A behavioristic approach to oral hygiene

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The art of treating malocclusions is progressively becoming more of a predictable science. This is due, in part, to the development of sophisticated growth and treatment predictions,[1] an improved understanding of biology,[8-13] and appliances that are more compatible with natural tooth positions.[2-3] This improvement in technical abilities continues to be limited by a highly variable feature of orthodontic practice, namely, the ability of the patient to cooperate in his treatment.

The most discernible mark of orthodontic patients' cooperative ability is still their oral hygiene habits. While the permissive wearing of elastics or headgear is sometimes difficult to evaluate objectively, the quality of personal oral hygiene is quite easy to judge accurately.

Many studies and publications have emphasized the importance of good oral hygiene during orthodontic treatment.[4-7] Most of the articles written on orthodontic patients' oral hygiene have emphasized the hygiene technique, per se, to the exclusion of how one might influence the patient to adopt a particular regimen. In fact, there is very little in the orthodontic literature that speaks to the question of how a patient might be motivated to cooperate in orthodontic treatment,[8-9] and even less is said about specific recommendations for modifying patients' behavior.

This lack of specific information may be due to the acceptance and advocacy of the historically popular *medical model* of human behavior. This view is taken from psychoanalysis, psychiatry, and medicine. Its basic feature is the idea of *inner cause and outer symptoms.*[10] In other words, in the traditional medical model, inner problems cause outer problems and proper treatment seeks to eliminate the inner problem. Throughout medical and dental training, young doctors are constantly admonished to treat the disease and not just the symptoms, and this is sound advice when one is treating physical diseases.

The traditional medical approach is to discover and remedy some condition *within* the person which is producing some outer effect. However, this idea of etiologic treatment of physical diseases is so advanced in western civilization that

it has also shaped the thinking of those who deal with issues of emotional, mental, and behavioral adjustment. Sigmund Freud and many subsequent inquirers have accepted this medical model as a basis for their theories and practices. That is, behavioral problems are nothing more than symptoms of inner conflict and frustrations. In this view, all outer behavior is an indication of our inner mental state. If we are frustrated inside, our manifested life style will be maladjusted some way.

The medical model clearly implies the need for skilled professional diagnosis and treatment of the problems of adjustment. It is no wonder, then, that there is such a short supply of information about the resolution of noncooperative behaviors in orthodontic patients. If we subscribe to the popular medical model, the reasons for such maladjusted behaviors are unlimited and require an entire new discipline which is not included in the ordinary orthodontic curriculum.

The ordinary orthodontist, then, with his meager and usually limited psychological background, approaches a noncooperative patient at something of a disadvantage. From the medical model viewpoint, a noncooperating youngster's attitude has a deep-seated basis which the orthodontist is incompetent to diagnose, much less treat. Thus, a state of mutual resentment settles in, and any progress that occurs is slow and is achieved in spite of what the patient does.

Within the past few decades a somewhat new approach to problems of behavioral adjustment has begun to emerge. This psychological discipline, which ignores the medical model of emotional and behavioral maladjustment, is known as behaviorism.[11] The appeal that behaviorism has for dentistry generally and orthodontics specifically is that it offers some principles for modifying patients' behavior that are routinely successful, acceptable to the patient, and do not require a vast amount of training to implement.

The remainder of this article will be devoted to a description of an oral hygiene technique that has evolved in a private orthodontic practice using behavioristic principles. Specifically, these principles are *modeling*, *reinforcement*, and *shaping*.

Modeling

A useful technique in teaching any new behavior is for the learner to observe the successful achievement of the goal he has in mind. Although some have objected to initiative learning as unauthentic, there is a wealth of evidence that modeling is the way we learn almost everything.[12-13] In fact, the most economical kind of human learning is imitative. Even Will Durant[14] has suggested that only idiots are truly original. Quite often, by observing good models, one can perform very complicated behavior accurately on the first try.

In this oral hygiene technique, modeling consists of demonstrating to the patient, in his own mouth, as he observes in a mirror:

1. How to stain plaque (Fig. 1).
2. How to hold and position the brush so that the soft bristles go under the gingiva (Fig. 2).
3. How to vibrate the brush in this position so that the teeth are cleaned and the gingiva is stimulated.

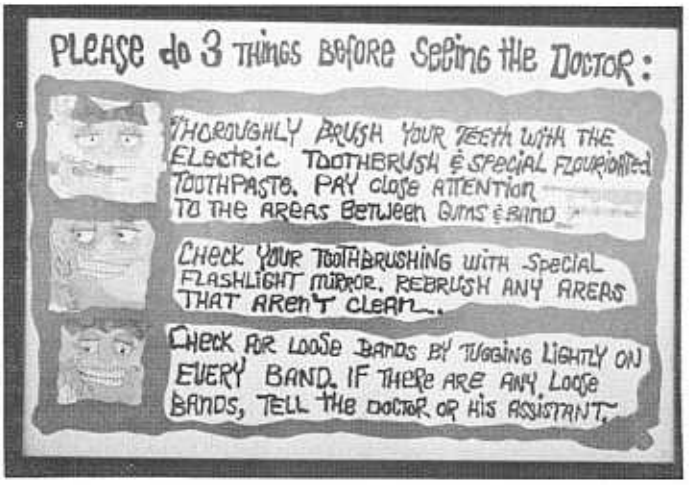

Fig. 1. Wall poster reminds patients of oral hygiene techniques at each visit.

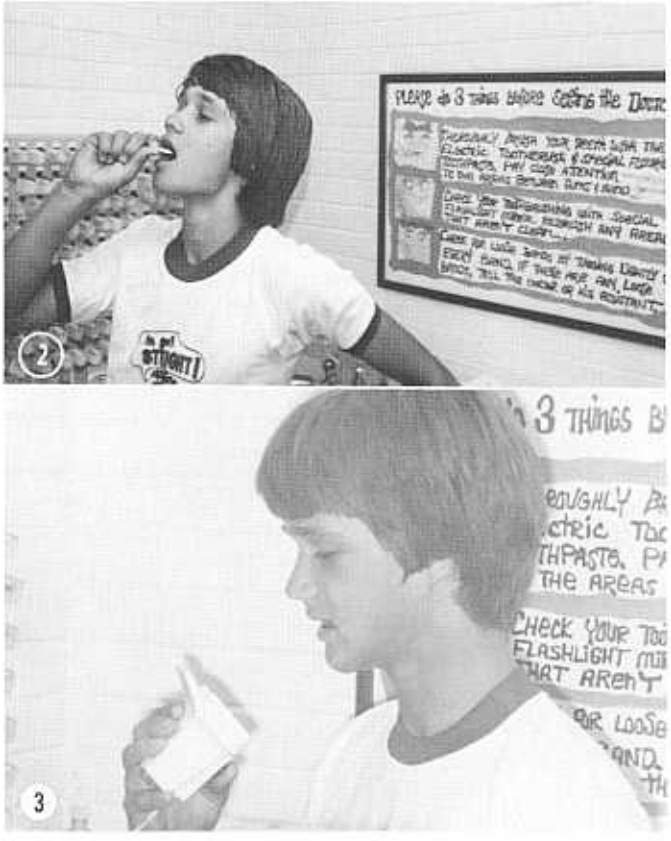

Fig. 2. Patient staining plaque prior to brushing.

Fig. 3. After brushing, patient checks for any remaining plaque with a plaque light.

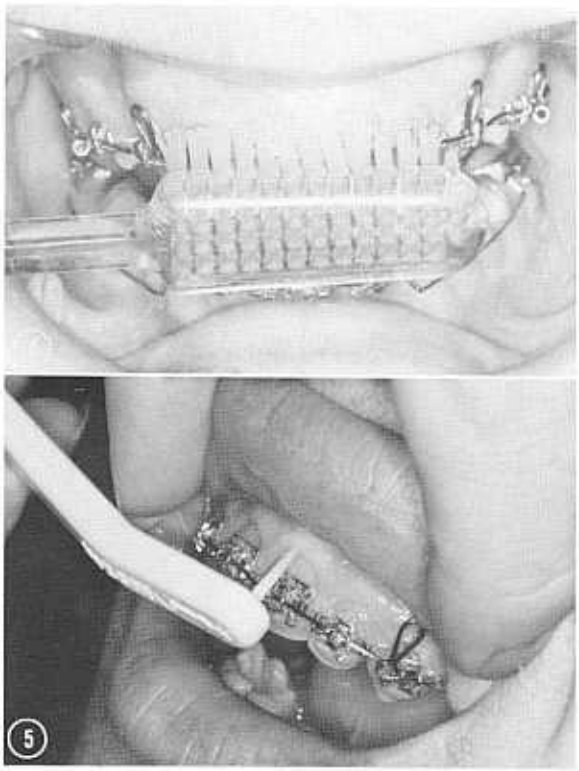

Fig. 4. Soft-brush bristles are positioned beneath the gingival margin.

Fig. 5. The interdental stimulator is positioned under the free gingival margin.

4. How to check for the signs of remaining plaque after brushing (Fig. 3).
5. How to place an interdental stimulator (toothpick) under the gingiva to break up plaque that might remain untouched by the toothbrush (Fig. 4).

As the patient watches and participates in this demonstration that is performed in his own mouth, he is given immediate feedback from the orthodontic assistant as to the success of his efforts. This immediate knowledge of results allows the patient to learn more quickly[15] (Fig. 5).

After this initial modeling and reflective exercise, the patient is shown an audio-visual filmstrip that again models the information and technique that he has just experienced (Fig. 6). At the conclusion of this film viewing, the assistant comes back into the room and questions the patient on what he has just seen and heard. For most persons total memory of an event is increased if visual memories are converted to auditory storage by verbal rehearsal. Obviously, ancient teachers who required recitation in class understood how learning was best accomplished. At any rate, this immediate feedback allows the patient to gain an accurate idea of what his current oral hygiene knowledge is.

After the feedback period is finished, the patient is again asked to perform, with the aid of a mirror, the techniques of brushing and interdental stimulation

Fig. 6. The orthodontic assistant provides continual feedback to patient during the instruction period.

Fig. 7. The patient and parent monitor an oral hygiene audio-visual program prior to being tested on the information.

that he has just learned. Again, immediate feedback on his success is registered by the assistant.

Reinforcement

If one had to express the essence of behaviorism, it would simply be that "behavior is controlled to a large extent by its consequence."

There are two broad classes of consequences: (1) rewarding consequences, which are also known as positive reinforcements, and (2) punishing consequences, or negative reinforcements.

Skinner has reliably shown that learning is quicker and easier when positive reinforcement outweighs negative reinforcement, and this positive approach is the main basis for our reinforcement schedule.

A positive reinforcer, then, is any consequence that strengthens behavior by its added presence, whereas a negative reinforcer is any consequence that

strengthens behavior by its being subtracted from the situation. A negative reinforcer has the power to increase the rate of behavior by its removal. There is a very subtle but vital feature of negative or aversive stimuli that must be emphasized at this point if we are to understand fully the role that these punishing stimuli can play in a successful behavioristic scheme.

If the negative reinforcement is delivered after the behavior is performed, it is simple, pure punishment and, as such, will reduce the probability of that behavior being performed again. The biggest advantage of pure punishment is that it can be depended upon to extinguish or inhibit unwanted behavior if the punishment is severe enough and as long as the threat of punishment exists.[16] However, if we, through our behavior, could prevent an expected punishment from being delivered, then that behavior would be rewarding. That is, we are reinforced by performing an act that eliminates or prevents a painful experience, and the negative reinforcement could be expected to strengthen our readiness to repeat this behavior under similar circumstances.

It often is difficult to understand the difference between pure punishment and negative reinforcement, but that difference is enormous. Pure punishment produces many side effects that are not evoked by negative reinforcement—emotional arousal, unhappiness, unpleasant feelings, and counteraggressive behaviors. Once these effects are produced, they become counterproductive to cooperative learning and can certainly lead to a doctor-patient impasse that may never be corrected. By avoiding a pure punishing consequence, we can avoid these unwanted side effects.

Another form of punishment that needs to be mentioned is the withdrawal of positive reinforcers. This type of punishment is slower in its effects and certainly is less emotionally disrupting. This type of aversive conditioning is used quite effectively in our reinforcement technique.

Aside from the undesirable side effects that punishment produces, perhaps the most severe limitation is its inability to teach new behaviors. The mere extinction of certain behaviors is seldom the total goal of orthodontists, because so much of their treatment depends upon the learning of new behaviors and skills by the patient. And punishment simply cannot do that alone.

However, the results of several experiments have consistently shown that unwanted behavior (an unhygienic mouth, in our case) can be effectively and quickly eliminated if the unwanted behavior is negatively reinforced while positive reinforcement is simultaneously offered for desired and competitive behaviors (in our case, a hygienically clean mouth).

The aversive stimulus in our practice is a "high-powered cleaner" made of quinine powder and flour of pumice. It is a bitter-tasting remedy with which the patient must brush if his oral hygiene is inadequate. The positive reinforcement, which is simultaneously competitive with the negative reinforcement, is a token economy. If the patient's oral hygiene is good, he is awarded points which he can accumulate and then exchange for a tangible reward.

A few features that need to be emphasized about the reinforcement procedures are (1) the grading system is not arbitrary, (2) it is not verbally abusive or insulting, and (3) a positive attitude is taken by the examining assistant.

The orthodontic assistant gives the patient a hand mirror and says: "I'm sorry I can't give you any points today because you left some plaque in your mouth. Can you see it in the mirror? Now, you wouldn't want me to give you any points for that kind of brushing, would you?" Inevitably the youngster answers: "No, I really don't deserve it today." This approach prevents any acrimony or misunderstanding because, in essence, the patient has judged himself and this delivers him from a threatening situation that would occur if someone else were judgmental.

The assistant then tells the patient that since plaque is still in his mouth he needs to use some of the "high-powered cleaner" to rid himself of the plaque. It should be noted that the use of the "high-powered cleaner" is, in fact, pure punishment, but as the patient begins to avoid its application by brushing well, it becomes a negative reinforcer without the unwanted side effects of pure punishment.

If the patient's mouth is clean, the assistant congratulates him (positive reinforcement) and tells him how many points he has just earned and what his current point total is (more positive reinforcement).

A third feature of importance in our oral hygiene technique is that the reinforcements are given immediately and are contingent upon the behavior we wish to promote. It is known that behavior is influenced not only by contingencies but by the temporal aspects of reinforcement. The desirability of immediate feedback was mentioned previously in the discussion of modeling.

When one selects reinforcers that are strong enough to evoke responses (and ours seem to be) and makes these reinforcements absolutely contingent upon the desired behavior, as we attempt to do, it is remarkable how quickly patients get the message and begin to exhibit oral hygiene that is par excellence.

Shaping

The last behavioristic principle that I want to mention is shaping, or the reinforcement of successive approximations. This is a brief, arcane manner of describing that technique of getting someone to learn a new way of doing things by starting where he is and rewarding every small step in the direction of the thing you want him to do.[17]

New, complex behaviors seldom emerge quickly and successfully, because difficult tasks take time, thought, and patience to develop. We have to crawl before we walk and to walk before we run. But if we can break the ultimate goal or task into smaller, more manageable parts and reward the step-by-step approximations of each subgoal, we will eventually come to possess the new, desired behavior. The logic of shaping is simple: One is much more likely to take a small, successful, limited step than a giant one. When people fail in the teaching and learning of new behaviors, it is almost always because they "bite off more than they can chew." If, by analysis, the task can be broken into simpler and simpler parts, we can, theoretically, reduce steps to painless, understandable, and repeatable events.

In an orthodontic practice new and sometimes complex behaviors, such as the wearing of elastics, headgear, myofunctional exercises, etc., must be taught. If we overload the patient with too many complicated tasks at once, he may very

well decide not to do any of them. I am convinced this is the cause of a great deal of poor cooperation. What we must do is to lead patients gradually from simple tasks to the more difficult ones.

In orthodontics, the primary task is adequate personal oral hygiene. In my own experience, if that is not learned, other shaping efforts usually fail. Why a behavior such as maintaining a clean mouth should be related to the ability to wear a headgear successfully is not known—at least, by me—but research is being done on the interrelatedness of behaviors, and we may soon be correcting many kinds of secondary behaviors that, on the surface, have little to do with the primary behavior defect.

At any rate, we ought not put the cart before the horse, because, in my own experience, it is not likely to succeed. The successful shaping of orthodontic behaviors must start with a thorough understanding and practice of good personal oral hygiene. Otherwise, both orthodontist and patient are going to be disappointed with the final result.

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