Fear and anxiety are frequently given as reasons many persons fail to seek out or continue dental treatment. Even when the patient is not a truly phobic individual, anxiety and fear are believed to interfere with or hinder dental treatment (Gale and Ayer, 1969; Filewich, Jackson, and Shore, 1981). Statistical estimates for children having fear of dentistry (Weinstein, 1980; Stricker and Howitt, 1965) range from 6 percent to 16 percent. Anecdotal accounts place the percentage at a much higher rate. Estimates for adult phobic patients are about 6 percent (Shoben and Borland, 1954; Friedson and Feldman, 1958). For severely anxious patients the range is similar to that observed for children.

**EFFECT OF HIGH FEAR AND ANXIETY ON OFFICE PRACTICE**

Filewich and his colleagues (1981) have investigated the effects of high fear and anxiety on the efficiency of dental practice. Their findings indicated that high-fear patients required approximately 20 percent more chair time than did low-fear dental patients. Although cavity preparation time was essentially the same for both low-fear and high-fear groups (as measured by drilling time), the high-fear group was characterized by more frequent interruptions during cavity preparation.

Thus dental fear and anxiety not only prevent patients from seeking treatment, but also interfere with the efficiency of treatment. This finding justifies the concern of many behavioral scientists that dentists must learn and utilize various management techniques to relieve fear and anxiety in their patients not only for the patient's sake, but for the potential economic impact such fear has on the business practice of dentistry.
DEFINITION OF ANXIETY AND FEAR

Everyone experiences anxiety sometime during the normal course of living. Anxiety maintained beyond what appears to be warranted becomes maladaptive and results in maladaptive behaviors. In other words, beyond some acceptable level, anxiety begins to distort experiences and learning and prohibits the development of normal adaptive reactions. A dentally anxious individual may postpone or cancel appointments. The true dental phobic may avoid dental appointments completely.

A dramatic example was reported by Wolpe (1958), who described the case of a dentist who became increasingly anxious about giving local anesthesia injections because of a progressively intensifying fear that the patient would die. He eventually stopped giving injections, with profound consequences for his practice. Gale and Ayer (1969) described the case of a man who was so frightened of dentistry that he drove out of his way to work to avoid going past the family dentist's office. Although these examples may appear extreme, they illustrate how severe anxiety and fear may intrude on many aspects of life.

Anxiety may be manifested in cognitive, psychophysiological, and behavioral spheres. All three spheres may be active in an anxious individual, although it is quite common for the three to show no correlation. Cognitively, the individual may experience apprehension, dread, fear of impending disaster or death, etc. Psychophysiologic activity may occur, such as heart rate increases, sweating, and elevated blood pressure. Behavior manifestations include tremor, jumpiness, disruptive or uncooperative behavior, grimaces, and random movement.

Since the manifestations are frequently uncorrelated and individuals react differently, these factors have required the development of measures of anxiety appropriate for each system.

MEASUREMENT OF DENTAL FEAR AND ANXIETY

Measures of anxiety and fear are categorized as cognitive, psychophysiological, and behavioral.

Cognitive Measures

Cognitive measures are largely self-report tests and may include a list of statements or questions to which the patient is requested to re-
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spond. They may also include some forms of projective tests. The early self-report or questionnaire tests were derived largely from psychology tests such as the Manifest Anxiety Scale, the Spielberger-Trait Anxiety Scale, the Draw-a-Person Test, and others. The Spielberger Scale has been particularly useful in the study of anxiety. It measures at least two types of anxiety—situational anxiety or anxiety due to some situation or impending event (such as a dental appointment), or long-standing general anxiety. This scale has shown good reliability and validity.

The length of these scales has encouraged other investigators to develop new scales more appropriate to dentistry. Corah (1969) developed a four-item scale to measure dental fear or anxiety (see Exhibit 4.1). The Corah Dental Anxiety Scale (CDAS) readily distinguishes mildly anxious individuals from severely phobic ones in scores ranging from 4 to 20.

EXHIBIT 4.1. The Corah Dental Anxiety Scale (CDAS).

1. If you had to go to the dentist tomorrow, how would you feel about it?
   A. I would look forward to it as a reasonably enjoyable experience.
   B. I would not care one way or the other.
   C. I would be a little uneasy about it.
   D. I would be afraid that it would be unpleasant and painful.
   E. I would be very frightened of what the dentist might do.

2. When you are waiting in the dentist's office for a turn in the chair, how do you feel?
   A. Relaxed
   B. A little uneasy
   C. Tense
   D. Anxious
   E. So anxious that I sometimes break out in a sweat or almost feel physically sick

3. When you are in the dentist's chair waiting while he gets his drill ready to begin working on your teeth, how do you feel? (Same alternatives as #2)

4. You are in the dentist's chair to have your teeth cleaned. While you are waiting and the dentist is getting out the instruments that he will use to scrape your teeth around the gums, how do you feel? (Same alternatives as #2)

Source: Taken from Corah, 1969.
Corah has also demonstrated a reduction in scores of dental-phobic patients who have completed courses in behavior therapy. Weisenberg, Kriendler, and Schachat (1974) have translated the scale into Spanish and have demonstrated its utility for cross-cultural research. The scale is available in Swedish as well as several other languages.

When assessing anxiety in children, the inability to read and follow instructions has necessitated the so-called projective tests. These, as noted earlier, have developed out of the Draw-a-Person Test. This test assumes that if an individual is given a sheet of 9 x 11 paper and asked to draw a same-sex person, the size of the drawing will show the amount of anxiety the child (or adult) is experiencing. A smaller, constricted drawing reflects greater amounts of anxiety. Because no objective methods of scoring have been developed, they are simply interpreted as showing anxiety or as not showing anxiety. As a result, researchers have attempted to devise other tests.

Venham (Sonnenberg and Venham, 1977) designed cartoon figures to measure situational anxiety in young children. The children were asked to identify the cartoon figures they believed were most like themselves. The score is determined by the number of times the child picks the unhappiest cartoon figure of each pair (thus possible scores range from 0 to 8). Venham’s test correlated moderately with other measures of clinical anxiety and indicated the need for more sensitive ways to measure anxiety in children.

Psychophysiological Measures of Anxiety

The physiological measures used in the study of anxiety and fear are actually arousal measures which are assumed to be related to anxiety. Increased heart rate prior to a dental appointment or procedure may be interpreted as indicating anxiety. Although sweating may actually be the result of an extremely hot day, it may also be related to some anxiety-producing event.

The psychophysiological measures include heart rate, galvanic skin response, blood pressure, Palmer Sweat Index, and muscle tension. These measures may be subject to misinterpretation unless they are utilized by individuals who are skilled and knowledgeable in their usage.
Behavioral Measures

Of major interest to researchers has been the development of reliable and valid ways to measure behavior in the dental treatment setting. One of the first scales was developed by Frankl (Frankl, Shiere, and Fogels, 1962) to evaluate specific behaviors of children during specific segments of the dental visit (Exhibit 4.2). Many investigators have utilized this scale or some modification of it. It has been easier to quantify disruptive behaviors than cooperative behaviors. As expected, disruptive behaviors have been of more concern in clinical practice than have cooperative behaviors, because disruptive behavior interferes with dental treatment.

Machen and colleagues (1983) believed that the literature consistently focused on eight negative behaviors: head movement, high hands, low hands, torso-trunk movement, leg movement, crying protest, verbal protest (noncrying), and oral physical resistance. These behaviors are considered negative because they may interfere with dental treatment and are potentially dangerous during dental treat-

EXHIBIT 4.2. Behavior Rating Scale.

<table>
<thead>
<tr>
<th>Rating</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Definitely negative&lt;br&gt;Refusal of treatment, crying forcefully, fearful, or any other overt evidence of extreme negativism</td>
</tr>
<tr>
<td>2</td>
<td>Negative</td>
</tr>
<tr>
<td>3</td>
<td>Positive&lt;br&gt;Acceptance of treatment; at times cautious&lt;br&gt;Willingness to comply with the dentist, at times with reservation, but follows the dentist's directions cooperatively</td>
</tr>
<tr>
<td>4</td>
<td>Definitely positive&lt;br&gt;Good rapport with the dentist, interested in dental procedures, laughing and enjoying the situation</td>
</tr>
</tbody>
</table>

ment, which requires that the patient remain relatively still and cooperative.

From their studies, they concluded that two negative behaviors—crying and oral physical resistance—correlated with the Frankl scale and that high hands and leg movements were also important discriminators of disruptive behaviors. They also felt that the measurement of these four behaviors was sufficient and reliable for evaluating child behaviors during dental treatment.

Depending on the needs of the investigator, other behavioral measurement devices are available that vary in complexity and ease.

**ORIGINS AND DEVELOPMENT OF FEAR AND ANXIETY**

Shoben and Borland (1954) concluded that the significant factor in the etiology of dental fears was that of the attitude of the patient's family toward dentistry. Forgione and Clark (1974) reanalyzed Shoben and Borland's data and concluded that fear and anxiety were the result of complex interactions of unfavorable experience, family attitudes, and traumatic facial experiences combined with low pain tolerance.

Kleinknecht, Klepac, and Alexander (1973) and Molin and Seeman (1970) also reported that unfavorable dental experiences as children were significant etiological factors in the development of dental fears and anxieties. Negative expectations from siblings and peers have also been cited (Morgan et al., 1980; Kleinknecht and Bernstein, 1979). A number of investigators reported indifferent professional behavior and fear of disapproval by the dentist as important (Bernstein, Kleinknecht, and Alexander, 1973; Gale, 1972).

In a study of British children, Shaw (1975) found that anxious children had been to the dentist earlier, had received more extractions, and had higher DMF (decayed, missing, and filled teeth) rates than nonanxious children. Females consistently show higher levels of fear and anxiety than do males.

Studies using adults share the common finding that unfavorable experiences as children with dentists are associated with fear and anxiety as adults (Molin and Seeman, 1970; Forgione and Clark, 1974). Fear of disapproval and insensitive approaches by the dentist
have begun to emerge as potential causes and may reflect the fact that such factors have only recently begun to be examined.

Few studies have examined the influences of socioeconomic background on the development of anxiety and fear. Children from upper socioeconomic backgrounds have been reported to be better behaved and less anxious than children from lower socioeconomic backgrounds (Wright and Alpern, 1971). One reason for this may be that higher socioeconomic status patients are healthier and thus typically require less treatment.

A potentially alarming development that dental fears may be increasing has been reported by Corah, Gale, and Ilig (1979). Although they were reluctant to speculate why this may be occurring, this finding warrants monitoring until it is confirmed.

**ANXIETY AND BEHAVIOR ACROSS DENTAL VISITS**

Although the patient may bring fears and anxieties about dental treatment to the office, theoretically, repeated exposure to the dental setting should eventually bring about some reduction in fear and anxiety and increased ability to tolerate treatment.

A few studies have examined changes in dental visit behaviors across multiple dental visits. These investigators have used heart rate changes, behavior changes, and anxiety measures in their studies. Koenigsberg and Johnson (1975) examined behavior changes in children who had no prior dental visit experience over three dental visits and found no significant changes in behavior across appointments. Stricker and Howitt (1965) studied cardiac rate in children and found that as the children became more familiar with dental treatment, their physiological arousal decreased. Initial and recall visits were noted to produce less arousal than examination or treatment visits.

Venham and his colleagues (Venham, Bengston, and Cipes, 1977; Venham and Quatrocelli, 1977) assessed heart rate, clinical anxiety, and cooperative behaviors in lower-middle-class children aged two to five years throughout six visits. They found that the children's behaviors became increasingly negative for the first four visits and then improved during the last two visits. They believed that the dental experience initially sensitized the children to stressful aspects of treatment,
but eventually permitted the children to discriminate among dental visits for stress. In other words, experience resulted in sensitization to the more stressful aspects of dental treatment and desensitization to the less stressful aspects.

**OTHER VARIABLES INFLUENCING ANXIETY AND FEAR**

A large body of conventional wisdom holds that other variables affect anxiety in the dental office. These include the color of the clinician’s gowns or clothing, office environment, and the area where the first examination or interview is conducted.

Cohen (1973) studied children’s attitudes toward dentist’s attire and concluded that the evidence did not support the hypothesis that children were affected by the color of the dentist’s smock. Unfortunately, he used children who had no previous dental experience and it is possible that a child could become sensitized to the dentist’s attire (regardless of color) across dental visits.

Jackson (1978) attempted to study dentists’ appearance (young bearded, midcareer “clean-cut,” and older graying dentists, all wearing white smocks) and office environment (aged and contemporary, and ultramodern dental operatory) using night school students (mean age = 20.5 years). He found no effect for dental appearance. He did find, however, that the ultramodern operatory was perceived as managed by the dentist charging the highest fees.

Although these factors have attracted much attention and discussion, it is remarkable that they have received virtually no scientific study.

**Effect of Mother’s Presence on Child Behavior in Operatory**

Whether it is best to have the mother in the operatory during treatment of her children continues to be debated among dentists. When the few studies that have addressed this issue are evaluated, it appears that the mother’s presence occupies a positive influence on children less than fifty months of age and has no effect on children older than fifty months of age (Frankl, Shiere, and Fogels, 1962).
MANAGING FEAR AND ANXIETY

The goal of patient management should be the development of a calm, comfortable, and cooperative patient who can tolerate dental treatment without undue stress (Trieger, 1974). This appears to be the case with most dental patients. However, other patients may be so fearful and anxious that they require general anesthesia, premedication, or some form of psychosedation to undergo emergency or initial treatment. All of these modalities represent forms of psychological management and should not be dismissed as being unwarranted when an obvious need exists to utilize them.

One can, however, make the argument that the goal of patient management should be the eventual weaning of the patient’s reliance on them, since most people require a lifetime of dental treatment and should be able to accept routine dental treatment and examinations with a minimum of emotional and physical discomfort.

Individuals who are phobic or severely anxious about dental treatment have several behavior therapy management techniques available to help them. These include modeling techniques, systematic desensitization, cognitive rehearsal techniques, and distraction or relaxation techniques.

Modeling Techniques

An important type of learning occurs by imitating or observing the behaviors of other persons. This is called observational learning, vicarious learning, or modeling, and represents a process through which one may learn a response without previously having performed that behavior (Bandura, 1977).

Many people consider modeling one of the most important forms of learning and substantial amounts of data indicate that such learning can be used effectively to aid individuals to acquire, strengthen, or extinguish various behaviors.

Modeling involves exposing an individual to the behavior of another (model) in a live situation (in vivo) or in a filmed or videotaped situation. Modeling has been found effective for children preparing to undergo dental or medical treatment.
The first attempt to use modeling techniques in dentistry was recorded by Adelson and Goldfried (1970). A shy, withdrawn, three-and-one-half-year-old girl who was apprehensive about dental treatment observed a gregarious four-year-old-girl (model) undergoing a dental examination. In the successful attempt the previously fearful child was able to cooperate during the examination and posed no behavior problems.

Since then, other studies using live or filmed models have consistently demonstrated that modeling is effective in reducing dental fears and disruptive dental behaviors in children (Machen and Johnson, 1974; Malamed, Weinstein, Hawes, and Katin-Borland, 1975; Malamed, Hawes, Heiby, and Glick, 1975). The results have shown significant decreases in disruptive behaviors both in children with prior dental experience and in naive children (children without previous dental experience). Models may be described as coping models or as mastery models. Coping models exhibit responses that are typical but can be coped with by the individual. A coping model, for example, might flinch when receiving an injection, but remain still. A master model would not flinch or show other signs of discomfort.

Whether it is best to use a coping model or a master model continues to generate some discussion in the literature. It would seem that a model who displays reactions but demonstrates control of such reactions would provide more realistic and supportive information than a mastery model. Additional research is needed to clarify these issues. In general, it is also considered appropriate to use a model of the same sex who is slightly older than the subject.

In the future, videotapes are likely to be available for modeling purposes in a variety of environments. They could be incorporated into nondental settings as part of educational programs to aid children and adults in learning what happens in the dental treatment situation and what constitutes appropriate and acceptable behavior. Used in this manner, modeling could contribute to the prevention or reduction of dental fears and anxieties.

**Systematic Desensitization**

Systematic desensitization has been used to treat a variety of anxieties and fears. At its simplest level, systematic desensitization is
based on the concept that one cannot be anxious and relaxed at the same time (Gale and Ayer, 1969), and involves presenting imagined anxiety-producing situations while the patient is relaxed. Eventually, the cues that signaled anxiety become replaced with cues that signal relaxation.

Based on the original work by Jacobson (1938), systematic desensitization was originally adapted to treating dental fears and anxieties by Ayer and Gale (1969). After training in relaxation and imagery, the patients were requested to imagine anxiety-evoking items for periods of five to ten seconds while they were relaxing. The patients progressed through the items and were eventually able to initiate and receive dental treatment. Additional studies have demonstrated the effectiveness of systematic desensitization with adult dental phobics (Corah, Gale, and Ilig, 1978; Carsson, Linde, and Ohman, 1980; Gatchell, 1980; Berggren, 2001).

Many investigators have observed a large number of patients undergoing systematic desensitization who have initiated and made appointments before completion of the hierarchy, thus providing additional support for the efficacy of this technique.

Systematic desensitization has consistently been shown to be effective with adults. Its utility with children is unclear or questionable because children may be unable to follow the instructions in imagery training and relaxation.

**Cognitive Rehearsal Strategies**

Meichenbaum and Turk (1976) and many others have been impressed with the relationship between cognitions (thoughts, expectations, beliefs, what the patient says to him/herself, and behavior). These researchers have developed cognitive rehearsal strategies to prepare patients to cope with stressors, interpersonal anxiety, fear, and pain.

Meichenbaum and Turk (1976) proposed that some education or instruction should occur about what triggers anxiety or fear, training in self-talk skills, strategies for dealing with the stressor, and, finally, exposure to the stressor. Cognitive rehearsal strategies apparently lessen anticipatory anxiety, reduce the impact of the stimulus, and
provide opportunities for postevent reinforcement (Thompson, 1981; Meichenbaum and Cameron, 1974).

Cognitive rehearsal could be used with patients who have severe anxieties and fears of dentistry. A critical component appears to involve not merely telling the patient to relax, but what the patient can do to relax.

**Distraction and Relaxation**

Distraction and relaxation have both been advocated for reducing anxiety in the dental office. Corah and his colleagues (Corah, Gale, and Illig, 1979) permitted patients to play video Ping-Pong games (distraction) or listen to tape-recorded relaxation instructions through earphones while they received a Class II amalgam restoration. Both groups reported significantly less discomfort than did a control group. However, more people in the distraction group preferred the technique. Fewer people in the relaxation group preferred hearing the tape.

Frere and his colleagues (Frere, Crout, Yorty, and McNeil, 2001) developed an audiovisual device showing various scenes in three dimension and without a plot. They reported that the device was effective in patients undergoing dental prophylaxes.

**REFERENCES**


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