued as it may serve as a useful adjunct to successful monitoring of treatment compliance.

**Psychosocial and Psychologic Aspects**

Considerable attention has been devoted to evaluation of the effects of patients' psychologic traits and psychosocial background on compliance during orthodontic treatment. It is generally believed that patient's personality characteristics, his or her relationships with the family, peers and orthodontist, as well as performance at school are closely linked with compliance, and might serve as valuable sources of information regarding both prediction and management of compliance.\(^8,21,33,34\)

Cooperative orthodontic patients tend to have better grades and show less deviant behavior at school,\(^4,15,19,20\) they are less frequently truant from school, are considered academically brighter and more sociable by their teachers,\(^5\) and reveal higher levels of self-perceived cognitive competence.\(^35\) On these grounds, patients' scholastic performance might serve as a useful predictor of treatment compliance.\(^15\) Some observations indicate that children of above-average intelligence are more cooperative during treatment, which, however, does not necessarily imply that children of below-average intelligence show poor compliance, because both variables appear to depend strongly on a number of other psychosocial factors.\(^36\) Based on the experience that compliant patients are also inclined to be cooperative pupils at school, it has been suggested\(^4,37\) to characterize the "orthodontic-psychologic" profile of the child before treatment by administering a standardized questionnaire, in which school teachers assess a child's conformity of behavior, self-reliance, reasonableness, willpower, and reliability. Although this approach has been shown to predict reliably conscious cooperation during orthodontic treatment, its practicability remains limited because of the necessity of engaging school teachers, and the requisite psychologic expertise for evaluation.\(^38\)

Studies investigating parents' attitudes toward childrearing, and evaluating the influence of the child-parent relationship or parents' attitude to treatment on child's compliance\(^8,17,20,21,39\) have provided no conclusive evidence supporting these parameters as reliable compliance predictors. Mehra et al\(^39\) suggested that parental beliefs are important for a child's compliance, and that assessment of the child-parent relationship may help predict the level of cooperation. However, it appears from other studies\(^15,20,21\) that a child's personal psychologic characteristics may be a more decisive factor determining the level of treatment compliance. Nevertheless, parents seem to play a prominent role in influencing a child's decision to seek orthodontic treatment,\(^40\) and parental attitudes influence the child's compliance in the earlier stages of treatment.\(^15,17,22\)

The importance of peer group relationships in the child's individual development, especially during adolescence, is well known.\(^16\) Although the influence of the peer group on health-related behavior of adolescents is recognized,\(^41\) little information is currently available regarding its potential significance for treatment compliance in orthodontics.

A recent study by Nanda and Kierl\(^91\) evaluated several factors of potential relevance to compliance prediction. Treatment-related psychosocial factors such as patient's and parents' treatment attitudes and expectations, or relationships between the child, parents and orthodontic practitioner, were investigated and the results obtained were subjected to extensive statistical testing. Among the parameters tested, the practitioner's perception of the interpersonal relationship between the patient and practitioner showed the highest correlation with measures of compliance and was the only variable close to meeting the criteria defining compliance predictors. These observations imply that development of an effective relationship between the orthodontist and the patient at the earliest stages of treatment is beneficial for future compliance, and that the orthodontist's perception of his or her interpersonal relationship with the patient may be useful in predicting compliance.

Substantial evidence has accumulated suggesting that patients' personality characteristics are important for the individually attainable level of treatment compliance. Studies dealing with the psychologic assessment of patients undergoing orthodontic treatment\(^8,20\) have outlined psychologic profiles of uncooperative and cooperative patients. A large scale investigation was conducted by Sergl et al\(^20\) comparing ex-
traordinarily cooperative orthodontic patients with patients rated by their clinicians as highly uncooperative. Specific psychologic diagnostic tests were used for evaluation of patients' cooperation, responsibility, reliability, and endurance during treatment. The results indicated that irrespective of gender, the patients who tend to be uncooperative are inclined to attitudinal preferences conventionally regarded as masculine, which are expressed as active, aggressive, and realistic behavioral patterns and self-images, rather than sensitive, esthetic and idealistic ones. Impulsiveness, need for ego-assertion, individualism, impatience, intolerance, and negligence are also characteristic psychologic traits of the noncooperative patient. Patients more likely to show higher levels of treatment compliance are enthusiastic, outgoing, energetic, self-controlled, responsible, trusting, diligent, and obliging persons.

**Health-Related Behavior**

It is believed that a patient's attitude to orthodontic treatment, and health-related behavior in general, might substantially influence treatment compliance. Health behaviors comprise personal efforts aimed at reducing health-compromising behaviors, as well as increasing the practice of health-promoting behaviors. Such behaviors may be influenced by patients' attitudes toward dental esthetics, perceived severity of malocclusion, desire for orthodontic correction and expectations from orthodontic treatment, and anticipated self-efficacy. Self-efficacy may be defined as the individual's belief in his/her ability to achieve a goal through his/her own efforts.

Treatment compliance seems to be strongly related to perceived severity of malocclusion and to internal control orientation. According to the locus of control theory, internal control orientation implies that patients attribute treatment outcomes to their personal efforts without relying primarily on chance or endeavors of others. It is likely that orthodontic patients who make fewer external attributions retain some sense of responsibility, and possibly control, over treatment outcomes and believe that their participation and cooperation can facilitate treatment progress. The results of recent studies support the view that the patient's desire for orthodontic correction, his or her value of dental esthetics, and their attitude toward orthodontic treatment at its start may serve as useful predictors of the level of compliance to be expected from this patient. It may be recommended that for the assessment of compliance in clinical situations, that patient's initial attitude toward orthodontics should be thoroughly considered and carefully discussed with the patient.

Assessment of the level of oral hygiene practised by the patient and the extent of its improvement after detailed oral hygiene instructions has been used as an indicator of the previous oral health-related behavior and may serve as a useful adjunct for compliance prediction.

**Initial Experience With Orthodontics and Acceptance of Treatment**

It has been shown that previous compliance may significantly predict the degree of compliance shown later. As patients may experience a considerable amount of discomfort from orthodontic treatment it is reasonable to expect that patients' initial experience with orthodontic treatment, adaptation to it and its acceptance at an early stage might strongly influence the degree of compliance at the subsequent stages. It is recognised that insertion of a new orthodontic appliance may diminish cooperation by causing considerable discomfort such as unpleasant tactile sensations, feeling of constraint in the oral cavity, stretching of the soft tissues, pressure on the mucosa, displacement of the tongue, soreness of the teeth and pain. Pain, functional and esthetic impairment, and associated complaints are the principal reasons for the patient's wish to discontinue treatment and for early termination of the latter by the patient. The amount of initial pain and discomfort experienced may predict acceptance of the appliance and treatment in general. The patient's self-confidence might be affected by speech impairment and visibility of the appliance, especially during social interactions when attention is focused on the face, eyes and mouth. Effects of appliance type on oral complaints, such as higher degree of pain or speech impairment during wearing of the bionator and the headgear, increased incidence of perceived pain,
tension, sensitivity, and pressure under treatment with functional and fixed appliances, or differences in initial acceptance of various designs of functional appliances, have been described. It seems likely that because of different experiences encountered, the type of appliance may have a substantial effect on initial adaptation and should also be considered in compliance prediction.

General personality variables and specific attitudes to orthodontics seem to play an important role. The results of recent investigations indicate that patients' attitudes toward orthodontics at the beginning of treatment may predict their capability to accommodate to initial discomfort associated with an orthodontic appliance, which in turn, may predict the patient's acceptance of the appliance and the degree of subsequent compliance. Appliance adaptation and treatment acceptance or denial are short-term events occurring within a few days after the initiation of treatment. This evidence suggests that attention of the treating clinician to patients' adaptation is necessary at the earliest treatment stages, to ensure and enhance future compliance.

Conclusion

It is apparent that a plethora of factors including patient's psychologic and psychosocial characteristics, health-related behavioral patterns and early events of adaptation to treatment, may determine patient compliance during orthodontic treatment, and these factors may differentially relate to specific aspects of orthodontic treatment. In assessing the level of compliance attainable by each individual patient it is advisable to pay sufficient attention not only to the technical matters but also to the psychologic aspects of the treatment progress. Use of conventional psychologic tests to predict compliance have proven unsuccessful. Because no practicable reliable standardized prediction tests are currently available, our knowledge about this aspect of orthodontic treatment will increase with the development of appropriate test methods. At present it is recommended to obtain all relevant information by interviewing prospective patients and assessing their environment, as well as from closely monitoring compliance progress in the earliest treatment stages. This information should be processed on the basis of the existing knowledge in order to successfully predict the individual levels of treatment compliance.

References


