STRESS REACTIONS OF VARIOUS JUDGING GROUPS TO THE CHILD DENTAL PATIENT

by

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CERTIFICATE OF APPROVAL

MASTER'S THESIS

This is to certify that the Master's thesis of

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has been approved by the Examining Committee for the thesis requirement for the Master of Science degree in Pedodontics at the May, 1978 graduation.

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Special thanks goes to Dr. Paul Kerber for his invaluable advice and assistance in this project.

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Finally, appreciation goes to my wife, Arleen, for her patience and assistance.

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PREFACE

Chapter I of this thesis consists of the original research protocol. Chapter II is in the form of a paper to be submitted for publication in the Journal of Dental Research. The format used follows that accepted by this journal except for the references, which have been made uniform.

CHAPTER I

PROTOCOL

Introduction

The importance of stress in dentistry for children needs little elaboration. Many young patients come to the dentist's office with preconceived fears and stress. Fear is a normal protective response to a negative stimulus within the environment. Without fear response the organism cannot survive.[1]

The dentist, as well as the child patient, may experience stress during the dental appointment time. The dentist may be stressed by an anticipated potential for humiliation in the eyes of the patient and parent by his/her ineffective management of a seemingly uncontrollable child. Both child and dentist can evaluate and respond to some stimuli with primitive irrational emotions, occasionally modified and controlled by intellectual rationalization.[2] In order to be successful in treating children, the dentist must not only be familiar with the developmental plateaus of children and have a good understanding of the child's relationships to parents and society but he/she must be aware of and learn how to recognize his/her own typical responses to stress and then try to modulate his/her life in accordance with them.[3] Selye[3] points out that a certain amount of stress is essential to well being and that certain kinds of stress-what he calls

"eustress"-are beneficial for people. He also states, however, that some people occasionally mistake their own capabilities and push themselves beyond their normal stress endurance.

The problem to be investigated in the study involves stress and anxiety as it relates to potentially stressing situations within the field of pedodontics. The principle area under examination is concerned with how these situations are perceived by dental personnel having varying levels of clinical experience and education in pedodontics. The judging groups to be represented include the following:

A. Senior dental hygienists
B. Freshman dental students
C. Sophomore dental students
D. Pre-pedodontic clinic junior dental students
E. Post-pedodontic clinic junior dental students
F. Pedodontic dental assistants
G. General practitioners
H. Pedodontic graduate students
I. Pedodontists

Upon completion of the research, questions to be answered are as follows:

1. Will two trained raters interpret voice prints made from vocal recordings on a seven-point scale with a satisfactory degree of inter-rater reliability?
2. Will potentially stressful visual stimuli be capable of eliciting a stressful response as measured by the PSE-101?

3. Is the Psychological Stress Evaluator (PSE-101) developed by Dektor Counterintelligence and Security, Inc. a valid indicator of stress?
4. Does clinical experience/education in pedodontics decrease absolute amounts of stress (no adjustment for situational stress made)?
5. Does clinical experience/education in pedodontics decrease relative amounts of stress (adjustment for situational stress made)?

Review of the Literature

Models of Stress

Although stress has been researched with considerable frequency, it often remains a vague and ambiguous concept used without explicit definition. Many conceptual models have been proposed to explain the phenomena of stress. Mechanic[4] has formulated a model of stress for the purpose of interpreting selected problems concerned with the social psychology of adaptation. He defines stress as "the discomforting responses of persons in particular situations." Whether or not a situation, event or happening produces discomforting responses depends upon four factors: the ability and capacity of a person; skills and limitations produced by group practices and traditions; the means provided to individuals by the social environment; and the norms that define where and how an individual may utilize these means. The successful mastery of a situation and the feelings that are aroused in

the process are termed reversibility. Reversibility depends upon adaptive devices consisting of thoughts and behavior relevant to one's situation or to one's feelings about it. If behavior is relevant to situational demands, it is termed coping behavior. The term "defense" is used in reference to behavior and thoughts aimed at managing feelings evoked by the situation and the coping behavior. This stress model was developed for and applies most appropriately to the social and social-psychological level of functioning in the organism.

Basowitz[5] developed a model of stress based upon a study of men in combat. The central concepts in this model are "anxiety," "stress" and "stress situations". Anxiety is defined as a conscious and reportable experience of intense dread and foreboding. Such feelings typically arise when the integrity of the organism is in some manner threatened. In this model any stimulus may threaten the integrity of an organism and thereby produce the experience of anxiety. Empirically, some stimuli are more likely than others to produce anxiety. Stress refers to this latter class of stimuli. Stimuli form a continuum based on differential meaning to the organism and on the anxiety-producing potential they have. At one end of this continuum are stimuli that have meaning only to a single individual or a few persons; at the other end of the continuum are stimuli that because of their intensity and their explicit threat to vital functions, are likely to overload the coping capacity of most organisms. Basowitz uses this idea to designate as stressful certain kinds of stimuli without regard to response. Such stimuli are regarded as stressful because of their

assumed or potential effect, even though it is recognized that they may provoke differing responses. By virtue of their assumed generality, these are referred to as stress situations. This model has been used primarily to interpret the responses of groups of persons who are simultaneously subjected to conditions of extreme duress.

Studies by Alexander,[6] Dunbar,[7] and Grinker and Spiegel[8] have produced the psychosomatic model of stress. The psychosomatic model is based on the premise that the tensions and strains that occur in one system of the body often have pathological consequences for other body systems. Anxiety or fear generated by serious conflicts in a person's life may be expressed not only through subjective feelings of intense dread and discomfort, but through alterations in basic physiological processes as well. Such basic physiological reactions occur when the organism's responses to provoking circumstances are inappropriate. Solvable conflicts handled directly or in an overtly assertive fashion are less likely to result in significant, sustained alterations in organic processes since the tension generated by the initial conflict is externally and not internally dissipated. If, however, such conflicts are not confronted directly, the predicted result is that the tension will be internally dissipated by flowing from one bodily system to another and thereby producing certain characteristic organic changes.

Another model of stress, developed by Wolff[9] is closely related to the psychosomatic model. The principle concept in this model is the "protective reaction pattern." According to this model, when the

body is confronted with insults to its physical integrity, a complex reaction occurs aimed at sealing off and then ridding the body of it's threat. This process is illustrated by the nasal adaptive reaction induced by inhaling noxious fumes. The reaction consists of intense mucous secretion and tearing, which is aimed at flushing out the nose and eyes, thereby ridding the body of the noxious agent. This same reaction may be set in motion by symbolic as well as by physical threats, and the reactions thereby induced are similar in both instances. This model differs from the psychosomatic model in that the protective reaction pattern is not conceptualized as a chain reaction beginning with feeling states and then progressing to altered bodily reaction and finally to organic abnormality. Altered feelings, bodily adjustment and behavior are considered to occur simultaneously and in varying degrees.

A physiological model of stress has been developed by Hans Selye.[10] This model is basically concerned with an analysis of stress at the physiological and biochemical levels of human functioning. Selye defines stress as "a state manifested by a specific syndrome which consists of all of the nonspecifically induced changes within a biologic system." A nonspecifically induced change is one that affects all or most parts of a system without selectivity. Nonspecifically induced changes are described in terms of the General Adaptation Syndrome, a three-stage process brought about by a specific stressor, or a stress-producing stimulus. The first stage is characterized by an alarm reaction, during which a general mobilization occurs. This

phase leads to a stage of resistance, which is characterized by a set of internal responses that stimulate tissue defense. If the stressor continues to affect the organism despite these responses, the third stage-that of exhaustion-is eventually reached.

Another model of stress, one evolved by Dohrenwend,[11] modifies Selye's physiological stress model in order to apply it to studies of the prevalence and distribution of mental disorders in the social environment. Dohrenwend has isolated five basic sets of factors involved in stress reactions. These are (1) external stressors that throw the organism into an imbalanced state; (2) factors that mediate or alleviate the effects of the stressor; (3) the experience of stress itself, which is the produce of the interaction between the stressor and the mediating factors; (4) the adaptive syndrome, which consists of the organism's attempt to cope with the stressor; and (5) the organism's response, which may be either adaptive or maladaptive.

Mediating factors play a very important role in Dohrenwend's model. Two basic types of mediating factors are identified. One type are those that determine the amount of external constraint associated with stress. The second type are those that determine the amount of inner constraint. External and internal constraint, in turn, produce conditions of external and internal control. External control is experienced when force is exerted in favor of activity that is demanded by outer events. Conversely, internal control is experienced when an individual attempts to inhibit action demanded by outer events in favor of actions demanded by inner events. From this activity

Dohrenwend derives several basic propositions concerning factors that determine the intensity and duration of stress. In this model, stress is defined as a state intervening between antecedent constraints and consequent efforts to reduce constraint. As such, stress is regarded by Dohrenwend as the product of any behavior in response to pressures, regardless of whether the behavior is adaptive or maladaptive.

Janis[12] has evolved a model of stress that is basically concerned with psychological responses of individuals to traumatic events. His model is comprised of three basic elements: the disaster situation; the psychological responses of individuals to disaster; and intrapsychic and situational determinants of these psychological responses. Janis identifies three major phases of danger found in all large-scale disasters. These are the threat phase, in which persons perceive objective signs of impending danger or in which they receive explicit warnings that some kind of danger might be approaching, but at a time when the immediate environment is still free from the physical impact persons are actually confronted with physical dangers in their immediate environment such that their chances of escaping injury or death are at least partly contingent upon the speed and efficience of their protective responses; and the danger-of-victimization phase, which usually occurs immediately after the actual impact of the danger has subsided or terminated, and in which people perceive the variety and magnitude of the losses sustained by themselves and others.

A large number of studies have isolated specific physiological changes that are commonly produced by stressful stimuli. These studies

fall into two broad categories. First, there are studies of the effects of stress on such physiological processes as cardiac functioning[13,14,15] mucous membrane secretion,[9] gastric functioning,[16] respiration,[17-22] muscle tension,[17,23-28] and electrical phenomena of the skin.[22,29-33] Second, there are studies of the relationship between stress and the origin and onset of specific disease syndromes such as cardiovascular disorders,[34] ulcerative colitis,[35,36] dermatitis,[37] and glaucoma.[38] Generally, these studies do not contain an explicit conceptual model but instead are guided by a set of implicit assumptions about stimuli that are stressful, how these stimuli operate upon the organism, and why the effects of stress are manifested as they are. An examination of these implicit assumptions suggests a kind of mechanical model of stress. In this model, stress is viewed as the internal response of the organism to an external load placed upon it by some pathogenic agent, stressor or life crisis. Stress in turn produces distinct pathological changes and certain typical disorders of adaptation.

There have been other attempts to develop models of stress.[39-42] In general, these efforts appear to be variations of the conceptual models discussed previously.

Critique of Stress Models

Each of the models discussed previously has made contributions to the existing theory and research about stress. At the same time, each has had definite limitations. It would seem for the most part

that these models are useful conceptualizations of the phenomena they are intended to interpret. However, limitations are created when the task switches from the analysis of stress at one level of human functioning to a broader and more complicated view of stress phenomena.

One of the major factors that inhibits conceptual continuity of existing models of stress is that the meaning of stress itself is defined differently in different conceptual models. Mechanic[4] defines stress in terms of responses that individuals have to situations. Basowitz[5] and to some degree Janis[12] define it as a quality of a situation that is independent of the reaction of individuals to it. Selye[10] and Dohrenwend[11] who both adhere to a mechanical model, define stress as an intervening state which is an internal reaction to stressors, loads or noxious stimuli. Dunbar's[7] version of the psychosomatic model defines stress as an attribute of the stimuli. Alexander's[6] and Wolff's[9] model of the Protective Reaction Pattern define stress both as a quality of the stimulus as well as the individual's response to it. The fact that there are so many different referents to the concept of stress makes it very difficult to meaningfully interpret findings generated by these differing conceptions of the phenomena.

Another limitation of these models is that they can only be applied to one or two of the several environmental fields to which the human organism simultaneously adapts. This limitation is a serious one since according to Howard and Scott[43] studies of stress have shown it to be a phenomenon that largely transcends the arbitrary levels of analysis designated by the terms biochemical, physiological,

psychological and sociocultural. Stress manifests itself in all of the environmental fields to which the organism simultaneously adapts. Traumatic psychological stimuli often produce basic changes in the organism's physiological and biochemical function's. Social crises may affect the individual both as a psychological and as a biochemical organism. A major characteristic of a complete model of stress must therefore be its ability to describe stress phenomena at all levels of organism functioning without unreasonably distorting the specific phenomena at any given level. For the most part, the models described earlier reflect phenomena of a biochemical, or a physiological, or a psychological, or a sociological nature, but not for combinations of these areas.

Another limitation of some stress models is that they deal exclusively with events of an extreme and highly traumatic nature. This association with trauma and duress can have the effect of directing attention away from stimuli that are wearing to the organism, and that have important physiological and psychological consequences for it, but which are neither dramatic nor especially unusual. The relevance of such stimuli for the study of stress is suggested by the findings of Scott[44] in which the patterns of illness in a group of female employees in a large commercial enterprise were studied. The study revealed that traumatic events such as the sudden death of a family member or friend, a recent divorce, or similar personal crises often produced acute illnesses. It was also clear, however, that such events were comparatively rare, and therefore of little value in

helping to explain the very large amount of illness that routinely occurred on a day-to-day basis. An analysis of the data revealed that the life style of the individual, and especially the quality of her social role relationships with others, was much more determinative of the amount and severity of illness she suffered than the occasional traumatic situations that arose. In effect, both traumatic and nontraumatic but wearing events are stressful in the sense that they both produce the same types of physiological and psychological responses. For the most part, this fact is ignored in many existing models of stress.

Another limitation is that many of these models are incomplete in that they do not take into account all of the relevant variables that produce stress. In considering the phenomena of stress in terms of the many factors suggested or implied in all of the stress models taken in total, then the incompleteness of each particular model becomes apparent. Each model leaves out certain factors that have been shown by the models to be important determinants of whether or not a given stimulus, event, or situation does or does not result in stress.

In addition, some stress models contain assumptions that may be unjustified. For instance, Wolff's[34] theory contains the assumption that any stimuli perceived by the individual to be stressful will necessarily produce physiological and psychological consequences of a detrimental character. Also, the Basowitz model[5] contains the assumption that what is stressful for one person must necessarily be stressful for another.

Finally, it should be noted that a number of these models do not entirely explain the phenomena they supposedly account for. This may be especially true in the case of Wolff's Protective Reaction Pattern model.[34] Research based upon his model has produced a variety of physiological response to stress. Examples are changes in gastric function, mucous membrane secretion, blood chemistry, cardiac functioning, blood flow to the brain and extremities, respiration, muscle tension and electrical phenomena of the skin. These reactions are explained as inappropriate physiological responses by the organism to threats. Howard and Scott[43] explain this by illustrating how, when a foreign object lodges in the eye, we flush it out by tearing. When we are confronted with threatening symbolic stimuli, we may also respond physiologically by tearing, as though to symbolically wash away the perceived threat. According to them, the major problem with this model is that it does not explain why certain persons respond to noxious symbolic stimuli by tearing, others by intense mucous membrane secretion, others by hyperactive gastrointestinal activity, and still others with no apparent response at all.

Howard and Scott[43] have made an attempt to formulate a comprehensive framework for the analysis of stress in the human organism which encompasses many of the concepts previously described in this thesis. Their model is based upon an analysis of human functioning in problem-solving terms and relies upon a set of complex assumptions about the character of the human organism. One of these assumptions is that each human organism tends to develop a characteristic level of

activity and stimulation at which it most comfortably functions and that these levels vary tremendously among individuals. For example, there are persons who require high and sustained levels of stimulation in order to feel comfortable and satisfied and there are others who require comparatively low levels of stimulation and who feel most comfortable when demands made upon them center around very low activity levels. According to Howard and Scott, both genetic and behavioral factors determine variations in the ranges of comfortable activity levels. They conclude that a problem is defined as a stimulus or condition that produces demands on the human organism that require it to exceed its ordinary level of functioning or to restrict activity levels below usual levels of functioning. This formulation suggests that a situation of boredom or of sensory deprivation are problem situations in much the same way that crises, disasters and acute insults to the integrity of the organism are problems.

As empirical research continues, new stress models will undoubtedly emerge. Concepts may become more closely related to practical procedures and hopefully advancements will be made beyond the limited frameworks presented so far.

Physiological Indication of Stress Through Voice Analysis

Remembering the interpretative limitations when conducting stress research, stress has been associated with the identification of changes in the quality of the voice mechanism. A number of elements of vocalization can be selected as acoustical indicators of stress.

Two of the basic elements are the intensity of the voice and its frequency composition. The relationship of these elements to psychological stress or anxiety has been investigated by several workers.[45-48] More recently, interest has evolved around another type of acoustic indicator which involves the existence of irregularities of the rhythmic modulations of the acoustic signal.[49] Work in this area has evolved around the discovery of a microtremor which exists in states of relaxation.[50]

The existence of micro-muscle tremor has been known since 1956.[51] The most complete description of psychophysiology of micro-tremor has been described by Lippold.[50,52] The muscle fasciculations (or ripples) of micro-muscle tremor occur in the alpha range (8-14 cycles per second), and they concompass 1 percent to 2 percent of the total contraction length of the muscle and/or muscles. Lippold states, "that these tremors are both frequency modulated and amplitude modulated." He believes that they constitute a servomechanism designed to dampen muscular activity or in the quiescent state to prepare the muscle for ready activity.

The micro-tremor is superimposed upon voluntary contraction. Since this physiological tremor is found in all voluntary, striated musculature, and since the micro-muscle tremor itself is a ripple or contraction superimposed upon a normal muscle action, the micro-muscle tremor can be recoverable by electronic sensors from the human voice since the human voice is a function of striated muscles.

Bell, Ford and McQuiston, utilizing electronic filtering and frequency discrimination techniques, have developed instrumentation which is able to isolate the micro-muscle tremor from the human voice. They found that in the normal unstressed, voluntary spoken voice the physiological tremor (micro-muscle tremor) is present. With their instrumentation, termed the Psychological Stress Evaluator (PSE), they found they could reporducibly retrieve the micro-muscle tremor from the spoken voice of any individual.[53]

Micro-muscle tremor is a normal accompaniment to the activity of any voluntary muscle and (during periods of little or no stress) appears to be controlled by the central nervous system even though it is involuntary. However, during periods of stress, the sympathetic and parasympathetic branches of the autonomic nervous system which inervate the voice mechanism gain in dominance. The initial phenomenon which occurs is that the sympathetic nervous system causes a suppression or elimination of the muscle micro-tremors proportional to the amount of stress within the individual. This suppression continues until the stress situation is eliminated at which time the parasympathetic nervous system works to restore the system to a homeostatic condition. A change to this homeostatic condition results in the reappearance of normal physiologic micro-muscle tremor.[54]

The PSE detects, measures, and displays certain specific stress-related components of the human voice. In this display, the inaudible frequency modulations resulting from the micro-tremor are superimposed over audible voice frequencies. The strength of the FM indicator

relates inversely to the degree of psychological stress experienced by the subject at the time of the utterance. The greater the stress, the greater the dominance of the autonomic system; therefore, the greater the suppressive effect on the micro-tremor.[55]

Hypotheses

This study will test the following hypotheses:

1. Two trained raters will interpret voice prints made from vocal recordings on a seven-point scale with a satisfactory degree of inter-rater reliability.
2. Potentially stressful visual stimuli used in the study will be capable of eliciting a stressful response as measured by the PSE-101.
3. The Psychological Stress Evaluator (PSE-101) is a valid indicator of stress.
4. Clinical experience/education in pedodontics decrease absolute amounts of stress (no adjustment for situational stress made).
5. Clinical experience/education in pedodontics decrease relative amounts of stress (adjustment for situational stress made).

Materials and Methods

Sample

Subjects taking part in this study will be placed into one of several rank ordered judging groups based on level of clinical

experience/education in pedodontics. An appropriate number of representatives for each judging group will be selected as subjects largely on the basis of availability from the University of Iowa College of Dentistry and will comprise the following groups:

A. Senior dental hygienists

B. Freshmen dental students

C. Sophomore dental students

D. Pre-pedodontic clinic junior dental students

E. Post-pedodontic clinic junior dental students

F. Pedodontic dental assistants

G. General practitioners

H. Pedodontic graduate students

I. Pedodontists

No attempt will be made at developing two separate rank orders of judging groups; one based upon clinical experience and one based upon education in pedodontics. Justification for this is based on the assumption that the single rank ordering sufficiently reflects both clinical experience and education in pedodontics.

In addition, four combined groups will be developed from the previously established rank ordering in an attempt to further clarify the delineations of clinical experience/education in pedodontics. Group A (Dental hygienists) will be omitted from these combined groups since clinical experience of the subjects in both the hygiene clinic and pedodontic clinic was uncertain. They are as follows:

1. Groups B and C
2. Groups D and E
3. Group F
4. Groups G, H and I

Visual Stress Stimuli

Fifteen slides will be selected from a bank of 40 slides comprised of both potentially stressing and non-stressing pedodontic situations. In order that there might be some rationale for the selection, each slide will be viewed by a group of 17 psychology graduate students and given a value of zero to five for pleasantness or unpleasantness with five being the most unpleasant. Stressors will be chosen from those slides assigned a value of four or higher and nonstressors will be chosen from those valued at three or less. Four stressors will be chosen and each spaced apart by two nonstressors in the slide sequence. Content of the stressors will include a variety of situations such as a crying child, traumatic injury and congenital malformations. Content of the nonstressors will include unconnotative textures of various colors.

Scoring System

The scoring system will be based upon principles developed and accepted by Dektor Counterintelligence and Security, Inc., the manufacturers of the instrument. This system is comprised of a seven-point scale, ranging from no stress (0) to hard stress (6).

Examples of voice prints with appropriate stress scores are included in Appendix F.

Experimental Setting

After reading a brief summary of the project (Appendix C), signing a certification of subject consent (Appendix B), completing a personal profile (Appendix D), and listening to a prerecorded set of instructions (Appendix E), each subject will view a series of 15 slides comprising a range of potentially stressful information. After a slide has come into view the subject will respond "yes" to the examiner's question, "Do you see the slide?" These series of responses from the subjects will be recorded onto master tapes from which voice prints are to be made and scored at a later time.

The independent variables in this study are the various judging groups based on clinical experience/education in pedodontics and the stressfulness of the visual stimuli presented. The dependent variables are the derived quantitative stress scores determined from the voice prints printed by the Psychological Stress Evaluator (PSE-101).

Adjustment for Situational Stress

Because all subjects have the potential of being stressed by the experimental setting itself and also may be stressed by situations unrelated to the experiment, an adjustment will be made to isolate each subject's relative stress by establishing his baseline of stress. This will be accomplished by averaging the stress values for slides one and two which will be nonstressors and subtracting this value

from each subsequent stress value. This adjustment will be done on the four combined groups only.

Analysis of the Data

Inter-Rater Agreement

The inter-rater agreement between the two raters will be computed by using percentage of agreement in identically scoring each voice print within a seven-point scoring system.

Experimental Group

A discriminant analysis will be completed to determine whether any differences between judging groups will be sufficiently great to reclassify subjects into their appropriate experience/education group.

In addition, independent t-tests will be computed to test for differences between nonadjusted mean stress values of stressors and nonstressors within individual groups, adjusted mean stress values of stressors and nonstressors within combined groups, the nonadjusted mean stress value of stressors and nonstressors within combined groups, the nonadjusted mean stress value of stressors and nonstressors for all subjects, and the adjusted mean stress value of stressors and nonstressors for all subjects within combined groups. Differences will be considered significant with $p < .05$.

CHAPTER II

REVIEW AND CONCLUSIONS

Introduction

The importance of stress in dentistry for children needs little elaboration. Many young patients come to the dentist's office with preconceived fears and stress. Fear is a normal protective response to a negative stimulus within the environment. Without fear response the organism cannot survive.[1]

The dentist, as well as the child patient, may experience stress during the dental appointment time. The dentist may be stressed by an anticipated potential for humiliation in the eyes of the patient and parent by his/her ineffective management of a seemingly uncontrollable child. Both child and dentist can evaluate and respond to some stimuli with primitive irrational emotions, occasionally modified and controlled by intellectual rationalization.[2] In order to be successful in treating children, the dentist must not only be familiar with the developmental plateaus of children and have a good understanding of the child's relationships to parents and society but he/she must be aware of and learn how to recognize his/her own typical responses to stress and then try to modulate his/her life in accordance with them.[3] Selye[3] points out that a certain amount of stress is essential to well being, and that certain kinds of stress-what

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Bell, Ford and Mcquistin,[53] utilizing electronic filtering and frequency discrimination techniques, have developed instrumentation which is able to isolate the micro-muscle tremor from the human voice. They found that in the normal unstressed, voluntary spoken voice the physiological tremor (micro-muscle tremor) is present. With their instrumentation, termed the Psychological Stress Evaluator (PSE), they found they could reproducibly retrieve the micro-muscle tremor from the spoken voice of any individual.

Micro-muscle tremor is a normal accompaniment to the activity of any voluntary muscle and (during periods of little or no stress) appears to be controlled by the central nervous system even though it is involuntary.

However, during the periods of stress, the sympathetic and parasympathetic branches of the autonomic nervous system which inervate the voice mechanism gain in dominance. The initial phenomenon which occurs is the sympathetic nervous system causes a suppression or eleimination of the muscle micro-tremors proportional

to the amount of stress within the individual. This suppression continues until the stress situation is eliminated at which time the parasympathetic nervous system works to restore the system to a homeostatic condition. A change to this homeostatic condition results in the reappearance of normal physiologic micro-muscle tremor.[54]

The PSE detects, measures and displays certain specific stress-related components of the human voice (Appendix F). In this display, the inaudible frequency modulations resulting from the micro-tremor are superimposed over audible voice frequencies. The strength of the FM indicator relates inversely to the degree of psychological stress experienced by the subject at the time of the utterance. The greater the stress, the greater the dominance of the autonomic system and therefore, the greater the suppressive effect on the micro-tremor.[55]

The problem investigated in this study involved stress and anxiety as it relates to potentially stressing situations within the field of pedodontics. The principle area under examination was concerned with how these situations were perceived by dental personnel having varying levels of clinical experience and education in pedodontics. The judging groups represented included the following:

A. Senior dental hygienists

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C. Sophomore dental students

D. Pre-pedodontic clinic junior dental students

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The hypotheses tested in this study were the following:

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5. Clinical experience/education in pedodontics decreases relative amounts of stress (adjustment for situational stress made).

Materials and Methods

Sample

Subjects taking part in this study were placed into one of several rank ordered judging groups based on level of clinical experience/education in pedodontics as stated previously. An

appropriate number of representatives for each judging group were selected as subjects largely on the basis of availability from the University of Iowa College of Dentistry.

No attempt was made at developing two separate rank orders of judging orders. For example, one being based upon experience and one based on education in pedodontics. Justification for this was based on the assumption the single rank ordering sufficiently reflected both clinical experience and education in pedodontics.

In addition, four combined groups were developed from the previously established rank ordering in an attempt to further clarify the delineations of clinical experience/education in pedodontics. Group A (Senior dental hygienists) was omitted from these combined groups since clinical experience of the subjects in both the hygiene clinic and pedodontic clinic was uncertain. The combinations were as follows:

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Visual Stress Stimuli

Fifteen slides were selected from a bank of 40 slides comprised of both potentially stressing and non-stressing pedodontic situations. In order that there might be some rationale for the selection, each of 40 slides was viewed by a group of 17 psychology graduate

students and given a value of zero to five for pleasantness or unpleasantness with five being the most unpleasant. Stressors were chosen from those slides assigned a value of four or higher and nonstressors were chosen from those valued at three or less. Four stressors were chosen and each spaced apart by two nonstressors in the slide sequence. Content of the stressors included a variety of situations such as a crying child, traumatic injury and congenital malformations. Content of the nonstressors included unconnotative textures of various colors.

Scoring System

The scoring system was based upon principles developed and accepted by Dektor Counterintelligence and Security, Inc., the manufacturers of the instrument. This system is comprised of a seven-point scale, ranging from no stress (0) to hard stress (6). Examples of voice prints with appropriate stress scores are indluced in Appendix F.

Experimental Setting

After reading a brief summary of the project (Appendix C), signing a certification of subject consent (Appendix B), completing a personal profile (Appendix D), and listening to a prerecorded set of instructions (Appendix E), each subject viewed a series of 15 slides comprising a range of potentially stressful information. After a slide came into view the subject responded, "yes" to the examiner's question, "Do you see the slide?" These series of responses from the

subjects were recorded onto master tapes from which voice prints were made and scored at a later time.

The manipulative variables of this study were the various judging groups based on clinical experience/education in pedodontics. The dependent variables were the derived quantitative stress scores determined from the voice prints printed by the Psychological Stress Evaluator (PSE-101).

Adjustment for Situational Stress

Because all subjects had the potential of being stressed by the experimental setting itself and also may have been stressed by situations unrelated to the experiment, an adjustment was made to isolate each subject's relative stress by establishing his baseline of stress. This was accomplished by averaging the stress values for slides one and two which were nonstressors and subtracting this value from each subsequent stress value. This adjustment was done on the four combined groups only.

Analysis of the Data

Inter-Rater Agreement

The inter-rater agreement between the two raters was computed by using percentage of agreement in identically scoring each voice print within a seven-point scoring system.

Experimental Group

A discriminant analysis was employed to determine whether any differences between judging groups was sufficiently great to reclassify subjects into their appropriate experience/education group.

In addition, independent t-tests were computed to test for differences between nonadjusted mean stress values of stressors and nonstressors within individual groups, adjusted mean stress values of stressors and nonstressors within combined groups, the nonadjusted mean stress value of stressors and nonstressors for all subjects, and the adjusted mean stress value of stressors and nonstressors for all subjects within combined groups. Differences were considered significant with $p < .05$.

Results

Inter-Rater Agreement

The inter-rater agreement between the two raters as calculated by percentage of agreement was 83%.

Experimental Group Behavior

A discriminant analysis was employed to determine whether any differences between judging groups was sufficiently great to reclassify subjects into their appropriate experience/education group. Table 1 summarizes the number of observations and percents classified into each individual group. It was found that 35 of 91, or 38.46% of the judges were correctly reclassified into their proper level. Table 2

TABLE 1

NUMBER OF OBSERVATIONS AND PERCENTS OF
SUBJECTS RECLASSIFIED INTO EACH INDIVIDUAL GROUP

FROM GROUP	A	B	C	D	E	F	G	H	I	TOTAL
A	5	0	0	1	0	1	3	0	0	10
	50.00	0.00	0.00	10.00	0.00	10.00	30.00	0.00	0.00	100.00
B	2	2	1	0	2	0	2	1	1	11
	18.18	18.18	9.09	0.00	18.18	0.00	18.18	9.09	9.09	100.00
C	1	3	2	1	0	2	0	0	1	10
	10.00	30.00	20.00	10.00	0.00	20.00	0.00	0.00	10.00	100.00
D	1	0	0	8	0	1	2	0	0	12
	8.33	0.00	0.00	66.67	0.00	8.33	16.67	0.00	0.00	100.00
E	0	2	0	0	6	1	1	1	0	11
	0.00	18.18	0.00	0.00	54.55	9.09	9.09	9.09	0.00	100.00
F	1	1	0	3	0	6	0	0	2	13
	7.69	7.69	0.00	23.08	0.00	46.15	0.00	0.00	15.38	100.00
G	3	1	0	1	0	1	4	0	0	10
	30.00	10.00	0.00	10.00	0.00	10.00	40.00	0.00	0.00	100.00
H	0	0	2	1	1	0	0	1	0	5
	0.00	0.00	40.00	20.00	20.00	0.00	0.00	20.00	0.00	100.00
I	3	2	1	0	0	1	1	0	1	9
	33.33	22.22	11.11	0.00	0.00	11.11	11.11	0.00	11.11	100.00
TOTAL	16	11	6	15	9	13	13	3	5	91
PERCENT	17.58	12.09	6.59	16.48	9.89	14.29	14.29	3.30	5.49	100.00

summarizes the number of observations and percents classified into each combined group. It was found that of 81 judges in these groups 38 or 46.91% were correctly reclassified into their proper level. Tables 7 and 8 show the probability of reclassification into individual and combined groups by chance alone.

Independent t-tests of differences between nonadjusted mean stress values of stressors and nonstressors within individual groups revealed significant differences ($p < .05$) in Groups C, F and G (Table 3).

Independent t-tests of differences between adjusted mean stress values of stressors and nonstressors within combined groups revealed significant differences ($p < .05$) in Group 4 (Table 4).

An independent t-test of difference between the nonadjusted mean stress values of stressors and nonstressors for all subjects revealed a significant difference ($p < .05$) with $p = .003$ (Table 5).

In addition, an independent t-test of difference between the adjusted mean stress value of stressors and nonstressors for all subjects within combined groups revealed a significant difference ($p < .05$) with $p = .002$ (Table 6).

Finally, figures 1-9 illustrate comparisons of nonadjusted mean stress values for Groups A-I vs nonadjusted mean stress values for all subjects; figures 10-13 illustrate comparisons of adjusted mean stress values for Combined Groups 1-4 vs adjusted mean stress values for all subjects within combined groups; and figure 14 illustrates comparisons

TABLE 2

NUMBER OF OBSERVATIONS AND PERCENTS OF SUBJECTS RECLASSIFIED INTO EACH COMBINED GROUP

FROM GROUP	1	2	3	4	TOTAL
1	5	4	1	11	21
	23.81	19.05	4.76	52.38	100.00
2	4	11	3	5	23
	17.39	47.83	13.04	21.74	100.00
3	2	2	8	1	13
	15.38	15.38	61.54	7.69	100.00
4	3	4	3	14	24
	12.50	16.67	12.50	58.33	100.00
TOTAL	14	21	15	31	81
PERCENT	17.28	25.93	18.52	38.27	100.00

TABLE 3

INDEPENDENT t-TESTS OF DIFFERENCES BETWEEN NONADJUSTED MEAN STRESS VALUES OF STRESSORS AND NON-STRESSORS WITHIN INDIVIDUAL GROUPS

GROUP	$\bar{X}s$*	$\bar{X}ns$**	df	t	p
A	2.600	2.382	14	2.088	.056
B	1.727	1.595	14	.641	.530
C	1.900	1.700	14	3.301	.005
D	2.479	2.310	14	.886	.390
E	1.909	1.562	14	1.730	.105
F	2.596	2.273	14	2.438	.029
G	2.000	1.627	14	3.267	.006
H	1.950	1.582	14	1.582	.136
I	2.000	1.919	14	.792	.442

* Stressors
** Nonstressors

TABLE 4

INDEPENDENT t-TESTS OF DIFFERENCES BETWEEN ADJUSTED MEAN STRESS VALUES OF STRESSORS AND NON-STRESSORS WITHIN COMBINED GROUPS

GROUP	$\bar{X}s$*	$\bar{X}ns$**	df	t	p
1	.333	.206	12	1.836	.091
2	.598	.420	12	1.647	.125
3	.442	.145	12	2.073	.060
4	.510	.303	12	3.229	.007

* Stressors
** Nonstressors

TABLE 5

INDEPENDENT t-TEST OF DIFFERENCE BETWEEN THE NONADJUSTED MEAN STRESS VALUE OF STRESSORS AND NONSTRESSORS FOR ALL SUBJECTS

	$\bar{X}s$*	$\bar{X}ns$**	df	t	p
ALL SUBJECTS	2.155	1.915	90	3.631	.003

* Stressors
** Nonstressors

TABLE 6

INDEPENDENT t-TEST OF DIFFERENCE
BETWEEN THE ADJUSTED MEAN STRESS
VALUE OF STRESSORS AND NONSTRESSORS
FOR ALL SUBJECTS WITHIN COMBINED GROUPS

	$\bar{X}s$*	$\bar{X}ns$**	df	t	p
ALL SUBJECTS WITHIN COMBINED GROUPS	.478	.286	80	4.054	.002

* Stressors
** Nonstressors

TABLE 7

PROBABILITY OF MEMBERSHIP
IN INDIVIDUAL GROUPS BY CHANCE

GROUP	FREQUENCY	PRIOR PROBABILITY	RECLASSIFICATION
A	16	0.11	50.00
B	11	0.12	18.18
C	6	0.11	20.00
D	15	0.13	66.67
E	9	0.12	54.55
F	13	0.14	46.15
G	13	0.11	40.00
H	3	0.05	20.00
I	5	0.10	00.00
TOTAL	91	1.00	

TABLE 8

PROBABILITY OF MEMBERSHIP
IN COMBINED GROUPS BY CHANCE

GROUP	FREQUENCY	PRIOR PROBABILITY	RECLASSIFICATION
1	14	0.26	23.81
2	21	0.28	47.83
3	15	0.16	61.54
4	31	0.30	58.33
TOTAL	81	1.00	

of adjusted mean stress values for all subjects within all combined groups vs nonadjusted mean stress values for all subjects. The t-tests of means indicate that the instrument was sensitive to stress illicited by the slides.

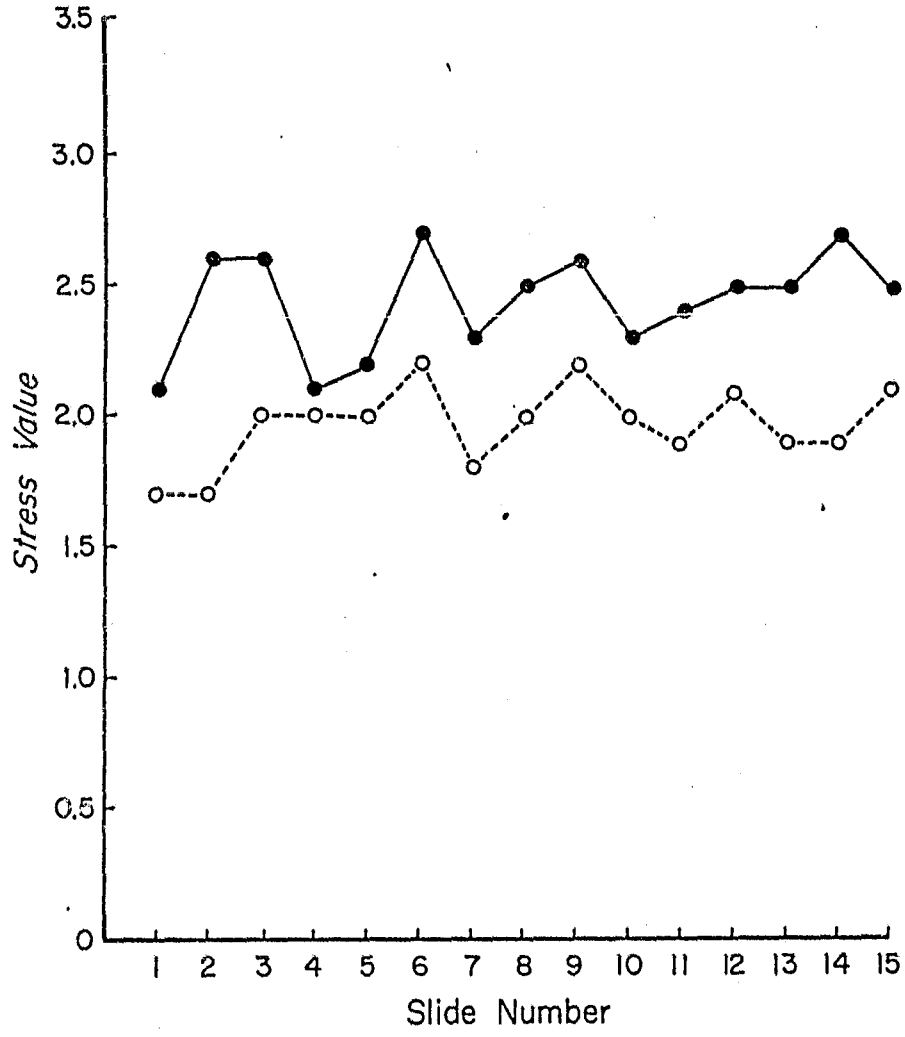
Discussion

An examination of figures 1-14 points out that higher levels of experience/education in pedodontics do not reduce either absolute or relative amounts of stress experienced when confronted with stressful stimuli of pedodontic situations. That a trend became apparent for quite the reverse could be explained by the fact that more experienced and educated subjects may have interpreted more from those situations and visualized greater implications of difficult clinical management. The task of managing or coping with stress is another important factor that was not investigated in this study.

Within any one single or combined group, individual subjects' stress values covered the full scoring range. Therefore, discriminant analyses revealed that one could not successfully reclassify subjects with any meaningful consistency back into their appropriate experience/education level (Tables 1 and 2). Also, within almost every level, there were subjects who stressed little and some who stressed greatly. It was not until means for each group were computed that group tendencies became apparent. However, tables 7 and 8 show that in most instances correct reclassifications were considerably above random chance alone.

Figure 1

Group A

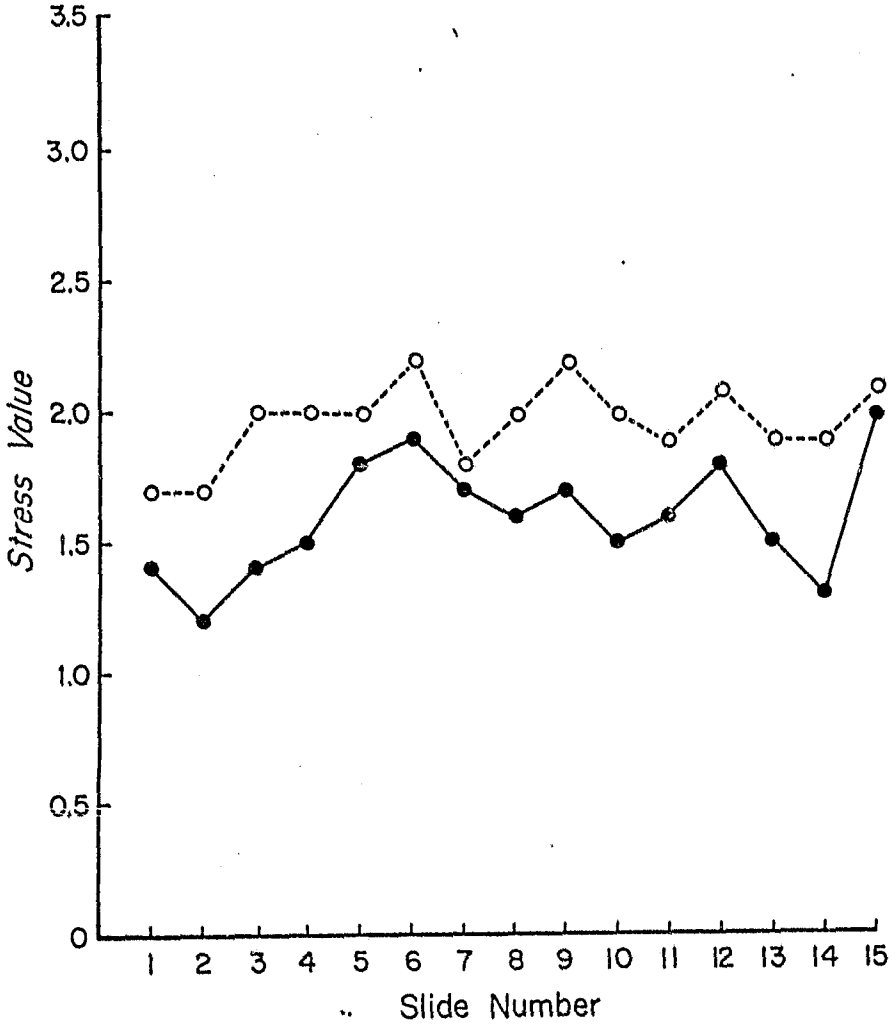


——— Nonadjusted mean stress values for Group A (Dental Hygienists).

----- Nonadjusted mean stress values for all subjects.

Figure 2

Group B

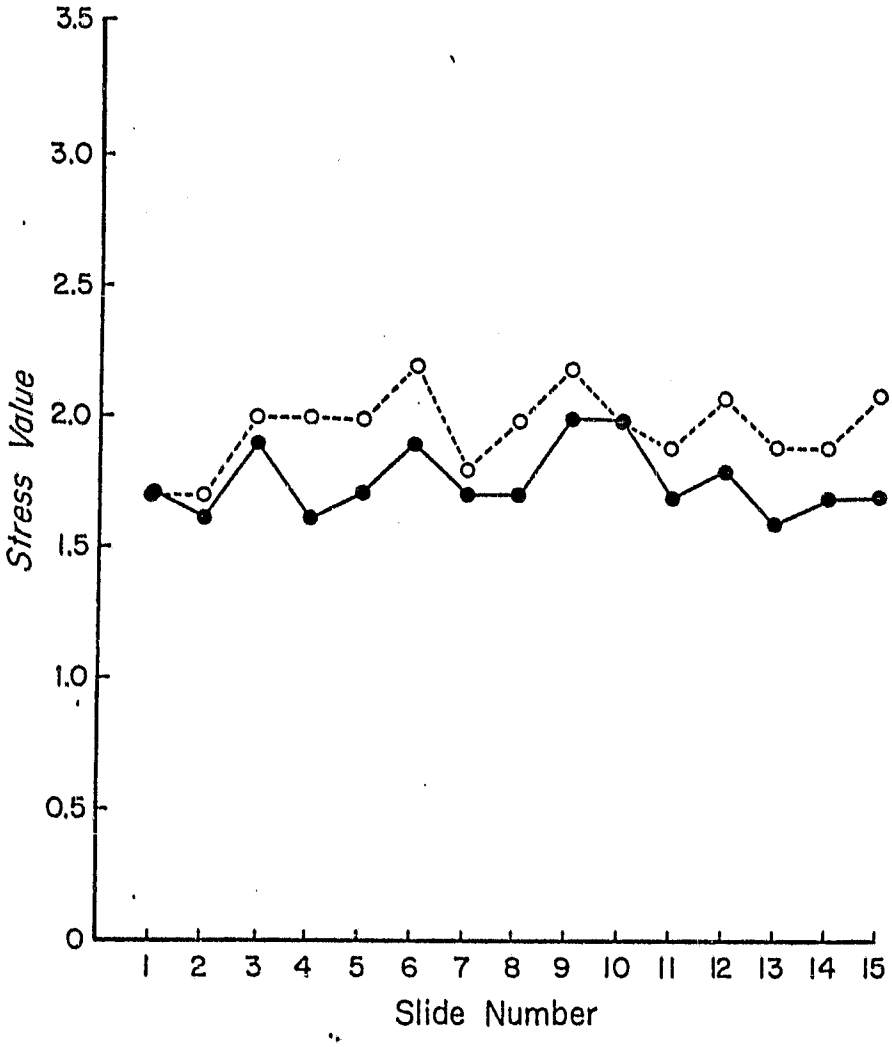


——— Nonadjusted mean stress values for Group B (Freshman Dental Students).

----- Nonadjusted mean stress values for all subjects.

Figure 3

Group C

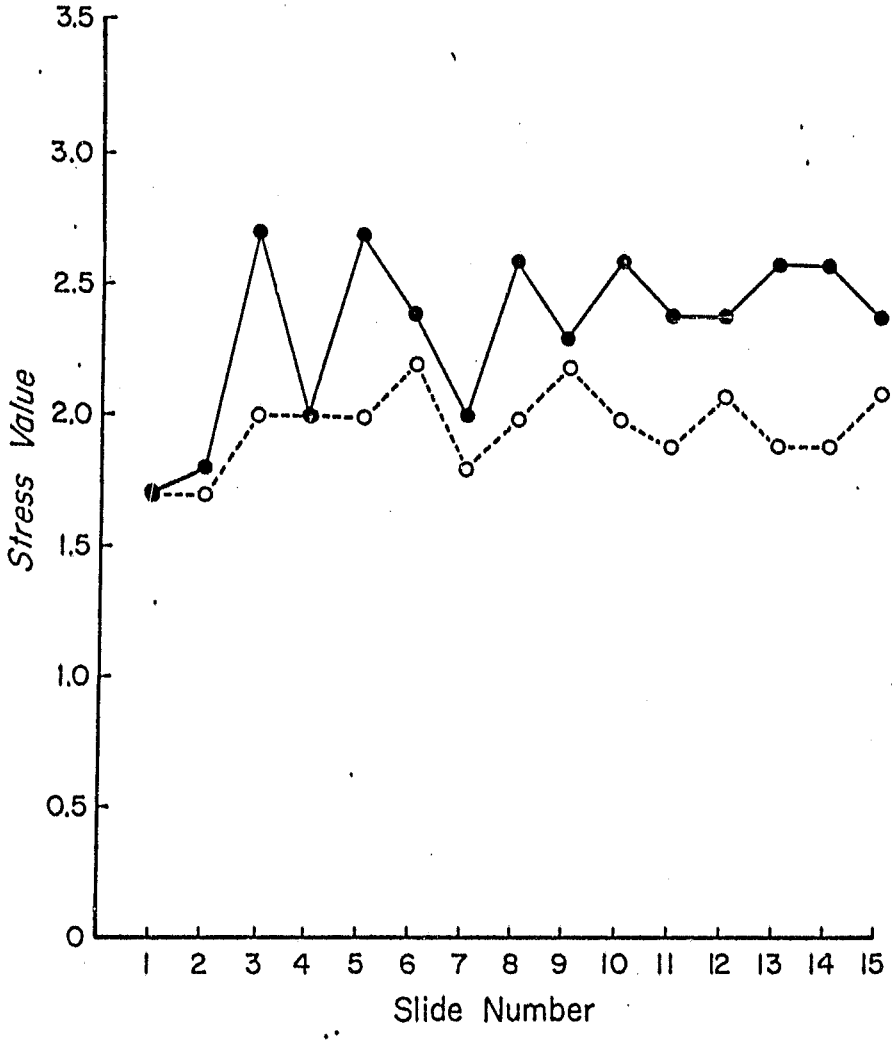


——— Nonadjusted mean stress values for Group C (Sophomore Dental Students).

----- Nonadjusted mean stress values for all subjects.

Figure 4

Group D

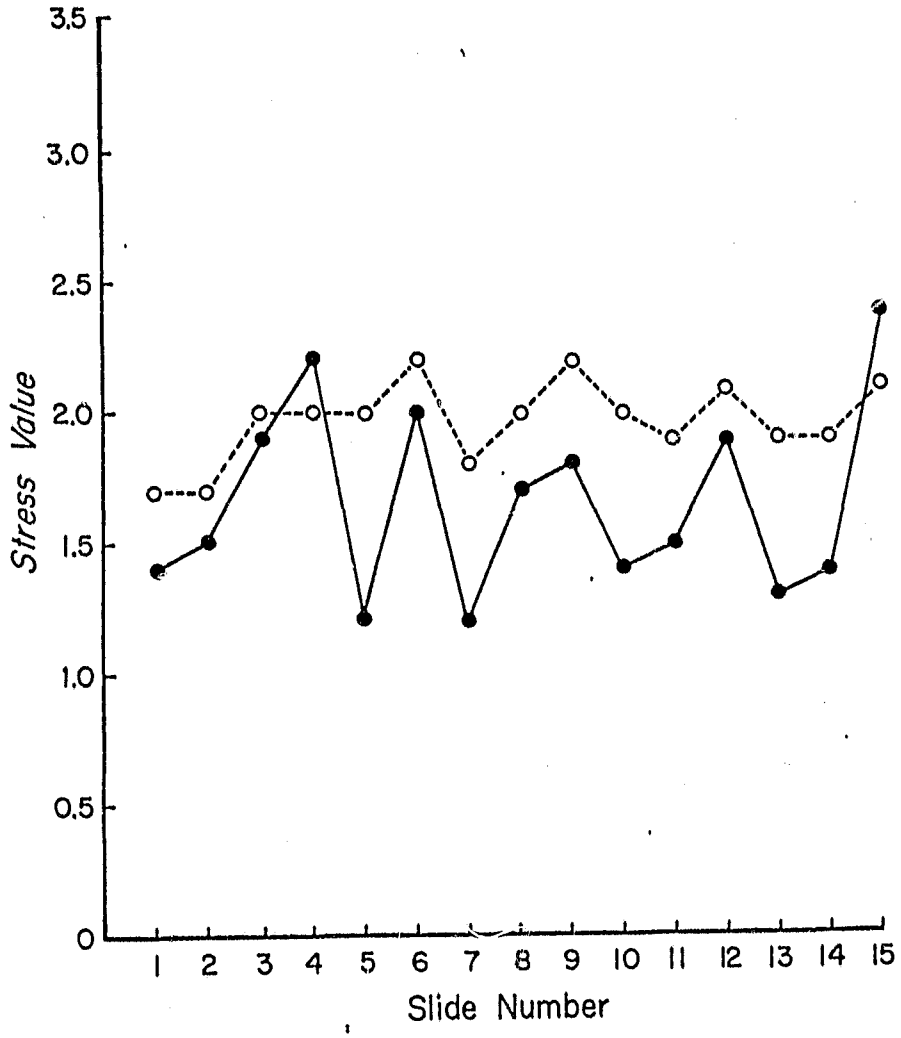


——— Nonadjusted mean stress values for Group D (Pre-Pedodontic Clinic Junior Dental Students).

----- Nonadjusted mean stress values for all subjects.

Figure 5

Group E

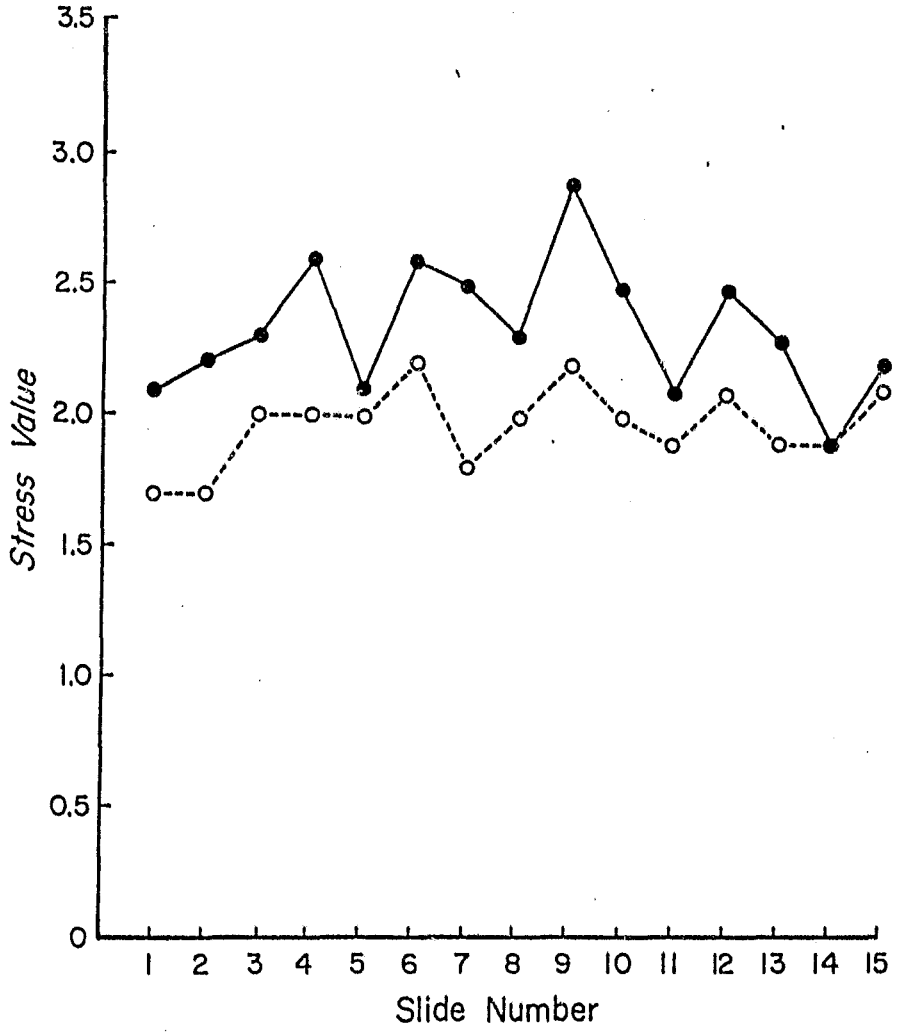


——— Nonadjusted mean stress values for Group E (Post-Pedodontic Clinic Junior Dental Students).

----- Nonadjusted mean stress values for all subjects.

Figure 6

Group F

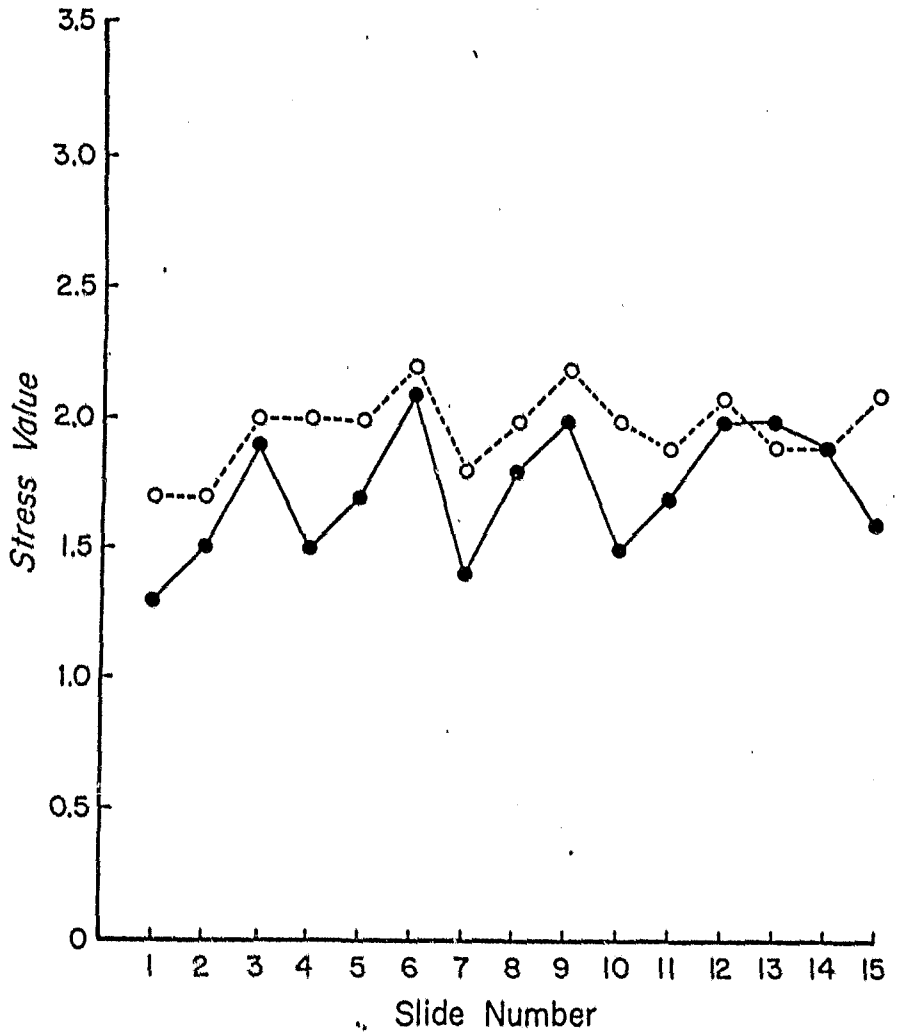


——— Nonadjusted mean stress values for Group F (Pedodontic Dental Assistants).

----- Nonadjusted mean stress values for all subjects.

Figure 7

Group G

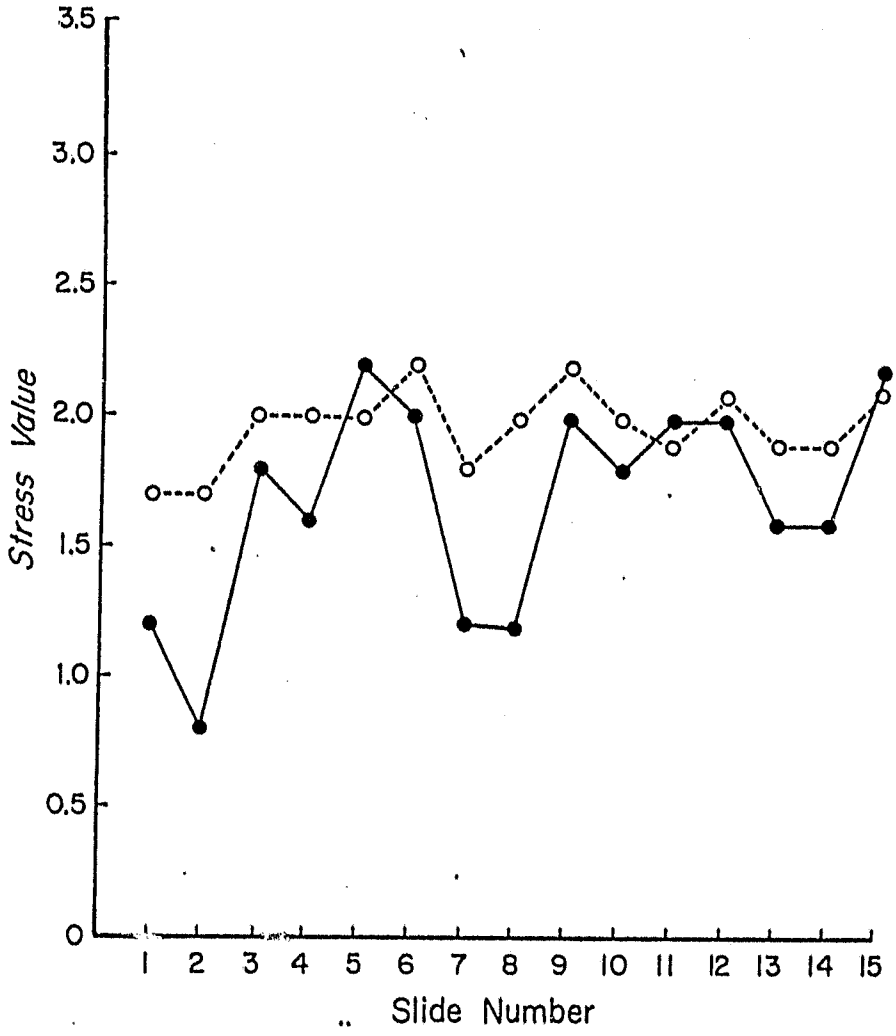


——— Nonadjusted mean stress values for Group G (General Practitioners).

----- Nonadjusted mean stress values for all subjects.

Figure 8

Group H

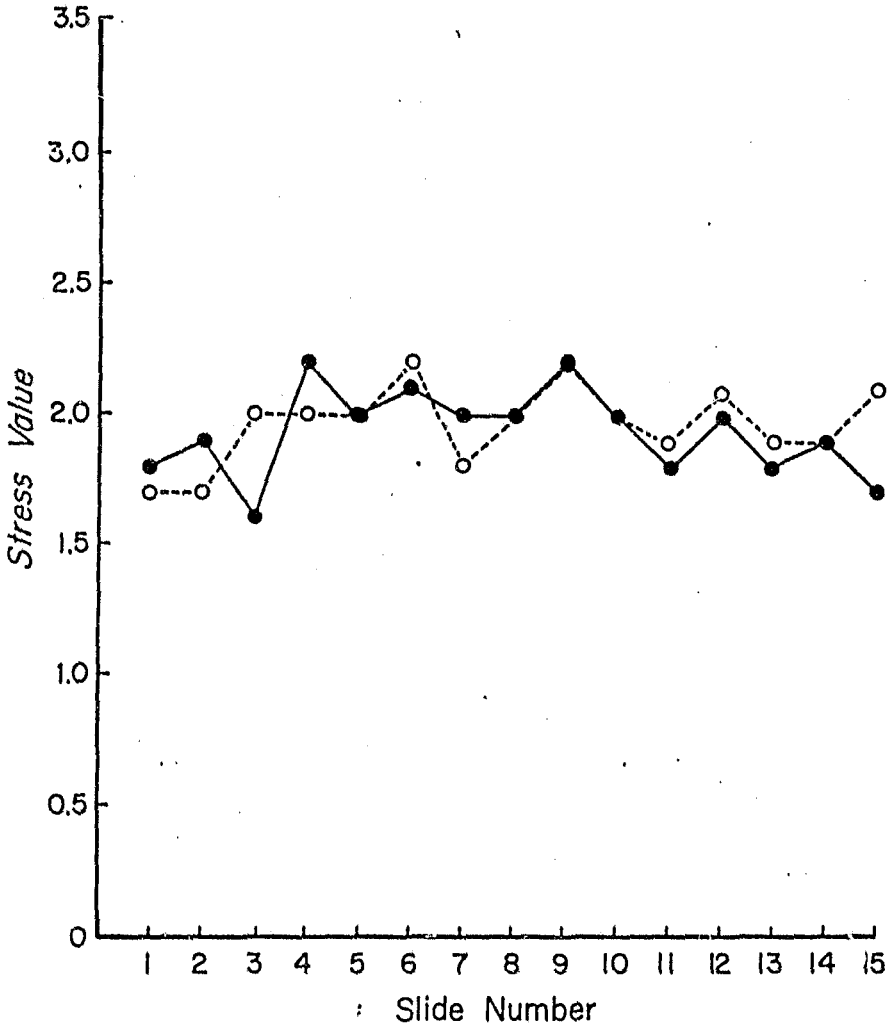


——— Nonadjusted mean stress values for Group H (Pedodontic Graduate Students).

- - - - - Nonadjusted mean stress values for all subjects.

Figure 9

Group I

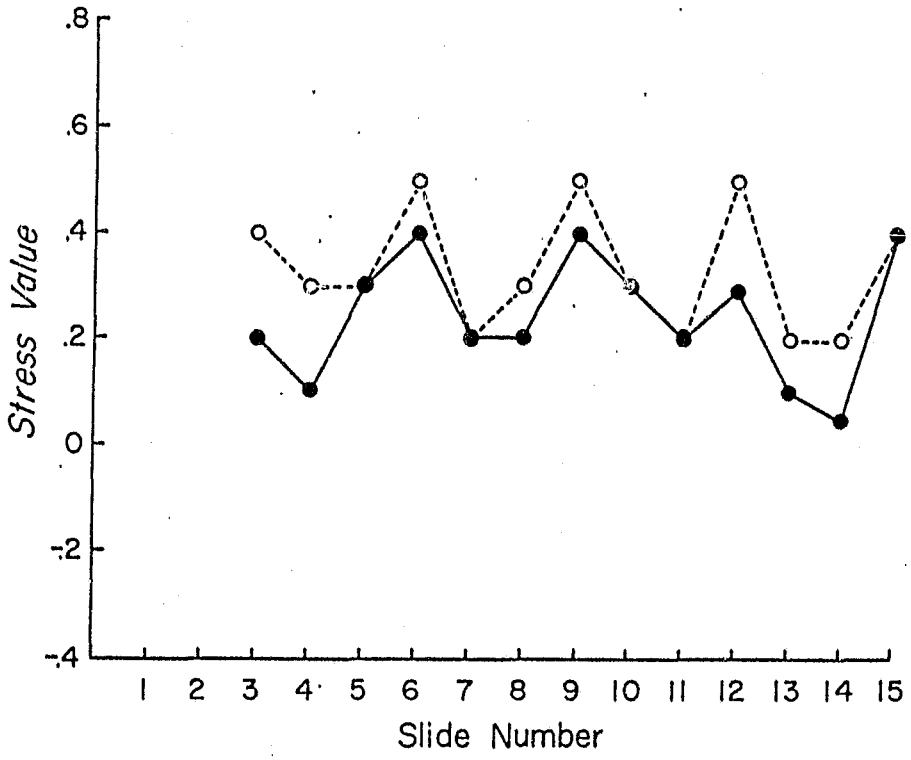


——— Nonadjusted mean stress values for Group I (Pedodontists).

----- Nonadjusted mean stress values for all subjects.

Figure 10

Group 1

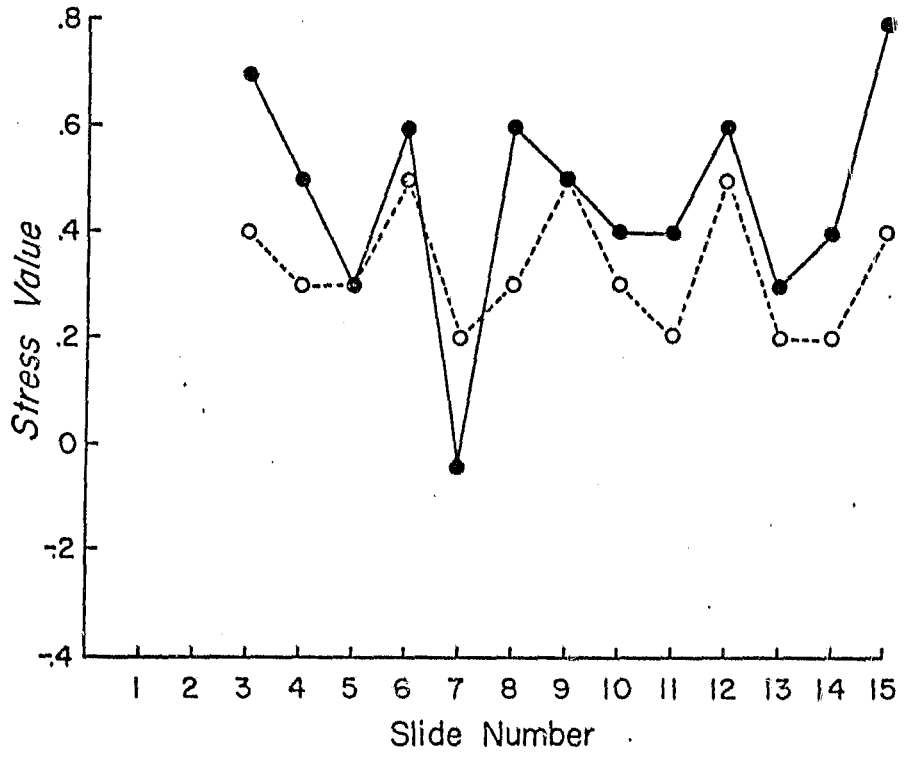


_____ Adjusted mean stress values for combined Group 1 (Freshman and Sophomores).

----- Adjusted mean stress values for all subjects within combined groups.

Figure 11

Group 2

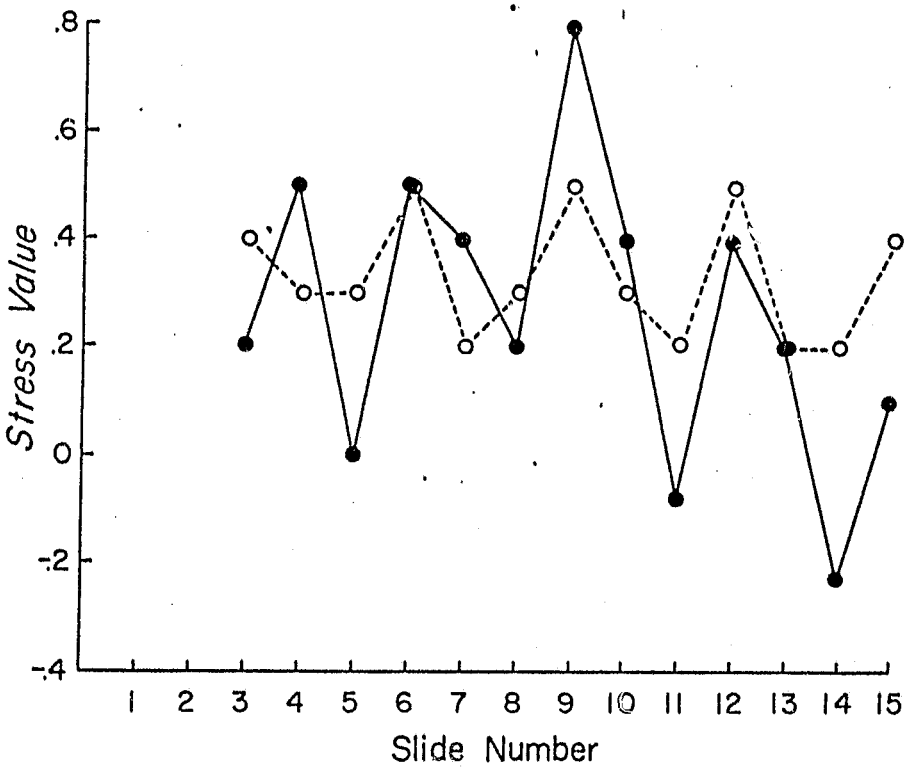


———— Adjusted mean stress values for combined Group 2 (Pre and Post Pedodontic Clinic Junior Dental Students).

----- Adjusted mean stress values for all subjects within combined groups.

Figure 12

Group 3

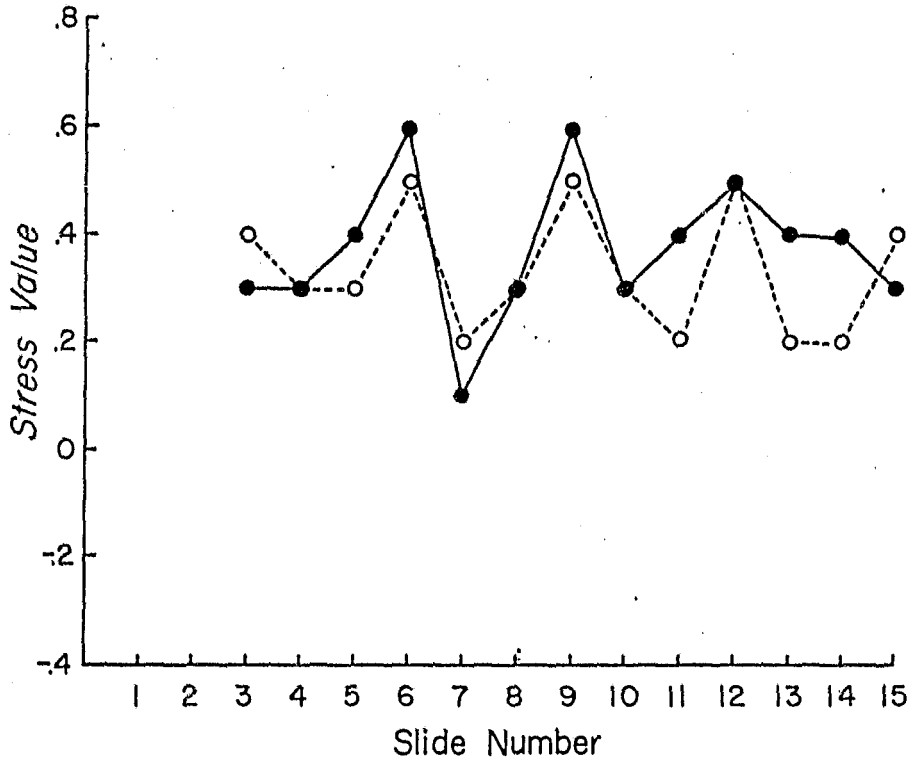


_____ Adjusted mean stress values for combined Group 3 (Pedodontic Dental Assistants).

----- Adjusted mean stress values for all subjects within combined groups.

Figure 13

Group 4

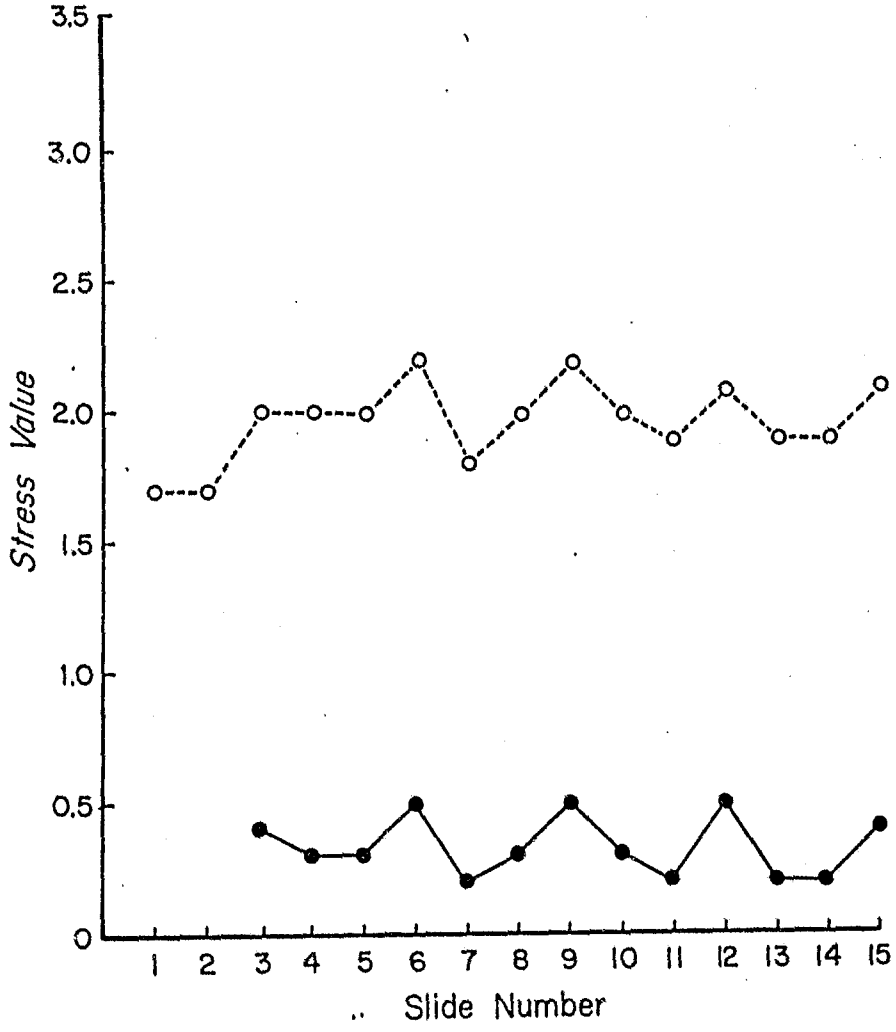


——— Adjusted mean stress values for combined Group 4 (General Practitioners, Pedodontic Graduate Students and Pedodontists).

----- Adjusted mean stress values for all subjects within combined groups.

Figure 14

All Subjects



———— Adjusted mean stress values for all subjects within combined groups.

----- Nonadjusted mean stress values for all subjects.

That the PSE-101 is a valid indicator of stress and that the potentially visual stimuli are capable of eliciting a stressful response is substantiated by the data in tables 5 and 6 which illustrate a significant difference (p=.003) between the nonadjusted mean stress value of stressors and nonstressors for all subjects and a significant difference (p=.002) between the adjusted mean stress value of stressors and nonstressors for all subjects within combined groups. The investigation might have found more significant differences within individual and combined groups (tables 3 and 4) had there not been so great an amount of variation of stress between subjects. Another factor contributing to a lack of significant difference in individual and combined groups was the frequent high stress level elicited by slide #15 which was a nonstressor. That slide #15 was placed in the slide sequence in a position normally occupied by a stressor might offer partial evidence of a conditioning effect taking place.

In response to the question of inter-rater reliability, an agreement of 83% was considered very satisfactory especially in view of the relatively large seven-point scoring system employed.

The question of how stress operates, why it affects some more than others, and why in some cases it leads to particular consequences in some and none in others remains relatively obscure. At least two major barriers have hindered our understanding of the stress phenomenon. The first barrier revolves around the lack of conceptual clarity surrounding the phenomenon itself. This difficulty is compounded by lack of agreement by various investigators on the

fundamental question as to whether the process is lodged essentially in the nature of the stimulus, the way it is perceived, or the manner in which it is managed.

The second major barrier consists of numerous methodological problems concerning how best to collect meaningful and valid data on stress.

Summary and Conclusions

The purpose of this study was to investigate stress as it relates to visual stimuli of potentially stressing situations within the field of pedodontics. The principle area under examination was concerned with how these situations would be perceived by professionals in dentistry having varying levels of clinical experience and education in pedodontics. The data from this investigation supports the following conclusions:

1. Two trained raters can interpret voice prints made from vocal recordings on a seven-point scale with a satisfactory degree of inter-rater reliability.
2. Potentially stressful visual stimuli are capable of eliciting a stressful response as measured by the PSE-101.
3. The Psychological Stress Evaluator (PSE-101) developed by Dektor Counterintelligence and Security, Inc. is a valid indicator of stress.
4. Clinical experience/education in pedodontics does not decrease absolute amounts of stress (no adjustment for situational stress made).

5. Clinical experience/education in pedodontics does not decrease relative amounts of stress (adjustment for situational stress made.

Many suggestions for future study in this relatively new area of investigation should be considered. First, several sets of sequentially randomized slides might be compiled and presented to subjects on a randomized basis. This would offer insight on the effects of sequencing of visual stimuli on stress reactions. Second, the methodology might require that all instructions and response evoking questions are prerecorded so that subjects can be examined in the complete absence of the investigator. This would eliminate the possibility of investigator stress being transmitted to the subject. Third, it might be desirable to allow greater recovery time between slides. For example, each slide might be spaced apart from the next by an empty slot so that a consistent white visual field appears between each slide. Fourth, in an attempt to find out if this technique is superior in measuring stress, other techniques might be employed to measure stress within the same basic experimental design.

APPENDICES

APPENDIX A

PHOTOGRAPH OF PSYCHOLOGICAL STRESS EVALUATOR (PSE-101) AND UHER 4000-IC

APPENDIX B

CERTIFICATION OF SUBJECT CONSENT

Project title: Stress Reactions of Various Judging Groups to the Child Dental Patient

Investigator: Jimmy Pinkham, D.D.S. and Jay B. Johnson, D.D.S.

I, _____ (subject's name), hereby certify that I have been told by Jay B. Johnson, D.D.S. of the Department of Pedodontics about the research on stress reactions to visual stimuli analyzed via voice prints and its purposes. I have been told about the procedures to be followed and which of them are experimental. I understand the possible discomforts and risks and the possible benefits relating to this research project.

A written summary of what I have been told is attached. I have been given an adequate opportunity to read it.

I understand that I have the right to ask questions about any procedure and to withdraw my consent and stop taking part in the project at any time without prejudice to me.

I hereby freely consent to take part in this research project.

_____
(signature of subject)

I, the undersigned, certify that I was present during the oral presentation of the written summary attached when it was given to the

above subject.

(signature of auditor-witness)

APPENDIX C

SUMMARY OF PROJECT

The chief purpose of this study is to determine which of several groups representing various educational and experience levels exhibit more stress to situations potentially encountered in pedodontics. As a participant in this study you will be a representative of one of these groups.

After listening to a brief recorded set of instructions as to what is to take place during the procedure, you will be viewing a series of approximately 15 slides comprising a range of potentially stressful information. After a slide has come into view you will respond "yes" to the examiner's question, "Do you see the slide?". This series of responses will be recorded for voice analysis at a later time using the Psychological Stress Evaluator (PSE-101).

Any discomforts involved to you as a participant in this study would be minimal and would result from the viewing of slides containing varying amounts of stressful information.

New knowledge derived from this study is expected to benefit professionals in pedodontics in general rather than specific participants taking part in this study.

All inquiries concerning the procedures will be answered upon request.

In addition, each participant is free to withdraw his consent and to discontinue participation in the project at any time without prejudice to the participant.

Finally, each subject's privacy in the analysis of stress will be assured since responses will be identified from the master tapes by number only.

"I have discussed the above points with the subject and it is my opinion that he/she understands the risks, benefits, and obligations involved in participation in the project."

Jay B. Johnson

APPENDIX D

PROFILE SHEET

1. _____
(social security number)

2. _____
(age)

3. M F
(sex)

4. Current experience level (please circle only one letter)

   A. Senior dental hygienist

   B. Freshman dental student

   C. Sophomore dental student

   D. Pre-pedodontic clinic junior dental student

   E. Post-pedodontic clinic junior dental student

   F. Pedodontic dental assistant

   G. General practitioners

   H. Pedodontic graduate student

   I. Pdodontist

APPENDIX E

PRERECORDED INSTRUCTIONS PRESENTED TO EACH SUBJECT VIA TAPED RECORDING

"The instructions for today's procedure are the following:

1) You will be viewing a series of slides comprising a range of potentially stressful information encountered within pedodontics.
2) After each slide has come into view, you will respond to the examiner's question "Do you see the slide?" by answering "Yes".
3) Your responses are being tape recorded for later voice analysis and are identified by number only."

APPENDIX F

VOICE PRINT SCORING SYSTEM

LIST OF REFERENCES

1. Kanner, L.: Child Psychiatry. 3rd ed. Springfield: Charles C. Thomas, 1957.

2. Beauer, H.A.: Management of a Young Patient. Journal of the Michigan Dental Association, 58: 73-80, February 1976.

3. Selye, H.: Eustress. Psychology Today, pp. 60-70, March 1978.

4. Mechanic, D.: Students Under Stress. Glencoe, Ill.: Free Press, 1961.

5. Basowitz, H.: Anxiety and Stress. New York: McGraw-Hill, 1955.

6. Alexander, F.: Psychosomatic Medicine, Its Principles and Application. New York: Norton, 1950.

7. Dunbar, H.F.: Mind and Body. New York: Random House, 1947.

8. Geinker, R.R., and Speigel, J.P.: Men Under Stress. Philadelphia: Blakiston, 1945.

9. Wolff, H.G.: Changes in Form and Function of Mucous Membranes Occurring as Part of Protective Reaction Patterns in Man During Periods of Life Stress and Emotional Conflict. Transactions of the Academy of American Physicians, 61: 313-34, 1948.

10. Selye, H.: The Stress of Life. New York: McGraw-Hill, 1956.

11. Dohrenwend, B.P.: The Social Psychological Nature of Stress: A Framework for Casual Inquiry. Journal of Abnormal Social Psychology, 62: 294-302, 1961.

12. Janis, I.: Problems of Theory in the Analysis of Stress Behavior. Journal of Social Issues, 10: 12-25, 1954.

13. Stevenson, I.P., and Ducan, C.H.: Alterations in Cardiac Function and Circulatory Efficiency During Periods of Life Stress as Shown by Changes in the Rate, Rhythm, Electrocardiographic Pattern and Output of the Heart in Those with Cardiovascular Stress. Research Publication, Association for Nervous and Mental Disorders, 29: 799-817, 1950.

14. Wolf, S.: Hypertension as a Reaction Pattern to Stress; Summary of Experimental Data on Variations in Blood Pressure and Renal Blood Flow. Annals of Internal Medicine, 29: 1056-76, 1948.

15. Bautt, H.: Emotions and Heart: Relationships of Stress in Changes in Blood Pressure, Cardiac Rates, Rhythms and Pain. L.E. Phillips, Psychological Research Symposium, 1966.

16. Margolin, S.G.: Variations of Gastric Functions During Conscious and Unconscious Conflict States. Research Publication, Association for Nervous and Mental Disorders, 29: 656-65, 1950.

17. Malms, R.B. and Shagass, C.: Physiologic Studies of Reaction to Stress in Anxiety and Early Schizophrenia. Psychom. Med., 11: 9-24, January-February, 1949.

18. Lindsley, D.B.: Emotions. In Stevens, S.S., editor: Handbook of Experimental Psychology. New York: John Wiley and Sons, Inc., 1958.

19. Bower, D.: Respiration and Blood Pressure in Sensory Motor Conflict. J. Gen. Psychol., 34: 47-58, January, 1946.

20. Ax, S.F.: Physiological Differentiation Between Fear and Anger in Humans. Psychosom. Med., 15: 433-442, September-October, 1953.

21. Shacter, J.: Pain, Fear, and Anger in Hypertensives and Normotensives. Psychosom. Med., 19: 17-29, January-February, 1957.

22. Srp, L. and Dominek, J.: Reaction of Children to Dental Treatment: an Experimental Study. Odont. Revy., 14: 178-186, No. 2, 1963.

23. Perry, H.T.: Occlusion in a Stress Situation. J. Am. Dent. Assoc., 60: 626-633, May, 1960.

24. Benson, A.J. and Gedye, J.L.: Some Suprospinal Factors Influencing Generalized Muscle Activity. Proceedings of Symposium on Skeletal Muscle Spasm. Leicester: Wheeler, 1961.

25. Horwitz, M.: Muscular Tension: Physiological Activation or Psychological Act? In Leiderman, P.H. and Shapiro, D., editors: Psychobiological Approaches to Social Behavior. Palo Alto: Stanford University Press, 1964.

26. Yemm, R.: Irrelevant Muscle Activity. Dent. Pract. (Bristol), 19: 51-54, October, 1968.

27. Yemm, R.: Variation in the Electrical Activity of Human Masticatory Muscles Occurring in Association with Experimental Stress. Arch. Oral Biol., 14: 873-878, August, 1969.

28. Yemm, R.: Masseter Muscle Activity in Stress: Adaptation of Response to a Repeated Stimulus in Man. Arch. Oral Biol., 14: 1437-1439, December, 1969.

29. Lewis, T.M. and Law, D.B.: Investigation of Certain Autonomic Responses of Children to a Specific Dental Stress. J. Am. Dent. Asso., 57: 769-777, December, 1958.

30. Okubo, S.: Application of Psychogalvanic Phenomenon at the Dental Clinic. Bul. Tokyo Dent. Col., 2: 13-31, May, 1961.

31. Stricker, G. and Howitt, J.W.: Physiological Recordings During Simulated Dental Appointments. N.Y. State Dent. J., 31: 204-206, May, 1965.

32. Corah, N.L. and Pantera, R.E.: Controlled Study of Psychologic Stress in a Dental Procedure. J. Dent. Res., 47: 154-157, January-February, 1968.

33. Corah, N.L.: Response to Sight and Sound in a Simulated Dental Procedure. J. Dent. Res., 48: 160, January, 1969.

34. Wolff, H.G.: Life Stress and Bodily Diseases. Baltimore: Williams and Wilkins, 1950.

35. Grace, W.J.: Life Situations, Emotions and Chronic Ulcerative Colitis. Research Publication, Association for Nervous and Mental Disorders, 29: 679-91, 1950.

36. Lindemann, E.: Modifications in the Course of Ulcerative Colitis in Relationship to Changes in Life Situations and Reaction Patterns. Research Publication, Association for Nervous and Mental Disorders, 29: 706-23, 1950.

37. Kepecs, J.G., and Robin, M.: Life Situations, Emotions and Atopic Dermatitis. Research Publication, Association for Nervous and Mental Disorders, 29: 1010-15, 1950.

38. Ripley, H.S.: Life Situations, Emotions and Glaucoma. Research Publication, Association for Nervous and Mental Disorders, 29: 523-36, 1950.

39. Bharucha-Reid, R., and Rodabe.: The Internal Modulating System and Stress: A Newrophysiological Model. Journal of General Psychology, 66: 147-58, 1962.

40. Caudill, W.: Cultural Perspective on Stress. Symposium on Stress, pp. 194-208. Washington, D.C.: Army Medical Service Graduate School, 1953.

41. Levine, S. and Scotch, N.: Toward the Development of Theoretical Models: II. Milfank Memorial Fund Quarterly, 8: 192-213, 1967.

42. Sarbin, T.R.: A New Model of the Behavior Disorders. Gaivein, 10: 324-41, 1962.

43. Howard, A. and Scott, R.A.: A Proposed Framework for the Analysis of Stress in the Human Organism. Behavioral Science, 10: 141-60, 1965.

44. Scott, R.A.: Illness and Social Role Difficulties. Mieog., 1963.

45. Alpert, M., Kurtzburg, R.L. and Friedhoff, A.J.: Transient voice changes associated with emotional stimuli. Archs. Gen. Psychiat., Vol. 8, 1963, pp. 362-365.

46. Rubenstein, L.: Electro-acoustical measurement of vocal responses to limited stress. Behav. Res. Ther., Vol. 4, 1966, pp. 135-138.

47. Hecker, M.H., Stevens, L., von Bismark, G. and Williams, C.E.: Manifestations of taste-induced stress in the acoustic speech signal. J. Acoust. Soc. Am., Vol. 44, 1968, pp. 993-1001.

48. Williams, C.E. and Stevens, K.N.: On determining the emotional state of pilots during flight: an exploratory study. Aerospace Med., Vol. 40, 1969, pp. 1369-1372.

49. Heisse, J.W. Jr.: Is the micro-muscle tremor usable?-The micro-muscle tremor in the voice. U.S. Congress. House Subcommittee of the Committee on Government Operations. The Use of Polygraphs and Similar Devices by Federal Agencies. Hearing, 93rd Cong., 2nd Sess., June 4 and 5, 1974. Washington: Government Printing Office, 1974, pp. 339-342.

50. Lippold, O.C.J.: Oscillations in the stretch reflex arc and the origin of the rhythmical 8-12 C/S component of the physiological tremor. The Journal of Physiology, Vol. 206, No. 2, 1970, pp. 359-382.

51. Halliday, A.M. and Redfearn, J.W.T.: An analysis of the frequencies of the finger tremor in healthy subjects. The Journal of Physiology, Vol. 134, No. 3, 1956, pp. 600-611.

52. Lippold, O.C.J.: Physiological tremor. Scientific American, Vol. 224, No. 3, 1971, pp. 65-73.

53. Product Information: Psychological Stress Evaluator. Psychiatry and Neurology, Vol. 3, No. 5, 1972.

54. Dektor, Inc.: Psychological Stress Evaluator. 1977, available from Dektor, Inc., 5508 Port Royal Road, Springfield, Virginia 22151.

55. Green, G.B.: Truth verification. Security World, October, 1973, p. 39.

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