TEENAGE PATIENT COOPERATION IN THE PRIVATE ORTHODONTIC PRACTICE UTILIZING VIDEOTAPE INSTRUCTION

by

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This study examined the effects of a comprehensive counselling strategy on the level of cooperation of teenage patients during orthodontic treatment. Thirty four patients, 8 to 18 years of age, from a private orthodontic practice in Cleveland, Ohio (office of Dr. Terrence Wenger) were randomly chosen to participate in the study. A customized videotape and a kit containing scripted orthodontic instructions were tested for effectiveness. Both the videotape and the instructions stressed the importance of creating partnership between the patient and the orthodontist and were designed to improve compliance during treatment. The videotape and the orthodontic kit were created by S. Rozencweig (1990).

Seventeen patients comprised to the experimental group and were exposed to the videotape and the kit. The same number of patients were assigned to the control group and were exposed to the routine orthodontic instructions given to every teenage patient in the office. All subjects were evaluated using a modified version of the Orthodontic Patient Cooperation

Scale (PCS) developed by Slatker et al. in 1980. Data was collected for both groups at six weeks, three months and six months following the beginning of treatment. Kruskal-Wallis one-way analysis of variance and Chi-square tests were used to examine within and between the group differences.

Six weeks after the beginning of treatment, there was a significant difference ($p \leq 0.05$) between the two groups in the amount of complaints received about wearing braces (PCS10). The control group performed with higher compliance than the experimental group

No significant differences were noted within or between the two groups at the other two evaluations.

The results indicate that videotape instructions can not reliably increase patient compliance in a well-organised private orthodontic office. It is possible that a videotape program may be more valuable to in an office setting where compliance is known to be a problem.

DEDICATED

TO

My parents, Niko and Mimika,
for their love, support, trust and belief in me
through all the difficult but meaningful steps of my life.

My granny, Kiki,
who, since childhood,
taught me that there are no barriers
to knowledge and continuous education.

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whom I thank for their warm friendship,
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we spent together in United States.

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TABLE OF CONTENTS

Page

ABSTRACT....ii

DEDICATION....iv

ACKNOWLEDGEMENTS....v

TABLE OF CONTENTS....vii

LIST OF TABLES....viii

INTRODUCTION....1

LITERATURE REVIEW....3

STATEMENT OF THESIS....45

METHODS AND MATERIALS....46

RESULTS....61

DISCUSSION....77

SUMMARY AND CONCLUSIONS....88

APPENDIX I....91

APPENDIX II....93

LITERATURE CITED....103

LIST OF TABLES

Table Page

1. Demographic information for the video and non-video groups.....68

2. Frequencies (f) and Percentages (%) betwen the different parameters of Patient Cooperation Scale (PCS) for video and non-video group at Time I.....69

3. Frequencies (f) and Percentages (%) between the different parameters of Patient Cooperation Scale (PCS) for video and non-video group at Time II.....70

4. Frequencies (f) and Percentages (%) between the different parameters of Patient Cooperation Scale (PCS) for video and non-video group at Time III.....71

5. Kruskal-Wallis one-way ANOVA by ranks between the parameters of Patient Cooperation Scale (PCS) for video and non-video groups at Time I.....72

6. Kruskal-Wallis one-way ANOVA by ranks between the parameters of Patient Cooperation Scale (PCS) for video and non-video groups at Time II.....73

7. Kruskal-Wallis one-way ANOVA by ranks between the parameters of Patient Cooperation Scale (PCS) for video and non-video groups at Time III.....74

8. Kruskal-Wallis one-way ANOVA by ranks between total scores for video and non-video groups at times I,II and III.....75

9. Coefficient alphas, average inter-item correlations for Orthodontic Patient Cooperation Scale (OPCS) at times I,II and III.....76

INTRODUCTION

Orthodontic correction is a very complicated procedure. Increased scientific understanding of oral-facial growth and development as well as evolving technologic advancements have increased the methods by which the clinician can achieve treatment goals. In many instances, however, the methods of treatment chosen are influenced by the estimated and demonstrated cooperation levels of the patients.

Lack of adequate patient compliance is not only a treatment response problem but can be a source of frustration and anxiety for the orthodontist (Gross et al., 1985). Patient noncompliance with orthodontic regimens represents a significant challenge. Lack of patient cooperation will result in slow treatment response or no response at all. In addition, it is costly and frustrating for clinicians to devote large amounts of time and effort to treating a patient who subsequently fails to follow to their recommendations (Gross et al., 1988).

Some orthodontic techniques rely on cooperation more than others, but all fail without it. Yet, while the orthodontist is well trained in techniques of mechanotherapy, relatively little time is devoted to patient motivation.

As we examine ourselves, we certainly see how we differ from others in our personality traits. Most of us, as we strive to motivate our patients, will

take the same ingredients and mix them differently, putting more emphasis on some than others (Graber 1971).

The success or failure in achieving maximum motivational potential, used to be dependent directly on the personality factors of the orthodontist, and on his/her understanding of the transitional insecurity of the teenagers. In later years, in addition to the direct discussion, patient education booklets and audiovisual sequences were developed as a part of the educational armamentarium. Since many non-verbal cues can be observed only on a videotape or film, many behavioral experts feel that effective interpersonal training requires the use of visual aids (Schoonover et al., 1983).

A certain counselling strategy, consisting of a videotape and a manual with orthodontic instructions, was tested in this study to determine its ability to enhance teenage patient compliance in a private orthodontic practice. The purpose of the study was to understand the degree to which orthodontists can use videotape instruction to enhance patient compliance with treatment.

LITERATURE REVIEW

A compliant or cooperative orthodontic patient may be described as one who practices good oral hygiene, wears appliances as instructed without abusing them, follows an appropriate diet, and keeps appointments so the goal of a stable, functioning, esthetic dentition can be achieved expeditiously (Egolf et al., 1990). Allan and Hodgson (1968), described the composite cooperative patient as 14 years of age or younger, enthusiastic, outgoing, energetic, wholesome, self- controlled, responsible, trusting, determined to do well, hard-working, forthright, and obliging. The composite uncooperative patients were pictured as more than 14 years old, of superior intelligence, hardheaded, independent, aloof, often nervous, temperamental, impatient, individualistic, easygoing, self-sufficient, intolerant of prolonged effort or attention and disregarding the wishes of others. Fields (1980) talks about the thrill that an orthodontist can feel completing a patient who came with an extreme malocclusion and on the day of band removal has given the most grateful smile, showing that he feels better about himself. He also points out the miserable feeling that an orthodontist could have when another patient, who started with only a moderately severe problem, looked fair on the day the appliances were removed. The occlusion was not intercuspated well, there was some remaining overjet, and to make things even worse, some decalcification.

Why the difference? Orthodontists are presumably a constant. Fields suggests that the most important unknown, and one that can be influenced, is the compliance level of patients. The incidence of patients failing to comply is alarming (Oliver, Knapman 1985). Before we start examining the factors that can be influenced to improve patients'behavior and enhance compliance, a few characteristics of teenagers today will be reviewed.

I. Patient's Personality

Adolescence is a time when the child becomes increasingly autonomous. Frequently, there is a conflict with parents when the autonomy is unevenly achieved. Parents would like to see autonomy in doing homework, caring for one's clothes, and maintaining a neat room. Children want autonomy in staying up late, watching unlimited television, and using the family car. Some parents grant autonomy very reluctantly, subconciously keeping their children dependent. These children can be very poor orthodontic patients. They are immature and are reluctant to acknowledge their responsibility for the success of their orthodontic treatment (Rubin 1983).

Studies of adolescent cooperation with health care recommendations have often focused on the relationships between personality factors and adherence to a prescribed regimen (Litt, Cuskey, 1980) and have found that variables such as self-esteem, self-image and sense of autonomy are important determinants of adolescent cooperation (Friedman, Litt 1987).

As a teenager's identity develops, the teenager compares him or herself to vital, active peers and adults. The limitations implied by a treatment sequence may make the teenager feel different or defective.

Consequently, during this period, the whole treatment may be rejected by the teenager (Friedman, Litt 1986). Few children are able to "future-focus" on the desirability of healthy and attractive teeth for a lifetime while they are uncomfortable in the home situation (Rubin 1983).

The adolescent years bring internal stressors (e.g., new feelings and needs) and external stressors (e.g., changing relationships with parents, peers and the outside world). Additional stressors may include the diagnosis of a malocclusion and the necessity to follow a certain treatment plan. The number and type of specific stressors and how teenagers cope with them may affect the patient's ability to adhere to a treatment (Friedman, Litt 1983).

Individuals employ numerous coping methods to accomodate to stress. Among those most frequently used by adolescents, are denial (Soloff 1980), externalization, risk-taking (Litt, Steinerman 1981), acting out (Wickers et al., 1977), and intellectualisation (Hamburg, Inoff 1982), may be inimicable to compliance.

Amidst the flux of adolescence, it may appear that the decisions to adhere or not to adhere to a certain treatment are irrational and unpredictable (Friedman, Litt 1983). Research has shown that there are particular factors associated with orthodontic patient compliance and these factors will be examined in the next section.

II. Factors Associated with Orthodontic Patient Compliance

II.1. Age

Allan and Hodgson (1968), applied a stepwise multiple regression procedure to the Adjective Check List (Gouph 1965) responses of 30

adolescents to predict treatment compliance. They found that age, number of adjectives checked, and variables assessing need for dominance, autonomy and achievement significantly predicted patient cooperation. Crawford (1974) also used a multiple regression analysis of patient cooperation with orthodontic treatment and found that age was related to good patient cooperation. Jones (1984) investigated the initial discomfort caused by the placement of an archwire. He found that the discomfort experience by patients over 16 years old is greater than that experienced by patients under 16 years of age. Consequently, compliance diminishes as the teenager becomes older. Similarly, Kreit, Burstone, and Delman (1968) report that patients over 13 years of age are more uncooperative in wearing of the headgear than younger patients.

Haynes (1982) found that patient age was directly proportional to the discontinuation rate; the older the patient, the higher the failure rate. On the other hand, Broekman cites greater cooperation among patients over 14 years of age and Gosney (1985), Cucalon, and Smith (1989) stated that age was not significant in predicting compliance.

II.2. Gender

Cucalon and Smith (1989) found that the most important variable in predicting compliance was the gender of the patient. Females were found to be more likely to exhibit good compliance. Starnbach and Kaplan (1975) also found gender to be an important factor. They attributed this to the fact that orthodontics is concerned with improving appearance, which is of greater concern to adolescent girls. Females generally mature more quickly than males and are more capable of complying with treatment in an adult

fashion. Kreit, Burstone and Delman (1968), Broekman (1969) and Clemmer and Hayes (1979) also cited greater compliance among girls. It should be noted however, that a gender difference in compliance is not always observed. Swetlik (1978), Jones (1984), Gosner (1985) and Jacobson et al. found no gender difference in compliance with therapeutic regimens in 9 to 15 year old adolescents.

II.3. Patient's Perceived Orthodontic Condition

Lewit and Virolainen (1968) in a study of 129 American High School children showed that those with the severest malocclusion had the greatest desire for treatment. However, no significant difference in desire for treatment between moderate malocclusion and the good occlusion groups was found. According to Burns (1972), the concept of "body image" involves the development of a concious image of one's own apperance. This image is usually personally pleasing, but if it is not, the individual may develop anxieties which can eventually lead to psychological problems. Often, body image does not closely relate to an objective representation of the body. Further, the severity of a disfigurement frequently bears little relationship to the degree of anxiety it produces (McGregor 1970). Sometimes even a minor irregularity, such as median diastema or a rotated lateral incisor, is capable of producing a disproportionately less pleasing body image. For another individual, a gross anomaly, such as mandibular prognathism, may have no effect on body image. Persons for whom dental appearance is important increase the impact dental features have on body image. In contrast, individuals with low dental awareness demonstrate little dental influence on body image (Gosney 1986). It could be hypothesized that

those with an acceptable dentition may reduce its saliency by taking it for granted, whereas those with malocclusions may increase the importance that this feature has on self-esteem. Previous studies have not entirely supported this assumption. The esthetic self-evaluation of an appreciable number of patients, and subsequently the perceived need for orthodontic treatment, did not coincide with professional judgements (Myberg, Thilander 1973; Lindsay, Hodgkins 1973; Ingervall, Hedegard 1974). Thus, some patients may be unaware of, or relatively unconcerned about, a pronounced malocclusion. In contrast, other patients may show greater concern over a relatively mild irregularity.

Shaw (1981) points out that a patient's perception of his/her dental appearance is of considerable importance in treatment demand and patient cooperation. Clemmer and Hayes (1979) assessed the cooperation of young patients in wearing headgear and found that cooperative youngsters felt that their malocclusions were more severe. In a study by Lewis and Brown (1973), 74 of 100 children stated that they continued to wear orthodontic appliances because they wanted to "look better" or to "have straight teeth". However, an individual's perception of the attractiveness of various aspects of his facial appearance appears to be moderated by his general self-esteem (Korabik 1977). Teenagers with cleft lip and palate had a more favourable attitude to their defect when general self-esteem was high (Starr 1978). The complex inter-relationship between body image and self-concept has been investigated (Lerner, Karabenik 1974). Orthodontists should be aware that a number of young adolescents may experience a

disturbance in self image between the ages 11 and 14 years (Simmons et al., 1973).

In 1990, Egolf, BeGole and UpShaw studied the factors associated with patient compliance. They concluded that the orthodontists that want to screen patients for potential cooperation should ask "How self-concious or embarrassed are you by your teeth?", rather than measuring the severity of the patients' malocclusion which was not correlated with compliance.

II.4. Patient's Locus of Control

A number of psychologic theories explain how persons perceive and evaluate the behaviors and events that determine life's course. The technical, psychological term for this perception is locus of control. By definition, a person's locus of control reflects his/her beliefs as to whether or not life events are determined by personal actions or behaviors, by the actions of others, or by chance. Persons who are internally oriented believe they have control over their own lives. Persons who are externally oriented tend to believe that other people or chance factors control their lives (Tedesco et al., 1985; Friedman, Litt 1987).

The relationship between generalized locus of control orientation (Rotter 1966) and orthodontic cooperation has also been studied with somewhat conflicting results. Lewit and Virolainen (1968) found a greater desire for orthodontic treatment among patients with a more internal locus of control. However, that was true only for middle-class children with low scores on both anxiety and desirability. Crawford (1974) and El-Mangoury (1981) also found that adolescents who have an internal locus of control orientation were more cooperative overall. In contrast, Albini, Slakter and

Tedesco (1981) found that cooperation was associated with an external locus of control orientation. Clemmer and Hayes (1979) failed to find any clear relationship between locus of control and cooperation with headgear wear. However, El-Mangoury (1981) found a relationship between a patient's need for achievement and oral hygiene practices, and between high need for affiliation and the cooperative behaviors of keeping appointments, wearing and maintaining appliances.

II.5. Interpersonal Relationships

Parents

For teenagers, emotional and physical distancing from parents may impede compliance. For instance, parental involvement in health care often promotes adherence (Beck et al., 1980). In one study, the most important predictor of appointment compliance at a youth clinic was whether a parent made the first appointment for the teenager (Irwin et al., 1981), while in another study, higher patient satisfaction and better subsequent appointment keeping was demonstrated when teens scheduled their own appointments (Litt, Cuskey 1984).

The quality of parental involvement and support is important. Family harmony and acceptance of the youths in their family was perceived to be higher by adherent teenagers and their parents (Friedman et al., 1986). Another study showed that non-compliant girls and their mothers had more confrontation, less efficient negotiation, and higher levels of unresolvable conflict (Bobrow et al., 1985). Kreit, Burstone and Delman (1968) examined the cooperation of the teenage patients and stated that the most salient characteristic of patients rated as being uncooperative was the existence of

a poor relationship with their parents. Uncooperative patients are more likely to complain that their mother is "constantly bugging them about different things", and also more likely to feel that their mother is too strict, their folks "criticize them a lot", give them too little freedom, and think their grades in school are not high enough. Perhaps their poor relationship with their parents accounts for the fact that they are more likely to feel they "get a raw deal from life". Cooperative patients endorse positive statements about their parents. They feel that "most adults understand kids of their own age" and they "discuss things that are bothering them with their parents".

The fact that cooperative patients have a healthy child-parent relationship, may be related to the aquisition of standards of right and wrong. Cooperative patients claim they do their homework even if they know their teachers will not check it. They also state they would not sneak into a movie, even if they knew they could get away with it. Uncooperative patients are more likely to require the presence of an authority to enforce ethical standards of behavior. Nonetheless, cooperative patients are more apt to make unlikely claim that they "always brush their teeth immediately after breakfast and after every meal". Uncooperative patients are more apt to "like to dress in sharp clothes" and also to have a part-time job after school (Kreit et al., 1968).

Lewit and Virolainen (1968) observed that parental wishes were important for dependant adolescents. In contrast, self-reliant adolescents were less influenced by parental approval than by severity of malocclusion. These studies suggest that motivation for treatment and the decision to seek treatment are not always initiated by the child (Stricker, 1969). Therefore,

the incentive to cooperate fully during the treatment period may be reduced or absent.

In conclusion, although parental support is essential for young adolescent compliance, teenagers with a sense of autonomy are even more likely to cooperate. The adolescent still struggling to gain independence from his or her parents is less likely to follow the orthodontist's advice or otherwise strive to meet the expectations of authority figures (Friedman, Litt 1987).

Peers

The strong influence of peer culture on the adolescent creates additional challenges (Friedman, Litt 1987). Adolescents learn extensively from observing contemporaries. The benefits of positive peer modeling and social reinforcement have been shown in the experimental setting (Nessman et al., 1980; Jay et al., 1984).

There is also evidence that children's physical attractiveness is associated with popularity with their peers (Dion et al., 1972). Shaw (1981) made an observation that an influencial factor in a girl's desire for orthodontic treatment was the experience of teasing from her friends. In these instances peers are working on the same side as the orthodontist since they motivate patients to seek orthodontic treatment. There are situations in which peers can work against the orthodontist. Gabriel (1968) showed in his study that embarrassment is an important factor in headgear and rubber bands noncompliance. However, other investigators have found that embarrassment was not a major reason cited for noncompliance (Egolf et al., 1990).

Orthodontist

Generally, a patient's satisfaction with dental care and with dental specialists are strong determinants of adherence to treatment plans. In particular, adolescent patient satisfaction predicted subsequent appointment keeping behavior (Litt, Cuskey, 1984).

Story (1966), a psychologist, feels that the patients respond to orthodontists and parents in similar ways. The orthodontist becomes a substitute parent. In some patients there may be a strong desire for independence from parents during orthodontic treatment. The orthodontic patient does not want to be uncooperative, but the great desire for independence, autonomy and self-regulation takes precedence. The real patient-orthodontist relationship - its tone, quality and outcome - is critically important in understanding problems of patient motivation. The orthodontist should make every effort to be "a good parent" to the young patient, while firmly maintaining the role of professional provider of services. The orthodontist is faced with the challenge of having a meaningful relationship with a complete child, not just a mouth and face. Engaging the reluctant or stubborn child in a positive way, even at the most minimal level, is likely to benefit that child in a more complete way than is usually envisioned in orthodontics. First, fully and meaningfully inform each patient of the biologic-orthodontic situation. Second, if possible, find the willing and cooperative side of the patient. Third, side with that unequivocally. Fourth, indicate that it is important to include the patient in any consideration of bodily change and amelioration.

II.6. Socioeconomic Background and Status

The financial outlay incurred by the family must be justified in terms of the benefits of orthodontic treatment. The necessity to make regular and relatively frequent visits to the orthodontist during treatment can interfere with the child's education and may cause great inconvenience to the family. These practical difficulties may be so appreciable as to dissuade parents from accepting treatment for their child (Myberg, Thilander 1973).

Gosney (1985) did a survey with a sample of young patients and their parents in order to assess some of the socioeconomic factors which may mitigate against the provision and successful completition of the course of active appliances. Some of the factors included in his study were: 1) The distance from the patients' residence to the orthodontic office; 2) The total cost incurred by the journey; 3) The method of transport used and convenience of the journey; and 4) The time taken for the return journey. His findings showed that, although work was missed more frequently when a father accompanied the child, a greater frequency of loss of earnings occured for the working mothers, half of whom suffered financial loss if work was missed. When analyzed for social class, a marked increase in loss of earnings occured for an accompanying parent in the manually classified groups than for the non-manual classes. This could conceivably result in a greater deterrent to treatment acceptance for children from the manually classified social groups who would, therefore, be placed in a more disadvantaged position. Also, in the same study, there was a record of actual teaching time missed at school during each attendance for orthodontic treatment and the parents expression of concern over their

child's absence from school. The results indicated that the majority of young patients missed at least two hours of teaching time, with 73% missing the whole morning or afternoon session. Parental concern was slightly greater for the parents in the non-manual group.

No specific socio-economic pattern among 264 Norwegian patients who gave co-operation problems with conventional upper removable appliances followed by fixed appliances treatment was reported by Berg (1979). However, Rollings (1982) found a small difference between socio-economic groups in Danish school children.

Two more studies, Crawford (1972) and Starnbach and Kaplan (1975) reported that socio-economic status was related to patient cooperation. More specifically, patients in the lower middle or lower classes were more cooperative. Additionally, Cucalon and Smith (1989) in their recent article on the relationship between compliance by adolescent orthodontic patients and performance on psychological tests, pointed out that the socio-economic relationship to compliance may be related to the variety of familiar factors, such as supportiveness, communication and family involvement.

II.7. Patient's School Performance

Ratings of patient cooperation seem to be related to the patient's school cooperation. Kreit, Burstone and Delman (1968) administered a 287-question personality inventory to 1,386 patients. They found uncooperative patients admitted more often that their parents did not think their grades in school were high enough. Also, cooperative patients asserted more often that they always did what their teachers told them to do. In fact, research by

Herren et al., (1965) and by Burns (1970) showed that teachers gave higher ratings for school cooperation to orthodontic patients who received higher ratings for orthodontic cooperation. These findings suggest that patient cooperation reflects the mature attitude of a generalized personality trait (Clemmer, Hayes 1979).

II.8. Perception of Psychological and Physical Discomfort

Sanford Lewis (1961) has written that no field of dentistry is more concerned with emotional factors than is orthodontics. Nowhere does the question of body image become more important and nowhere must a therapist be more perceptive and sympathetic in his/her approach. Lustman and Seymour (1960) somewhat whimsically stated that "the patient brings his personality as well as his teeth to the office".

Many attempts have been made by many authors to assess the adverse psychological responses of young patients to orthodontic treatment. Maj et al., (1967) in a sample of one hundred children, 7 to 14 years of age, tried to evaluate each child's attitude toward the orthodontist and the appliances. Two different times were used for evaluation. First, when the personality evaluation was effected and second one year after the initial approach. The findings of the investigation showed that orthodontic treatment was viewed as a stressful situation by almost all the children. The child's state of anxiety was substantiated by thematic tests. The anxiety was made up of aggressive impulsions against family members, and of complex fears concerning his own physical well-being. The patient perceived danger for several reasons. First was a real fear of anatomic castration and a more complex fear of falling into decay, even to annihilation . These feelings were

caused by a number of factors, including the child's own aggressiveness against himself, his own passivity endured as if dangerous, and, more important, fear of being forsaken by his own parents and therefore unable to remain alive. This fear concerning personal survival was present in 70% of the sample. The study revealed that children found treatment to be a further source of anxiety. A year after first contact with the children, the investigators found that the feeling of frustration had spread to a larger number of children but had lost a great deal of its initial intensity. The child's awareness of his own emotional attitude brought about a better adaptation to reality. Regression and fixation, symptomatic of poor adaptation were reduced to very small percentages. A first hand understanding of treatment resulted in a decrease in its dramatic aspect.

Story (1966) emphasized the relationship that psychology has with the orthodontic field. He stated that the oral cavity and facial area have enormous psychological significance for everyone, and that there are many kinds of anxiety connected with oral functions.

Baldwin (1965) has also carried out a variety of studies regarding the adverse stress reactions of children to dental extraction. One of his studies concerned the size of human drawings made at several intervals before, during and after oral surgical procedures consisting of the extraction of the four first premolar teeth from each of 45 children. He found that under the threat of extraction, there was a consistent pattern of restriction in the size of human figures drawn by the children. The size of the figures was reduced following announcement to the patient of the impending extraction, and it was reduced still more immediately prior to the surgical procedure. A return

toward the original base-line size of the figures was observed post-operatively, suggesting that the earlier levels of anxiety had by then subsided. It would be a mistake to conclude that the above finding was related only to exodontia, because is likely relevant to a variety of other kinds of potentially stressful situations, including orthodontic treatment. At the very least, however, the almost inescapable conclusion was that the threat of a bodily injury, organ loss, or harm implied by the loss of teeth, was a high anxiety arousing experience for children.

Gosney (1985) examined some of the factors that caused stress on the patient. He wrote that the extraction of teeth usually forms an integral part of the orthodontic treatment and one is tempted to speculate on the possibility that fear of extraction may deter at least a few from accepting treatment. In his study, 62% of the patients who needed extractions as part of their treatment admitted to having experienced some degree of anxiety about the extractions. Girls experienced slightly more anxiety than boys, with the prevalence of anxiety tending to decrease with age. However, only patients who registered "a lot" of anxiety might be deterred from treatment and that occured in only 13% of the patients.

Continuing with the studies that examined factors which might deter patients from undergoing orthodontic treatment Lewis and Brown (1973) studied the level of worry induced by removable appliances in 100 British patients. They investigated the possibility of an association between that and the general anxiety state existing in a patient with respect to normal every day worries. No significant correlation was found. However, they concluded that the level of anxiety induced by appliance therapy was lower

than that reported by Maj et al., (1967). Thus a balance must be reached between the benefits of treatment and the psychological distress caused to patients, especially if the decision to have treatment followed parental pressure.

In addition to the psychological issues that are related to patient inconvenience during orthodontic treatment, there are other also very important physical components. Pain is one of the factors that varied considerably among patients, the amount of which depended to a certain extend on the method of the orthodontic treatment (Koller, Dorschl 1977; Sergl, Furk 1982) and on the ability to tolerate the inconvenience of the appliance (Kwam et al., 1987). The fear of pain is one of the key factors that may discourage a patient from seeking orthodontic treatment (Oliver, Knapman 1985). The response of patients to the initial movement of teeth varies (Story, Smith 1952) and it is difficult for the orthodontist to respond accurately to prospective patient inquiries regarding the extent and duration of discomfort that might be endured (Ngan 1989). The cause of the pain resulting from orthodontic tooth movement is not entirely clear. Furstman and Bernik (1972) suggested that periodontal pain was caused by a process of pressure, ischemia, inflammation and edema. Soltis and associates (1971), in an experiment to measure the subjective ability of orthodontic patients to distinguish differences in the intensity of force applied to the maxillary incisors, found that the proprioceptive and discriminatory abilities of patients were reduced four days after the insertion of orthodontic appliances. Patient discomfort was attributed to the lowering of the pain and disruption of the normal mechanisms associated with proprioception input

from the nerve endings in the periodontal ligament. Fujita (1978) reported changes in the maximum tolerance of persons when their teeth undergo orthodontic tooth movement. Burstone (1962), in a study examining the pain caused by orthodontic appliances, noted that there was a wide range of individual responses when similar forces were applied to the teeth. He identified an immediate and delayed pain response. He speculated that the former was related to the initial compression of the periodontal ligament immediately after the placement of the archwire. The latter response, which started a few hours late, was termed hyperalgesia of the periodontal ligament. Prostaglandins have been shown to cause hyperalgesia, which is an increased sensitivity to noxious agents such as histamine, bradykinin, serotonin, acetylcholine and substance P (Ferreira et al., 1978; Higgs, Moncada 1983). Inflammation of gingival and periodontal tissues during orthodontic treatment might lower pain tolerance by inducing tissue hyperalgesia. These tissues may then become responsive to stimuli that would not ordinarily evoke any reaction. Burnside et al., (1974) observed changes in the vitality response of teeth being moved by orthodontic appliances. Although correlation between decreased sensitivity of the pulp and teeth undergoing orthodontic treatment was found, they questioned its clinical significance. They concluded that there was little change in the pain response of the pulp during tooth movement.

Isaacson and Williams (1973) in their text wrote that when using fixed appliances teeth which are being moved demonstrate an increased mobility and are often slightly tender. They also suggested that excessive tooth mobility and pain should always be further investigated. Gianelly and

Goldman (1971) questioned the hypothesis that larger forces cause greater periodontal compression and hence greater pain. They doubted the validity of using pain response as a guide to the amount that the periodontal ligament was hyalinized. Boester and Johnston (1974) in a clinical investigation in which a variety of forces were applied to canines made the observation, that there was no relationship between tooth discomfort and the forces applied. However, their method has been questioned as to its accuracy (Jones, 1984). Jones (1984) attempted to examine the response of patients to the placement of the initial archwire. He found that of 30 patients, 23 suffered moderate to severe discomfort following placement of the archwire. Higher scores were generally recorded within the first three days, peak discomfort usually occured at night. For patients reporting mild discomfort that continued for approximately one week, symptoms were evenly distributed throughout the morning, afternoon and evening sessions. There was a significant difference in discomfort experience between those over and those under 16 years old, and no significant difference in the discomfort experience between sexes. Jones study did not take into account variables such as emotions, attitude, and personality factors that have been reported to modify the pain and discomfort sensations (Ngan 1989). Ngan's study indicated that there was discomfort associated with the insertion of orthodontic separators or arch wires. The level of discomfort tended to increase in the next twenty four-hour period but decreased to preplacement level within seven days. Discomfort depended on the severity of the existing malocclusion and the patient's anticipatory anxiety about orthodontic treatment. Cultural background, past experiences and other forms of

psychologic input that give meaning to a situation in which pain occurs have also been found to be factors (Dubner 1968).

Apart from pain there are also other barriers that prevent patient compliance. A major adjustment factor relates to eating habits and the experience of food getting caught in their appliances (Tayer, Burek 1981). Gosney (1985) in his investigation asked patients to indicate if their appliances had caused them any anxiety and the findings showed that discomfort ranked highest, with factors such as speech, eating and visibility. Forgetting to insert a removable appliance or removable component of a fixed appliance (e.g., extra-oral traction appliances or intraoral elastics) was the least important cause of concern about their appliances. Although the distribution of factors causing concern was similar for boys and girls, there was a difference according to the type of the appliance. A greater emphasis on discomfort, and less concern about speech, was noted with fixed appliances but that was reversed for removable appliances. No marked distributional difference occured with respect to age, but increased concern over speech and eating difficulties was mentioned by those in the oldest age group. The patients who had indicated that visibility and discomfort worried them "a lot" were further analyzed with respect to the response they gave to the question of whether they would have accepted their dentist's advice to have treatment had the appearance of their teeth not previously concerned them. A very high percentage of the patients indicated they would still undergo orthodontic treatment if advised to by their dentists. This finding showed that the level of concern produced in most patients is not so excessive as to dissuade them from accepting or continuing treatment.

Patients were also asked if they had been teased about their appliances, and if so, whether that had worried them. Over half of the responders were teased, particularly those undergoing fixed appliance therapy, but only 12% of those patients indicated that that caused them anxiety. Also Cousins et al., (1981) found that increased use of fixed appliances had no adverse effect on failure rate, while Myberg and Thilander (1973) found that dislike of fixed appliances caused some patients to discontinue treatment.

The preceding section attempted to address the questions; "Why do patients cooperate?" and "Why do they suddenly fail to adhere to a certain orthodontic treatment?". The next section will describe some of the intervention strategies which could improve patient compliance throughout orthodontic treatment.

III. Intervening to Improve Compliance

III.1. Confirming the Diagnosis of Noncompliance

The possibility of noncompliance is often first raised when the desired clinical effect is absent (Friedman, Litt 1987). Successful orthodontic treatment requires the patient's cooperation over a considerable period of time. Unfortunately, lack of compliance frequently becomes clear only as treatment has progressed more slowly or with more difficulty than initially expected. This factor tends to lead either to discontinuation of treatment or to a compromised result. Discontinuation or compromise is detrimental to the physical and socio-psychological well-being of the patient, and may also lead to considerable loss of confidence in orthodontic, dental and general health care by both patient and parents. Considerable manpower and financial resources which could be more constractively utilized in treating

the cooperative patient are wasted on true uncooperative patients (Woolass et al., 1988).

Many retrospective studies have been carried out to identify variables related to cooperation with orthodontic treatment. Usually, when a certain stage of cooperation has been reached, it becomes necessary to attempt behavior modification to promote improved cooperation if a satisfactory outcome of treatment is to be achieved (Fields 1980; Gross et al., 1985). It would be preferable to have some reliable method of predicting the level of compliance at the diagnostic stage, as this could then be taken into consideration during treatment planning (Woolass, Shaw, Viader and Lewis 1980). A number of studies have considered that problem (Herren et al.,1965; Allan and Hodgson 1968; Lewis and Brown 1973; Demisch 1975; Weiss and Eiser 1977; Oliver and Knapman 1985; Shaw et al., 1986) The findings in every one of these studies demostrated that there are few reliable predictors of future cooperation with orthodontic treatment.

Another problem in routine orthodontic practice is the reliability of subjective estimates of patient compliance. Sahm et al., (1990) recently reported a strong association between actual compliance and patient credibility. For example, "poor cooperators" glossly overstate their wearing time. Consequently, various patient characteristics and features of operator-patient interaction proved significantly correlated with both criteria. Among them, regularity of wear and duration of treatment are most influencial. Moreover, patient credibility appeared to be a salient point of the reciprocal perceptions of treatment partners and their personalities. The reliability of patient statements also depends upon how detailed the operator's questions

are and whether he/she draws his/her own conclusions from the information received instead of leaving them to the patient.

In conclusion, although there are no foolproof methods for determining whether deliberate misrepresentation of compliance or simple forgetting motivates a given patient's responses regarding compliance (DiMatteo, DiNicola 1982), the orthodontist needs to be aware of these implications in order to avoid misjudgements. Reliable information is more likely to be obtained by an operator who in a nondirective manner displays interest in and readiness for an intensive verbal interchange with his/her patient. Thus, the latter not only feels free to admit lack of compliance, but may be even more accessible to motivation.

III.2. Intervention Techniques

Behavior change results from the application of established educational and psychological principles. The first step is to establish that responsibility for the treatment plan, as mush as possible, rests with the teenager. Although this responsibility may be resisted at first, it is consistent with the emerging autonomy of adolescents and should help to remove compliance with the treatment as the focus of family tension. A direct role for family members in carring out the treatment sequence should be kept to minimum.

Intervention techniques have the greatest potential for full motivated, autonomous youth involved in a brief rather than a lengthy treatment plan. Intervention also works best for treatment of established conditions rather than prevention. In general, these techniques are most useful to initiate changes in discreet, specific compliance behaviors. They are less helpful in

fostering generalizations of those changes to other compliance behaviors and maintenance of those changes over time, but combined they can be successfull for long term treatments (Friedman, Litt 1987).

Combined programs succeed because they address motivational or predisposing factors (e.g., attitudes and knowledge), enabling factors (e.g., removing barriers and improving access to care) and reinforcing factors (e.g., social support) (Green 1979).

Education

By providing information, education aims at influencing attitudes and beliefs and, secondarily, altering behavior. Health education is a part of nearly every clinical encounter. However, all too often the patient leaves the physician's office not knowing exactly what is expected of him or her in the future (Glasgow et al., 1985). In theory, the more specific the expectation, the more likely it is to be carried out. Increasing patient knowledge is necessary, but not sufficient to promote compliance. This fact is illustrated by the mixed outcomes of educational programs detailed in the literature (Beck et al., 1980). Given these divergent results, health education has often been combined with other intervention strategies.

Education should be stressed for certain teenagers: Those starting brief therapies and those that are relatively new to their long-term treatments (e.g., orthodontics). Periodic reeducation is needed for those individuals whose therapy started in early childhood (Friedman, Litt 1987). Education, focusing on the specifics of the therapy, is relatively easy to examine. Improved knowledge can be easily measured by direct questioning. However, understanding, retention and compliance will vary widely,

depending on the methods used. Consider how an advertising writer would appeal to the teenage market and follow these guidelines in order to enhance effectiveness (Green 1979):

> "Brevity: Be selective. Limit the total length of the message.
>
> Organization: Summarize, outline, and categorize the information.
>
> Primacy: Important statements belong in the first one third of the message so they are most easily recalled.
>
> Readaptability: Remember the educational level of the audience.
>
> Repetition: Repeat the essentials, and ask the teenager to repeat them back.
>
> Specificity: Be specific with expectations rather than vague".

For the teenager, anxiety, wishful thinking and impulsive behavior may inhibit careful decision making. The "balance sheet procedure" is an educational technique that encourages consideration of potential risks and gains of many alternative actions (Janis, Robin 1979). Resistance to some of the negative peer influences that impede compliance may be taught by social learning techniques (Kaplan et al., 1985).

Tailoring the Treatment Plan

It is often possible to adjust the treatment to match the unique characteristics of each individual patient. Although clinicians often do this intuitively for patient convenience and as expression of care and concern, there have been few detailed descriptions of this method as used with adolescents (Friedman, Litt 1987). Success with this method depends upon the clinician's learning about the teenager's life and designing the plan

creatively. Simplification of the treatment plan is an important starting point. The teenager's preferences can be included, such as weighing the impact of different potential side effects (Friedman, Litt 1987).

Graduated Treatment Implementation

Complex therapies that require considerable behavioral change are more exacting. When medically safe, a gradual or stepwise implementation of the plan may enhance compliance. In this way, the patient may experience mastery and receive positive feedback at each step. This in turn may enhance motivation to cooperate further. Gradual implementation should be considered for use in conjuction with other methods (Friedman, Litt 1987).

Self-Monitoring

With self-monitoring the patient takes on the task of noting and documenting his or her own performances with the treatment plan. The method has been explored in several studies (Finney et al., 1985; Flanders, McNamara 1985).

There are several advantages to the use of the self-monitoring technique. The adolescent's responsibility for performing the treatment plan is reinforced (Remmell 1982). Immediate feedback is provided to the patient. Some individuals misperceive their own actions, reporting that they comply when they really do not. Some of these patients are likely to be helped by self-monitoring to become more accurate at self-assessment (Dunbar, Agras 1980). Monitoring also provides a reliable measurement of compliance in turn suggesting other methods that may be useful.

Self-motivated and autonomous adolescents should benefit most from monitoring. Motivation is needed in order to regularly complete a calendar. Daily activities must be fairly regular and predictable. Because they require extra effort on the part of the patient, self-monitoring devices should be designed to be easy to use and readily accessible. The device should provide immediate feedback. Success is greater when behavior is monitored rather than a more removed goal. It is also important to assess accuracy in recording in the begining rather than achievement of a specific behavioral goal (Dunbar et al.,1979; Dunbar, Agras 1980).

Reminders

A variety of displays and devices may prompt performance of elements of a treatment plan. Possible motivators include labels, stickers, calendars, postcards, and telephone calls. Reminders are most commonly employed to assist appointment keeping. To date, the potential for improving long-term treatment adherence with this technique is not known (Friedman, Litt 1987).

As cues, reminders are particularly useful when they are novel, as in short term treatment plans. Reminders are also effective for the busy, motivated but forgetful teenager. However, reminders are useless for teens who deny their problem and therefore try to forget the therapy. Reminders are most effective when self-administered. The teen can design and implement such a system upon the clinician's recommendation. The message is clear that responsibility for success rests with the teenager.

Increased Supervision

Greater involvement of other individuals in monitoring the treatment can be very helpful. Increasing involvement may consist of more frequent visits to the clinician or greater involvement of family members and friends. Increased supervision works for several reasons. First, supervision gives the teenager social reinforcement and encouragement from significant persons. Second, supervision, is also a cue for an action, similar to a reminder. Third, as an indicator of external reality it helps overcome misleading wishful thinking. Forth, as feedback of one's behavior that helps to facilitate self-regulation.

Increased supervision is perhaps the most effective intervention strategy to enhance adherence to long-term treatments. Self-motivation is not essential, although cooperation from the patient and family is necessary to implement the supervision. The technique concurs with the beliefs of teenagers with external locus of control, suggesting that they might be especially helped (Friedman, Litt 1987).

Given the usefulness of increased supervision, two cautions must be stated. First, supervision, whether by family member or a clinician, can become overly confrontive or intrusive. This is particularly true for teenagers who are struggling to establish independence. Sensitivity to these issues will help the supervisor to keep the appropriate distance. Second, the use of surreptitious monitoring is strongly condemned. Dishonesty by the clinician can destroy the teenager's trust and the entire potential for a useful alliance between them. Therefore, informed consent of the teenager should be obtained in advance (Friedman, Litt 1987).

Formalized Goal Setting

This is an agreement by the adolescent to attain reasonable goals of treatment adherence. The desired behaviors and expected performance levels are set and, perhaps, written and signed by the teenager. Feedback is provided by self-monitoring or other objective measures. This technique derives from the observation in social psychology that commitment to a goal can directly improve adherence to difficult decisions.

> "If a person is induced to announce his or her intention to an esteemed other, such as a clinician, the person is anchored to the decision not just by anticipated disapproval but also by anticipated self-disapproval".

In addition, expectations and values of the teenager can often be included when defining the objectives. This is particularly useful with teenagers struggling with autonomy issues. The clinician can also model flexibility by accepting less than perfect compliance (Friedman, Litt 1987).

Reinforcement

Any consequence that makes a behavior more (or less) likely to be repeated is reinforcement. Praise and rewards or, on the other hand, penalties and missed privileges, may reinforce compliance or noncompliance. Anticipation of positive or negative reinforcement is a reinforcer as well (Friedman, Litt 1987).

Adding an outside reward, whether praise or something more tangible, reinforces the behavior. Maintenance of behavior, rather than its initiation, is best achieved with reinforcement. A good example is the social support and modeling that occurs in groups. Often there may be coincident naturally occuring reinforcers (Finney, Christophersen 1984). Goals that can

be met as a consequence of cooperation should be identified and highlighted by the clinician. For example, one practical approach is to recruit the autonomous, compliant teenager to be a "peer counselor" to assist other less successful adolescents (Friedman, Litt 1987).

Although certain adolescents may be induced to cooperate in the way just described, for others fear-arousing warnings are counterproductive. Clinicians should have alternative, positive compliance-improving strategies available to use in such cases.

To ensure success, the reinforcement must be carefully tailored to the individual and the situation. Which behaviors are to be targeted? Which reinforcements will be most valued? By whom shall the reinforcement be administered - parents, peers or the teenager? The autonomous adolescent might be responsible for reinforcement, whereas parents might best be involved with early adolescent. How immediate must the reinforcement be? More immediate reinforcement is needed for complex or demanding tasks and for the less mature and less motivated teenager (Friedman, Litt 1987).

Contracting

Formalized goal setting is combined with either positive or negative reinforcement to create a contingent contract. Similar to goal setting, noncontingent contracts specify no particular reinforcement. There should be cautious to use this technique because "reactance" may occur if the teenager perceives a limitation of freedom of choice (Friedman, Litt 1987).

Individual Counselling

The clinician will occasionally encounter teenagers whose noncompliance is associated with isolation, lack of motivation, low self-

esteem and poor adjustment to their problem. Family strife and disruption further complicate the situation. Compliance may not be addressed at first. Rather, the task is to get conflicts out in the open and to build better coping skills. Initial goals should be limited. Structured interventions may be employed later to enhance cooperation with the treatment plan (Friedman, Litt 1987).

Ethical Considerations

Compliance-improving strategies are like any therapeutic intervention, requiring a careful weighing of their advantages and disadvantages. The patient should be willing partner in execution of any maneuver designed to alter compliance behavior. Because of lack of maturity, many adolescents are not capable of giving informed consent, even though it is their anticipation and cooperation that is sought. Consequently, informed consent is an ideal that is seldom attained. In the best interests of the adolescents, parents and, to some degree, clinicians, make decisions for them. For example, the clinician often defines which options are safe and which are not. At the same time, choices must be preserved for the teenager, such as the type of intervention and how compliance will be monitored (Friedman, Litt 1987).

III.3. Application of Intervening Techniques in Orthodontics

The successful orthodontic treatment depends on the skills of the orthodontist and his/her technique, as well as the appliances and equipment used. Success also depends on the motivation of the patient in oral hygiene, regularity and promptness in keeping appointments, persistency, amount and correctness of use of headgear and rubber bands and

accepting all orthodontic procedures and attendant demands on time (Gabriel 1968).

Oral Hygiene

The presence in the oral cavity of metal bands, brackets, arch wires, springs and other hardware contribute to environmental changes that can result in greater concentrations of acid-producing bacteria (Clark 1976). Acid-producing bacteria are the predominant cause of gingivitis, enamel decalcification and dental caries (McGlynn et al., 1987).

Gingivitis is so prevalent in orthodontic patients that it is viewed by many orthodontists as an inevitable by-product of their therapy (Hoover 1967). Orthodontic appliances, per se, do not usually cause inflammation unless they are mechanically damaging the gingiva or its attachment to the tooth. The appliances usually contribute to periodontal disease in that they collect microorganisms (Parker 1971).

If young people are first motivated, then given comprehensive home-care instruction, their chance of maintaining good oral hygiene throughout life is excellent (Keyes 1969). Since the orthodontist sees patients regularly over an extended period, he/she is in the unique position to initiate, and follow up this learning process (Clark 1976).

The use of regimens containing fluoride can prevent and reverse dramatically the process of decalcification. Fluoride reduces bacterial acid production, enhances mineralization and is sometimes incorporated into enamel (Myers1972; Bounoure, Vezin 1980; Gorelick et al.,1982; Clarkson, Wei 1982). Daily self-applications of products containing low concentrations of fluoride are the best means to prevent disease in a person with a mature

dentition (Silverstone 1979, 1982). Because more orthodontic patients have mature teeth, the orthodontist's goal is to promote daily use of tooth pastes and rinses containing fluoride.

Traditionally, dentists have attempted to promote their patients' home care activities with instruction and persuasion. The orthodox approaches succeeded in getting people to learn facts and concepts (Boffa; Kugler 1970; Moore 1976), but failed to affect the rates with which people perform home care behaviors (Craig, Montague 1976; Burt 1983). Traditionally, behavioral psychologists have attempted to increase rates of motor activities through the use of short-term rewards contingent upon targeted performances (Ayllon, Azrin 1968). Contingency management for oral hygiene performances has succeeded in influencing the rates with which such performances occur (Claerhout, Lutzker 1981; Iwata, Becksfort 1981).

One approach to programming home care contingencies that is potentially beneficial involves training people to reward themselves for completing targeted performances. "Behavioral self-management training" entails consistent activities for "self-monitoring", "goal-setting", "self-evaluation" and "self-reward" (Watson, Tharp 1972; Kanfer 1975; Stuart 1977). The activities of mouth rinsing and toothbrushing are cririca from the vantage point of the orthodontist. Behavioral self-management for orthodontic patients should entail consistent activities for self-monitoring of rinsing and brushing. Goals should be established for rinsing and brushing. Also, exact definitions of goal attainment for rinsing and brushing, and exact instructions for self-reward contingent upon achieving rinsing and/or brushing performance criteria are needed (McGlynn et al., 1987).

The structuring of the training program that aims to improve and maintain patient's good oral hygiene depends upon the orthodontist and his/her staff. Clark (1976) implemented a method in his office consisting of giving information through illustrations, use of a phase contrast microscope and demostration of hygiene during initial examination by a trained staff. In addition, Clark emphasized understanding of the responsibilities during the consultation. He suggested that the orthodontist, the child and the parents all must agree to discontinue the treatment if the proper level of health is not maintained. During treatment, hygiene care is reinforced. Lee (1981) gave a chart to patients for recording the number of times patients brushed each day (self-motivation). They based their study on the fact that self-recording some aspect of behavior can modify that behavior or increase an individual's awareness of certain behaviors. The authors found that the visual reinforcing value of a chart increased the frequency of brushing, but not necessarily the plaque and gingival scores. Graber (1971), after having instructed patients with a slide-tape show, gave explanations and demostrations utilizing the "chemical neutralizer technique". His method consisted of brushing the teeth of the patients with soap in front of the other patients in his office. He believed that the unpleasant taste, the peer pressure and the embarrassment are strong weapons against a repeat bad oral hygiene performance. The same approach is reported by Hickam (1977).

Patient Cooperation in Wearing Appliances

Patient cooperation during orthodontic treatment is an uncontrolled variable which may have a major influence upon the success of treatment.

The extend of wear of removable appliances and components such as extra oral traction, is critical for the achievement of the desired dentoskeletal relation. Behavioral methods seem to offer an easy and effective way to alter patient response (Gross et al., 1985). Clemmer and Hayes (1979) suggested that directing patients to focus on the severity of their malocclusion should increase cooperation in wearing headgear. The orthodontist might forcefully impress patients with the requirements for correcting their malocclusion. Gabriel (1968) felt that the instructions given for the use of headgear were adequate. He emphasized the need for orthodontist-patient communication aimed at increasing patient's feeling that orthodontist-patient cooperation does exist. He stressed the need of patient's information on his progress in treatment, of patient's preparation for anticipated embarrassment resulting from headgear, and finally the need of increased orthodontist's skills in recognizing patient's personal requirements, sensitivities, need of support, interest, reassurance and recognition for effort.

Headgear has been in use since the nineteenth century, and since their introduction there have been modifications to design and style. Graber and Swain (1975) felt that the magnitude of the applied headgear force was not critical, but the amount of wear was a major factor relating to clinical success. Graber and Swain (1975) and Root (1975) recommended that about fourteen hours every day were adequate. It is this reliance upon patient cooperation that is the major problem associated with success in headgear therapy. Younger children up to the age of 12 or 13 years do not yet possess a mature concept of duration and time (Piaget 1955; Fraisse

Rather than judging from the actual duration, they evaluate the quality of their wear from the frequency of inserting their appliance. Thus, it is inevitably difficult to assess accurately the extent of wear of removable appliances. Consequently, the use of a chart and the grading of success have been suggested by many investigators (Root 1975) in order to encourage greater patient cooperation. The incorporation of a timing device also appeared to allow extra monitoring of patient compliance (Northcutt 1974,1975,1976; Mitchell 1976). A different timing device was used in conjunction with a removable appliance (Savage 1982). Banks and Reed (1987) have tried to measure the cooperation of patients wearing headgear with a "timing headgear motivators system". That was an appliance which provided interesting feedback to the patient but did not give a consistently dependable recording of headgear usage.

On the other hand, Hickam (1977) reported that if a patient does not wear his rubber bands, he will tell the child not to come back to the office unless he has worn them for three weeks in a row. The patient is dismissed without an appointment if he hasn't called for six weeks. When the patient does not wear his headgear 14 hours a day (reported on the chart), the author ties in the appliance. Hickam (1977) stated that the patients don't have the maturity to decide whether they will cooperate or not. Tying the headgear in, relieves them of having to decide for themselves and as a result they are happier.

Ash and Arthur (1951) wrote that psychic and emotional factors can prolong the period of orthodontic treatment and are responsible for many non-productive hours of repairing appliances, recementing bands and

rescheduling broken appointments. The orientation of the professional worker, according to Hughes, Byron (1949), should be to provide security for the child, establish and maintain support in a friendly relationship, program for orthodontic education concurrently with orthodontic treatment, and help the child to introject the goals and purposes of what seem to him a vast array of oral indignities.

Finally, Owen (1988) believes that considerable change in patients' attitudes can be brought through awards and reinforcers, especially between the ages 7 and 11. The positive reinforcers should be given immediately or soon after the desired behavior (Dobson 1970; Kreit et al.,1981). White (1974) also recommended that positive reinforcers be desirable, durable, and current and that the requirements to receive awards must be realistic to be effective. He warned against setting standards too high. This system requires a highly trained staff, according to Owen (1983). The staff can motivate patients better than the doctor because of their innate ability to be more understanding and compassionate. The staff has a natural ability to communicate better, and the fact that they have a less authoritarian image than the doctor makes them less intimidating.

Keeping Appointments

Even though broken appointments have an important effect on the economics and efficiency of the orthodontic practice, very few studies have been published on why patients miss or cancel appointments (Trenouth, Hough 1991). Anxiety and psychological factors have been found to be related to appointment failures (Alpert 1964). Another study found a significant relationship between the number of broken appointments and the

total number of scheduled appointments (Hurtado et al.,1973). This could account for the relatively high failure rate among orthodontic patients.

Graber (1971) informed his patients at the beginning, in a pleasant manner that in his office the appointments are scheduled only during school time. In that way, he was motivating them and was not keeping patients in the waiting area for long period of time. Gross et al. (1988) described successful results in improving patient compliance with appointment keeping by entering the patients who kept their appointments and appeared on time, in a lottery system with awards.

In a very recent study, Trenouth and Hough (1991) investigated the ways in which orthodontic patients remembered their appointments and their reasons for missing or cancelling appointments. The results showed that forgetfulness was the most common reason for missing appointment. Illness was the most common reason for cancelling an appointment.. The second most common reason for both was the inability to get time off, or to find transportation. Other studies reported similar findings (Hansen 1953; Alpert 1964). It appears that modifying patients' behavior to encourage the use of a diary or appointment book is the orthodontist's best hope for reducing broken and cancelled appointments (Trenouth, Hough 1991). Telephone reminders prior to appointments had no effect on the failure rate, according to another study (Kidd, Euphrat 1971).

Another relatively recent article examined high-tech appliances and materials that are in use today and permit the patients to be seen at longer appointment intervals (six to eight weeks compared to three to eight weeks). So it is possible to increase the length of appointment intervals without

lengthening the overall treatment time (Alger 1988). Hopefully, that's another way to reduce failure of appointment keeping

III.4. Videotape and Behavior Modeling

According to Weinstein (1982), audiovisual materials are helpful in providing information but are not substitute for the practitioner's personal interest and concern for the patient. Since many non-verbal cues can be observed only on a videotape or film, many behavioral experts feel that effective interpersonal training requires the use of visual aids (Schoonover, Bassul et al., 1983). It has been shown that television has a major impact on children's knowledge, attitudes and behavior (Zuckerman 1985). Many Americans have been exposed to increasing audiovisual communication. They may absorb health care and scientific information more readily and comprehend it more completely if it is infused via audiovisual route (Paegle 1978). Although the effect of a motivation videotape in an orthodontic office has not been tested, it has been mentioned by Graber (1980).

In dentistry, the use of audiotaped material has been mentioned as effective by pedodontists and dentists in reducing fears (Smith et al.,1990). The contingent use of videotaped cartoons resulted in statistically and clinically significant reductions of uncooperative child behavior during dental treatment (Ingersoll et al., 1984).

Gatchel (1986) reported that even a brief exposure to a videotaped fear reduction program illustrating behavior modification techniques had a significant impact on stimulating moderately fearful people who avoid dental treatment to seek treatment. Ingersoll wrote that several studies of filmed behavior modeling, have shown that this method can produce considerable

improvement in attitude and behavior of young unexperienced dental patients. Filmed modeling can be as effective as the use of live models (Ingersoll 1982). Holtz (1988) has proposed a very interesting systemized behavior shaping method for acceptance of dental treatment in children. His training program includes a video film, a manual and a case form. The manual and the video developed a two way communication (message and return message), considered empathy and focused on achieving good rapport. He describes the behavior modification method called "tell-show-do". He found statistically significant increases in positive acceptance of dental treatment in children.

III.5 The Clinician's Response

Treating the nonadherent adolescent patient is a challenging task, often eliciting unsympathetic personal attitudes and feelings. These responses may compromise the clinician's ability to maintain a warm, accepting and authoritative tone. It is not surprising that noncompliant patients are seen with antipathy (Friedman, Litt 1987).

Noncompliance challenges the clinician's desire to produce changes. The outcome of the treatment may depend upon the clinician's response to the noncompliance.

Patients usually react to the clinician as they do toward their parents. Hostility and rejection by the clinician is neither helpful nor appropriate. Kaplan (1958) said that the orthodontist does not only straighten teeth but also helps in straightening out disturbed personalities. Most of the patients have pretreatment anxieties, including uncertainty about the treatment itself and the final outcome (Mindak 1987).

It often seems that orthodontists are more concerned about impressing patients and parents with their training and knowledge than they are about achieving real communication and cooperation. Dischinger (1991) uses a saying in his article for management and marketing:" patients want to know how much you care before they care how much you know".

Graber (1971) gives the description of the orthodontist's personality, characterizing him/her as respectful, enthusiastic, warm, informative, honest, sincere, kind, firm, prompt and perceptive of patients' attitude Graber also stated that the orthodontist should know about child psychology and be trained in communication skills in order to help reduce noncompliance in the orthodontic treatment.

III.6. Office-Staff: Utilization and Involvement

Graber (1971) said that the orthodontist's personality, the psycho-social behavior of the patient as well as the impact of the office staff and office environment are all ingredients of equal importance in terms of patient motivation.

Most orthodontists today relay heavily on their staff members (Mayerson 1990). Orthodontists have traditionally delegated reversible clinical tasks to properly trained personnel under their direct supervision as a logical extension of the doctor's capability. As a result, many duties previously performed only by the doctor are now being delegated to auxilliary personnel. Recently, there has been increased interest in delegating patient education and office communication. Another duty of the members of the staff is to discuss and define the role and responsibilities of each party during the consultation visit. The patient and the parent have the

right to know what is expected of them by the doctor regarding their cooperation and participation before making a final commitment to the orthodontic therapy. Inability of parents to fully understand and support orthodontic therapy can lead to dismal failures and a great deal of unhappiness (Kulis 1983). Mindak (1987) also emphasized the importance of a trained staff personnel. He believes that staff members are skilled in listening and can sense and help resolve patients' pretreatment anxieties. These people become the personification of the caring atmosphere that the orthodontists want to communicate.

When the staff is involved in the decision-making process, there is a higher level of interest, enthusiasm and commitment to achieve the goals for improving the practice. As the doctor makes organizational decisions throughout the day about patient treatment and practice control, the staff also makes organizational decisions throughout the day about the level of patient cooperation in oral hygiene, headgear wear, etc. (Bellavia 1985).

As Mayerson stated once more (1990), very recently, a carefully selected and well trained personnel can not be but extremely beneficial for any orthodontic practice.

STATEMENT OF THESIS

This study will examine the effectiveness of videotape instruction in motivating orthodontic patients. Patient compliance will be assessed using a ten part questionnaire. The null hypothesis can be stated: Videotape motivation does not improve the compliance of orthodontic patients.

METHODS AND MATERIALS

The counselling strategy tested used a videotape along with an orthodontic kit. The kit contained a manual, including handouts and charts, designed to be used as monitoring aids and reminders for the patients and their parents. The strategy was simple and designed to be easily incorporated into any busy orthodontic practice.

I. Experimental Design

I.1. Subjects

The study sample consisted of 34 subjects, 11 to 17 years of age, who were regular patients in a private orthodontic office in Cleveland, Ohio. The subjects had no previous orthodontic treatment and their treatment plan included full banded orthodontic therapy. No attempt was made to screen subjects on the basis of their possible cooperation. The subjects had a variety of personality characteristics and a wide range in the severity of the malocclusion. The control group consisted of 17 teenagers who were also patients in the same private orthodontic practice. The control group was exposed to the regular orthodontic instructions that the specific office offers to all the patients. The experimental group consisted of 17 patients at the same office who were exposed to not only the regular orthodontic instructions of the office but also to the videotape and the orthodontic kit. Subjects were evaluated successively at six weeks, three months and six

months after the placement of their appliances. The outcome data was collected at the the six month evaluation for each group.

I.2. Materials

A "Do-It Yourself Home Videoguide for Teenagers

Videotape modeling is a method of learning or modifying behaviors by the observation of others. Because of the proven effectiveness of this technique, a customized videotape (created by Dr. Sophie Rozensweig) was shown to the patient and his/her family at the consultation appointment.

The videotape included several characteristics known to be important for increased learning:

1. Model-observer similarities (age, appearance, etc....). Simulations of multiple models provide a variety of alternative behaviors from which the learner can choose. Struggling models seem to be more effective than ideal models because they encourage the observer to react.

2. The illustration of key skills within a framework of a "lifelike story" or familiar situations contribute to skill acquisition. The presentation should be slightly redundant and engage the imagination of the observer.

3. The pace of instruction is critical. It must be fast enough to maintain interest, but slow and repetitive enough to allow the patient to consider new ways of behaving. The videotape should last less than fifteen minutes.

4. The videotape should end on positive thoughts and conclude with a synthesis of the main ideas.

The possible anxiety of the new patient is a barrier to communication. This anxiety involves apprehension about orthodontic treatment often due to negative distortions, uncertainty and concern about the practitioner's judgement. The goal of the video was to diminish patient anxiety, to involve him with multiple models, and to engage him/her in the "braces situation".

The aim was to emphasize the importance of wearing appliances as prescribed, maintaining good oral hygiene, keeping appointments, taking care of braces and, mainly, to make the patient feel responsible for the treatment.

Rather than showing an orthodontist giving advice to patients, the scenario portays teenagers with braces making a humorous and serious videotape for their peers about orthodontics. These teenagers are motivated patients. They answer "all the most popular questions about braces", such as: "Why do I need braces?", "How do braces work?", "Why does my mouth feel sore after the appointment?", "Why does the headgear make me look like I have a basketball hoop on my face?", "Why do I have to wear rubber bands?" and finally "How is life with braces?". They also share some secrets that they learned along the way. Topics such as how to make the appliance time breeze right by, what happens when a bracket comes off, how to brush with braces, how to avoid getting bad breath, how a tooth moves, and what eating habits need to be modified.

Concepts are highlighted with animation sequences. That was done within a framework of familiar or funny situations. The purpose of the tape was to motivate the patient and to present the orthodontist as a friendly partner. The videotape lasts eleven minutes and thirty five seconds and ends with the idea that it is up to the patient to be happy during the orthodontic treatment and obtain a nice smile.

The videotape was produced by the "Educational Media Department Baker Building, Room 6, Case Western Reserve University, Cleveland, Ohio, 44106". It was directed by Ms. Gay Henderson and was part of Dr. Sophie

Rozensweig's Master's Thesis at CWRU School of Dentistry, Department of Orthodontics in 1990.

The Manual

The manual is a general approach to facilitate treatment adherence in teenagers. It emphasizes the importance of believing in and being enthusiastic about motivation. The principle is to establish a partnership between the orthodontic team and the patients. It is composed of four parts. Understanding the first two is essential for the successful implementation of the counseling strategy described in the third session. The first two sessions also prepare the staff to tailor communication styles to different types of patients which is covered in the fourth part.

"How to Create a Winning Team"

This section emphasizes the importance of the right practice atmosphere which depends not only on the orthodontist/patient relations but also on the staff/patient relations. Success can be achieved only by a winning team; a team that has confidence in itself and its ability to work together. Three aspects of an office policy are considered key factors for building successful team member/patient relations. The enthusiasm, efficiency and patient orientation of the team. Being an enthusiastic team will foster each member's pride in contributing to the success of the practice. Efficiency, on the other hand, is a necessary ingredient for success. It depends on the team members' ability to communicate and on their understanding of their roles in the office. At the bottom line of this chapter the author states that in order to be able to provide a service of excellence, you need to be aware of patients' expectations. It is important to

individualize a policy which will specifically outline how patients are to be treated in the orthodontic practice. It helps team members to pay proper attention to a patients' individual needs and also allow the patients to value what the practice has to offer to them.

"How to Become an Effective Communicator"

This section defines the basic aspects of interpersonal skills and describes the techniques of persuasion. Interpersonal relationships may be the single most important factor in a patient's commitment. Three qualities can help a member of the team to become an effective communicator: warmth, empathy and respect. Conveying warmth shows an interest in and a concern for the patient. It can be achieved by verbal and by non-verbal skills. Empathy is usually considered the most important characteristic of effective communication. Empathy is defined as the identification with and understanding of another's situation, feelings and motives. In order to demostrate empathy, it is important to know how to question and how to listen to the patient. Additionally, respect is reflected through our attitude, what we say and do not say, the environment we create. By conveying respect for the patients we help them value and believe in themselves more. They will continue to gain confidence in their ability to follow instructions so they will be more prone to incorporate them into their daily schedule.

Apart from interpersonal skills this section examines a few more techniques of persuasion, such as the correct way of presenting the information to the patient so he/she can understand, remember and act accordingly. A simple way to achieve that would be to give a message that is brief, clear, precise and organized.

"How to Implement the Counseling Strategy"

The aim of this strategy is to emphasize the subject's responsibility for the treatment progress, and his/her active participation in the clinical decision making progress. The strategy also creates a positive climate to open the patient to new ideas. This strategy is a step by step approach for the patient and is composed of three stages. These stages constitute normal steps in orthodontic treatment. They are:

i) The exploration phase: It includes first clinical examination and diagnostic records. The patient interview will help determine patient needs and expectations. It will also provide invaluable clues as to the best ways to interact with a certain patient to ensure a successful relationship. Also, the pretreatment meeting with the patient is an ideal opportunity to begin to make the patient aware that he/she is responsible for the majority of his/her own treatment.

ii) The understanding phase: The consultation in this phase includes the conference, the presentation of the videotape and the behavioral contracting between the patient and the orthodontist. Also at that stage some guidelines are given to the parents concerning their non-dominating role in the orthodontic treatment of their own child..

iii) The action phase: This chapter includes the active orthodontic treatment period and outlines the roles and functions of the hygienist and the chairside assistant within the orthodontic team. Because the patient is asked to be an effective self-manager, continued commitment and evaluation are needed from the orthodontic team.

"How to Meet the Challenge"

The objective of this chapter is to describe how you can alter your communication style to better meet different patients' needs. Not all patients are created equal. Some patients may be good partners at the beginning of the treatment but may not be consistent later. The major concerns when providing orthodontic treatment are negative reactions such as resistance, inconsistency, defiance, etc. Dealing with different patient responses to orthodontic treatment represents a special challenge for the orthodontic team. The orthodontist needs to identify who he/she is dealing with and how to best adapt to to the certain situation.

I.3. Procedures

The Control Group

The procedures used in communicating and working with each patient were:

a) Initial interview of the patient and their families, clinical examination, medical history and orthodontic records.

b) Diagnosis and plan of treatment described to patient and parents. During the consultation phase, the orthodontist described the orthodontic problems, reassured the patient about his/her future smile, reported all orthodontic treatment inconveniences including the anticipation of forgetfulness and ended the conversation with a closing summary.

c) banding and bonding of teeth and beginning of orthodontic treatment.

The Experimental Group

The exploration phase

This phase was almost identical with the first phase of the control group. The subject was intervewed by the treatment coordinator in order for

the prospects of good cooperation on behalf of the patient to be explored. Clinical examination, medical history and orthodontic records were also taken at the same appointment. Additionally, an orthodontic kit (Appendix II) with instructions was given to each patient. The orthodontic kit contained a "flow chart" that demostrated the different steps in the treatment plan, the amount of time expected for each phase and the occlusal results to be achieved. On this flow chart, the space for the treatment steps was left blank so the practitioner could individualize his/her own treatment plan. The purpose of presenting the treatment plan in writting was to benefit both the patient and the practitioner. The subject will be able to monitor his/her own progress, thus increasing his/her level of motivation, while on the other hand, the orthodontist will more easily evaluate the level of cooperation and plan for changes if necessary. Along with that, the "problem-solving road" was divided into the same number of intervals, each portion of which represented the length of one treatment phase. This handout shows the patient how to anticipate high risk situations. It involves him/her in finding solutions, and as a result, enhances motivation and self-esteem. It allows team members to reinforce communication with the patient. Additionally, the "taking control" hand-out was given to the patient. This hand-out introduces the subject to the new orthodontic situation and his/her new duties and responsibilities. Finally, a "personalized behavioral contract" was prepared. This contract enhanced treatment adherence by building a mutual agreement stressing the equality between the orthodontist's and patient's responsibilities for the outcome of the treatment.

The understanding phase

The conference: This meeting consisted of the following:

a) description of the orthodontic problems

b)provision of reassurance concerning the future of the patient's smile

c)explanation about the use of the flow chart; treatment monitoring by the patient

d) report of orthodontic treatment inconveniences

e)explanation about the use of the problem-solving road

f) anticipation of forgetfulness

g) closing summary.

The presentation of the videotape: The subject viewed a videotape of other teenagers' experiences in orthodontic treatment. After the presentation questions were asked by the treatment coordinator in order to ensure understanding and reinforce correct responses. Since parental support has an influence on the outcome of the orthodontic treatment, an extra hand-out was given to the parents which stressed their positive role in their child's therapy. The hand out is called "Child's treatment success and parental support" and was given to the parents of the subjects with an invitation to openly discuss any questions that they might have after reading the handout.

The action phase

On the day appliances were placed, a handout entitled "How to brush with braces/How to take care of your braces" was given to the subject. Instructions concerning tooth brushing, and new eating habits, were also

given verbally by the treatment coordinator. At each appointment the treatment coordinator would get subject feedback by reviewing the flow chart. The flow-chart was brought to each appointment by the patient.

I.4. Measures: Orthodontic Patient Cooperation Scale

The OPCS (Appendix II) is a list of 10 patient/family behaviors frequently considered in evaluating a patient's cooperation. It has been shown to possess good internal consistency and validity (Slatker, Albino, Fox, et al., 1980). The OPCS was modified slightly to clarify most of the criteria, so that each parameter could be rated as objectively as possible.

For each item, the youngster's evaluator was presented with either numerical ratings (0, 1, 2, 3, or 4: 0 being the most negative and 4 the most positive), or five descriptive statements corresponding to the same scale. To avoid any statistical bias, the evaluation of subjects was conducted by an assistant blinded to the subjects study status. The evaluating assistant had not participated in the consultation phase when each patient was exposed to either the office's standard orthodontic instructions or the new counselling strategy.

The following parameters of the OPCS were used to evaluate subjects' adherence. The criteria for each measure are given.

<u>Keeping Appointments</u>

A criterion-referenced scale was used to determine this measure.

0: Missed appointment. The patient either does not show up or cancels the same day,

1: Cancelled appointment. The patient calls 24 to 48 hours before the appointment. If the patient cancels more than 48 hours before, a new appointment is given, and the cancellation is not taken into

account,

2: Late with no excuse,

3: Late with excuse. The patient excuses himself as he enters the clinic,

4: On time.

Dietary Restriction

Cooperation with dietary restrictions was determined by monitoring appliance breakage. Two criteria were used. First, bands and/or brackets were broken and second, whether or not the patient called to schedule an appointment to correct the problem. The following criterion-referenced scale was used:

0: Bands and brackets loose/no call,

1: Brackets loose/no call,

2: Bands and brackets loose/call,

3: Bracket loose/call,

4: Everything was alright.

Compliance with Appliance Wear

Headgear wear and elastic wear were differentiated because it was estimated that a patient could demonstrate a different level of cooperation for each one of them. The same criterion-referenced scale was used to determine these two measurements. It was based on both objective criteria (physical signs proving the use of the auxillary) and subjective criteria (patient and family reports).

0: No wear/will not admit,

1: No wear/will admit,

2: Very minimal wear, but not as much as requested,

3: Significant wear, but not as much as prescribed,

4: Perfect wear.

The criteria to evaluate compliance with headgear were:

(i) information from the patient,

(ii) information from the parents,

(iii) tooth mobility,

(iv) tooth movement,

(v) wear and tear on the headgear pads or straps,

(vi) ease with which the patient could place and remove the facebow or J hook headgear.

The criteria for evaluating rubber bands wear were:

(i) information from the patient,

(ii) information from the parents,

(iii) interarch discrepancy correction,

(iv) number of rubber bands left in the package,

(v) ease with which the patient could insert and remove the rubber bands.

Oral Hygiene

Children were rated on the level of success they displayed concerning their oral hygiene programs by means of a criterion-referenced performance scale.

0: Plaque and tartar-inflamed and swollen gums,

1: Plaque-inflamed and swollen marginal gingiva,

2: Minimal amount of plaque and swollen papillae,

3: No brushing before the appointment (e.g. food debri on braces,

4: Good oral hygiene (e.g. no food debri, healthy tissues).

Parent's Attitude toward Orthodontics

The parents of the patient are observed to be interested and involved in treatment. The criterion was rated with the same numerical scale:0-4.

Patient's General Behavior

Patient general behavior was assessed with questions 7, 8, 9 and 10. Questions 7 and 8 were rated using a numerical scale from 0 to 4:

7. The patient acts enthusiastic and interested in treatment

8. The patient's behavior is cooperative and easy going.

Questions 9 and 10 were rated with simple statements corresponding to the same scale (always=0, frequently=1, sometimes=2, rarely=3, never=4):

9: The patient complains about treatment procedures,

10: The patient complains about having to wear braces.

A general rating of each youngster's level of overall adherence to treatment recommendations was obtained by summing and averaging these scores. The possible scores could range between zero and forty. If a patient failed to show up for any of the scheduled appointments his/her evaluation was conducted on the rescheduled appointment day.

I.5. Analysis of Data

For the analysis of the collected data, non-parametric statistics were used to test the differences between the video and non-video group at each time period. Nonparametric-statistics allow for the testing of hypotheses that are not statements about population parameter values. They are easy and widely used. They may be applied when the data being analyzed consists

merely of rankings or classifications. That is, when the data is not based on a measurement scale strong enough to allow the arithmetic operations necessary for carrying out parametric procedures. One of the weak measurement scales is the ordinal scale. Whenever observations are not only different from category to category, but can be ranked according to some criterion, they are said to be measured on an ordinal scale. The function of numbers assigned to ordinal data is to order (or rank) the observations from lowest to highest and, hence, the term ordinal (W. W. Daniel, 1987).

The scale that used in the present study was an ordinal scale, ranking from 0 to 4 (0: being the most negative and 4: being the most positive in terms of patient cooperation). The nonparametric test that will be used was called Kruskal-Wallis one way analysis of variance by ranks. The utilization of the ranks permitted us to incorporate more of the information about order into our tests than it is possible by using the Kruskal-Wallis test alone.

The null hypothesis (Ho) was that the two groups were identical in terms of patient cooperation. The alternative hypothesis (H1) was that one group tended to exhibit larger numbers than the other. The null hypothesis will be rejected at the 0.05 level of significance ($p<.05$). Chi-square statistics were also used to calculate the level of significance between the two groups. Any significantly large observed value of chi-square should make us suspect that the null hypothesis is not true. The Patient's Cooperation Scale (PCS1 to PCS10) scores for the video and non-video groups for the total evaluation period will be used to estimate compliance differences between groups.

Also, in order to report on the internal consistency and stability of the modified version of the Orthodontic Patient Cooperation Scale (OPCS) used in our study, we chose to apply a reliability test called Cronbach's Alpha. Alpha is based on the "internal consistency" of a test. That is, it is based on the average correlation of items within a test, if the items are standarized to a standard deviation of one. We assume that the items on a scale are positively correlated with each other because they are measuring, to a certain extend, a common entity. The average correlation of an item with all other items in the scale tells us about the extend of the common entity. If items are not positive correlated with each other, we have no reason to believe that they are correlated with other possible items we may have selected. In this case, we do not expect to see a positive relationship between this test and other similar tests.

RESULTS

I. Evaluation of the Sample

The sample in the present study consisted of 34 subjects, 17 in the control (non-video) group and 17 in the experimental (video) group. Both groups were randomly selected from patients in a private orthodontic practice located in Cleveland, Ohio (Dr. Terrence Wenger's office).

Demographic information

The demographic information collected for both groups included age, gender and parent occupational status.

As seen in Table 1 the video group consisted of 15 females and 2 males (88.2% and 11.8% respectively) with a range of age between 8 and 18 years (mean 11.882, SD 2.315), while the non video group consisted of 10 females and 7 males (58.8% and 41.2% respectively) with a range of age between 9 and 15 years (mean 12.235, SD 1.602).

Because of a wide variety of parent occupations presented in the study, an effort was attempted to classify the occupations into three classes - upper, middle, lower class - according to the subjective opinion of a randomly selected group (n=18) of students, residents, secretaries and assistants at Case Western Reserve University. The results were compiled from the judges scoring and a mean value was calculated for each occupation. The classification into three groups was done using only the

fathers' occupations due to the lack of information relating to the mothers' occupations. As shown in Table 1, among the video group 18.8% belonged to the upper class, and 81.3% to the middle class, while in the non video group 35.3% belonged to the upper class and 64.7% to the middle class. There was no representation of the lower class in either one of the groups.

II. Evaluation of Collected Data

Patient parameters (PCS1, PCS2, PCS5 to PCS10) in the present study were evaluated at three different times: 6 weeks, 3 months and 6 months after the beginning of treatment. Most patients did not have to wear headgear at least for the first three months of their orthodontic treatment while none of the patients had to wear rubber bands during the first six months of treatment. As a result, the ratings of the parameters 3 and 4 (PCS3, PCS4) which evaluated headgear and rubber bands wear were not included in the statistical evaluation.

III. Analysis of Collected Data

Frequency Measures

Each one of the eight different parameters (PCS1, PCS2, PCS5 to 10) were evaluated at three time periods (Time I: 6 weeks, Time II: 3 months and Time III: 6 months after the beginning of the orthodontic treatment). The scale utilized for each parameter was between 0 and 4 (0: being the most negative and 4: being the most positive in terms of patient compliance). The results of the frequency analysis for both groups are listed in tables 2-4 at each time of evaluation.

For the video group, the variable related to appointment keeping (**PCS1**) was found to have the highest compliance throughout the three

time periods (100%). For the non-video group, patient compliance was slightly lower at time II and time III because of a few missed appointments (11.8% at time II and 5.9% at time III).

The second variable (**PCS2**) concerned compliance with broken appliances. The video group had neither distorted nor loose appliances at time I, a few incidents of broken brackets and bands at time II (35.3%) and fewer incidents of distorted appliances at time III (11.8% and 5.9%). The non-video group showed minimum percentage of broken brackets at time I (5.9%), a lower percentage of broken bonds and bands than the video group at time II (11.8%). The response at time III, was variable and included a lower percentage of broken appliances and a higher percentage of cases with no broken bands or bonds (64.7%) compared to the video group.

The variable **PCS5** was associated with the patients' oral hygiene. At time I, the video group exhibited a 58.8% compliance in keeping appliances clean and gums healthy, while the percentage decreased (47.1%) for the same group at time II. Time III showed the highest compliance (64.7%) for this variable. The same pattern was evident for the non-video group. They showed a fair amount of hygiene compliance at time I (52.9%), a lower percentage at time II (35.3%) and the highest percentage at time III (58.8%).

PCS6 was related to parental interest in the orthodontic treatment of their children . For the video group, the grading did not vary much between time periods, with higher percentage (41.2%) of parents grading 3 on the PCS scale. For the non-video group, the results of the grading were similar

to those of the video group. A difference at time III was noted because the percentage of parents receiving a 4 was higher (35.3%).

The variables **PCS7** and **PCS8** were associated with patients' behavior. PCS7 graded the subject according to his/her enthusiasm and interest in treatment, and PCS8 rated the subject's attitude, i.e. if the subject was cooperative and easy going. For the video group, subject interest received a grade of 3 at the first two times of evaluation (47.1% at time I and 35.3% at time II), while at time III, 47.1% of the subjects received a grade of 2. Subject's personality was graded mostly with a 3 throughout the three times of evaluation for the video group (52.9% at time I, 58.8% at time II and 47.1% at time III). For the non-video group, the results were very similar to the video group for both variables. Subject's enthusiasm and interest toward treatment, as well as subject's cooperation and character were graded with 3 for most of the patients at all three times (47.1% at times I and II and 41.2% at time III for PCS7 - 47.1% at time I, 64.7% at time II and 35.3% at time III for PCS8).

The variables **PCS9** and **PCS10** were related to the subject's satisfaction throughout treatment. PCS9 answers the question "how often does the subject complain about treatment" and PCS10 examines the frequency with which the subject complains about having to wear braces. For the video group, most of the subjects at all three times were graded with 3 for both variables (47.1% at time I, 58.8% and 52.9% at time II and 82.4% at time III). Also, for the same group, there was a difference between the percentages of the subjects receiving a grade of 4 among times I , II and III. Forty-seven percent of the patients received a grade at time I and 41.2% at

time II, a reduced percentage of 17.6% was evident at time III, representing the subjects that expressed no complaints about braces and orthodontic procedures during treatment. For the non-video group, at time I, there was a high percentage of subjects (76.5% and 82.4%) that were not complaining about the treatment. At time II the percentage of patients with no complaints was reduced (47.1% and 47.1% respectively). At time III ,however, the percentages increased slightly (52.9% for both PCS9 and 10) and were much higher than those reported for the video group at the same time (17.6%).

Kruskal-Wallis one-way analysis of variance by ranks

Non-parametric statistics were used to test the differences between the video and non video groups for the eight variables and the total scores at each time. Since an ordinal scale was used in the present study (0-4), the Kruskal-Wallis one-way analysis of variance by ranks was used to analyze the data. The results are given in Tables 5-7. The null hypothesis was rejected at the 0.05 level of significance ($p<0.05$). A 0.1 level of confidence was used to denote marginal significance. Chi-square statistics were used to calculate the level of significance between the two groups. Any significantly large observed value of Chi-square should make us suspect that the null hypothesis is not true.

According to the last statement, and also taking into consideration that the higher the mean rank found in Tables (6-8) the better the level of compliance, we can conclude that at time I (6 weeks after the beginning of treatment) there was a significant difference ($p=0.0302$) between the two groups in the amount of complaints about wearing braces received

(PCS10). The video group (with the lower rank) seemed to have more complaints than the non-video group. Variable PCS9 which was related to patients' complaints about treatment procedures was almost statistically significant (p=0.0711). Again the video group reported more complaints than the non-video group.

At time II, a marginal significance (p=0.0742) was noted with the patients' appointment keeping. The video group seemed to have better compliance than the non-video group. The reason for the results were two missed and one cancelled appointments for the non-video group.

Finally, at time III, six months after the beginning of treatment, a marginal significance (p=0.0743) was noted with the variable PCS9.

The same test (Kruskal-Wallis one way ANOVA by ranks) was calculated for the total scores for both groups at the three different time periods. The results are given in table 8 and show no significant difference between the groups at any given time.

With regard to time trends, the video group had the best compliance at time II, while the non-video group had the worst compliance at time II. At time III, the compliance seemed to be similar to time I for both the groups. Thus, the only difference in compliance was noted at time II, which seemed to level off at time III. Therefore, the video may have an impact, but only for a short time.

Internal Consistency of the Orthodontic Patient Cooperation Scale

The internal consistency of the scale used in our study, as shown in table 9, was estimated by coefficient alpha to be 0.6938 and with a resultant

inter-item correlation of 0.2490, at time I (6 weeks after the beginning of treatment).

At time II, 3 months after the beginning of the orthodontic treatment, the internal consistency was estimated by coefficient alpha to be 0.7984 and a resultant inter-item correlation of 0.4377.

Finally, 6 months after the beginning of treatment (time III), the internal consistency of the OPCS was found by coefficient alpha to be 0.8473, with a resultant average inter-item correlation of 0.4670.

Table 1.--Demographic information for the video and non-video groups

VARIABLES	VIDEO*	NON-VIDEO**
AGE mean (SD)	11.882 (2.315)	12.235 (1.602)
GENDER (%) females males	 88.2 11.8	 58.8 41.2
PARENT OCCUPATION (%) I (upper class) II (middle class) III (lower class)	 18.8 81.3 0	 35.3 64.7 0

* **video: n=17**
** **non-video: n=17**

Table 2.–Frequencies (f) and Percentages (%) between the different parameters of Patient Cooperation Scale (PCS) for video and non-video group at Time I

		VIDEO*		NON-VIDEO**	
PARAMETERS	scale	f	%	f	%
PCS1	0				
	1				
	2				
	3				
	4	17	100.0	17	100.0
PCS2	0				
	1			1	5.9
	2				
	3			1	5.9
	4	17	100.0	15	88.2
PCS5	0				
	1			1	5.9
	2	4	23.5	6	35.3
	3	3	17.6	1	5.9
	4	10	58.8	9	52.9
PCS6	0				
	1	1	5.9		
	2	4	23.5	1	5.9
	3	7	41.2	11	64.7
	4	5	29.4	5	29.4
PCS7	0				
	1	1	5.9	1	5.9
	2	3	17.6	4	23.5
	3	8	47.1	8	47.1
	4	5	29.4	4	23.5
PCS8	0				
	1			1	5.9
	2	1	5.9		
	3	9	52.9	8	47.1
	4	7	41.2	8	47.1
PCS9	0				
	1				
	2	1	5.9		
	3	8	47.1	4	23.5
	4	8	47.1	13	76.5
PCS10	0				
	1				
	2	1	5.9		
	3	8	47.1	3	17.6
	4	8	47.1	14	82.4

* video: n=17
** non-video: n=17

Table 3.--Frequencies (f) and percentages (%) between the different parameters of Patient Cooperation Scale (PCS) for video and non-video group at Time II

		VIDEO*		NON-VIDEO**	
PARAMETERS	**scale**	**f**	**%**	**f**	**%**
PCS1	0			2	11.8
	1			1	5.9
	2				
	3				
	4	17	100.0	14	82.4
PCS2	0				
	1	6	35.3	2	11.8
	2				
	3			2	11.8
	4	11	64.7	13	76.5
PCS5	0				
	1	1	5.9	3	17.6
	2	3	17.6	6	35.3
	3	5	29.4	2	11.8
	4	8	47.1	6	35.3
PCS6	0				
	1				
	2	7	41.2	6	35.3
	3	7	41.2	10	58.8
	4	3	17.6	1	5.9
PCS7	0				
	1				
	2	6	35.3	8	47.1
	3	6	35.3	8	47.1
	4	5	29.4	1	5.9
PCS8	0				
	1			1	5.9
	2	3	17.6	2	11.8
	3	10	58.8	11	64.7
	4	4	23.5	3	17.6
PCS9	0				
	1				
	2			2	11.8
	3	10	58.8	7	41.2
	4	7	41.2	8	47.1
PCS10	0				
	1				
	2			1	5.9
	3	9	52.9	8	47.1
	4	8	47.1	8	47.1

* video: n=17
** non-video: n=17

Table 4--Frequencies (f) and Percentages (%) between the different parameters of Patient Cooperation Scale (PCS) for video and non-video groups at Time III

		VIDEO*		NON-VIDEO**	
PARAMETERS	**scale**	**f**	**%**	**f**	**%**
PCS1	0			1	5.9
	1				
	2				
	3				
	4	17	100.0	16	94.1
PCS2	0			1	5.9
	1	2	11.8	1	5.9
	2	1	5.9	1	5.9
	3			3	17.6
	4	14	82.4	11	64.7
PCS5	0				
	1	1	5.9	2	11.8
	2	4	23.5	3	17.6
	3	1	5.9	2	11.8
	4	11	64.7	10	58.8
PCS6	0				
	1				
	2	7	35.3	5	29.4
	3	6	41.2	6	35.3
	4	4	23.5	6	35.3
PCS7	0				
	1				
	2	8	47.1	4	23.5
	3	6	35.3	7	41.2
	4	3	17.6	6	35.3
PCS8	0				
	1			1	5.9
	2	6	35.3	4	23.5
	3	8	47.1	6	35.3
	4	3	17.6	7	35.3
PCS9	0				
	1				
	2			1	5.9
	3	14	82.4	7	41.2
	4	3	17.6	9	52.9
PCS10	0				
	1				
	2			2	11.8
	3	14	82.4	6	35.3
	4	3	17.6	9	52.9

* video: n=17
** non-video: n=17

Table 5.--Kruskal-Wallis one-way ANOVA by ranks between the parameters of Patient Cooperation Scale (PCS) for video and non-video groups at Time I

Variables	Mean Rank Video	Mean Rank Non-Video	Chi-Square	p-value
PCS1	17.50	17.50	0.0000	1.0000
PCS2	18.50	16.50	2.0606	0.1511
PCS5	18.62	16.38	0.5360	0.4641
PCS6	16.06	18.94	0.8645	0.3525
PCS7	18.21	16.79	0.1966	0.6575
PCS8	17.06	17.94	0.0845	0.7713
PCS9	14.88	20.12	3.2583	0.0711
PCS10	14.41	20.59	4.6995	0.0302*

* significant at $p<0.05$

Table 6.--Kruskal-Wallis one-way ANOVA by ranks between the parameters of Patient Cooperation Scale (PCS) for video and non-video groups at Time II

Variables	Mean Rank Video	Mean Rank Non-Video	Chi-Square	p-value
PCS1	19.00	16.00	3.1875	0.0742
PCS2	16.15	18.85	0.9874	0.3204
PCS5	19.68	15.32	1.8005	0.1797
PCS6	17.68	17.32	0.0130	0.9091
PCS7	19.50	15.50	1.6029	0.2055
PCS8	18.00	17.00	0.1138	0.7358
PCS9	17.59	17.41	0.0034	0.9536
PCS10	17.76	17.24	0.0311	0.8599

Table 7.--Kruskal-Wallis one-way ANOVA by ranks between the parameters of Patient Cooperation Scale (PCS) for video and non-video groups at Time III

Variables	Mean Rank Video	Mean Rank Non-Video	Chi-Square	p-value
PCS1	18.00	17.00	1.0000	0.3173
PCS2	18.79	16.21	0.9548	0.3285
PCS5	18.00	17.00	0.1135	0.7361
PCS6	16.15	18.85	0.7072	0.4004
PCS7	15.06	19.94	2.3156	0.1281
PCS8	16.29	18.71	0.5621	0.4534
PCS9	14.91	20.09	3.1855	0.0743
PCS10	15.32	19.68	2.1570	0.1419

Table 8.--Kruskal-Wallis one way ANOVA by ranks between total scores for video and non-video groups at times I,II and III

	Mean Rank Video	Mean Rank Non-Video	Chi-Square	p-value
TSCORE I	16.53	18.47	0.3278	0.5670
TSCORE II	18.50	16.50	0.3453	0.5568
TSCORE III	16.38	18.62	0.4370	0.5086

Table 9.--Coefficient alphas, average inter-item correlations for Patient Cooperation Scale (PCS) at times I, II and III.

	Coefficient alpha	Average inter-item correlations
Time I (6 weeks)	.6938	.2490
Time II (3 months)	.7984	.4377
Time III (6 months)	.8473	.4670

DISCUSSION

I. Evaluation of the Sample

Many researchers in previous years had identified the gender of the patient to be a very important variable in predicting patient compliance in orthodontics (Starnbach, Kaplan 1975; Cucalon, Smith 1989). They discovered that females were exhibiting better compliance than males because females were more concerned than males about improving their facial apperance.

The sample in our study consisted to its majority primarily of females (88.2% of the video and 58.8% of the non-video group). According to the previous findings, we would expect to find higher levels of cooperation with the present design than if the sample was equally distributed between males and females.

The significance of age as another parameter that influences patient cooperation has been widely discussed in the literature (Allan, Hodgson 1968; Graber 1971; Crawford 1974; Eiser 1977). They all agreed that the age more close to increased level of compliance was around 12 years of age. In the present study, the age of both samples varied between 8 and 18 years. The mean value for the video group was 11.882 with standard deviation of 2.315, while for the non-video group the mean value was 12.235 and the standard deviation 1.602. As a consequence, since both

groups have almost the same mean values, so that age differences were not expected to influence the study results.

Apart from the two already mentioned parameters that are associated with patient compliance, there are numerous others like the patient's school performance, the patient's perception of the orthodontic condition, the patient's locus of control, the interpersonal relationships between the patient and his/her parents, peers or the orthodontist, as well as the patient's socioeconomic status and background. Because of limited information concerning some of the above parameters, no attempt was made to identify each individual patient based on those. However, an investigation on the socioeconomic background of the patients participating in the study was succeeded by collecting information concerning the occupations of the patients' parents. The occupational titles were subjectively classified in three groups, I for the upper class, II for the middle and III for the lower class.

It has been shown that lower or lower-middle socioeconomic status is related to better adherence to orthodontic treatment (Crawford 1972; Starnbach, Kaplan 1975). In our sample, the percentages of the three classes were somehow the same for both groups. The lower class was not evident in either one of the groups, while the middle class occupied 64.7% of the control and 81.3% of the experimental group. As a result both groups were homogenous in respect to the socioeconomic status and background.

It would be very interesting in a follow up study with a more complete design to determine if parameters like the ones we failed to identify here, which were mentioned above, can inluence patient cooperation throughout the orthodontic treatment.

II. Evaluation of the Design

Since videotape modeling is a proven method of learning (Weinstein et al., 1983; Rubin, Locascio 1985; Gatchell 1986; Meichenbaum, Turk 1987; Jacob, Plamping 1989), the customized videotape tested in the present study, was given to a certain number of patients in a private orthodontic practice, in order for the young patients to get engaged in the "braces situation".

Weinstein (1982) stated that audiovisual materials are helpful in providing information but are not substitute for the practitioner's personal interest and concern for the patient.

The aim in the present study, was to emphasize, with the use of the videotape and the manual, the importance of keeping appointments, taking care of braces, maintaining good oral hygiene, wear appliances as prescribed and make the subjects feel responsible for their treatment.

In a successful private orthodontic practice, with a comfortable atmosphere and a staff that is highly motivated, like the one participating in our study, it would be critical to find out if an audiovisual technique could actually add significantly to patient adherence towards treatment.

Melvin and Meyerson (1990) believe that high quality treatment is a primary objective for an orthodontist, and any management efforts that reduce the quality of treatment will ultimately hurt both the patients and the practice. Carefully selected and trained personnel can be very beneficial. Most orthodontists practicing today rely heavily on their staff. It's the staff's responsibility to keep the patients compliant with the treatment. With the implement of any new behavioral motivating technique to the orthodontic

practice, the orthodontist primarily needs to become interested and motivated in order to increase the significance of the technique in the eyes of the staff members.

The manual for the orthodontic team that was included in our study, was aimed to establish a partnership between the team and the patients. It emphasized the importance of the right practice atmosphere which depends not only on the orthodontist-patient relations but on the staff-patient relations as well. The primary purpose of the manual was to help team members to pay proper attention to patients' individual needs and also to allow patients to value what the practice has to offer to them. It also described persuation techniques as how to present the information to the patient correctly so he/she can understand, remember and act accordingly.

At this point, it should be noted that the members of the staff (chairside assistant, hygienist, receptionist) that participated in the present study, were highly motivated, to start with, as well as trained to spend a long time with the patients of the office, especially the new ones, explaining in details the importance that the good hygiene, the regular appointment keeping and the proper utilization of the orthodontic appliances would have on their treatment. Consequently, the regular way of presenting information to the patient, in the particular office, was complete and thorough and it would be really difficult to expect dramatic changes in patient compliance, after the implementation of the tested here behavioral motivation technique.

Another part of the experimental design that was associated with data collection should also be discussed. The fact that we wanted to avoid any statistical bias, led us to design a study as blind as possible. The assistant

that was showing the videotape to the experimental group was different from the assistant that was evaluating the patients in both groups and who did not know anything about the distribution of the patients in the two groups. Also, the investigator in the study, was only collecting the written evaluation forms for each patient at the end of every time period (time I,II and III). As a result, all the ratings were blind, a fact that could make us hope that the outcomes of the study would be conclusive and significant. Unfortunately, the reduced size of the sample (n=34) as well as the heterogenesity of the groups were against our expectations. Two more inadequacies were present in our design: (i) the short duration of the study. As S. Rozensweig reported in her pilot study in 1990, when she introduced the same counselling technique in a group of patients in the Orthodontic Department of CWRU, duration is a very important consideration in orthodontics, since high levels of patient coperation should be maintained for more than two years. The manual, included in the technique, contained information that needed long time evaluation. The importance of constant encouragement by team members, the self- monitoring aids to keep the patient interested in treatment, the "problem solving road" handouts that help the patients cope with difficult situations, as well as the reinforcement guidance to the parents in order to increase their children's motivation, could not be evaluated in such a short time, as six months that was used in the present study. On the other hand of course, Weinstein et al., (1983) believe that two thirds of the patients drop out preventive programs within 90 days period, something that should make us think that a six month follow up could give us at least an idea of the long term effects of the technique in patient's compliance, (ii) the

second inadequacy, was the fact that cooperation with wearing rubber bands or headgear could not be studied. Most of the patients did not have to wear headgear till the third period of evaluation, while none of the patients had to wear rubber bands in the whole six month period. Apparently, no statistical studies could be done based on this data. However, the dimension "appliance wear" was shown by Crawford (1972), El-Mangoury (1981) and Gross et al., (1988) and was reported by S.Rozensweig (1990), to be correlated with "hygiene care", a parameter that was tested in the present study.

It would be interesting, in a future study with a bigger homogenous sample to test the significant differences (if any) that the examined here motivation technique could have on teenage patient compliance throughout the total period of the orthodontic treatment (average:2 years).

III. Evaluation of the Data

The Orthodontic Patient Cooperation Scale (OPCS) used in the present study, was a list of parameters associated with patient's compliance. Each parameter was evaluated in three different times.

Missed or broken appointments cost a great deal of frustration in the orthodontic practice. Trenouth and Hough (1991) investigated the reasons for missed or cancelled appointments and found that forgetfulleness was the primary reason for missing appointments, illness for cancelling appointments and inability to get time off or to find transportation, for both. Also anxiety and psychological factors have been found responsible to appointment failures in older studies (Alpert 1964).

The results in the present study, showed that the video (experimental) group had the best cooperation in terms of keeping appointments throughout the whole evaluation period, while the non-video (control) group showed slightly less compliance at time II (3 months), which was leveled again at time III (six months). In comparison, the two groups had no difference what so ever ($p=1.0000$) at time I (6 weeks), a marginally significant difference at time II ($p=0.0742$) with the video group performing better, and no significant difference at time III. A possible explanation would be that both groups consisted of very motivated subjects who were well educated by the staff of the office, on the importance of keeping all the appointments with the orthodontist. The slight difference at time II, with the video group performing better than the non-video group, should not be considered significant in predicting the future evolution of the parameter "keeping appointments", because: the duration of the study was minimum and also the at time III the results leveled out and no difference was evident any more.

The same pattern among the three times was observed for the parameter "appliance care", when the video group performed slightly better than the non-video group at times I and III and the non-video group performed better at time II. It is well known that appliance breakage usually occurs during the early months of treatment, that's why the short duration of the present study should not alter the results significantly (S.Rozensweig 1990). Still though, since the sample size is small and the significance levels very low, we can not make any conclusions about the weak contribution of the videotape at time II.

Gingivitis has been viewed by many orthodontists as an inevitable by-product of their therapy (Hoover 1967), because orthodontic appliances collect microorganisms and thus contribute to periodontal disease (Parker 1971). Instruction and persuasion should be used in every orthodontic practice, in order for the patients to comprehend the value of maintaining good oral hygiene. The motivational technique that we tested here had a slight impact on the video (experimental) group which showed constantly higher cooperation levels than the non-video (control) group in keeping satisfactory oral hygiene, throughout the total evaluation period. Despite that fact, the significance levels of difference between the two groups ($p=0.4641$ at time I, $p=0.1797$ at time II and $p=0.7361$ at time III) were not adequate to permit us to conclude that the videotape had a dramatic positive effect on the experimental (video) group.

The quality of parental involvement and support is always important for teenagers. Although, it has been shown that teenagers with a sense of autonomy are even more likely to cooperate. The results in the ratings of the parameter that was associated with parental interest in orthodontic treatment, were not significantly different between the two groups. Despite the extra handout "Child's treatment success and parental support" that was given to the parents of the teenagers in the video group, the non-video group performed slightly better than the video group at times I and III. Still no definite conclusions can be derieved from the levels of significance ($p=0.3525$ at time I and $p=0.4004$ at time III). Possibly the parents of the patients that belonged to the non-video group were "by chance" more concerned about the treatment of their children than the parents of the video

group. Socioeducationally speaking, both groups were fairly homogemous, and as a result, we couldn't say that the family background had any impact on the observed parental interest.

The contribution of the self-monitoring and reinforcement aids included in the patient's orthodontic kit (flow chart, problem solving road, etc) should be reflected in the ratings of the two following parameters. The patients in the video group, seemed to act more enthusiastic and interested in treatment than the patients in the non-video group at times I and II. They also complied slightly more and were more easy going than the patients in the non-video group at time II, while the non-video group showed more interest and treatment compliance at time III. Again, the results were not significantly different between the two groups ($p=0.6575$ and 0.7713 at time I, $p=0.2055$ and 0.7358 at time II, $p=0.1281$ and 0.4534 at time III). The most possible explanation should be that the quality of care the office staff provided to every subject, no matter to which group the subject belonged to, was very high.

The frequency with which the subjects complained about treatment procedures and about having to wear braces, was measured and the ratings between the two groups were compared. Apparently, a significant difference ($p=0.0302$) and a marginally significant difference of $p=0.0711$ were evident at time I, with the non-video group performing better than the video group. The same results were observed at time III, but with less significance ($p=0.0743$, $p=0.1419$). Although, at time II (3 months) there was absolutely no difference between the two groups. Again, the change in the pattern between the different time periods should make us suspicious that there is

no real significant difference between the video and non-video groups at times I and III.

Additionally, the absence of any significant difference between the total scores of the patients in both groups at times I,II and III, contributes once more to our previous thinking.

At this point, we should be reminded that all the subjects, in both groups, were exposed to the regular instructions that the office staff presented to them, with only the video group being exposed additionally to the videotape and the patient's orthodontic kit.

According to all the results presented in our discussion so far, the control (non-video) group, most possibly, consisted of very well motivated youngsters who felt responsible for their treatment from the beginning and who, along with their parents, were so interested and enthusiastic that in certain instances performed better than the patients in the experimental (video) group.

Finally, we should say that the results of the present study were not conclusive in terms of the importance of the videotape modeling technique that we tested here, because of the compromised in certain aspects design, as well as of the very short duration of the study.

IV. Reliability and stability of the Orthodontic Patient Cooperation Scale (OPCS)

Given the results, which were summarized in Table 9, we may conclude that the new version of the Orthodontic Patient Cooperation Scale used in our study, has adequate consistency as measured by coefficient alpha. The ten variables are relatively homogeneous and apear to be

measuring essentially the same dimension. Additionally, as M. J. Slakter showed in a reliability test of the OPCS that he introduced in 1980, the magnitude of the long-term stability provides evidence that subjects who were cooperationg at time I tended to be cooperating at times II and III and subjects who were not cooperating at time I, most possibly would not be cooperating at times II and III. Therefore, the Patient Cooperation Scale is fairly stable and would tend to have the same effect throughout treatment. Summarizing, the OPCS has adequate internal consistency and should be useful for studies looking for predictors of patient cooperation and for studies examining the relationship of patient cooperation and outcome of treatment.

SUMMARY AND CONCLUSIONS

The positive effects of behavioral self-management counselling strategies (Barkley 1972; Kasdin 1980; DiMatteo, DiNicola 1982; King et al.,1983; Patterson 1985; Meichenbaum, Turk 1987; Holst, Ek 1988), as well as the importance of videotape modeling (Brooks 1976; Paegle 1978; Ingersoll 1982; Gatchell 1986) have been reported in many health care fields.

The present investigation attempted to study the effects of a comprehensive behavioral strategy on the overall level of cooperation of teenage patients during the orthodontic treatment. Thirty four patients of a private orthodontic practice in Cleveland-Ohio (Dr. T. Wenger's office) were randomly selected to participate in our study. The subjects had no previous orthodontic treatment and received fixed appliances therapy.

The control group consisted of seventeen teenagers who were exposed only to the regular orthodontic instructions that the office staff offers to every patient in the practice. The experimental group was also consisted of equal number of subjects (n=17) who were exposed to the behavioral modification technique tested here.

The subjects in both groups were evaluated with an Orthodontic Patient Cooperation Scale, which was developed by Slatker et al. in 1980, and was modified to meet the needs of the present study. The data was

collected in three time periods, six weeks, three months and six months after the beginning of treatment.

The results were analyzed statistically and showed the following:

At time I (six weeks), there was a significant difference between the two groups in the amount of complaints about braces (p=0.0302) and a marginal significance (p=0.0711) in the complaints about treatment procedures. In both instances the control (non-video) group performed better than the experimental (video) group.

At time II (three months), a marginal significance (p=0.0742) was noted with patients' "keeping appointments". The experimental group seemed to have better compliance than the control group.

At time III (six months), there was a marginal significance (p=0.0743) evident with the variable related to patients' complaints about braces, with the control group performing again better than the experimental group. Finally, there was no significant difference noted between the total scores of both groups at any given time.

Summarizing the results, the experimental (video) group had the best compliance at time II, while the control group performed with higher treatment adherence at times I and III. Because of the short duration of the study, as well as the small size and the heterogeneity of the sample, the results of the present study were not conclusive in terms of the impact that the tested behavioral technique had on teenage patient's compliance. More complete experimental designs with larger samples and longer-term analysis, concerning the various facts that influence patient compliance,

should be carried out in the future, in order to examine the evolution of patient cooperation throughout the entire treatment period in orthodontics.

APPENDIX I

Orthodontic Patient Cooperation Scale

CASE WESTERN RESERVE UNIVERSITY • CLEVELAND, OHIO 44106

PATIENT COOPERATION SCALE

NAME:.....AGE :.....

BEG. OF TREATMENT:..... DATE :..... TOTAL PTS :...../40

SCALE :

0	1	2	3	4

I. The patient keeps appointments and is prompt.

missed appt	cancelled appt	late, no excuse	late, with excuse	On time

II. Distorted wires and/or loose bands.

Bands and bkts loose/no call	bkts loose no call	Bands and bkts loose / called	bkts loose called .	Everything's all right

III. This patient cooperates in the use of headgear.

No wear will not admit	No wear/ Admitted	Very minimal wear	Wear/not the right amount of time	Perfect wear

IV. This patient cooperates in the use of rubber bands.

No wear will not admit	No wear/ Admitted	Very minimal wear	Wear/not the right amount of time	Perfect wear

V. The patient 's oral hygiene.

decalcifications Plaque & inflamed / swollen gums	Plaque & inflamed / swollen gums	Plaque	No brushing before appt	Good hygiene

VI. The parent(s) of this patient is(are) observed to be interested and involved in treatment. (grade from 0 to 4 : - to +)

0 (-)	1	2	3	4(+)

VII. This patient acts enthusiastic and interested in treatment (grade 0 to 4 : - to +)

0 (-)	1	2	3	4(+)

VIII. This patient's behavior is cooperative and easy going (grade 0 to 4 : - to +)

0 (-)	1	2	3	4(+)

IX. This patient complains about treatment procedures.

Always	Frequently	Sometimes	Rarely	Never

X. This patient complains about having to wear braces.

Always	Frequently	Sometimes	Rarely	Never

School of Dentistry
2123 Abington Road
Cleveland, Ohio 44106
216-368-3200
Fax 216-368-3204

APPENDIX II

Orthodontic Kit with instructions:

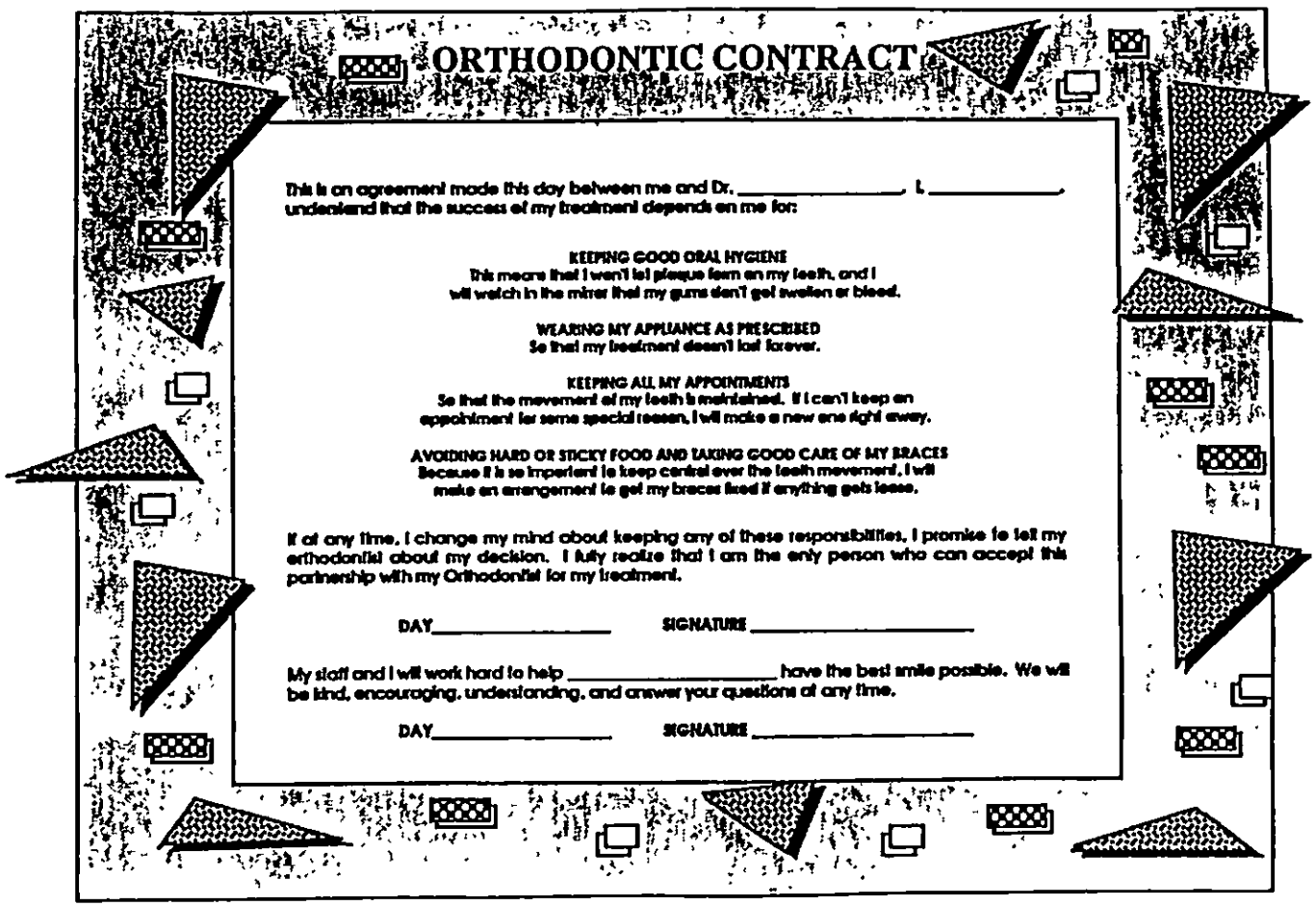
(i) Orthodontic Contract

(ii) Taking Control

(iii) Flow Chart-Treatment Plan and Solving Road

(iv) Child's Treatment Success and Parental Support

(v) How to Take Care of Your Braces-How to Brush With Braces


ORTHODONTIC CONTRACT
This is an agreement made this day between me and Dr. _____, I, _____, understand that the success of my treatment depends on me for:
KEEPING GOOD ORAL HYGIENE
This means that I won't let plaque form on my teeth, and I will watch in the mirror that my gums don't get swollen or bleed.
WEARING MY APPLIANCE AS PRESCRIBED
So that my treatment doesn't last forever.
KEEPING ALL MY APPOINTMENTS
So that the movement of my teeth is maintained. If I can't keep an appointment for some special reason, I will make a new one right away.
AVOIDING HARD OR STICKY FOOD AND TAKING GOOD CARE OF MY BRACES
Because it is so important to keep control over the teeth movement, I will make an arrangement to get my braces fixed if anything gets loose.
If at any time, I change my mind about keeping any of these responsibilities, I promise to tell my orthodontist about my decision. I fully realize that I am the only person who can accept this partnership with my Orthodontist for my treatment.
DAY_____ SIGNATURE _____
My staff and I will work hard to help _____ have the best smile possible. We will be kind, encouraging, understanding, and answer your questions at any time.
DAY_____ SIGNATURE _____

TAKING CONTROL

When you began orthodontic treatment, you entered into a partnership with your orthodontist. And, as in any partnership, both you and your orthodontist have duties and responsibilities to fulfill. As a partner of your orthodontist, you need to take control over your different responsibilities. Brushing properly, remembering to insert your appliance etc.... are habits that take practice, yet can be mastered. Therefore, the better you take control, the better the results, and the faster the treatment time.

Some slipping is inevitable. For example, you may forget to use your headgear one day. The most important thing is to get back and stay on track. To get back on track, you need to make up for lost time by wearing it more hours the next day. It is critical to find ways to remind yourself to use your appliance every day, as prescribed. If you aren't consistent with appliance wear, the back and forth movement of your teeth will set up a resistance that will slow down or stop the progress.

If you give up you are throwing in the towel, and you will never get that super smile. It only takes a little effort now to achieve a beautiful smile that can last for a lifetime.

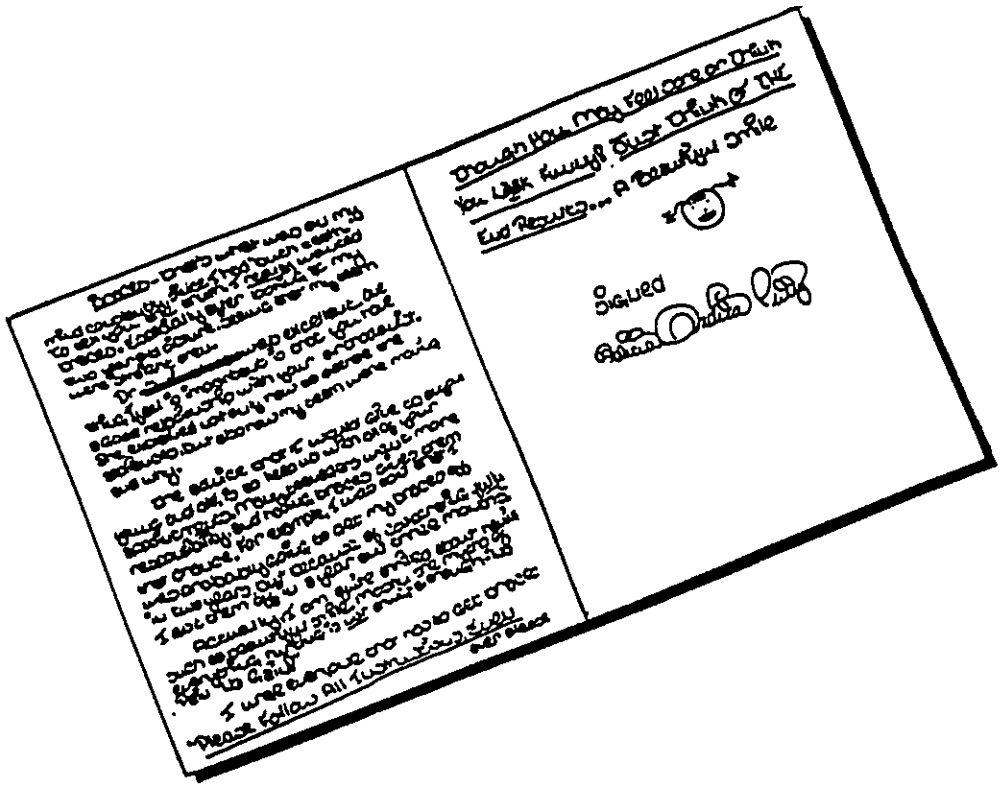
If you begin to feel angry or frustrated, it is important to ask yourself these questions:

- How can I change the situation?
- Who do I talk to? What must I do?

Sometimes you need to think about things in a different way, and you will feel better about the situation. Here are some examples:

SITUATIONS I FIND MYSELF IN	THOUGHTS / SOLUTIONS I CAN CONSIDER
• My parents cannot bring me for my next appointment.	• Can I go alone? • Who else can take me? • I need to check my parents schedule and call for a new appointment.
• I feel pressure on my teeth from my rubber bands.	• I should continue to wear my rubber bands because this means my teeth will start moving into the right places. • While the pressure persists, I should ask my parents to give me a mild medication.
• I forgot to insert my headgear.	• I may have lost what I gained yesterday. So I should make up for lost time by wearing it longer today. • Now what can I do to remind myself to wear my headgear?... Insert it when I start watching TV every day...Or put it on my desk where I do homework...
• I want to eat this candy.	• This candy is sticky, and it will probably loosen my braces. I'd better find a treat that is not going to make me lose time.

If you find a solution, you will feel very good about yourself. If it is a tough problem, and you are having difficulty finding a solution, please call us here at the office. Tel:.....



Braces - that's what was on my mind constantly, since I had "buck teeth". To tell you the truth, I really wanted braces. Especially after looking at my two year old picture, seeing that my teeth were straight then

— Dr [redacted] was excellent. One thing I feel is important is that you have a good relationship with your orthodontist. Dr [redacted] not only explained how to operate the appliance, but also how my teeth were moving and why.

The advice that I would give to anyone young and old, is to keep up with all of your appointments. Many teenagers want more responsibility, and having braces gives them that chance. For example, I was told that I was probably going to get my braces off in two years, but because of cooperating fully I got my braces off in a year and three months.

Actually, I am quite thrilled about having such a beautiful smile. Mostly the myths of everything hurting is not true, although "No Pain, No Gain"!

I urge every one that has to get braces, "Please Follow All Instructions, Eventhough you may Feel sore or think you LOOK funny! Just think of the End Results..... A beautiful smile.



Signed

Felicia Indira Curry

YOUR FLOW CHART

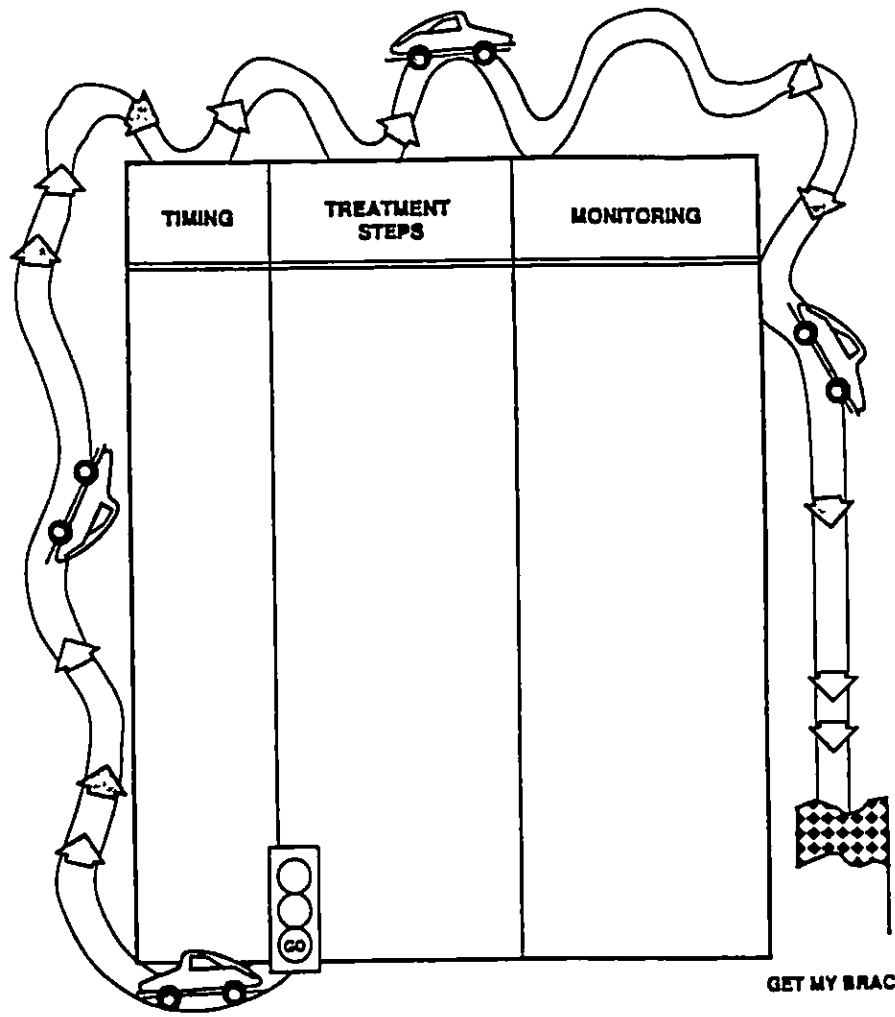
THIS CHART IS VERY IMPORTANT FOR YOU AND YOUR ORTHODONTIST

1) We need your help in monitoring your progress closely: Your specific treatment plan will be described for you, with the amount of time expected for each phase and the results to be obtained at the end of each. This will allow you to assist us in noticing any delays, so that your treatment does not last forever.

2) We also need your help in reporting your reactions, especially if you have unusual difficulties. This is why, attached to this chart, you will find little dots. Each time you experience a problem, stick a dot along the road, with a number on it. In the space below, mark the number of the dot, and write the possible solutions you have found. Let us know as soon as possible if you haven't found the solution to problems, because we are here to help you!!!

FLOW CHART

TREATMENT PLAN AND PROBLEM SOLVING ROAD



CHILD'S TREATMENT SUCCESS AND PARENTAL SUPPORT

We are pleased to have your child as a new patient and are delighted that you had the love and wisdom to give your child the opportunity to look good, function better and feel good about him/herself.

The orthodontic treatment will last many months, and it will sometimes seem long and difficult to your child. We understand that you may feel responsible for your child's treatment. However, much of the success of the orthodontic treatment is a direct responsibility of the patient's.

Our goal is to build a **PARTNERSHIP** with our patient in which they share the responsibilities for the outcome of their treatment. Because there are areas that we don't have control over, such as growth, we need their full adherence for:

- Keeping their appointments.
- Taking care of their braces by carefully watching their eating habits.
- Cleaning their teeth perfectly.
- Wearing their appliances as prescribed.

It is critical that the teenager cooperates on his/her own accord, because parental nagging does not work. Nagging shifts the responsibility to the parents and the child becomes conditioned to wear the appliance only when the parent is asking him/her to do so. Nagging can also yield the child to react negatively and do the opposite of his/her parents' demands.

However, your care and understanding will probably be very important for your son or daughter. Here are some guidelines that may help you in being positive and supportive to your child, and will help us implement our office responsibilities. We will be more than happy to discuss them with you during child's next appointment.

I - HELPING YOUR CHILD TAKE RESPONSIBILITY

It is very important to remember that you are involved in the success of the treatment, but your child is the one who is ultimately responsible. There are some important tips that will help you :

1 - Reducing use of the word "you".
2 - Present facts without blaming or giving negative value judgements.
3 - Help your child to plan his/her schedule so as to incorporate proper appliance wear, brushing techniques, etc in order to develop good orthodontic habits.
4 - Suggest ideas that will link orthodontic responsibilities to every day activities.

EXAMPLES :

DON'T SAY:

"Why don't you wear your headgear ? Do you want me to make you go to the orthodontist for four more years?" "You always forget to brush your teeth" . "Your teeth are dirty".

DO SAY:

"Your headgear is resting on the corner of the kitchen table" or" It seems that your braces are not as shiny as they were the first day".

" Susie, you mentioned that you can't wear your appliance tonight at the party. When do you think you could catch up the balance today?".

"John, you really watch this TV show at 5 o'clock every night and enjoy it... Why don't you keep your headgear by the television and put it on while you're watching?".

II - SHARING YOUR CHILD'S EXPERIENCE BY LISTENING AND TALKING

• Help your child anticipate and seek solutions for cooperation problems

You should be very supportive and sort out the relevant factors in a difficult situation. Examine the consequences of each factor and let your child make personal decisions.

• Staying neutral

To encourage communication, you may, on some occasions, speak about your own experience. This will demonstrate your understanding of your child's problems. However, you should not overuse personal experience or "self-disclosure" statements, as they are called, because they can make you speak about yourself instead of listening to your child. •

EXAMPLES :

" I knew you would love to have these caramels now, and I understand how difficult it is for you to resist. I am very proud of you though. I will buy you the biggest box you ever had at the end of the treatment. I was once on a very difficult diet for two years. I would constantly long for my favorite chocolate pecan candies. I resisted and lost weight . I am so happy now I did. Aren't you proud of your mother ? Now let's be constructive . Let's make a list of your favorite foods and treats, and we'll sort out the ones that are compatible with your treatment. When your treatment is finished, I will buy you a big bag of caramels".

III - REWARDING AND PRAISING TO HELP KEEP YOUR CHILD MOTIVATED

1- Praising the child often to hel him/her take pride in their cooperative behavior. This will reinforce the child for effort during treatment.
2- Modifying child's behavior with meaningful rewards.

If you desire so, we will be able, at the office, to give or take away points depending on the level of cooperation, so that your reward may be given, say after the third point. In any case, if you agree to monitor your child's treatment in a DELICATE manner and are willing to dispense reinforcement, the treatment coordinator will keep in touch with you, letting you knew the level of cooperation of your child. Giving rewards should be done gradually: initially, you may want to offer a present, or do a special activity to reward one aspect of the desirable behavior (e.g maintaining good oral hygiene, wearing appliances as directed, ...etc) after a short one or two weeks time period. Over time, however, as your child gets on track, the criteria and the delay for reinforcement should gradually be increased to one or two months.

EXAMPLES:

1- *"Your teeth are so shiny" " let me give you a big kiss. I am so proud of you, but most of all, you must be so proud of yourself ".*

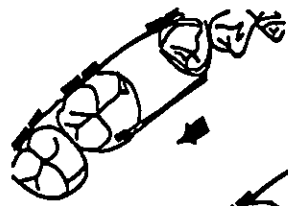
2- *"Okay Susie, I will take you shopping in your prefered mall in two weeks if you wear your headgear as prescribed by your orthodontist".*

Some teenagers have a difficult time relating to their families during adolescence. However, most youngsters who are exposed to warmth and openness in their homes, whose achievements are met with approval and affection, and who are encouraged to be independent, move forward into adolescence with fewer problems. The orthodontic treatment is a fantastic opportunity for you to give your child a sense of control, and an enhanced self-esteem.

HOW TO TAKE CARE OF YOUR BRACES

Damaged appliances are the biggest bother for the orthodontist and the patient. It takes a long time to replace them, and when a bracket is loose, the tooth becomes out of control:

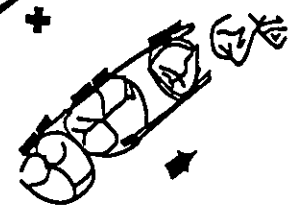
INSTEAD OF GOING WHERE IT SHOULD



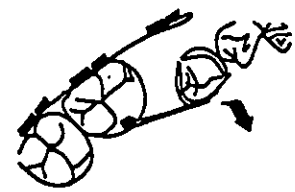
THE TOOTH STOPS MOVING



OR MOVES BACK TO ITS ORIGINAL POSITION



OR EVEN WORSE, IT MAY GO IN THE WRONG DIRECTION



TO AVOID LOOSING YOUR TIME AND THE ONE OF YOUR ORTHODONTIST:

1 – Avoid hard foods: ice, popcorn, nuts. When eating raw vegetables, cut them into bite size pieces

2 – Avoid sticky foods: taffy, bubble gum, caramel

3 – Use your common sense before biting.....!!!!!

IN ANY CASE CALL YOUR ORTHODONTIST RIGHT AWAY IF ANYTHING HAPPENS!!!

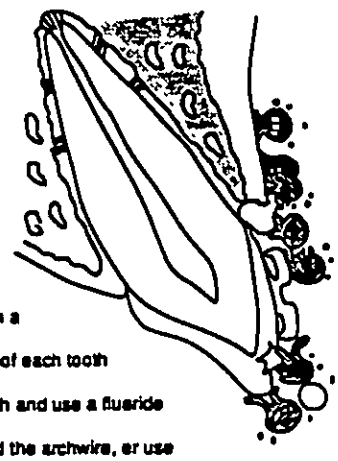
HOW TO BRUSH WITH BRACES

You and your orthodontist, as partners, have the same goal: ***A BEAUTIFUL SMILE*** with white, straight teeth and healthy gums. However, braces create small edges trapping foods. It is also harder to brush when you are wearing braces. This is why one of the most common fears about orthodontics is that braces can cause decay, gingivitis and ***BAD BREATH*** . . . . . Here is what will happen if you don't brush properly:

Plaque, a white sticky layer of harmful bacteria will build up to significant levels within hours, especially in the DANGER ZONE, between the braces and gum. These billions of bacteria NEVER SLEEP, they multiply non-stop!

They can attack the tooth creating decalcifications and decays, white and brown spots on the teeth, thus leaving lifelong scars on the teeth.

They can attack your gums which will become red, swollen, sore and bleeding; and also the bone around the teeth.



There Is One Solution:
THE SIX STEP WAY TO PLAQUE CONTROL

1 – Brush around each bracket, including your back teeth
2 – Brush in the danger zone, where gums and teeth meet, in a small motion as if you were erasing a paper
3 – Brush both the tongue side and lip or cheek side surface of each tooth
4 – Brush the chewing surface
5 – Brush your tongue and your palate to have a sweet breath and use a fluoride rinse too!
6 – Floss if some food gets stuck by sliding the thread behind the archwire, or use an oral irrigator which shoots a strong stream of water where your tooth brush can't reach

IT'S UP TO YOU !!

TO BRUSH YOUR TEETH, BRACES AND GUMS AFTER EACH MEAL UNTIL THEY ARE SPOTLESSLY CLEAN.....AND TO KEEP A SWEET BREATH

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43 397CS TH
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