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BEHAVIOR MANAGEMENT OF ORTHODONTIC PATIENTS

**A project submitted to the College of Dentistry
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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا مَا
عَلَّمْتَنَا إِنَّكَ أَنْتَ الْعَلِيمُ الْحَكِيمُ

صدق الله العظيم

سورة البقرة (آية ٣٢)

I WOULD LIKE TO DEDICATE THIS WORK TO
MY BELOVED FAMILY AND FRIENDS

TO MY DOCTORS

AND A VERY SPECIAL APPRECIATION TO MY
AMAZING SUPERVISOR WHO HAS BEEN THE
BACKBONE OF ALL OF THIS

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Introduction:

Not too long ago, orthodontists, of all the dental specialties had to deal with the most complex psychosocial issues because most orthodontic patients were children and adolescents who were working out conflicts with authority figures such as parents and teachers as well as the orthodontist who like other doctors, were perceived to be in charge. Parents, usually the mother, also had to interact with their children and the clinician in making decisions about orthodontic treatment. Orthodontists actually shared the burden with parents for motivating their children to comply with the requirements of orthodontic treatment. Modern orthodontics, however has progressed beyond 'beware of children' to interacting complementing, and even competing with other dental and medical specialists involved in the increasing complexities of overall health care (Giddon et al., 2011).

Orthodontic treatment processes require changes in established individual routines and also affect different social activities. Behavior modification to accommodate new demands placed by orthodontic techniques and appliances may involve changes that range from simple to extremely complex (Albino, 2000). Decreasing the complexity of the required behavior change may lead to better compliance (Sinha and Nada ,2000). Also, because most patients are in the adolescent age group, they present with a unique process of changing from parental values toward acceptance of peer-group standards . Not surprisingly, studies have shown better compliance in patients under age 12 years than in older groups .Although important, this fact may not effectively predict or improve patient compliance (Albino, 2000) .

Chapter one

1. Review of literature

1.1 Perception of facial attractiveness:

As noted earlier by (Baldwin ,1980), approximately 80% of those seeking orthodontic treatment do so for esthetic rather than functional reasons. Potential patients judge their appearance by looking at a reflection of their full face while the orthodontists base their assessments primarily on the profile, which is not easily viewed by the patient (Giddon et al. ,2011) pointed out that most people in fact, have no idea about their own profiles. The fact that perceived personality and other characteristics attributed to the profile differ from those for the full frontal face only adds more complexity and possible shortcomings to the two-dimensional (2D) representations of faces (Bruce et al.1991; Hancock et al., 2000). While the orofacial area is more important than the rest of the body in judging overall attractiveness and ultimately self-concept (Currie and Little, 2009), the mouth itself is second only to the eyes in focus of attention.

However Hassebrauck in 1998 found that patients rated teeth as the most important feature in judging facial attractiveness, with no gender difference (York and Holtzman,1999). For example gaze aversion or increasing interpersonal distance from people with craniofacial anomalies, the cognitive, affective, and behavioral responses to perceived anomalies can often have disproportionately greater impact than the actual magnitude of the disfigurement. Individuals with ‘mild’ dysmorphias as classified by the clinician may be at greater risk for developing psychological problems than those with severe dysmorphias.

That is, patients with mild to moderate facial deformities who perceive themselves as near normal may actually experience greater psychological distress than those with more severe anomalies. As shown by (Bruun et al.,2008) there is some disagreement even among clinicians about what is classified as mild, moderate, or severe. In general however, the more severe the deformity, the more consistent and predictable are the negative, often stereotypical reactions, such patients may in fact develop a subculture with different methods for coping with social inequities (Giddon et al.,2011). Patients with visible facial disfigurements tend to be judged as less intelligent, and less athletic, with attributes such as untrustworthiness and dishonesty. Even parents may view their unilateral cleft lip and palate children (UCLP) negatively with a greater likelihood of sexual or physical abuse than non-UCLP children (Sullivan et al. ,1991). Children with anomalies often have a lower frustration tolerance, resulting in behavior which increases the household stress and the risk of being maltreated by parents or trusted adults such as teachers (Polnay, 1993).

1.1.1 Self and social perceptions and attributions:

Dental-facial aesthetics and self-perceptions are extremely important factors in most decisions to obtain orthodontic treatment (Albino et al., 1984). The perceptions of facial aesthetics influence psychological development from early childhood to adulthood. An infant's visual preference for human faces is adaptive recognition of familiar faces is critical for an infant's survival ,by the age of 6 months, children can discriminate between familiar and unfamiliar faces ,by the age of 6 years children have internalized cultural values of physical attractiveness, by age 8 their criteria for attractiveness are the same as those of adults.

A teacher's perceptions of a child's attractiveness can influence the teacher's expectations and evaluation of the child (Dare 1992). Children perceived as more attractive are not only more socially accepted by their peers, they are also believed to be more intelligent and to possess better social skills.

Self-concept is defined as the perception of one's own ability to master or deal effectively with the environment (Novic et al., 1995). Self-concept is a broad-ranging concept relating to personal self-concept, i.e. facts or one's own opinions about oneself and social self-concept, i.e. one's perceptions about how one is regarded by others. Developmental psychologists generally agree that a child's self-concept develops from the "reflected appraisal" that he or she receives from others. In other words, self-concept is affected by the reactions of others toward the child. Self-concept also depends on social comparisons and self-attributions by the child. Researchers have consistently found that self-concept is related more to the individual's perceptions of others' evaluation than to objective evaluations by others (Vander ,1985;Gosney,1986;Bull and Rumsey ,1988). As discussed earlier, facial attractiveness plays an important role in social acceptance by peers. A positive relationship also exists between physical/facial attractiveness and interpersonal popularity, as well as others favorable evaluations of personality, social behaviors and intellectual expression (Albino et al., 1994).

Kenealy in 1991 found that Females have consistently been found to have more negative body image and self-concept scores. This phenomenon begins in adolescence, when girls become more concerned about their physical appearance and weight.

Although pubertal change increases the self-consciousness of boys and girls females more influenced by these rapid changes in their physical appearance and continue to attach more importance to these external characteristics into adulthood (Albino and Lawrence ,1993).

Longitudinal studies have suggested that malocclusion may adversely affect self-concept in adulthood, not only during adolescence ,adolescence is often associated with increased self - consciousness confusion about identity and acceptance by others, and concerns about recognition from adults and peers. Younger children are influenced greatly by their parents and other adults (Tung and Kiyak ,1998). As the child enters adolescence, however, peers assume a greater role in their lives, especially in terms of self-image (Vander ,1985). Peers often serve as a standard of comparison and implicit or explicit critics of the adolescent's appearance dress, activities, and interests. With a large proportion of the patients seen by orthodontists being in the adolescent stage, an orthodontist aware of the complex psychosocial links associated with this developmental stage would better serve the orthodontist in relating to the patient and lead to a better understanding of the issues that may arise from treating adolescent. For example, if an adolescent has significant concerns about the appearance of his or her teeth and has friends who are undergoing or have undergone orthodontics, they can serve as role models for the child. This role-modeling can result in greater cooperation with the treatment regime. If however, the child is absorbed in other developmental tasks of adolescence, it may be wrong to initiate treatment (Ukra et al., 2011)

This stresses the need for strong orthodontist-patient relationships to ensure that the orthodontist is aware of the patient's background, psychological wellbeing, and motive for seeking treatment which may ultimately lead to treatment success or failure.

A number of studies have reported that there is no strong evidence that orthodontic treatment in children results in significant changes in self-concept or an increase in self-esteem (Tung and Kiyak, 1998 ; Kenealy et al., 2007).

Lazaridou in 2003 and Kenealy in 2007 found that self-esteem was more strongly predicted by psychological variables at outcome such as the perception of quality of life, life satisfaction self-efficacy, depression, social anxiety, emotional health, and by self-perception of attractiveness. However, a randomized controlled trial conducted by O'Brien (O'Brien et al .,2003). Found that orthodontic treatment using a Twin-Block functional appliance of class II div 1 malocclusions resulted in an increase in self-concept, specifically self-esteem (Ukra et al., 2011).

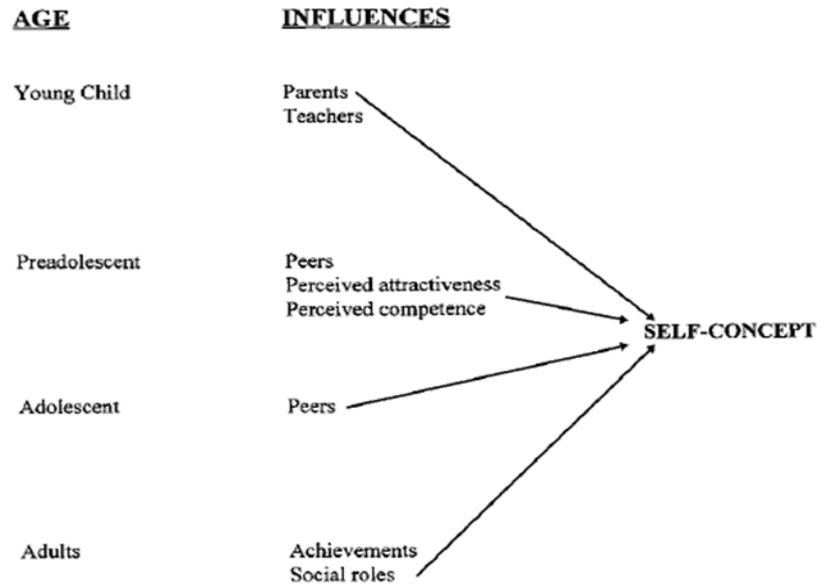


Figure1: Social factor affecting self- concept

1.1.1.2 Patient's Causal Attributions:

Patients attribute events in their lives to external and internal causes, external causes are outside of their control (external locus of control), versus internal, which are within their control (internal locus of control). The relationship of the locus of control to orthodontic patient compliance has been reported in the literature. El- Mangoury in 1991 found that orthodontic patients who attributed outcomes to internal causes were significantly more cooperative , also Albino in 1991 found that those patients who attributed responsibility for their orthodontic condition and treatment externally to either chance or their orthodontists showed lower levels of compliance scores compared with others , therefore, patients who attribute internally are better compliers compared with those who attribute externally .Those patients who make fewer external attributions possess a sense of responsibility and consequences consequently believe that their participation and cooperation facilitates treatment progress. These findings can be used clinically to improve patient compliance by initially developing strong relationships and a high level of communication with patients. Good rapport along with patient education can empower patients to make informed decisions regarding their role in determining the success of treatment.

1.2 Compliance with treatment and oral Hygiene:

Orthodontist-patient relationships can enhance treatment outcomes by encouraging the patient to cooperate in following prescribed instructions related to appliance wear and maintenance of oral hygiene, (Nada and Kierl , 1992). Successful orthodontic treatment requires active cooperation from the patient throughout the necessary lengthy orthodontic procedures, patient compliance makes it possible to achieve treatment objectives in a minimum treatment time. Improved cooperation by the patient can also result in a reduction of expenses involved in orthodontic treatment. The efficiency of care and improved oral hygiene can minimize damage to the periodontal tissues, limit the deleterious effects of decalcification and even rampant caries (Gorelick et al., 1982; Mizrahi, 1982). With a noncompliant patient it is necessary to compromise treatment methods and treatment objectives, therefore standards of orthodontic care can be immensely improved with greater patient adherence. Several studies have aimed to examine the influence interpersonal relationships have on compliance (Nada and Kierl , 1992; Rinchuse and Zullo ,1992).

Mehra in 1998 reported that the most common methods to improve patient compliance were to verbally praise the patient, educate the patient about the consequences of poor compliance, discuss treatment goals with the patient, educate the patient about the proper use of elastics, discuss the results of poor cooperation with the patient, and educate the patient regarding the proper use of adjunctive appliances. These items demonstrate that communication with the patient about the need for compliance was of paramount importance in improving patient compliance.

Educating patients and giving them more autonomy over their treatment can decrease anxiety, which in turn might increase adherent behavior. Also, the patient may feel that he or she is a more active participant in the treatment and that a team approach is applied where doctor and patient are striving together to achieve the same treatment outcomes (Ukra et al 2011).

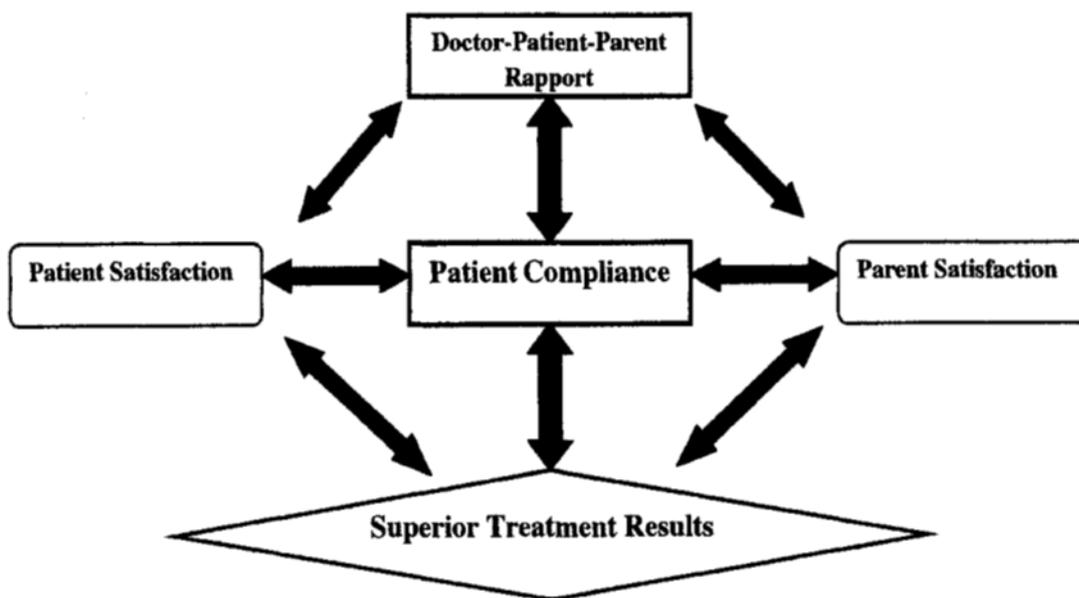


Figure2: The interrelationship between rapport, satisfaction compliance, and superior treatment outcomes in orthodontic treatment.

1.2.1 Psychosocial variables influencing compliance:

According to social-learning theory as shown in figure: 3 by Rotter in 1966 who believe that their oral health depends on their own efforts, report increased oral health behaviors, preventive oral health behavior includes the adherence to professional instructions and practicing self-help procedures. Self-efficacy and later health self efficacy have been used to explain perceived ability to perform preventive behaviors.

Patients considered to have good dental esthetics have greater dentofacial awareness and engage in preventive behaviors more than those with less attractive dentitions (Giddon et al., 2011).

These observations are consistent with recent studies (Johnston et al., 2010) finding that physically attractive people enhance their self-esteem by looking at their own images in the mirror for comparison with others compared with less attractive individuals who avoid such comparisons.

An additional benefit of orthodontic treatment, therefore, may be that monitoring of oral health behaviors, based on two personality measurements, the most cooperative patient was 14 years or younger enthusiastic, outgoing, hard-working, forthright, and obliging, whereas uncooperative patients were those older than 14 years, with superior intelligence, hard-headed, self-sufficient, intolerant, individualistic impatient, etc.

Other variables which correlated with compliance with wearing of headgears and intraoral elastics clustered weakly into four factors:

- 1-Personality type, pain thresholds, inconvenience, and dysfunction.
- 2-General health awareness
- 3-Specific dental knowledge.
- 4-Personal oral embarrassment.

Girls were generally more cooperative than boys in wearing headgear, which correlated with their need for improved dentofacial esthetics. A good parent–child relationship also appears to facilitate treatment compliance. Unfortunately, patients who most needed to wear their headgear were the most troublesome (Giddon et al.,2011).

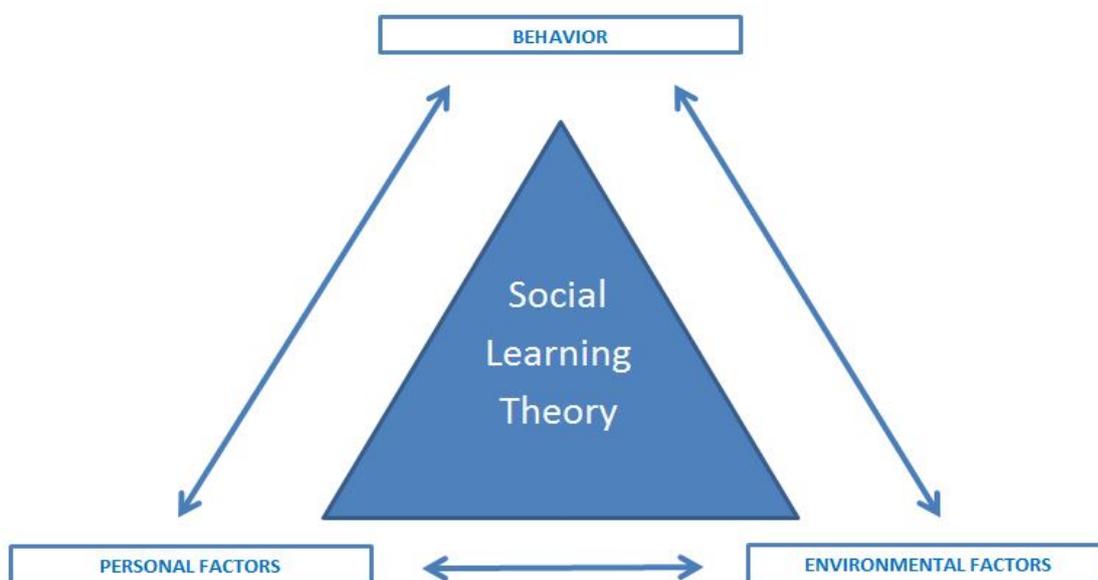


Figure 3 :social learning theory of Rotter

1.2.2 Need versus demand for orthodontic care:

Objective measures of malocclusion or need for orthodontic treatment does not translate directly into perceived demand, which may or may not result in actual care. Nevertheless, the demand for orthodontic treatment continues to increase for both children and adults.. In other words, the difference between demands or the desire to seek orthodontic treatment and actually receiving it is a function of acceptability based on the willingness to comply with temporal and financial requirements of a successful outcome. Thus, what the clinician thinks is best for the patient is not necessarily what the patient and/or parent wants. Note, for example (Miner et al. ,2007), who found differences among the perceived preferences of patients, parents, and clinicians, as shown in Figure4 . In addition to the assumed skill of the clinician the actual and perceived behaviors of the orthodontist and staff, including physical appearance, are major factors . For example, politeness, providing accurate information to enhance health literacy, reassurance etc. Such demonstration of concern is significantly correlated with compliance and ultimately patient satisfaction (Sinha et al., 1996).

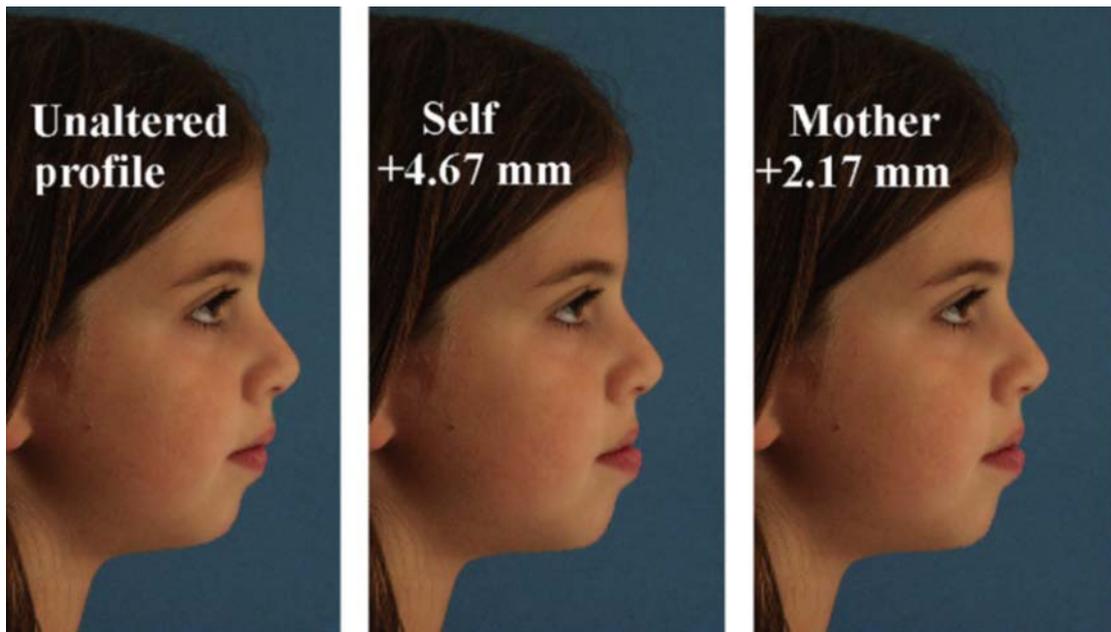


Figure4: Results for most accurate task displaying least accurate patient/mother.

1.2.3 Patient-Centered Care Versus Practitioner Centered Care:

Traditionally, orthodontic treatment has been prescribed by the practitioner based on defined professional standards without considering the priorities and capabilities of the patient. Patients who fail to follow prescribed instruction are labeled as "noncompliant", this is often done without considering the fact that the treatment prescribed may not have taken into account the capabilities, motivations, and expectations of each individual patient. Hence, patients have had to bear the burden and the outcome of noncompliance rather than considering the inability of the practitioner to understand individual patient needs and to make appropriate treatment plans.

A patient-centered approach would place some of the responsibility of successful patient compliance on the practitioner. The practitioner would prescribe treatment plans based on individual patient expectations priorities, Repeated treatment progress re-evaluations and patient/parent consultations are a key component of success in this proposed model. (Ramsay and Dougals, 2000).

In the orthodontic treatment realm, key issues that relate to this concept fall:

(1) Patient education

(2) Patient empowerment and contracting procedures (Sinha and Parmod, 2000).

(3) Contracting procedures.

1.2.3.1 Educational Psychology: Patient Learning Styles:

One of the most promising areas of current research in patient cooperation is the area of educational psychology notably the application of experiential learning theory and patient learning styles. It is often assumed that the word doctor implies healer. In reality, the word comes from the Latin docere, which means to teach. Originally, the word doctor meant someone who teaches. (Steed in 1998), was the first to explore the orthodontist-patient relationship from the perspective of a teacher-student relationship rather than that of healer-patient relationship. Through the application of experiential learning theory, significant advances have been made in diverse areas of education including diabetic patient education, smoking cessation programs corporate personnel training and classroom management for adolescent students (Kolb et al. 1984) as shown in figure 5.

(Steed in 1998) reasoned that if the orthodontist was trying to teach the adolescent patient how to cooperate for treatment success rather than dictating a set of doctor's orders, the application of experiential learning theory to clinical orthodontics may meet with success similar to that achieved in the areas previously mentioned.

Various demonstration tools are available to aid in the education process. Good standard patient records such as study casts and photographs can be used to describe the problem. A presentation customized for the patient by different commercially available computer software programs is an excellent method for explaining mechanics and appliances (Ramsay and Dougals, 2000).

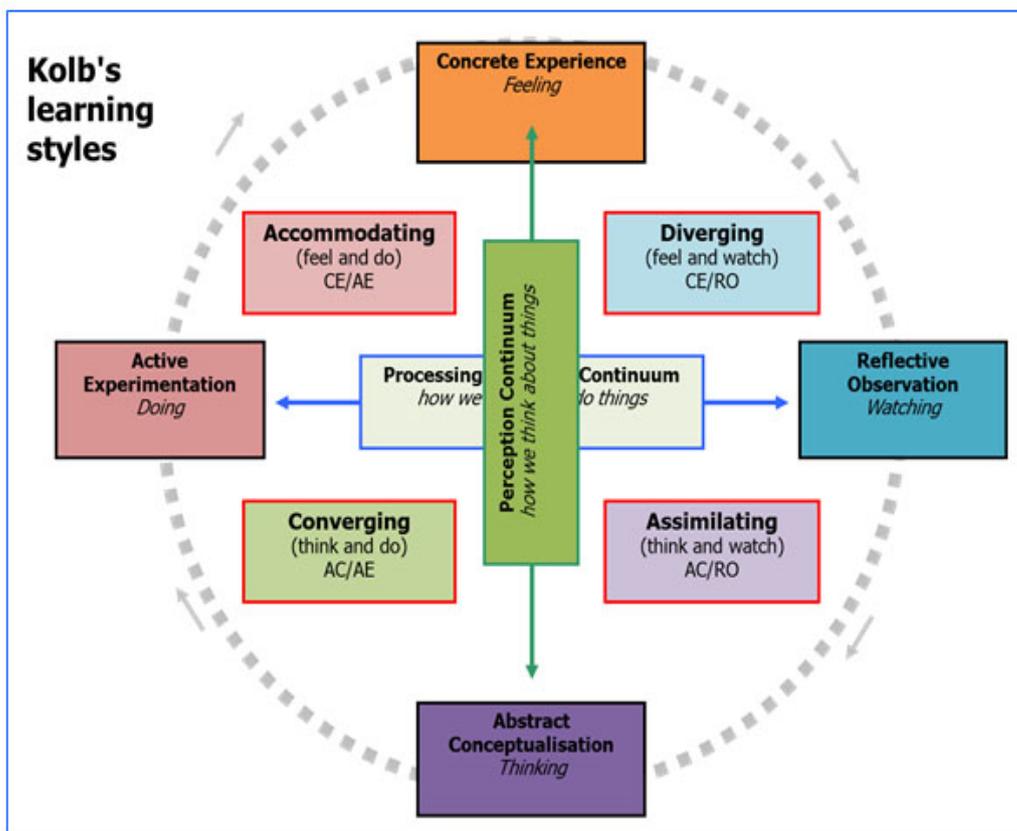


Figure 5: Kolb learning style.

1.2.3.2 Patient Empowerment:

Educating patients regarding their condition gives them the tools to make informed decisions. The individual feels involved in the process of selecting what is most suited for the necessary change, sometimes the patient's decision conflicts with their best interests and also goes against the wishes of the parents regarding possible outcomes. In these situations, flexible treatment strategies need to be devised in order to succeed. A compromise treatment plan may offer the best solution in some instances. In other situations, a suggestion to postpone treatment or the decision to withdraw from seeking treatment may solve the conflict. Most often, alternatives are available and should be offered following an understanding of the limitations of different approaches (Sinha and Parmod ,2000). Once a decision has been reached using this process, the patient is empowered and selects a treatment option from choices offered. This process obligates the patients to comply with a previously reached agreement.

1.2.3.3 Contracting Procedures:

Once a decision has been reached using this process, the patient is empowered and selects a treatment option from choices offered. This process obligates the patient to comply with a previously reached agreement. Continuing this process, a contract is made with the patient to reconfirm the previous choice. This approach has been successful in improving compliance in different areas of orthodontic care (Rubin ,1995; Gross et al., 1991) .

1.2.4 Rewarding Compliant Behavior:

Improving patient compliance in day-to-day practice is very challenging and often a complex problem. Behavior modification by way of a reward program can be effective in improving patient compliance to prescribed instructions. In the orthodontic literature, recommendations establishing a reward program to motivate patients and improve patient compliance have been cited..%15-20 A study carried out at the University of Oklahoma revealed the following findings regarding the use of awards as a motivating tool (Richter et al., 1998).

1-The award/reward program resulted in improvement in patient compliance scores in below average compliers as reflected in the improvement of oral hygiene scores (Richter et al., 1998).

2-Above average compliers remained above average throughout the length of the study, below average compliers improved with rewards however, they never reached the compliance levels achieved by the above average compliers (Richter et al. ,1998).

1.3 Communication and health literacy:

The first step in motivating patients to participate in orthodontic treatment should be to facilitate effective communication among patients, surrogates, and clinicians about the importance of morphology and function of the orofacial area to overall physical and mental health (Colgate,2006 ;Jontell and Glick, 2009) the second step is to discuss the advantages and disadvantages of orthodontic treatment. Specifically, does the patient understand the importance of a realistic treatment and is the patient willing to do what is necessary to comply with treatment protocols.

Health literacy is defined as ‘the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions. Poor health literacy is a better predictor of poor health status than age, income, employment, education level, or race (Kutner et al., 2006). As orthodontic treatment may be uncomfortable, inconvenient or costly, patients with low health literacy may not fully comprehend the biological reasons for orthodontic treatment. Such patients also may not appreciate the esthetic and oral health benefits or the importance of keeping appointments, perhaps the most critical information to be communicated for a successful treatment outcome is the need for the patient to understand the differences between objective cephalometric data and subjectively determined profile preferences, that is, this distinction is necessary to determine the patient’s self-perception of his or her actual facial configuration relative to what changes are being planned and why; and then how the patient feels about these proposed changes. Unfortunately, many misunderstandings about expected changes become examples of deficiencies in health literacy or rather illiteracy. Even the meaning of words used to describe existing and/or desired changes may differ between patient and clinician. To overcome this problem a simple binary classification is suggested, similar to that used with the quantitative, psychophysical facial perception , (Prahl-Anderson et al., 1979).

What is considered attractive or preferred obviously differs among dental health professionals and lay persons In addition to maximizing cooperation and mutual satisfaction the use of quantitative methods to establish a range of proposed or preferred changes, rather than a series of single static photo images, will reduce the risk of medicolegal action resulting from unfulfilled expectations which may well have been unrealistic.

Thus, it behooves the orthodontist to provide the patient with enough understandable information to agree with an acceptable and realistic expectation of treatment outcome. The treatment process itself can also be the source of disruptive and unnecessary agitation. For example, the problem may simply be due to the failure to explain that biomechanical movement of teeth can cause unpleasantness or pain as the result of unexpected stimulation of tactile or proprioceptive receptors in the periodontal membrane (Giddon et al., 2007). To anticipate problems with patients, it is essential to obtain a detailed medical and social history with clinical observations laboratory for effective treatment.

1.3.1 Cognitions, emotions, and behavior influencing motivation for orthodontic treatment:

The psychosocial variables intervening between need and demand for treatment can be conceptualized into three domains: cognition, which includes memories and perceptions or what we think about verbal or nonverbal communications between patients and clinicians, the accuracy of which is as noted in the previous section 'Communication and health literacy'. The affective domain includes emotion and associated neurophysiological responses, including facial expression, or how we feel about the communication. Emotions also provide cues to intended behaviors regarding whether or not to seek treatment. Attitudes then denote the directionality and magnitude of feeling about the transferred information. Beliefs reflect the influence of age, gender, ethno-cultural and socioeconomic variables determining personal values indicating why we feel the way we do about changes in the facial morphology (Giddon, 2011).

Emotions certainly enter into a child's decision to accept treatment because of being teased or bullied related to his or her Class II malocclusion, or reject treatment because braces make him or her look different.

The behavioral domain has three clinically distinct categories:

(a) volitional, (b) semi-volitional, (c) nonvolitional.

Volitional behaviors refer to an individual's intended actions mediated by the somatic nervous system, e.g for speech, preventive oral health, keeping appointments; or conversely, noncompliant actions such as not wearing headgear or elastics, making inappropriate verbal comments, or unreasonable demands such as debonding before an important social event.

Also mediated by the somatic nervous system are the semi-volitional behaviors, such as breathing, facial expressions, and most, pernicious habits, such as tongue thrusting, nail biting clenching, smoking, and gum chewing or gagging. Nonvolitional behaviors are primarily under the control of the autonomic nervous and neurohormonal system, of which the patient is not usually aware, such as changes in salivary flow, diaphoretic activity on the upper lip and, ventral surface of the hand, pupillary dilation, palpitations and other responses associated with anxiety, depression, or discomfort related to mechanical tooth movement (Giddon et al., 2007).

Each individual in fact has a unique and consistent, pattern of responses across different stressors (Bakal, 1992; Belsky and Pluess, 2009). The magnitude and duration of these responses may vary on a continuum from simple annoyance to severely disruptive psychopathology. Of relevance to orthodontists is the demonstration of greater psychophysiological responses to simulated distortion of one's own profile than found with distortion of a neutral profile (Amram et al., 1998).

1.4 Oral habits :

There is a great deal of controversy in the literature concerning the causes and treatment of oral habits. Much of what has been written has been based on clinical observation and on psychoanalytic theory which is difficult to investigate experimentally (Ukru et al., 2011). Thumb-sucking is considered as a manifestation of infantile sexuality. Thus (Kanner in 1950) suggested that one of the first steps in the treatment of the child should be directed to parental attitudes and that the parents should be reassured that no harm will be done to the child if the habit is ceased. Further, he suggested that the child should be kept busy and interested in doing things which occupy his/her hands. Many studies warned that forcible cessation of the habit could bring about dire results such as sexual frigidity in later years.

The psychological treatment provided involved two parts. The first part was an effort to gain the child's cooperation in breaking the thumb-sucking habit. This was achieved by (1) showing the child, by means of a mirror, the deformation in his/her own mouth caused by thumb-sucking; (2) showing the child plaster models and color photographs of the malocclusion, tongue thrust and abnormality of the lip and other structures caused by thumb-sucking; and (3) motivating the child by creating a desire to break the habit. The second part involved educating the parents on the effects of thumb-sucking and to enforce the basic laws of learning psychology to reward the child for not sucking his/her thumb (Ukru et al., 2011).

Habit reversal therapy (HRT) is currently regarded as a well-established and efficacious treatment for habit disorders such as thumb-sucking (Bate and malouff ,2011;Woods, 1999;Woods and Miltenberger, 1995). HRT was initially developed to treat the autistic behaviour of mentally-challenged and autistic children with or without oral habits ;and was found to be effective in cessation of thumb-sucking in oral habits of two normal children, nowadays, HRT is commonly used to treat tic disorders; habit disorders such as trichotillothomania (compulsive hair pulling), nail biting, temporomandibular disorder thumb-sucking and repetitive oral-digital habits (Woods and Miltenberger ,1995). The original version organized into five phases: (a) awareness training, (b) relaxation training c) competing response training, (d) motivation procedures and (e) generalization training .A simplified version of the HRT is more routinely used nowadays as the original version is time and labor intensive. The simplified version consists of awareness training, competing response training and a social support component (Bate and malouff, 2011;Woods et al., 1999). A number of studies have reinforced the efficacy of HRT in reducing the oral-digit habits in children (Bate and malouff ,2011;Woods et al., 1999; Woods and Miltenberger ,1995).

This impacts not only physical treatment modalities such as tongue cribs, but also the psychological support and education to better equip the child to cease a habit.

(A) Awareness training is based on the premise that increased awareness of behavior facilitates self-control (Piacentini and Chang, 2005). A client is taught to discriminate each occurrence of the habit, including the environmental antecedents that precede its manifestation. Awareness training components include: (a) response description identification of occurrences surrounding performance of the target behavior, (b) response detection: self-observation and diary monitoring of the topography, frequency and severity of target movements, (c) early warning: focusing on the sensations preceding behavior onset, and (d) situation awareness: acknowledgement of high-risk situations for the target behavior.

(B) Relaxation training is based on the premise that increases in stress lead to increases in habit behaviors (Piacentini and Chang, 2005). However, some experts have noted that the effects of relaxation training on the occurrence of target behavior have not been observed to generalize outside treatment sessions (Adams and Miltenberger, 2008; Piacentini and Chang, 2005).

(C) Competing response training has the aim of rendering performance of the undesirable behavior impossible due to the use of antagonist muscles to the behavior (O'Connor, 2005). This antagonistic response serves to normalize the behavior by replacing it with a less conspicuous action. Azrin and Nunn in 1973 proposed that the competing response should (a) be opposite to the target behavior, (b) be able to be maintained for several minutes (Woods and Miltenberger, 1995).

c) produce heightened awareness of the behavior through muscle contraction, (d) be socially inconspicuous, (e) be compatible with normal activity, and (f) should strengthen the muscles antagonistic to the target behavior (Piacentini and Chang, 2005).

Competing responses include the following: For tics, isometric tensing of muscles opposite to the tic movement (Azrin and Peterson, 1990); for stuttering, breathing slowly, deeply, and regularly, relaxing chest and throat muscles, and speaking upon exhaling (Waterloo and Gotestam, 1998) for thumbsucking, clenching both fists with the thumb inside Adams in 2008 and Miltenberger in 2008 describe other competing responses for various repetitive behavior disorders.

(D) Motivation training techniques are used to enhance the acceptability of HRT to children and their families (Piacentini and Chang, 2005) and to encourage treatment compliance. The three standard motivational techniques are (a) a habit inconvenience review that involves identification of the impairments, problems and discomforts caused by the habit, (b) social support training involving the recruitment of a person in the client's life to provide encouragement and support (e.g prompts to use the competing response) in order to aid implementation of the procedures (Woods, 2006), and (c) public display, involving public performance and demonstration of the client's control of the target behavior.

(E) Generalization training involves symbolic rehearsal in which the client imagines successful control in situations identified during the awareness Miltenberger, stage (Adams et al., 2008; O'Connor, 2005; Woods and Miltenberger, 1995). With each situation the client imagines beginning the target behavior, stopping the behavior, and performing the competing response (Miltenberger, Fuqua, and Woods, 1998). Azrin and Nunn (1973) tested the original treatment procedure for HRT in just one treatment study.

Contemporary applications of HRT follow this precedent and are typically implemented in a small number of sessions, followed by booster sessions as required (Adams et al., 2008). Woods (2006) described a short form of HRT as consisting of three sessions. The first session is devoted to clinical assessment of the client's intellectual, psychological and social functioning, and habit severity, typically in a 2 to 3 h period. The primary objective of session two is the implementation of HRT.

Woods in 2006 noted that, if more than one habit is present successful applications should focus on a single target behavior. In this case, a habit hierarchy is established based on the participant's subjective rating of the distress elicited by each habit (Piacentini and Chang, 2005), and each behavior is addressed sequentially from most to least distressing. Finally, the third session includes a review of the HRT procedure and the investigation of any problems that may have arisen throughout the course of treatment (Woods, 2006).

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