IMAGERY, SELF-CONCEPT, ANXIETY, AND STRESS
AS PREDICTORS OF SERIOUSNESS
OF DISEASE

DISSERTATION

Presented to the Graduate Council of the
North Texas State University in Partial
Fulfillment of the Requirements

For the Degree of

Doctor of Philosophy

By

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May, 1981
Harris, Jerry Lon, *Imagery, Self-concept, Anxiety and Stress as Predictors of Seriousness of Disease.* Doctor of Philosophy (Counseling and Student Personnel Services), December, 1980, 175 pp., 9 tables, 4 illustrations, bibliography, 157 titles.

This research study was designed to investigate the relationships of imagery, self-concept, anxiety, stress, subjective stress and seriousness of illness and to determine the potential of certain cognitive mediating variables, especially imagery and an interaction between self-concept and imagery, to significantly increase the efficiency of stress as a predictor of seriousness of illness. The purposes of this study were: (1) to determine the efficiency of stress as a predictor of disease, (2) to determine if cognitive mediating variables will significantly increase the predictive efficiency between stress and disease, (3) to investigate selected correlations among the variables, (4) to provide a research base for current treatment procedures using imagery treating various illnesses.

A total of 188 subjects, from a small suburban junior college, comprised the sample of convenience. The following instruments were administered: the Social Readjustment Rating Scale (SRRS), the Tennessee Self-concept Scale (TENN), the State Trait Anxiety Inventory (STAI), the Betts Questionnaire on Vividness of Imagery (BETTS), the Guy
Emotive Imagery Scale (GUY), the spatial relations section of the Differential Aptitude Test (DAT), the Subjective Feeling of Stress (SS) and the Seriousness of Illness Rating Scale (SIRS). The data were treated using correlation and multiple linear regression.

Of the eight correlations investigated, five were found to be significant, life stress (SRRS) with illness (SIRS), self-concept (TENN) with vividness of imagery (BETTS), trait anxiety (STAI) with vividness of imagery (BETTS), trait anxiety (STAI) with visual imagery (DAT), and self-concept (TENN) with trait anxiety (STAI).

Six of the ten variables added to life stress as a predictor of illness significantly increased the efficiency of prediction. These were: trait anxiety, subjective feeling of stress, self-concept, visual imagery, sex, and the interaction between self-concept and emotive imagery. The most efficient model, found by stepwise regression, included trait anxiety, sex and life stress, which accounted for a combined 36% of the variance in predicting seriousness of illness.

The results of this study support a phenomenological interpretation of stress. Cognitive mediating variables such as trait anxiety and self-concept were more efficient in predicting seriousness of illness than was the external life stress measure.
It appears that the spatial relations section of the DAT may be confounded with frustration. The DAT was significantly negatively correlated with seriousness of illness and with trait anxiety. It was interpreted that those individuals that frustrated easily also scored low leading to the significant correlations.

The results of this study support the concept that there is a doubtful relationship between imagery and disease. Therefore only tentative support for treating physical illnesses with imagery was found. Significant interactions were found, but they contributed less than 2% of the variance, and they were not in the direction hypothesized.

The following recommendations were made:

1. A great deal of caution should be used in relating illnesses to imagery.

2. More emphasis should be placed on stress and anxiety management, improving self-concept and dealing with the subjective feeling of stress.

3. Further research should be conducted investigating low imagers as they interact with self-concept, predicting disease.

4. Further research should be conducted to determine if the spatial relations section of the DAT is confounded with frustration.

5. This model, using multiple linear regression, should be expanded to include more, relevant variables.
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CHAPTER I

INTRODUCTION

Imagery, defined as an internal picture or mental image, is one of the oldest of mental phenomena. It has long been an integral part of philosophy, literature, and religion. Aristotle considered images to be revivifications of sensations; Hume wrote papers discriminating between sensations and perceptions, and religion is replete with images and visions. On the surface, it seems that a great deal is known about imagery, yet much of what is known is speculation, little of what is known is documented (29).

Individuals who are capable of vividly and actively imagining emotionally loaded situations experience some of the same effects as if they were physically present in that situation. That is, they will experience effects of symptoms caused by the sympathetic nervous system. Symptoms associated with arousal in the sympathetic nervous system include increased respiration, increased heart rate, inhibited digestion (tightness in the stomach) and a general feeling of arousal (12, 23). It is not necessary that these responses be associated with external events. Samuels (28) states, "Our bodies react regardless of whether the situation has occurred in the external world or is an image held in
the mind" (p. 219). The examples of blushing and sexual arousal are common responses to memory and images.

When a person holds a strong fearful image in his mind's eye, his body responds, via the autonomic nervous system, with a feeling of "butterflies in the stomach," a quickened pulse, elevated blood pressure, sweating, goosebumps, and dryness of the mouth. Likewise, when a person holds a strong relaxing image in his mind, his body responds with a lowered heart rate, decreased blood pressure, and obviously, all his muscles tend to relax (28, p. 66).

Brown (1) in her pioneer research in bio-feedback has demonstrated that many autonomic processes that were previously thought to be beyond "conscious" control can actually be controlled by individuals. She presents evidence of the conscious control of brain waves, heart rates, blood pressure, blood supply, skin temperature, and muscle tension.

Exactly what mental processes are involved in the control of these phenomena is open to speculation. Most investigators in these areas are either practitioners or researchers interested in physiological changes and not the mental processes involved. It seems that some mental process, such as imagery, attitude, or the unconscious, does have an influence on autonomic physical events that were previously thought to be beyond the control of any conscious mental event (1, 37).

Since bio-feedback and imagery can lead to changes in the autonomic nervous system, it seems possible that
these phenomena could be related to Selye's work concerning stress and changes in autonomic nervous system. Selye (30,32) discovered that stress can lead to physiological changes which can ultimately lead to disease processes in the organism. Is it possible, therefore, that imagery could lead to changes which could ultimately lead to disease in the organism?

A review of the literature in this area revealed that extensive research had been done relating stress (30, 32) and life events (9) to disease, but no studies were found which related imagery and its effects to disease. Some theoretical support for relating imagery to disease was found in the writings of Weil (37), Samuels and Samuels (28), and Simonton (33).

Weil (37) has hypothesized that disease processes, physical and mental, are influenced or caused by mental states. My experiences in allopathic medicine, both as a patient and as a practitioner, have led me to conclude that all illness is psychosomatic. I do not use the word in the sense of "unreal" or "phony," as many allopaths do. Rather, I mean that all illness has both psychic and physical components, and it seems to me that the physical manifestations of illness (including the appearance of germs in tissues) are always effects, while the causes always lie within the realm of the mind, albeit the unconscious mind. In other words, the disease process seems to me to be initiated always by changes in consciousness. In the case of infectious illness, the initial causative change is not that germs appear to attack the body but that something happens in the person that permits a breakdown of the normal harmonious balance between the body and the microorganisms surrounding it (37, p. 142).
According to Weil (37), many "disease causing" germs, such as staphylococci, are always present in or on our bodies. At times something happens to destroy the balance and the germs become invading organisms, that is, disease. Weil proposes that this imbalance is brought on by "unconscious factors." That is, the ultimate cause of the disease is the person's mind and not the invading organism.

Simonton (33) believes that all persons probably have some type of cancer process several times during their lifetime. He has theorized that these disease processes are normally destroyed by the body's immunological system, and that a patient's attitude has an influence on the immunological system. Therefore, one could treat disease by helping attitude. The question is -- how does one help an attitude?

Simonton (33) uses visualization and imagery to treat cancer in his patients, and some of the patients classified as "terminal" have recovered from their cancers. Simonton has found that if patients can follow instructions and form positive images concerning the remission of the disease, their likelihood of recovery is greatly increased. Positive imagery appears to be related to the remission of cancer.

These authors imply that certain mental states, including imagery, can influence autonomic processes and
appear to be related to disease. Lazarus (15) states that there are mediating cognitive processes in individuals which lead to an evaluation and appraisal of the stressful event. An autonomic response will occur depending not upon the event but upon the individual's appraisal of the event. It seemed, therefore, possible that imagery might be an important variable in that cognitive evaluation. This hypothesis is directly supported by the research of de Faire and Theorell (3) and Rabkin and Struening (26), which indicates that stressful life events, when taken alone, are not efficient predictors of illness. However, if other measures are added, such as social support, the predictive efficiency increases.

Although imagery alone as a significant factor in the cognitive evaluation process has not been investigated, it seemed unlikely that imagery alone would significantly affect an evaluation process. Imagery, either vivid or not, would have to interact with some basic evaluative process of the individual. Although there were no guidelines from the literature, it was hypothesized that self-concept was that basic evaluative process which might interact with imagery and alter the perception of the stressfulness of the external event.

Another variable that could be important in determining an individual's appraisal of an event is anxiety. Manuck, Hinrichsen, and Ross (20) found that stress and anxiety
are highly correlated; therefore would information concerning anxiety, when added to the other variables, significantly improve the ability to predict disease? Is it reasonable to assume that individuals with a character trait of anxiety will perceive events as being more stressful than less anxious counterparts and thus experience more seriousness of disease?

In summary, the following model was posed: a stressful event can be mediated by some cognitive process, consisting of but not limited to the variables of imagery, anxiety, and self-concept, which, depending upon the mediation, might eventually lead to health or disease. Little research has been done concerning the relationship between these variables and disease. Therefore, research is needed to determine if mental states, such as imagery and self-concept, interact with stress and anxiety to produce disease. Furthermore, research in this area is needed to provide a better theoretical base for what is already being done in treatment procedures. Finally, research in this area could help provide information for identifying individuals with a high probability for disease and for identifying individuals who would respond best to imagery related treatments.

Statement of the Problem

The problem of this study was to determine the relationships between imagery, self-concept, anxiety, stress, and seriousness of disease.
Purpose of the Study

The purposes of this study were (1) to determine if anxiety, stress, imagery, self-concept, and seriousness of disease are related, (2) to determine the efficiency of stress as a predictor of disease, (3) to determine if a combination of imagery and self-concept, along with stress, will increase the predictive efficiency concerning seriousness of disease, (4) to determine if anxiety will increase the predictive efficiency when added to the other vectors, (5) to provide information that may help develop a theoretical base concerning imagery and disease, and (6) to provide information that may be beneficial with regard to future research involving imagery, self-concept, anxiety, stress, and disease.

Definitions

Disease and health are complex multidimensional phenomena which can be defined in terms of physical, mental, and social variables (36). Traditionally, in line with the medical model, diseases are conceptualized as being caused by diagnostic entities, in that the organism is invaded by an alien entity, such as a germ, the immunological defense system does not respond properly, symptoms arise, and disease is diagnosable (31).

Diseases which are generally termed psychosomatic, such as ulcers, headaches, and heart problems, are characterized by physically diagnosable symptoms but no observable
diagnostic entities. To show the extreme diversity of definitions in this area, a broad definition is given by Howell (11), who divides the term "dis-ease" and uses the term to refer to any condition that would cause discomfort to the individual.

Recently the discrimination between psychosomatic disease and physical disease (referring to the diagnostic entity) has become difficult to make, and some authorities term all disease as psychosomatic (37). Weil proposed that even concerning diagnostic entities, the individual, due to certain mental states, has "opened up" to the disease. In this concept of disease, the potential capabilities of the mind have been greatly expanded.

Garrity, Marx, and Somes (7) contrast one continuum of disease, from serious to not serious illness, with severity of illness. Seriousness of an illness is the likelihood that the illness will result in the death of the individual. An illness may be severe, such as a migraine headache, but present very little threat to life. Seriousness of disease, in this study, was operationally defined as the scores on the Seriousness of Illness Rating Scale.

Anxiety, defined as the feeling of worry and apprehension that is experienced by an individual, has been divided into two types, state and trait anxiety, by Spielberger, Gorsuch, and Lushene (34). State anxiety is that state or condition of the individual at any specific moment, and this state of
anxiety can range from uneasiness to complete panic. Trait anxiety, which predisposes the individual to react to situations with worry and anticipation, is characterological. For the purposes of this study, anxiety was defined as a trait and was operationally defined as the scores on the State Trait Anxiety Inventory.

Imagery is a complex phenomena and a difficult concept to define. Richardson (27) states,

Mental imagery refers to (1) all those quasi-sensory or quasi-perceptual experiences of which (2) we are self-consciously aware, and which (3) exist for us in the absence of those stimulus conditions that are known to produce their genuine sensory or perceptual counterparts, and which (4) may be expected to have different consequences from their counterparts (p. 2).

Within the framework of this definition many different types of imagery are possible, such as the following: after-image, eidetic imagery, memory imagery, imagination imagery, hypnagogic imagery, perceptual isolation imagery, hallucinogenic drug imagery, meditation imagery, and others.

Different aspects of imagery were measured in this study, including vividness of imagery, emotive imagery, and visual spatial imagery. For the purposes of this study, these concepts were operationally defined as the scores obtained on the Questionnaire on Vividness of Imagery, Guy Emotive Imaging Scale, and the Spatial Relations section of the Differential Aptitude Test.
Self-concept is defined by Fitts (5) in terms of how individuals see themselves. Fitts (5) states,

Those people who see themselves as undesirable, worthless, or bad tend to act accordingly. Those who have a highly unrealistic concept of self tend to approach life and other people in unrealistic ways. Those who have deviant self-concepts tend to behave in deviant ways. Thus, a knowledge of how an individual perceives himself is useful in attempting to help that individual, or in making evaluations of him (p. 1).

For the purposes of this study, self-concept was operationally defined as the Total P score on the Tennessee Self-concept Scale.

Stress can be defined as any experience such as a physical event or a psychological event (including imaginal), that is encountered by the individual and calls for an adaptive reaction. Life itself is stressful, and events such as the beating of the heart, walking, the pressures of business or school, all are stressful. For the purposes of this study, those events that call for an adaptive reaction by the individual were considered stressful and were operationally defined as the scores on the Social Readjustment Rating Scale.

Background

The relationship between stress and disease has been studied extensively (4, 7, 8, 9, 10, 14, 19, 22). Levi (17) has published a three-volume collection of articles concerning stress and its effects upon physical and mental health, marriage, male and female roles, and stress and its effects
upon behavior of children and their mental and physical health. Other collections of articles by Dohrenwend and Dohrenwend (4) and Monat and Lazarus (25) include research into stress and coping, the measurement of stress, stress and physical and psychiatric symptomatology. A computer search of psychological abstracts, limited to the past 10 years, indicated that over 47,000 articles referenced stress as it relates to either health, disease, patients, sickness, or illness.

The initial research concerning stress and physiological changes was conducted by Cannon (2), who was interested in the bodily changes that accompanied major emotions such as pain, hunger, etc. Cannon noted that bodily changes such as an increase in blood sugar and adrenalin, circulatory changes, and an increase in the clotting factor in the blood, prepared the individual for fighting and the possibility of injury. These changes were viewed as being adaptive and not as precursors to disease.

In contrast with Cannon, Meyer (24) did not think that life events had to be catastrophic to elicit physiological changes. Furthermore, Meyer hypothesized that events such as a change in living habits, admission to school, working conditions, dates of the birth and death of significant friends and family members, and other significant environmental events were important in the etiology of disease. Meyer thought that normal life events, not only those
associated with major emotion, could lead to physiological changes which in turn could lead to disease and disorder.

The classical experiments concerning stress and disease were conducted by Selye (30), who induced stress by using either extreme cold or injecting sublethal doses of different toxic agents into animals. It was discovered that regardless of the toxic agent or the irritating situation, the physiological responses were basically the same. There seemed to be a general organismic response to stress which was an attempt by the animal to adapt, and Selye termed this the "general adaptation syndrome" (GAS).

The GAS was viewed as an "automatic" response to stress, that is, an autonomic nervous system process which was not influenced by cognitive factors (32). If the stress to which the animal was subjected continued, the animal died. The death was not directly due to the poison or cold but to a complex physiological process with which the animal was trying to protect itself. In essence, stress caused physiological reactions which eventually led to breakdowns in organ systems, which led to death.

Lazarus (15, 16, 25), in a contrasting position to that of Selye, approaches stress and emotions from a cognitive point of view. Lazarus states that the GAS of Selye may be understood completely from a psychological point of view, in that any animal that has experienced injury or any physical insult must in some way sense that it is
in trouble or there will be no attempt at adaptation (GAS). Monat and Lazarus state,

Moreover, in research on the GAS, psychological mediation has almost never been ruled out. Thus, one could argue with some justification that this cognitive appraisal of harm via cerebrally controlled processes is necessary to initiate the body's defensive adrenal cortical response. An animal that is unconscious can sustain bodily harm without the psychoendocrine mechanisms of the GAS becoming active (25, p. 147).

Symington (35) lends credibility to this position in his comparison of autopsies on patients who were conscious during fatal injury or illness with autopsies on patients who were unconscious during similar injury or illness. The unconscious patients showed normal adrenal cortical conditions, while the conscious patients showed adrenal cortical changes.

Further support for the cognitive appraisal position comes from research by Lief, Young, Spruiell, Lancaster, and Lief (18), who interviewed medical students witnessing their first autopsy. The students' abilities to detach and depersonalize the autopsy procedure were found to be related to their ability to cope successfully with the situation. Research by Marks, Marset, Boulougouris, and Huson (21), comparing neutral and phobic imagery and autonomic nervous system changes, found similar results in that neutral imagery elicited no response, while phobic images elicited measurable changes in the autonomic nervous system.
According to Monat and Lazarus (25), a person's cognitive appraisal of the stressful event will determine the amount of emotion and stress that is experienced specifically by that individual. Conversely, Selye (31) attributes little or no importance to the intervention of cognitive factors in the stress response; it is not that Selye attacks that position; he simply omits it directing his attention to the complex physiological mechanisms of stress. Lazarus states in a book edited by Selye (32), "There is elaborate empirical support for the mediating role of cognitive processes in psychological stress. The general principle seems not to be greatly challenged or in doubt according to most recent writers" (p. 91).

This study employed a measure devised by Holmes and Rahe (10), whose theoretical position appears closer to that of Selye than Lazarus. Illness is seen as resulting from the stress and tension of adaptation caused by certain life events. It seems to be assumed by Holmes and Rahe that the cognitive appraisal of these events is not important or at least not significant enough to cause individual variations in stress. This is in line with the position of Selye (32).

It has been documented that the Social Readjustment Rating Scale (10) is not an exceptionally efficient predictor of illness when taken alone (3, 26). Therefore, it seems reasonable to use measures of cognitive appraisal
processes to determine if it would be possible to increase the predictive efficiency of the Social Readjustment Rating Scale. First, should one begin with the variable of stress or life events in the prediction of disease? Next, are self-concept, imagery, and anxiety possible variables in some cognitive evaluation process which could mediate between the external event and the internal physiological reactions which may lead to disease processes?

Most of the research to determine the relationship between stress and disease has found significant results (4, 17, 25, 31, 32). Specifically, most of the research using the Social Readjustment Rating Scale (SRRS) has found that scale positively correlated with illness and disease (4), indicating that those individuals with high scores on the SRRS experience more frequent or more severe illnesses. Even though this relationship has been significantly positive, the correlation has usually not been high, thus suggesting that other factors such as cognitive appraisal, genetic influence, physical condition, and social support mediate between stress and illness (13). Therefore, this study began by using life events to predict seriousness of illness and added variables to this model in order to attempt to increase the predictive efficiency of the model.

Although a great deal of research has been done in the area of stress and the relationship with disease,
conspicuously absent from the investigations in this area is research including imagery as a variable concerning the etiology of disease. Taking this into consideration, what support is there for the supposition that imagery could be a variable in some mediating process?

Samuels (28) has stated that it is commonly known that imagery can influence a person's pulse, blood pressure, sweating, etc., and Marks, Marset, Boulougouris, and Huson (21) have demonstrated with research that normal subjects when given different imagery instruction will differ significantly in heart rate, skin conductance, and subjective anxiety ratings. These autonomic responses are similar to those found by Selye (30) in the initial stages of his stress research. It seems feasible to assume, therefore, that imagery may contribute in some manner in the stress response.

In examining the areas of stress and disease, one must not forget the extremely broad definition possible with the word disease. Luborsky, Docherty, and Penick (19) have suggested that all illnesses, not just those termed psychosomatic, are brought on by stress. All the patients in their study experienced some type of stress prior to the onset of the disease. Significant variables they found related to the onset of disease were (in rank order) resentment or hostility, frustration or rejection, depression or hopelessness, anxiety, helplessness, separation from loved ones, changes in life situation, and difficulties in
relationships with the therapists or experimenters. The writings of Weil (37) support this concept that stress is related to all disease. In reviewing the literature in the area of imagery and disease, a broad definition of disease, including references to physical and psychological diagnostic categories, has been found.

Even though there is little experimental research concerning the relationship of imagery and illness, imagery is frequently used to help alleviate human suffering and disease. These areas include systematic desensitization, bio-feedback, autogenic training, and the work of Simonton (28) with cancer patients. What is the relationship of imagery to disease in these areas?

Systematic desensitization assumes a relationship between imagery, anxiety, stress, and disease. Clients are instructed to imagine certain situations, and these images are crucial in achieving therapeutic change. Franks (6) presents considerable evidence concerning the efficacy of systematic desensitization, which uses imagery and relaxation to reduce maladaptive behavior. Although there is a great deal of research concerning the efficacy of this approach, there is little research concerning the relationship of imagery, anxiety, stress, and disease.

Brown (1) has demonstrated, via her excellent research in bio-feedback, that many autonomic processes that were
previously thought to be beyond "conscious" control can actually be controlled by individuals. She presents evidence of the conscious control of brain waves, heart rates, blood pressure, blood supply, skin temperature, and muscle tension: control which is frequently achieved via imagery.

Autogenic training, which is used primarily in Europe, is similar to hypnotic induction during the initial phase in that patients are taught to relax deeply and imagine parts of their bodies being "heavy" or "warm." After learning the initial procedure, the patient is directed to spontaneously visualize colors, objects, or concepts such as happiness, feelings, or people. The meditative training may then be directed to the associated illness. According to Samuels (27),

Autogenic Training has been used in coordination with standard drug and surgical procedures in Europe to treat a broad range of disease, including ulcers, gastritis, gall bladder attacks, irritative colon, hemorrhoids, constipation, obesity, heart attacks, angina, high blood pressure, headaches, asthma, diabetes, thyroid disease, arthritis, and low back pain. It has also been used on obstetrics and gynecology, dermatology, ophthalmology, surgery, psychiatry and dentistry. Extensive research has been done which demonstrates the efficacy of Autogenic Training in the treatment of a number of chronic diseases (p. 225).

Simonton (27) uses visualization in the treatment of various types of terminal cancers. Initially patients are taught to relax and to visualize a scene which is peaceful to them. Patients are then instructed to visualize
their disease, and to visualize their bodies' defense systems attacking and killing the disease; then, using imagery and fantasy in a visual and concrete manner, the defense system is seen as attacking the disease and killing it. Finally the patients see themselves as being well. Simonton (28) has studied 152 patients over a two-year period and found that of the nine patients who were rated as fully cooperative with the visualization, all displayed excellent and dramatic improvement. Thirty-five patients were rated as uncooperative or rarely cooperative, and of those thirty-five nineteen displayed no relief of symptoms; fourteen displayed fair relief of symptoms; two displayed good relief of symptoms; and none displayed excellent improvement. Samuels and Samuels (28) state, "The implications of a study such as Simonton's are that a person's visualizations play a fundamental role in the cause of disease and its cure."

Each of these therapeutic areas uses imagery in the treatment of different disease processes, and each reports significant results. It appears interesting that in an area such as stress, where research abounds, little or no experimentation has been done studying the basic relationships of stress, anxiety, imagery, self-concept, and disease, when stress is known to be a related factor to disease, and imagery is used frequently in the treatment processes. In order to help people, from the point of view of prevention
of disease and to understand the work already being done, it seems important to begin to develop a conceptual base as to how stress relates to imagery and likewise how these factors relate to health and illness. An investigation of the use of imagery and the interaction of imagery with self-concept to increase the predictive efficiency between stress and disease represents a unique aspect of this study.

In summary, stress has been found to be a significant but weak predictor of disease. In order to increase the efficiency of prediction, other variables must be investigated, some of which include cognitive mediation factors between stressful events and disease. Imagery is used in many different treatment modalities, including systematic desensitization, bio-feedback, autogenic training, and Simonton's treatment of cancer. Imagery appears to be an important and related mediating variable in both the etiology and the remission of disease processes. However, imagery as an isolated variable would not appear to contribute to an evaluation process, which the mediating cognitive process appears to be. How vividly people can image in relation to how people perceive themselves, appears much more related to an evaluation process. Also, the basic approach a person takes to stress and problems would appear to be involved; thus a measure of trait anxiety might improve the predictive efficiency of disease. It appears compelling that in order to form a conceptual base so as to
possibly prevent some disease and justify already existing
treatment procedures, research in the area of stress,
imagery, self-concept, and anxiety, as they relate to disease,
should be done.

Hypotheses

1. There will be a significant positive correlation
between stress and the seriousness of illness, as determined
by scores on the Social Readjustment Rating Scale and the
Seriousness of Illness Rating Scale.

2. There will be no significant correlation between
imagery and self-concept, as determined by the scores on the
Tennessee Self-concept Scale and
   a. the Questionnaire on Vividness of Imagery,
   b. the Guy Emotive Imaging Scale, and
   c. the spatial relations section of the Differential
      Aptitude Test.

3. There will be no significant correlation between
imagery and anxiety, as determined by scores on the State
Trait Anxiety Inventory and
   a. the Questionnaire on Vividness of Imagery,
   b. the Guy Emotive Imaging Scale, and
   c. the spatial relations section of the Differential
      Aptitude Test.

4. There will be a significant negative correlation
between self-concept and anxiety, as determined by scores on
the **Tennessee Self-concept Scale** and the **State Trait Anxiety Inventory**.

5. Using as the basic model stress as a predictor of disease, no significant increase in $R^2$ will be obtained when trait anxiety is added to the model.

6. Using as the basic model stress as a predictor of disease, no significant increase in $R^2$ will be obtained when perceived stress is added to the model.

7. Using as the basic model stress as a predictor of disease, a significant increase in $R^2$ will be obtained when self-concept is added to the model.

8. Using as the basic model stress as a predictor of disease, no significant increase in $R^2$ will be obtained when imagery is added to the model. Imagery will be determined by scores on
   a. the **Questionnaire on Vividness of Imagery**,  
   b. the **Guy Emotive Imaging Scale**, and  
   c. the spatial relations section of the **Differential Aptitude Test**.

9. Using as the basic model stress as a predictor of disease, no significant increase in $R^2$ will be obtained when a vector discriminating sex is added to the model.

10. Using as the basic model stress as a predictor of disease, a significant increase in $R^2$ will be obtained when a multiplicative combination of imagery and self-concept is added to the model. That is, there will be a significant
interaction between imagery and self-concept. Imagery will be determined by scores on

a. the Questionnaire on Vividness of Mental Imagery,
b. the Guy Emotive Imaging Scale, and
c. the spatial relations section of the Differential Aptitude Test.

11. The most efficient model in predicting disease will include some combination of imagery and self-concept.

Limitations

1. Measurement of imagery, stress, self-concept, anxiety, and disease was limited by the sophistication of the measures being used.

2. Subjects were limited to freshmen students in a junior college setting.

3. The majority of subjects were from a white population.


Stress which results from psychological and social stimuli is thought to be an etiological factor in physical and mental disease, and there is a rapidly growing body of research which supports this position. In 1974, Kagan and Levi (63) reviewed hundreds of articles concerning the relationship between stress and disease and developed a theoretical model from which to study the relationship between stress and illness. In the final analysis, Kagan and Levi concluded, "causation of disease by psychosocial stimuli is unproven but at a high level of suspicion" (63, p. 225). Since 1974, enormous quantities of material have been written concerning stress and disease. Of particular interest to this study is the theoretical position of Lazarus (70) that cognitive mediation is important in the stress response. Unique to this study is the evaluation of imagery as a variable in cognitive mediation. In order to manage the large amount of material, this review of the literature is organized around and generally limited to the variables that were examined by this study and, where possible, studies using the Social Readjustment Rating Scale. Therefore, the effects and the interactions of stress, anxiety, self-concept, and imagery, as they relate to disease in human subjects, are examined.
Stress and Disease

According to Monat and Lazarus (93), the leading researchers in the field of stress have been unable to agree as to an operational definition of stress, and some researchers have even suggested abandoning the term "stress." Levine and Scotch state, "Even writers who complain about the vagueness of the concept often proceed to present their empirical finding without themselves explicitly defining the concept" (75, p. 8). It is therefore frequently difficult to interpret findings and to replicate studies in the area of stress and disease because of the vagueness of the definitions of stress.

It was this confusion that prompted Justice, McBee, and Allen to write,

Many of the studies of stressful life events awaited the development by Holmes and Rahe (1967) of an instrument for quantitative measurement of change. In fact, the formal designation of changes in a person's life as life change events, "life crisis," or "life events" seems to have originated with their work (60, p. 467).

Although far from perfect, the Holmes and Rahe (54) Social Readjustment Rating Scale presents an operational definition of stress and a measure which can be used to replicate research.

The Social Readjustment Rating Scale is a measure which assigns a numerical value to stressful events, and the initial data for this scale was generated from the records of over 5000 patients who had been interviewed using the
life chart of Adolph Meyer (54, 91). The life chart of Meyer, who thought certain life events were related to the onset of illness, organized the social and psychological phenomena of the individual patient in a systematic and recordable manner. These data for over 5000 patients were analyzed and certain life events tended to cluster prior to the onset of illness; thus it is these life events that make up the initial Social Readjustment Rating Scale (Appendix A).

In the initial pilot study (53), the Social Readjustment Rating Scale was mailed to 200 resident physicians with instructions to list all major health changes during the past 10 years. Subjects were then instructed to also complete the Schedule of Recent Experience, a special form of the Social Readjustment Rating Scale for multiple-year studies. Eighty-eight subjects returned the data, and the initial analysis of the data revealed that 93 percent of the illnesses were associated temporally with a clustering of life event changes. A further analysis of the data revealed that when the life crisis events summed between 105 and 199, 37 percent of the subjects experienced a health change. When the events summed between 200 and 299, 51 percent experienced a health change, and this percentage rose to 79 when the scores summed over 300 (26).

Life change units for the prior 18 months were summed and used as the basis for predicting future illness in a follow-up study using 84 of the 88 initial subjects (53).
Nine months after taking life change measures, data concerning disease were collected, and in the high-risk group, a summed score of 300 or more, 40 percent reported illness. In the medium-risk group, scores of 200 to 299, 25 percent experienced illness, and 9 percent of the low-risk group, scores between 150 and 199, reported illness. Several similar studies have been conducted with similar results (26, 100, 103, 135).

The relationship between stress, as measured by the Social Readjustment Rating Scale, and physical illness is well documented. Rahe and Lind (102) found a positive correlation between high life-change scores and sudden cardiac death. A high positive correlation has been found between high life-change scores and the time of onset of myocardial infarction (105, 133). Rahe, Meyer, Smith, Kjaer, and Homes (104) found that the Social Readjustment Rating Scale is capable of discriminating between tuberculosis, cardiac, and skin disease patients and matched controls. Using military personnel as subjects, Rahe and Arthur (101) found significantly higher life change scores prior to illness onset.

Holmes and Holmes (52), using the Social Readjustment Rating Scale to predict daily changes in health, found that higher scores tended to cluster around health changes, and on days of high stress, the subject experienced more minor symptoms than on days of low stress. In a related study, Bramwell (13) found that college football players
with high stress experienced more injuries requiring loss of playing time than players with low stress scores. Stress appears not only related to disease but to injury as well.

The results of the Social Readjustment Rating Scale have also been used to show a relationship between stress and psychological problems. Paykel (96) found higher life change scores in hospitalized depressed patients than in a matched control group, and in a following study Paykel (96) found that the intensity of neurotic symptoms was related positively to life change scores. Justice, McBee, and Allen (60) found high stress scores to be associated with impairment in both social and psychological functioning.

Although the Social Readjustment Rating Scale has received wide and varied use, one problem concerning studies of this type has been that the dependent variable, that is disease or illness, is just as difficult to operationally define and measure as the concept of stress. Most studies have been predicated on the idea that stress will somehow cause the individual to become more vulnerable and thus to experience more illness of all types. Dependent variable measures have included many different definitions of disease, including any and all illnesses experienced, number of sick days, physicians diagnoses, general health questionnaires, etc., therefore, these measures were generally limited to time of illness onset of ill or not ill. This area of
research has needed consistent and valid measures of disease which are able to provide more dimensions than simply onset of illness.

In 1968, Wyler, Masuda, and Holmes developed an instrument called the **Seriousness of Illness Rating Scale** which consisted of a list of 126 diseases which were ranked from least serious to most serious. The instrument was developed in much the same manner as the **Social Readjustment Rating Scale**, in that the 126 diseases were rank ordered as to seriousness by two groups, physicians, and those without medical training, and a high correlation was found between the rankings of these two desperate groups. Further research (147) among different types of groups supports the findings of a high concordance of agreement; thus the **Seriousness of Illness Rating Scale** provides a measure of the dimension of seriousness of disease.

Volicer and Burns (138), who were interested in developing a measure of hospital stress, used a multiple regression approach in an attempt to determine the best predictors of hospital stress. A total of 450 medical and surgical patients was given the **Social Readjustment Rating Scale**, the **Seriousness of Illness Rating Scale**, and a new measure, the **Hospital Stress Rating Scale**. Demographic data were also taken. In the final analysis, the **Social Readjustment Rating Scale** was significant predictor for hospital stress in both medical and surgical patients, which would
indicate that those that experienced stress before hospitalization experienced stress during hospitalization. Life change scores significantly correlated with seriousness of illness for surgical patients only, and not for medical patients. Age was a significant predictor of hospital stress and was significantly correlated with life change scores; however, no data as to how ages were broken down, how many categories, or age range in the categories were given. Thus, stress in this study was found to be correlated with hospital stress and with seriousness of illness for surgical patients only. In a subsequent study Volicer (137) found that patients with high hospital stress made less improvement after discharge than patients with low hospital stress.

Garrity, Marx, and Somes (39) reported that only one other study had been conducted using the Seriousness of Illness Rating Scale between its development and their study in 1978. In that one study of 232 hospitalized patients, the original authors, Wyler, Allen, Masuda, and Holmes (145), found that higher life change scores were positively associated with seriousness of illness. Garrity, Marx, and Somes (39) used 313 college freshmen to study whether recent life changes as measured by the Social Readjustment Rating Scale were related to the seriousness of illness as measured by the Seriousness of Illness Rating Scale. A significant correlation between life change and the seriousness of illness was found. In order to establish validity, the Seriousness of Illness Rating Scale
was correlated with number of days ill, the number of disability
days caused by the problem, the subject's estimate of the
seriousness of his or her problem, and assessment of
general health status. The Seriousness of Illness Rating
Scale was significantly correlated to all of the four
measures. Therefore, Garrity, Marx, and Somes concluded
that the Wyler, Allen, Masuda, and Holmes measure is in-
deed measuring some dimension of seriousness of illness.

Garrity, Marx, and Somes, in their prediction of illness
using the Social Readjustment Rating Scale, did not separate
male scores from female scores; in fact many studies
using the Social Readjustment Rating Scale have not discrimi-
nated between the sexes concerning life change scores and
illness. Masuda and Holmes (83) analyzed 19 studies which
used the Social Readjustment Rating Scale and found of
those that discriminated between sexes, the effects of sex
on life change scores was not clear. The majority of the
studies found that sexual status had no effect on the
occurrence of total life events; however, ambiguous and
conflicting results have been found (83). Therefore, this
study examined sex as a variable in life change and disease
measures.

In 1976, de Faire and Theorell used life change scores
to predict myocardial infarction, and after analysis of
the data, they pointed out that life changes, when taken
alone, are a predictor but a weak predictor of heart
problems. When life changes are used in conjunction with other measures, especially in this instance social support, the prediction becomes much stronger. Thus they recommend that, to increase the power of the prediction, change be used in conjunction with other measures such as social support.

Rabkin and Struening (99) arrived at the same conclusion; the measure of life stress is a weak predictor of illness when taken alone. In addition to life change, other variables determine why health is sometimes affected and at other times not affected. Social support is a critical variable concerning the health of the individual, especially in relation to heart problems. In response to the Rabkin and Struening article and in order to improve predictive efficiency, this study employed several measures to add to life change scores as predictors of illness.

Several studies have been published which are critical of the Social Readjustment Rating Scale. Fairbank and Hough (31) and Mechanic (89) are critical of the scale because it is impossible for the investigator to know the direction of the stressful change, given the scale as it is. Some of the items on the scale are positive, some are negative, and many may be either positive or negative. For example, "a major change in eating habits," may be either a negative or a positive change depending upon the circumstances of the individual. The scale might provide much
more information if one were able to know the direction of change. Also many of the items on the scale are very ambiguous in wording. Instead of simply knowing that an individual has changed jobs, it might help to know if the job matches the capabilities of the individual; information as to whether the person feels challenged or overloaded, successful or a failure, would provide more specific information.

Roberts and Starr (110) question whether or not the **Social Readjustment Rating Scale** is a ratio scale. They point out that the scale does not have a zero point, and they question whether one would be able to form a ratio of one score to another.

Fairbank and Hough (31) defended the **Social Readjustment Rating Scale** as a ratio scale and stated that Roberts and Starr's discussion seems to reflect a misunderstanding of a ratio scale; also it might be of interest to point out that many statistical techniques do not require ratio data. According to Masuda and Holmes, "In spite of questions raised, the fundamental concept of the relationship of accumulating life change to illness remains intact" (83, p. 237).

In summary, the preponderance of the literature supports the idea that life change or stress is a weak but positive predictor of disease, and in order to more efficiently predict disease, it has been suggested that other variables be used in conjunction with life change.
Anxiety, Self-concept
Stress and Disease

In the early literature concerning anxiety, stress and anxiety were used almost interchangeably (124, 125). Currently it has been suggested by Spielberger and Diaz-Guerrero (126), that the terms stress, threat, and anxiety denote different aspects of a sequence of events in time; that is, stress refers to the external event, the stimulus properties of the event, and threat refers to the individual's perception of the external event. If the event is seen as dangerous or threatening by the individual, this subjective evaluation of the event will lead to the evocation of anxiety. Thus it would seem clear by this sequence of events that stress is an external event and anxiety is an internal phenomenon. However, Selye, (118, 119) defines stress as an internal physiological response; thus the dimensions referred to by these two terms may overlap, and by some definitions may be the same. In this study, anxiety is considered as a response to, or the potential to respond to, external stimuli as measured by psychological anxiety scales. The complexity does not end here, Spielberger and Sarason state:

Anxiety is perhaps most commonly used in an empirical sense to denote a complex reaction or response - a transitory state or condition of the organism that varies in intensity and fluctuates over time. But the term anxiety also is used to refer to a personality trait - to individual differences ... The anxiety process is extremely complex and involves a number of different measurable components. To use the term anxiety to refer to the entire process attempts to incorporate too much within a single concept (128, p. 137).
Anxiety appears to be a multidimensional construct, and the dimensions of state anxiety and trait anxiety must be considered. State anxiety is considered to be the condition or feeling state of the individual, on a continuum from relaxed to tense, at a specific moment in time, whereas trait anxiety is characteristic of how that individual approaches stress, pressure, and personal problems. Spielberger (127) developed the State Trait Anxiety Scale (STAI) in order to discriminate between state and trait anxiety. He points out that individuals with high measures of trait anxiety tend to be self-deprecatory and are concerned with fear of failure. Furthermore, individuals with high trait anxiety are more strongly predisposed to react to threatening situations with high state anxiety than are individuals with low trait anxiety (126).

Spielberger and Sarason (128) discuss several research studies which induce anxiety in subjects by the use of electrical shock, negative verbal feedback, failure, or other socially irritating events. In other studies anxiety is defined by the presence of the appropriate psychiatric diagnosis (12). In each of these situations one cannot be sure whether state or trait anxiety is the variable being manipulated. Therefore, research in which anxiety is defined as momentary discomforts, psychiatric diagnosis, or irritating events, must be interpreted with caution.
in relation to trait anxiety. However, some of the research studies most relevant to this study use these definitions of anxiety; therefore, they will be reviewed and taken as tentative support for the relationships associated with anxiety in this study.

Another widely used measure that must be taken as tentative support for trait anxiety is the Taylor Manifest Anxiety Scale. Spielberger and Sarason (130) have found that the Taylor Manifest Anxiety Scale appears to be a trait measure but may be measuring some other trait than anxiety. Donovan, Smyth, Paige, and O'Leary (28) found that the Taylor Manifest Anxiety Scale and the Social Anxiety Scale were not significantly correlated, and discovered that high scores on the Manifest Anxiety Scale are arrived at by a willingness to answer positively questions which are self-deprecatory. Therefore, they concluded that the Manifest Anxiety Scale may be measuring "neuroticism" or a negative attitude toward the self. Lader and Marks (68) found a very high correlation between the Manifest Anxiety Scale and scales of emotionality or neuroticism, and they concluded that the Manifest Anxiety Scale is unlikely to be a simple measure of anxiety, but probably assesses a general tendency to respond emotionally. In the light of these findings, Spielberger and Diaz-Guerrero (126) state that the Manifest Anxiety Scale is a measure of anxiety proneness and thus a measure of trait anxiety.
There appears to be some dispute as to what the Manifest Anxiety Scale is measuring. Studies using the Manifest Anxiety Scale are reviewed here but interpreted with caution.

Several studies have found a significant negative relationship between the Manifest Anxiety Scale and self-concept (28, 69, 94, 126). In a monograph studying self-concept as measured by the Tennessee Self-concept Scale and other variables, Thompson (134) points out that self-concept and anxiety have been the focus of numerous investigations. He reports seven independent studies, all of which found negative correlations between self-concept (Total P on the Tennessee Self-concept Scale) and anxiety, using the following measures: Taylor Manifest Anxiety Scale, the anxiety subscale of the Neuroticism Scale Questionnaire, the Anxiety Differential Scale, the IPAT Anxiety Scale, behavioral ratings of anxiety, and the State Trait Anxiety Scale. The relationship between the State Trait Anxiety Scale and self-concept was -.65 for state anxiety and -.67 for trait anxiety, significant beyond the .05 level. Thompson concludes,

Findings from these studies indicate that self-concept and anxiety are related variables. All of the Tennessee Self-concept Scale P scores, which measure self-esteem, show a negative correlation with the anxiety scores, and almost all of these correlation coefficients are significant (134, p. 60).
Cowen (21), using 16 male patients entering a crisis intervention day hospital, measured anxiety by the Multiple Affect Adjective Check List. This measure was found to correlate significantly in a negative direction with self-concept as measured by the semantic differential scales, indicating that the lower the individual's self-concept, the more likely that that individual would experience anxiety.

Bond (12) selected as subjects 30 psychiatric patients who had been diagnosed during psychiatric interviews as experiencing "free-floating anxiety." A matched group, as to age, sex and educational level, of 30 normal subjects was used as controls. The psychiatric patients displayed a significantly less favorable self-concept than the matched control group, leading Bond to the conclusion that this specific condition of anxiety seems to correlate highly, in a negative manner, with self-concept.

It appears safe to assume that self-concept and trait anxiety are negatively correlated; now, how do these two variables relate to stress? Manuck, Hinrichsen and Ross (80), using 129 undergraduate students, studied the relationships between life stress, measured by the Life Change Inventory, and state and trait anxiety, measured by the State Trait Anxiety Inventory. Using Rotter's Locus of Control questionnaire, groups were divided into high stress, low stress, internals, and externals. Subjects in the high stress group reported significantly greater
anxiety than subjects in the low stress group on both the state and trait anxiety measures. There was no significant relationship between locus of control and anxiety and stress.

In another study by Reavley (107), 40 subjects, a convenience sample made up of evening students and clerical workers, were given the Social Readjustment Rating Scale, the Taylor Manifest Anxiety Scale, the IPAT Anxiety Scale, and the Symptom Rating Test. Five subscores concerning different aspects of anxiety and a total score for anxiety were derived from the IPAT Scale. The Symptom Rating Test resulted in four subscales, anxiety, depression, somatic, and inadequacy, along with a total emotional adjustment score. The Social Readjustment Rating Scale was correlated with the IPAT, the Manifest Anxiety Scale, the Symptom Rating Test, and all subtests. Out of 12 possible correlations, the correlation between the Social Readjustment Rating Scale and the Manifest Anxiety Scale ranked tenth. This correlation of .37 was significant at the .05 level of confidence but was taken as support for the indication that the Manifest Anxiety Scale is not a sensitive measure of anxiety. The correlations between three subscales of the IPAT Anxiety Scale and the Social Readjustment Rating Scale were significant, and the total anxiety score on the IPAT Anxiety Scale was correlated at .71 with the Social Readjustment Rating Scale, which was significant at the .001 level of confidence. The highest correlation between the Social Readjustment
Rating Scale and the IPAT Anxiety Scale was a .90 concerning subscale "Q3." Reavley states, "High scores on Q3 reflect the subjects' inability to integrate behavior about a clear self-concept, and this is closely associated with high SRRS scores" (107, p. 442). Thus a high concern for one's self-concept appears to relate highly to Social Readjustment Rating Scale scores. All subscales and the total score of the Symptom Rating Scale were significantly correlated to the Social Readjustment Rating Scale, with a correlation between the anxiety subscale and the Social Readjustment Rating Scale of .69, which was significant at the .001 level of confidence. The other symptoms, depression, somatic, and inadequacy, were significantly correlated with the Social Readjustment Rating Scale at at least the .01 level of confidence. Significant relationships were found between stress, anxiety, and symptoms, with one of the measures indicating a significantly negative relationship between stress and concern for one's self-concept.

It appears that life stress and anxiety are positively related, and anxiety and self-concept are negatively related. There was some indication in the Reavley (107) study that concern for self-concept and the measure of life stress were related.

Finally, how do these variables, anxiety and self-concept, relate to disease?
Branch (14) studied the case histories of medical patients who suffered with anxiety and found a relationship between anxiety and the following diseases or problems: heart, skin, stomach, allergy, pain, obesity, and learning and speech disorders. In current literature these diseases continue to be related to anxiety (17, 64).

Gersten, Langner, Eisenberg and Orzek (40) used 674 children and young adults and studied the relationship between desirable and undesirable life events and several measures of psychological impairment and behavioral change, including a measure of anxiety. It was interesting to note that life changes, both desirable and undesirable, are associated with anxiety. The hypothesis that change itself is more important in disease than desirability of change is supported by Ruch (113) in a research study using multidimensional scaling techniques. This supports the idea behind the Social Readjustment Rating Scale that life changes, both desirable and undesirable, are associated with disease (54), in that anxiety seems to be the primary response to life changes. The total life change score was significantly correlated with all measures of psychological impairment and behavior change.

Studies relating both anxiety and self-concept to disease are not numerous, and there are many and varied problems concerning research in this area. The following are typical examples or research in relating anxiety, self-concept, and disease.
Kumar, Powars, Allen, and Haywood (67) studied the relationships between anxiety, self-concept, and personality measures in twenty-nine children ages 12 to 18, with sickle cell anemia. They were ethnically matched with a control group of 29 students from a black junior high school. The following instruments were administered: General Anxiety Scale for Children, Piers-Harris Self-concept Scale, and the California Test of Personality. The experimental group scored significantly lower on anxiety (.005) than the control group. This relationship was not in the direction that one would expect, but there was no speculation as to the possible reason. The experimental group scored significantly lower on self-concept than the control group (.001). There was no significant difference in personality measures. The writers concluded that children with sickle cell anemia are no different from other children, with the exception that they are lower in self-concept.

Using the Social Readjustment Rating Scale, Bedell, Giordani, Amour, Tavormina, and Boll (5) divided chronically ill children into high stress and low stress groups. Both groups were administered the State Trait Anxiety Inventory and the Piers-Harris Self-concept Scale, and subjects were then interviewed individually to ascertain their reaction to school and personal satisfaction. The children were then evaluated for the number of illness episodes during their stay in a summer camp. The low stress children displayed significantly
more positive self-concepts and significantly fewer episodes of daily illnesses; however, there was no significant difference between the children concerning the anxiety measures. The authors concluded that the high stress children had poorer self-concepts, and more incidents of illness, and, based upon interviews, felt less able at school, less popular, and less satisfied with themselves.

Lewis, Gottesman, and Gutstein (76) administered the State Trait Anxiety Scale, the Social Readjustment Rating Scale, and the Rosenberg Self-concept Scale to cancer patients and surgery patients on admission to a hospital or clinical program (prior to surgery) and at 2, 5, and 8 weeks, and compared the two groups. The cancer group displayed significantly higher anxiety scores at all times. Concerning the measure of self-concept, there were no differences at admission, 2, or 5 weeks. However, there was a significant difference at 8 weeks, in that the surgery group scored significantly more positively on self-concept at 8 weeks than the cancer group.

There are several problems with the above three studies. Two studies, by Bedell, Giordani, Amour, Tavormina, and Boll (5), and Lewis, Gottesman, and Gutstein (76), did not use healthy control groups. Ill people were compared to other ill people, with no comparison to discriminate among variables. The illnesses in these studies are very diverse and involve children and adults with a wide range of ages. The measurement of anxiety
and self-concept of individuals may be very different prior to an illness as compared to during the illness, and may differ dramatically depending upon the seriousness of that illness. It is very difficult, if not impossible, to control all the variables in studies such as these since, due to restrictions on time and funding, one must use situations and subjects that are available.

To organize these data into meaningful statements concerning self-concept, and anxiety, and their relationship to disease, is difficult. Overall, these studies support a negative relationship between trait anxiety and self-concept. They tend to support a negative relationship between self-concept and disease and a positive relationship between anxiety and disease.

In summary, research supports the concept that anxiety is a basic response to external stress and life events, regardless of whether those events are desirable or undesirable; and, as such, anxiety appears to be positively related to disease. There is strong evidence to support a negative relationship between anxiety and self-concept, and some evidence to support a negative relationship between self-concept and disease.

Imagery and Disease

This section of the research review summarizes evidence related to imagery, examines theory concerning imagery and disease, and concludes with imagery as a potential
variable in illness research. Imagery as a variable in a cognitive mediating process between stress and disease has received no research attention that could be found via computer searches of published reports. Imagery has been studied as a possible variable in the hallucination processes of schizophrenic patients (15, 123), as a means of pain control (32, 44, 45, 87, 142, 143), as a means to control autonomic processes (6, 8, 46, 81, 85, 140), as a means to control blood pressure (92), and as a means to reduce anxiety and improve self-concept (9, 29, 106). Also, imagery as it relates to disease has received attention from workers in theory and practice, especially imagery in the relaxation response (82, 97, 111, 116, 122, 141).

Sheikh and Panagiotov (121) did a comprehensive and thorough study of the use of imagery in psychotherapy. Imagery has the potential for being a focal point for strong affect, and, they suggest, should be used more frequently in counseling and psychotherapy. Pertaining to the future use of imagery in psychotherapy, Sheikh and Panagiotov state,

It appears that the images hold an important potential for application in psychosomatic medicine. This application involves the release of affect represented by the psychosomatic symptoms and the possible facilitation of psychological control of physiological responses. Ahsen cogently explains how certain mental images are points of connection between the psychological, emotional, and physical responses (121, p. 581).

In 1968, Grossberg and Wilson (46) devised a study to test Wolpe's assumption in systematic desensitization therapy
that fearful scenes produce physiological arousal. It was this assumption that led Wolpe to have clients practice the "incompatible response" of relaxation. In the initial study, 18 high-anxiety and 18 low-anxiety subjects were selected and were told to imagine fearful scenes while measures of heart rate and skin conductance were taken. When no significant difference was found, the study was repeated using a control group imagining neutral scenes. When those subjects with fearful imagery were compared with those with neutral imagery, significant differences in heart rate and skin conductance were found, giving support to the assumption of Wolpe. It is also interesting to note that imagery alone, and not exposure to the actual scene, was responsible for the physiological changes.

In a similar study by Marks, Marset, Boulougouris, and Huson (81), a subjective measure of anxiety and a hierarchy or fearful images were added to measures of heart rate and skin conductance. Sixteen phobic patients were selected and were subjected to six flooding sessions (phobic imagery) and six relaxation sessions (neutral imagery) in a balanced crossover experimental design. Measures of heart rate, skin conductance, and the subjects' subjective evaluation of anxiety were all significantly different when phobic imagery was compared to neutral imagery. It was noted that the increase in autonomic activity was proportional to the intensity of imagery in the hierarchy of phobic imagery.
Thus more intense imagery elicited stronger autonomic responses. These findings were supported by the research of May and Johnson (85) and Weerts and Land (140).

Beiman (8) was interested in studying the effects of instructional set on physiological responses, and in order to induce physiological activity, used stressful and frightening imagery. This study supports the concept that different types of imagery (neutral or fearful) will reliably elicit different autonomic responses.

Pain control using imagery and related techniques has received a great deal of research attention, with most studies finding positive results, some studies showing conflicting results, and other studies being difficult to interpret due to the many different types of imagery used. In one of the studies finding positive results, Wescott and Moran (143) divided 40 male and 40 female college students into four groups: neutral imagery, anger-emotive imagery, relaxation-emotive imagery, and a no-treatment control group, in an attempt to see which type of imagery would facilitate the subjects' immersion of a hand into freezing water (0°C) for as long as possible. The results for male students were nonsignificant; however, the anger-emotive imagery was significantly more effective for females than for female no-treatment controls.

Grant (44) was interested in finding procedures which would help individuals cope with the pressures of endodontology.
Subjects were randomly assigned to one of four groups (30 subjects in each group): autogenic training, positive mental imagery, autogenic training with positive mental imagery, and a no-treatment control group, with measures of cooperation, resistance, anxiety and speed of recovery being taken on all groups. A discriminant analysis revealed a significant F with resistance and recovery, and further analysis revealed that the autogenic training group plus the positive mental imagery group showed significantly less resistance to treatment than all other groups. These two groups also recovered more quickly than the controls.

Beers and Karoly (6) found positive results concerning imagery in helping male subjects cope with the pain of immersion of a hand in freezing water, compared to no-imagery controls. Weinstein (142), in a practical application of these procedures, helped a 10-year-old child burned over 70 percent of his body to endure the pain of bathing. All screaming and hitting were extinguished, and even frightening nightmares were eliminated, by using relaxation along with positive imagery. In a 12-month follow-up there had been no return of these symptoms.

In a study with conflicting results, Green and Reyher (45) found that imagery that was bodily oriented, as used in hypnnotic induction, did not significantly alter pain tolerance: in this case, electrical shock. However, when the imagery instructions were changes, specifically not
bodily oriented, the ability to tolerate pain was significantly increased compared to that of a control group. In another study with negative results, Fenerstein (32) found that client's expectation was more important than any treatment modality in the reduction of anxiety and headache pain.

In a very carefully controlled, well designed study, McKinlay (87) found that a self-instruction group, given instructions to repeat, and a cognitive coping group, which used imagery and attention control strategies, could significantly control pain, as measured by immersion of a hand in freezing water. It does appear that using certain types of imagery in certain specific situations can alter the perception of the individual and increase pain tolerance.

Minsky (92), in a study using imagery to help control hypertension, divided subjects into three groups: a placebo group, progressive muscle relaxation with general imagery (specific instructions to visualize a hammock scene), and progressive muscle relaxation with directed imagery (specific instructions to visualize arteries expanding). Five weeks after the conclusion of the training only one group continued to significantly lower blood pressure (by 9 percent p. 001) lower than any other group, and that was the group using progressive muscle relaxation with directed imagery.

In other studies, imagery has been used to decrease anxiety (9, 29) and to improve self-concept of subjects (9, 106). Research seems to confirm that imagery, depending
upon whether fearful or relaxed images are used, has the capacity to help individuals control autonomic processes and alter bodily states. These are the types of processes which could significantly alter stress responses in individuals and thus alter the possibility of stress-related diseases.

Samuels and Samuels (116), in their book on visualization, extensively examine visualization and imagery in the healing and disease process. They point out that there is a long history of visualization being used in religious healing ceremonies and shamanistic healing rituals, which have carried down to modern times in the beliefs and practices of the Rosicrucians and the Christian Scientists. The use of visualization in healing was thought of as unscientific until recently, but has returned in practices such as those of Simonton (122).

Simonton (122) teaches his patients about their immune mechanisms, showing them photographs of white blood cells engulfing diseased cells and pictures of tumors healing so that the patients will have specific images to visualize. He has found visualization a significant factor in the remission of terminal cancers.

Imagery has found more use in different counseling and psychotherapeutic techniques than in traditional medical practice. Sheikh and Panagiotov (121) list the uses of imagery in the following areas of psychotherapy: the spontaneous and dream imagery used by Freud and his followers,
imagery in systematic desensitization, emotive imagery used by Lazarus in the treatment of children, the rational imagery of Albert Ellis, symbolic and covert modeling of Bandura, used in some therapy techniques, imagery used in psychodrama, gestalt therapy, and psychosynthesis.

From a review of the research, it appears that imagery is frequently used in psychotherapy and some medical practices, but is infrequently investigated as a variable in psychological and physical illnesses. Furthermore, it appears that different types of imagery can alter those autonomic processes that are associated with anxiety and the stress response, and it is those responses that have been associated with disease. In fact, it is surprising, considering the therapeutic work and the experimental work already done in imagery, that studies relating imagery to physical diseases have not already been performed. There is certainly enough evidence to include imagery as a possible variable in the cognitive mediating process between stress and disease.

Summary

Numerous studies have found stress related to disease in a weak but positive manner, with recommendations being made to consider other factors in the relationship. Other factors in the relationship between stress and disease may be of a cognitive, emotional, genetic, social, and physiological nature. The concern in this study was possible
cognitive factors, among which were anxiety, self-concept, and imagery. The review of the literature indicated that anxiety appears to be highly related to stress; in fact anxiety appears to be the primary response to stress, regardless of whether the stress is desirable or undesirable. Anxiety appears to be correlated in a negative manner to self-concept, and the literature suggests a relationship between self-concept and disease. Imagery, depending upon whether it is positive, relaxing imagery, or negative, fearful imagery, is associated with autonomic responses that have been associated with disease.

Synthesis of the Research

It was the intent of this investigation to present research concerning the variables being examined by this study, their relationship to disease, and, when appropriate, their relationship to each other, in order to lend support to the hypotheses and the direction of the hypotheses. However, due to the design of this study, very little research of the same design could be found. In fact, only one study using the Social Readjustment Rating Scale and a similar design was found, and that was the Volicer and Burns study (138), which used multiple linear regression to predict hospital stress. No other studies using multiple linear regression with the Social Readjustment Rating Scale were found, even though this appears to be an excellent
methodology to use in this type of study. Simple correlations of stress and illness will be of little further benefit.

Lazarus (70) suggests considering psychological factors, among others, in the relationship between stress and illness. That is, between stress and illness are very important cognitive mediating factors: cognitive factors which would facilitate an individual's perceiving small amounts of stress and converting them to large autonomic responses, or likewise, perceiving large amounts of stress and yet dealing with them in a relaxed manner, thereby reducing the autonomic responses involved and the propensity to disease. It was the intent of this study to add possible cognitive mediating variables to stress, to determine if it is possible to increase the efficiency of predicting disease.

The preceding review indicates that stress, anxiety, self-concept, and imagery appear to be related to disease. Also, these factors may be involved in the process of cognitive mediation between stressful external events and autonomic factors suspected of leading to disease processes.
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CHAPTER III

Organization of the Study

In the initial organization, a brief description of the study, along with the instruments used, was sent to the director of research of the institution from which subjects were selected. After obtaining institutional approval, the investigator obtained approval of the directors of biology and psychology to use those students as subjects. A meeting was then held with the specific instructors of each class to explain each specific test and administration procedures for the tests. (Appendix F) After the data were collected, an analysis was made at the North Texas State computer center.

Theoretical Basis for the Study

In 1974, Kagan and Levi (17) developed a theoretical model explaining the relationship between external stimuli or life events and disease which they hoped would help form a conceptual basis for research. It appeared to them that there were certain psychosocial stimuli which could eventually lead to disease processes. The question was, by what process did these stimuli cause or facilitate the development of disease?

These stimuli appear to be social in origin and ultimately to affect the individual through autonomic
nervous system processes. Initially the individual reacts to these social stimuli, and the tendency to react in a certain manner is determined by genetic variables, along with the influence of early environment. Kagan and Levi call this process the "psychobiological program." This "program" places little emphasis upon the cognitive evaluation process and refers only to genetic variables and early environment. This is far from the dynamic cognitive evaluation process seen by Lazarus:

The key feature of psychological stress that distinguishes it from stress at the social and physiological levels is the presumption that cognitive activities—evaluative perceptions, thoughts, and inferences—are used by the person to interpret and guide every adaptational interchange with the environment. The person is said to appraise each ongoing and changing transaction (or bit of commerce) with the environment with respect to its significance for that person's well-being. This appraisal includes judgments (whether conscious or unconscious) about environmental demands and constraints as well as about the person's resources and options for managing them. At the human level, cognitive appraisal processes are complex and symbolic, permitting individuals to recognize and distinguish among harm-loss, threat, and challenge, and to make numerous other subtle cognitive distinctions that give human life its highly rich and complex emotional qualities (18, p. 91).

At this point in the model constructed by Kagan and Levi, it would seem advantageous to include cognitive appraisal processes, with little or no advantage being gained by excluding these processes. Lazarus states,
One broad issue possessing three aspects stands out in our minds as particularly interesting, important, and as yet under-examined, namely, how adaptational outcomes, especially somatic illness, are affected by mediating cognitions, emotions, and coping processes (18, p. 91).

The inclusion of mediating cognitions in the model could stimulate research in an area Lazarus says is "under-examined." After the external life events are processed through the cognitive evaluation (a process including trait anxiety and self-concept) of the individual, depending upon whether or not the event is interpreted as stressful, certain psychological autonomic reactions take place. The intensity, frequency, and duration of the stimuli combined with and depending upon the cognitive evaluation, can lead to autonomic reactions of similar intensity, frequency, and duration. If these autonomic changes persist long enough, tissue changes can result which Kagan and Levi (17) term "precursors of disease."

The exact relationship between these precursors of disease and disease is complex and unknown; however, if the stress response persists long enough, disease appears to follow.

In summary, the following processes and variables interact to develop a useful disease model. The external events are perceived and interpreted by the individual, and depending upon that individual's genetic influence, early environment and current cognitive evaluation processes, as assessment of the event takes place. This cognitive evaluation process would include whether or not individuals
respond to situations in an anxious manner, trait anxiety, and how those individuals perceive themselves. If the event is interpreted as "dangerous" or "threatening" and the individual becomes tense, the stress response, an autonomic response, takes place. If these autonomic responses persist long enough, tissue changes take place and disease is likely to follow. Disease itself may be influenced by some genetic weakness in the individual, an invading organism, or some specific response to the continued stressor (11, 17, 22).

In relation to this model, this study employed the Social Readjustment Rating Scale as a measure of external life change and the Subjective Stress Scale, and State-trait Anxiety Inventory, the Tennessee Self-concept Scale, the Betts Questionnaire on Vividness of Imagery, the Guy Emotive Imaging Scale, and the spatial relations section of the Differential Aptitude Test as measures of variables concerned with the cognitive appraisal process. The Seriousness of Illness Rating Scale was the measure of existing disease processes.

Instruments

In 1909, the emphasis in psychology was to study the "mental life" of the individual, and at that time Betts developed an instrument to measure the vividness of imagery. In 1967, after a revival of interest in imagery, Sheehan (25) factor-analyzed the Betts instrument, shortened and
revised it, and developed the Questionnaire on Vividness of Mental Imagery (Appendix B). Cross-validation correlation between the original form and the shortened form are in excess of .90 for total scores (23).

Reliability measures for the Questionnaire on Vividness of Mental Imagery, (BETTS) total score (there are seven subtests) range from .91 (6), .78 (25) to .63 (29). White stated the reason why this correlation appears low (.63), is that it reflects a test re-test measure over one year.

For validation purposes, Sheehan (25) used the Questionnaire on Vividness of Mental Imagery to compare weak imagers and vivid imagers and accuracy of reproduction of stimuli. He found that vivid imagers were significantly and consistently more accurate in accuracy of reproduction of stimuli. Weak imagers might be accurate or inaccurate, which was interpreted as indicating that one does not need good imagery to have good memory. In a review of the literature, Richardson (23) reports that vivid imagers, as measured by the Questionnaire on Vividness of Mental Imagery, perform significantly better than low imagers concerning visual memory tasks. The Questionnaire on Vividness of Mental Imagery seems to have utility in discriminating between vivid imagers and weak imagers.

Di Vesta (4), in a factor-analytic study found that the spatial relations test on the Differential Aptitude Test (DAT), the Flags test (very similar to the DAT), and the
Gottschaldt Figures test all loaded heavily on a single factor that was termed "imagery." The Questionnaire on Vividness of Mental Imagery and the Gordon Controllability of Visual Imagery Questionnaire loaded on a factor which Di Vesta termed social desirability (there already was an imagery factor). Based on his findings, Di Vesta states, "introspective reports, as measures of imagery, do not possess construct validity" (4, p. 478). Di Vesta considers these tests to be confounded with a response bias, which is social desirability.

McKelvie and Rohrberg (19) used the Flags test, the Questionnaire on Vividness of Mental Imagery, and the Gordon Controllability of Visual Imagery, and had subjects perform certain visual tasks. They found a difference in measures and interpreted the difference as indicating that the Flags test involves "dynamic imagery," while the Gordon Controllability of Visual Imagery and the Questionnaire on Vividness of Mental Imagery involve "static imagery." Thus, their interpretation of the difference between these instruments was that different aspects of imagery were being measured. In order to avoid these problems, this study utilized both the spatial relations section of the Differential Aptitude Test and the Questionnaire on Vividness of Mental Imagery.

The spatial relations section of the Differential Aptitude Test, which was used as a measure of imagery, is
described by Buros (3) as the best test of its kind. Buros states: "reliability coefficients . . . are split-half correlations corrected by the Spearman-Brown formula. . . . These coefficients attest to the high degree of short-term consistency of the DAT scores" (3, p. 1050).

The reliability measures reported in the manual of the Differential Aptitude Test are .95 for boys (grade 12) and .94 for girls on the spatial relations test. Concerning validity, the manual reports correlations of around .72 between the spatial relations test and measures of nonverbal IQ. More important for this study, the subject is required to take an image, mentally manipulate that image and select a correct alternative, which seems directly related to kinetic imagery, the manipulation of a visual image. The spatial relations test on the Differential Aptitude Test is frequently used in research on imagery (4).

The Guy Emotive Imaging Scale (Appendix C) was developed in 1978 and a coefficient alpha of .87 has been reported, which indicates adequate internal consistency. This measure of emotive imagery correlates .50 with the total score on the Questionnaire on Vividness of Mental Imagery, and Guy (13) interprets this correlation in the following manner.

Also the .50 correlation coefficient between total sensory imagery on the Betts questionnaire and total emotive imagery on the Guy scale is noteworthy. Although there is some similarity between sensory imagery and emotive imagery, there must also be a difference (13, p. 1271).
The rationale here seems to be that if the correlation were higher, the tests would be measuring the same thing. If the correlation were lower, the tests might be measuring totally different factors. Guy interprets the correlation as indicating the common variance is the factor of imagery; thus the difference is that the Guy Emotive Imaging Scale measures "emotive" imagery and the Questionnaire on Vividness of Mental Imagery test measures "sensory" imagery.

The State-trait Anxiety Inventory was developed in two forms and reportedly discriminates between state anxiety and trait anxiety. Anastasi (1) calls this a promising test of anxiety and reports that the trait section of the test measures how the individual generally feels. Test-retest reliabilities on this section range from .73 to .86 (1). Concerning the state section of the test, a measure of how the individual feels at the moment, reliability measures range from .16 to .54, which is consistent with the concept that this section is measuring a temporary state. Kuder-Richardson reliabilities for both scales were high .83 to .92 (26).

The Social Readjustment Rating Scale (Appendix A), which was developed by Holmes and Rahe (15), was built on the work started by Meyer concerning his "life chart" and the relationship to health and disease (15). Using Meyer's data, over 5000 patient histories were studied, and specific life changes which precede major health
changes were empirically determined. The 42 items on
the Social Readjustment Rating Scale (SRRS) were taken from
this data and were ordered by 394 subjects using a method
developed for use in Psychophysics (15). The ordering done
by subjects was broken down 16 ways, such as comparing the
order derived by males to females, young to older, etc. All
of the correlations were in excess of .90, except for that
between white and black subjects, which was .82. Kendall's
coefficient of concordance for the 394 individuals was
significant at beyond the .0005 level. Studies have since
compared the rankings of college students, physicians,
physicians in speciality area, and numerous different cultures,
and have found a high agreement concerning ranks (5, 15, 30).

The Social Readjustment Rating Scale has received a
great deal of attention, probably because it is the only
measure of life stress available. It has been found
effective in predicting major health changes (5, 10, 14,
21, 30). Holmes reports the test-retest reliability over
a nine month period is .74 (5).

The Tennessee Self-concept Scale is a well known and
widely used instrument consisting of 100 items which provide
up to 29 separate variables. This scale has been widely
used in both clinical evaluations and experimental research
(3).

The total positive score was used as a measure of
self-esteem and positive self-concept. This is not one of
the empirical scales, but was derived by what Fitts (9) calls "phenomenological classification." Seven judges classified the items, and in the final analysis there was perfect agreement among the judges concerning the items. Fitts (9) reports a test-retest reliability of .92 for the total positive score. Concerning validity, the manual reports a correlation of -.70 between the total positive score and the Taylor Anxiety Scale, and a correlation of .46 with locus of control. There has been a series of monograph published describing numerous research studies showing a significant negative correlation between measures of anxiety and self-concept as measured by the Tennessee Self-concept Scale (7, 8, 28).

One criticism of the Tennessee Self-concept Scale is that no information concerning internal consistency is reported (3). It is thought that these measures would be high; nevertheless they have not been done. This calls into doubt the common practice of multiplying scales. However, this was not done in this study.

The Seriousness of Illness Rating Scale (Appendix D) was developed by Wyler, Masuda and Holmes (30) specifically to study the relationship of life change to illness onset. The scale consists of 126 items which are rank-ordered along a continuum of least serious to most serious. Initially, two groups of physicians were sent the 126 items and were instructed to rank-order those items from most to least
serious. The first group, which consisted of 150 general-practice physicians and interns, was mailed questionnaires of which 117 were returned, and the second group, which consisted of 476 specialists in different medical practices, was mailed questionnaires of which 203 were returned.

Spearman's rank order correlation coefficient was used to compare the rank orders of the two groups. Spearman's rho was extremely significant at .998. The Mann-Whitney U test was used to test for significant differences in ranking between all groups, and no significant differences could be found at the .05 level (30). Wyler (30) concluded that the Seriousness of Illness Rating Scale is a reliable measure of physicians' estimation of the seriousness of illness.

After reviewing an unpublished study contrasting the rank order of the 126 items by physicians and the rank ordering by individuals without medical training, Wyler states, "A high concordance in the ranking of disease items was found between these two contrasting groups" (30, p. 59). Thus Wyler concluded that this is a reliable scale concerning rank order regardless of medical training.

Garrity, Marx, and Somes (10), using the Seriousness of Illness Rating Scale (Appendix D) with 313 freshmen college students, administered four additional measures relating to seriousness of illness to assess the validity of the Seriousness of Illness Rating Scale. The first measure was the number of days each health problem was experienced. Second
was the number of days that each health problem prevented the pursuit of normal activities. Third, subjects were asked to give a subjective evaluation of the seriousness of each health problem, ranked on a 10 point scale. Finally, on a 10-point scale, subjects were asked to rate their overall state of health.

Garrity, Marx and Somes (10) found that the Seriousness of Illness Rating Scale (SIRS) significantly related, beyond the .01 level, to all four measures. The correlations between the Seriousness of Illness Rating Scale and the other measures were as follows:

1. Days with problem  .69
2. Disability days  .40
3. Subjective seriousness  .57
4. Overall health  -.27

The authors concluded, "The Wyler measure is truly tapping a dimension related to illness seriousness and severity" (10, p. 9).

In scoring the Seriousness of Illness Rating Scale, Garrity, Marx and Somes (10) used the specific weights or ranking for each illness. For each subject, the appropriate weights were summed, giving a total score. The same scoring procedure used by Garrity, Marx, and Somes was used in this study. The total score for seriousness of illness was the dependent variable for this study.

In order to determine if there was a relationship between the subject's perception of stress and the external
measure of stress, a simple one-item rating scale was devised. Subjects were asked to rate themselves on a scale from 1 to 7, indicating how much stress they had experienced during the past twelve months. For convenience, the term **Subjective Feeling of Stress** (SS) was assigned to this measure (Appendix E).

**Population and Subjects**

The population sampled was a small junior college with a total enrollment of 3,296, of which 53.4 percent were males and 46.6 percent were females. The racial breakdown of the population was 86 percent Caucasian, 8 percent Spanish, 4 percent Black, 1 percent American Indian, and 1 percent Oriental, and ages were 72 percent under 30 years, with 58 percent under 25 years of age. The sample consisted of a nonrandom selection of 8 freshman classes, six classes of psychology and two classes of biology, consisting of 202 students. Fourteen students were dropped from the study due to either withdrawal from college, dropping the class selected in the sample, or inability to complete the total battery of instruments, leaving a sample size of 188. Sample data were 44.7 percent males and 55.3 percent females: 91 percent Caucasian, 4 percent Black and 1 percent American Indian; 88 percent were under 30 years of age, 80 percent were under 25 years, with an average age of 23. The sample appears to be younger, to be less racially balanced, and to have a higher percentage of females than the population. This is probably due to the fact that only academic day classes
were sampled, leaving night and technical classes unsampled.

Procedures for Data Collection

Appointments were made with the instructors of each specific class, three instructors for eight classes, in order to acquaint them with the specific tests being used and instructions for each test. Two of the instructors were faculty in the department of psychology, and the other was a faculty member in the department of biology, with some counseling experience. All were familiar with standard testing procedures. At this time the instructors were given instructions to read to their students, and the first instrument to give to their classes (Appendix F). The tests were randomly ordered and given to each instructor in that order, with the exception of the Seriousness of Illness Rating Scale, which was given last. The rationale for giving that instrument last was it might alert some students to the possible purpose of the experiment. Testing was completed in approximately eight class sessions during the eighth through the eleventh week of the Spring, 1979, semester. Students were encouraged to make up missed tests until the last test was given; make-up tests could be obtained from the instructor or by going by the office of the examiner. Students and instructors were blind to the purpose of the experiment until after completion of the data collection.

After the data collection was complete, the experimenter visited each class and presented and discussed the purpose of the research. Also the results of each test were
available to the student if they were curious as to their test scores.

Procedures for Data Analysis

After the data collection was completed, the measures were hand scored, and the data were organized and key punched onto appropriate cards. The NTSU Computing Department analyzed the data, using correlations between the variables and a test for the significance of each correlation. Multiple linear regression was employed, using the following model:

\[ Y = \beta_1 X_1 + \beta_2 X_2 + \ldots \beta_{11} X_{11} + A + E, \]

where \( X_1 \) = scores on the Questionnaire on Vividness Scale (BETTS),

where \( X_2 \) = scores on the Differential Aptitude Test (DAT),

where \( X_3 \) = scores on the Guy Emotive Imaging Scale (GUY),

where \( X_4 \) = scores on the State-trait Anxiety Scale (STAI),

where \( X_5 \) = scores on the Social Readjustment Rating Scale (SRRS),

where \( X_6 \) = scores on the Tennessee Self-concept Scale (TENN),

where \( X_7 \) = scores on the Subjective Feeling of Stress (SS),

\[ Y = \text{scores on the Seriousness of Illness Rating Scale (SIRS)}, \]

\[ b = \text{beta weights, and} \]

\[ A = \text{constant.} \]

For further analysis the following vectors were included:

\[ X_8 = \text{a combination of } X_1 \text{ times } X_6 \text{ (TENBET)}, \]
$X_9 = \text{a combination of } X_2 \text{ times } X_6$ (TENDAT)

$X_{10} = \text{a combination of } X_3 \text{ times } X_6$ (TENGUY)

$X_{11} = \text{a vector discriminating males from females (SEX)}$

The first four hypotheses were tested using the initial correlation matrix and a test for significant correlations.

The basic model for hypothesis five and for all following hypotheses was $Y = b_j X_5 + A + E$. Using this as the basic model, vectors were added in order to test the hypotheses, using the following models.

Hypothesis 5 $Y = b_1 X_5 + b_4 X_4 + A + E$

Hypothesis 6 $Y = b_3 X_5 + b_4 X_7 + A + E$

Hypothesis 7 $Y = b_5 X_5 + b_6 X_6 + A + E$

Hypothesis 8 $Y = b_7 X_5 + b_6 X_3 + A + E$

$Y = b_9 X_5 + b_{10} X_2 + A + E$

$Y = b_{11} X_5 + b_{12} X_1 + A + E$

Hypothesis 9 $Y = b_{13} X_5 + b_{14} X_{11} + A + E$

Hypothesis 10 $Y = b_{15} X_5 + b_{16} X_8 + b_{17} X_1 + b_{18} X_6 + A + E$

$Y = b_{19} X_5 + b_{20} X_9 + b_{21} X_2 + b_{22} X_6 + A + E$

$Y = b_{23} X_5 + b_{24} X_{10} + b_{25} X_3 + b_{26} X_6 + A + E$

Hypothesis 11 was tested by selecting, as the initial predicting variable, the variable with the highest correlation with seriousness of illness. Each variable then selected was selected on the basis that it would contribute to the largest increase in $R^2$ compared to all other variables left out of the model. Variables were then added, one at a time in a stepwise manner, to find the fewest and most efficient predictors.


8. _, The Self Concept and Performance, (Research Monograph No. V), Dede Wallace Center, 2410 White Avenue, Nashville, Tennessee, April, 1972.


28. Thompson, W., *Correlates of the Self Concept*, (Research Monograph No. VI), Dede Wallace Center, 2410 White Avenue, Nashville, Tennessee, June, 1972.


CHAPTER IV

PRESENTATION AND ANALYSIS OF THE DATA

The purpose of this chapter is to present the results of the data analysis concerning each hypothesis tested in this study. The hypotheses of this study were restated in the null form for the purpose of statistical analysis. A level of significance of .05 was established as the criterion for either retaining or rejecting the hypotheses. Hypotheses 1 through 4 investigated the correlations among the variables and were restated in the null form as follows:

1. There will be no significant correlation between stress and the seriousness of illness as determined by scores on the Social Readjustment Rating Scale (SRRS) and the Seriousness of Illness Rating Scale (SIRS).

2. There will be no significant correlation between imagery and self-concept as determined by scores on the Tennessee Self-concept Scale (TENN) and
   a. the Questionnaire on Vividness of Imagery (BETTS)
   b. the Guy Emotive Imagery Scale (GUY) and
   c. the spatial relations section of the Differential Aptitude Test (DAT).

3. There will be no significant correlation between imagery and anxiety as determined by scores on the State Trait Anxiety Inventory (STAI) and
a. the **Questionnaire on Vividness of Imagery** (BETTS),
b. the **Guy Emotive Imagery Scale** (GUY) and
c. the spatial relations section of the **Differential Aptitude Test** (DAT).

4. There will be no significant correlation between self-concept and anxiety as determined by scores on the **Tennessee Self-concept Scale** (TENN) and the **State Trait Anxiety Inventory** (STAI).

Table I presents Pearson product moment correlation coefficients for the appropriate variables, along with levels of significance which were computed using a t test to determine if the correlation significantly departed from zero. For clarity the abbreviations used for the instruments are as follows:

a. **Seriousness of Illness Rating Scale** (SIRS),
b. **Social Readjustment Rating Scale** (SRRS),
c. **Tennessee Self-concept Scale** (TENN),
d. **Guy Emotive Imagery Scale** (GUY),
e. **Betts Questionnaire on Vividness of Imagery Scale** (BETTS),
f. the spatial relations section of the **Differential Aptitude Test** (DAT),
g. **State Trait Anxiety Inventory** (STAI),
h. subjective stress scale (SS),
i. an interaction between TENN and BETTS will be TENBET,
j. an interaction between TENN and GUY will be TENGUY,
k. an interaction between TENN and DAT will be TENDAT.
The correlation between stress scores (SRRS) and seriousness of illness scores (SIRS) was .25, which was significant at beyond the .001 level of confidence. Therefore, null hypothesis 1 was rejected.

The correlations between self-concept scores (TENN) and the three measures of imagery were as follows:

a. scores on the Questionnaire on Vividness of Imagery (BETTS) correlated at -.21, which was significant at the .01 level of confidence;
b. scores on the Guy Emotive Imagery Scale (GUY) correlated at -.09, which was not significant;

c. scores on the spatial relations section of the Differential Aptitude Test (DAT) correlated at .08, which was not significant.

Therefore, null hypotheses 2b and 2c were retained, and 2a was rejected.

The correlations between anxiety scores (STAI) and the measures of imagery were as follows:

a. scores on the Questionnaire on Vividness of Imagery (BETTS) correlated at .25, which was significant at the .001 level of confidence;

b. scores on the Guy Emotive Imagery Scale (GUY) correlated at .08, which was not significant;

c. scores on the spatial relations section of the Differential Aptitude Test (DAT) correlated at -.15, which was significant at the .05 level of confidence.

Therefore, null hypotheses 3a and 3c were rejected and 3b was retained.

The correlation between self-concept scores (TENN) and trait anxiety scores (STAI) was 0.63, which was significant at beyond the .001 level of confidence. Therefore, null hypothesis 4 was rejected.

Hypotheses 5 through 11 investigated the efficiency of the prediction of seriousness of illness scores using
selected variables, and were restated in the null form as follows:

5. Using as the basic model stress (SRRS) as a predictor or disease (SIRS), no significant increase in $R^2$ will be obtained when anxiety (STAI) is added to the model.

6. Using as the basic model stress (SRRS) as a predictor of disease (SIRS), no significant increase in $R^2$ will be obtained when perceived stress (SS) is added to the model.

7. Using as the basic model stress (SRRS) as a predictor or disease (SIRS), no significant increase in $R^2$ will be obtained when self-concept (TENN) is added to the model.

8. Using as the basic model stress (SRRS) as a predictor of disease (SIRS), no significant increase in $R^2$ will be obtained when imagery is added to the model.

Imagery will be determined by scores on

a. the Questionnaire on Vividness of Imagery (BETTS),

b. the Guy Emotive Imagery Scale (GUY),

c. the spatial relations section of the Differential Aptitude Test (DAT).

9. Using as the basic model stress (SRRS) as a predictor of disease (SIRS), no significant increase in $R^2$ will be obtained when a vector discriminating sex is added to the model.
10. Using as the basic model stress (SRRS) as a predictor of disease (SIRS), no significant increase in $R^2$ will be obtained when a multiplicative combination of imagery and self-concept is added to the model. That is, there will be no significant interaction between imagery and self-concept (TENN). Imagery will be determined by scores on

a. the *Questionnaire on Vividness of Imagery* (BETTS),

b. the *Guy Emotive Imagery Scale* (GUY),

c. the spatial relations section of the *Differential Aptitude Test* (DAT).

11. The most efficient model in predicting seriousness of disease will not include any combination of imagery and self-concept.

Table II reflects the results of adding a vector representing each variable, individually, to a vector representing SRRS scores as predictors of SIRS scores. A vector representing each variable was added, one at a time, then removed from the model, and another vector representing another variable was added, in order to find the unique contribution to $R^2$ provided by each variable and in order to provide a test for the hypotheses. In Table II, the $R^2$ increase represents the square of the semipartial correlation coefficient for each variable. SRRS scores predicting SIRS scores were the basic model. SRRS scores alone were significant predictors of SIRS scores with a multiple $R$ of .25, which
TABLE II

SIGNIFICANCE OF INCREASE IN $R^2$ ADDING EACH VARIABLE ALONE TO LIFE STRESS AS PREDICTORS OF SERIOUSNESS OF ILLNESS

<table>
<thead>
<tr>
<th>Variables</th>
<th>Multiple $R$</th>
<th>$R^2$</th>
<th>Increase $R^2$</th>
<th>$df$</th>
<th>$F$</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRRS</td>
<td>.25</td>
<td>.06</td>
<td>---</td>
<td>1/186</td>
<td>12.78**</td>
</tr>
<tr>
<td>STAI</td>
<td>.52</td>
<td>.27</td>
<td>.21</td>
<td>1/185</td>
<td>50.97**</td>
</tr>
<tr>
<td>SS</td>
<td>.36</td>
<td>.13</td>
<td>.07</td>
<td>1/185</td>
<td>14.66**</td>
</tr>
<tr>
<td>TENN</td>
<td>.36</td>
<td>.13</td>
<td>.07</td>
<td>1/185</td>
<td>13.41**</td>
</tr>
<tr>
<td>BETTS</td>
<td>.26</td>
<td>.06</td>
<td>.00</td>
<td>1/185</td>
<td>.30</td>
</tr>
<tr>
<td>DAT</td>
<td>.31</td>
<td>.10</td>
<td>.03</td>
<td>1/185</td>
<td>6.91**</td>
</tr>
<tr>
<td>GUY</td>
<td>.28</td>
<td>.08</td>
<td>.02</td>
<td>1/185</td>
<td>3.72</td>
</tr>
<tr>
<td>SEX</td>
<td>.46</td>
<td>.21</td>
<td>.15</td>
<td>1/185</td>
<td>35.17**</td>
</tr>
</tbody>
</table>

* $F = 3.91$ p. 05 with 1/150 df
** $F = 6.81$ p. 05 with 1/150 df

accounted for 6 percent of the variance and was significant at beyond the .01 level.

There was a significant increase in $R^2$ when anxiety scores (STAI) were added to stressful life events scores (STAI) as predictors of seriousness of illness scores (SIRS). The multiple $R$ was .52, which accounted for 27 percent of the variance, an increase in $R^2$ of .21. This increase was significant at well beyond the .01 level of confidence. Therefore, null hypothesis 5 was rejected.
The beta weights for this model were as follows: **SRRS** was .347; **STAI** was 11.137, with a constant of -218.53. This indicated that as **STAI** scores increased, holding **SRRS** constant, **SIRS** scores tended to increase.

There was a significant increase in \( R^2 \) when subjective stress scores (**SS**) were added to stressful life event scores (**SRRS**) as predictors of seriousness of illness scores (**SIRS**). The multiple \( R \) was .36, which accounted for 13 percent of the variance, and increase in \( R^2 \) of .07. This increase was significant beyond the .01 level of confidence. Therefore, null hypothesis 6 was rejected.

The beta weights for this model were these: **SRRS** was .259; **SS** was 43.070, with a constant of 21.08. This indicated that as subjective stress increased, holding **SRRS** constant, **SIRS** scores tended to increase.

There was a significant increase in \( R^2 \) when self-concept scores (**TENN**) were added to stressful life events scores (**SRRS**) as predictors of seriousness of illness scores (**SIRS**). The multiple \( R \) was .36, which accounted for 13 percent of the variance, an increase in \( R^2 \) of .07. This increase was significant at beyond the .01 level of confidence. Therefore, null hypothesis 7 was rejected.

The beta weights for this model were as follows: **SRRS** was .349; **TENN** was -1.749, with a constant of 806.99. This indicated that as **TENN** scores increased, holding **SRRS** constant, **SIRS** scores tended to decrease.
There was no significant increase in $R^2$ when Questionnaire on Vividness of Imagery scores (BETTS) were added to stressful life event scores (SRRS) as predictors of seriousness of illness scores (SIRS). In fact, SRRS scores alone were as efficient in predicting SIRS scores as were the two variables. The beta weights for this model were these: SRRS was .366; BETTS was -.320, with a constant of 228.04.

There was no significant increase in $R^2$ when Guy Emotive Imagery Scale scores (GUY) were added to stressful life event scores (SRRS) as predictors of seriousness of illness scores (SIRS). The beta weights for this model were these: SRRS was .347; GUY was .918, with a constant of 52.00.

There was a significant increase in $R^2$ when Differential Aptitude Test, spatial relations section, scores were added to stressful life event scores (SRRS) as predictors of seriousness of illness scores (SIRS). The multiple $R$ was .31, which accounted for 10 percent of the variance, an increase in $R^2$ of .03. This increase was significant at beyond the .01 level of confidence. Therefore, null hypotheses 8a and 8b were retained, while null hypothesis 8c was rejected.

There was a significant increase in $R^2$ when a vector discriminating sex (males = 1, females = 2) was added to stressful life event scores (SRRS) as predictors of seriousness of illness scores (SIRS). The multiple $R$ was
.46, which accounted for 21 percent of the variance, an increase in $R^2$ of .15. This increase was significant at beyond the .01 level of confidence. Therefore, null hypothesis 9 was rejected.

The beta weights for this model were these: SRRS was .307; SEX was 171.541, with a constant of -47.07. This indicated that females tended to score higher on the SIRS than did males.

The interaction between the Tennessee Self-concept Scale (TENN) and the Questionnaire on Vividness of Imagery (BETTS) is shown in Table III. The table shows the variance and associated $F$ scores found when TENN, BETTS, and the interaction (TENBET) were added, in that order, hierarchically, one at a time, to SRRS scores as a predictor of SIRS scores. The interaction term had an associated $F$ of .16, which did not reach statistical significance. Therefore, null hypothesis 10a was retained.

### Table III
SIGNIFICANCE OF INTERACTION OF SELF CONCEPT AND VIVIDNESS OF IMAGERY ADDED TO LIFE STRESS AS PREDICTORS OF SERIOUSNESS OF ILLNESS

<table>
<thead>
<tr>
<th>Variables</th>
<th>Multiple $R$</th>
<th>$R^2$</th>
<th>Increase $R^2$</th>
<th>df</th>
<th>$F$</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRRS</td>
<td>.25</td>
<td>.064</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TENN</td>
<td>.35</td>
<td>.127</td>
<td>.063</td>
<td>1/185</td>
<td>13.41**</td>
</tr>
<tr>
<td>BETTS</td>
<td>.36</td>
<td>.136</td>
<td>.009</td>
<td>1/184</td>
<td>.07</td>
</tr>
<tr>
<td>TENBET</td>
<td>.37</td>
<td>.137</td>
<td>.001</td>
<td>1/183</td>
<td>.16</td>
</tr>
</tbody>
</table>

* $F = 3.91$, $p .05$ with $1/150$ df
** $F = 6.81$, $p .01$ with $1/150$ df
The interaction between the Tennessee Self-concept Scale (TENN) and the Guy Emotive Imagery Scale (GUY) is shown in Table IV. The table shows the variance and associated F scores, when TENN, GUY, and the interaction (TENGUY) were added in that order, hierarchically, one at a time, to SRRS scores as predictors of SIRS scores. TENGUY, with a F of 4.16, was significant at beyond the .05 level of confidence. Therefore, null hypothesis 10b was rejected. The direction of this interaction will be examined after considering hypothesis 10c.

**TABLE IV**

SIGNIFICANCE OF INTERACTION OF SELF-CONCEPT AND EMOTIVE IMAGERY ADDED TO LIFE STRESS AS PREDICTORS OF SERIOUSNESS OF ILLNESS

<table>
<thead>
<tr>
<th>Variables</th>
<th>Multiple R</th>
<th>R²</th>
<th>Increase R²</th>
<th>df</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRRS</td>
<td>.25</td>
<td>.064</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TENN</td>
<td>.35</td>
<td>.128</td>
<td>.063</td>
<td>1/185</td>
<td>13.41**</td>
</tr>
<tr>
<td>GUY</td>
<td>.37</td>
<td>.140</td>
<td>.013</td>
<td>1/184</td>
<td>3.52</td>
</tr>
<tr>
<td>TENGUY</td>
<td>.39</td>
<td>.160</td>
<td>.019</td>
<td>1/183</td>
<td>4.16*</td>
</tr>
</tbody>
</table>

* F = 3.91, p .05 with 1/150 df
** F = 6.81, p .01 with 1/150 df

The interaction between the Tennessee Self-concept Scale (TENN) and the spatial relations section of the Differential Aptitude Test (DAT) is shown in Table V.
The table shows the variance and associated F scores, when TENV, DAT, and the interaction were added, in that order, hierarchically, one at a time, to SRRS scores as predictors of SIRS scores. TENDAT with an F of 3.86 was not significant. Therefore, null hypothesis 10c was retained.

**TABLE V**

SIGNIFICANCE OF INTERACTION OF SELF-CONCEPT AND VISUAL IMAGERY ADDED TO LIFE STRESS AS PREDICTORS OF SERIOUSNESS OF ILLNESS

<table>
<thead>
<tr>
<th>Variables</th>
<th>Multiple R</th>
<th>R²</th>
<th>Increase R²</th>
<th>df</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRRS</td>
<td>.25</td>
<td>.064</td>
<td>----</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>TENN</td>
<td>.35</td>
<td>.127</td>
<td>.063</td>
<td>1/185</td>
<td>13.41**</td>
</tr>
<tr>
<td>DAT</td>
<td>.39</td>
<td>.154</td>
<td>.027</td>
<td>1/184</td>
<td>2.97</td>
</tr>
<tr>
<td>TENDAT</td>
<td>.41</td>
<td>.172</td>
<td>.017</td>
<td>1/183</td>
<td>3.86</td>
</tr>
</tbody>
</table>

* F = 3.91, p .05 with 1/150 df
** F = 6.81, p .01 with 1/150 df

In order to examine the nature of the interaction concerning TENGUY, the beta weights and hypothetical test scores were used. The beta weights involved for the variables were these: SRRS was .313; TENN was -6.647; GUY was -9.319; TENGUY was .030, with a constant of 2355.03. Hypothetical scores were developed from Table VI which gives the mean, standard deviation, and range of scores on the instruments involved in this study, using sample subjects.
### TABLE VI

**MEANS, STANDARD DEVIATIONS AND RANGE ON INSTRUMENTS**

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Mean</th>
<th>STD DEV</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIRS</td>
<td>307</td>
<td>220</td>
<td>9</td>
<td>990</td>
</tr>
<tr>
<td>SRRS</td>
<td>287</td>
<td>152</td>
<td>12</td>
<td>964</td>
</tr>
<tr>
<td>TENN</td>
<td>343</td>
<td>32</td>
<td>246</td>
<td>419</td>
</tr>
<tr>
<td>GUY</td>
<td>170</td>
<td>33</td>
<td>94</td>
<td>251</td>
</tr>
<tr>
<td>BETTS</td>
<td>80</td>
<td>27</td>
<td>36</td>
<td>174</td>
</tr>
<tr>
<td>DAT</td>
<td>33</td>
<td>11</td>
<td>10</td>
<td>56</td>
</tr>
<tr>
<td>STAI</td>
<td>38</td>
<td>9</td>
<td>21</td>
<td>60</td>
</tr>
<tr>
<td>SS</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td>7</td>
</tr>
</tbody>
</table>

From Table VI a high stress score (900) was selected and held constant for the equation. The nature of the interaction would be the same given any constant score for stress. For high and low scores on the **TENN**, 400 and 250 were arbitrarily selected, and for high and low scores on the **GUY**, 200 and 100 were arbitrarily selected. By inserting these values into a formula using the beta weights, predicted scores for seriousness of illness (**SIRS**) can be obtained, and a graph can then be used to determine the direction on interaction.

In Figure I, the interaction is displayed holding **GUY** scores constant at high (200) and low (100) and varying
the TENN scores across predicted SIRS scores. Subjects with high GUY scores, regardless of high or low self-concept (TENN) scores, had a narrow range or predicted SIRS scores, compared to subjects with low GUY scores. Subjects with low GUY scores and high self-concept (TENN) scores had the lowest predicted SIRS scores. Subjects with low GUY scores and low self-concept scores had the highest predicted SIRS scores. Self-concept (TENN) had little influence on predicted seriousness of illness scores (SIRS) for high emotive imagery subjects (GUY). In comparison, self-concept (TENN) had a large influence on low emotive imagery (GUY) subjects.

![Graph](image)

**Fig. 1**—Interaction found holding high and low emotive imagery constant and varying self-concept predicting seriousness of illness
The most efficient predictors of seriousness of illness are shown, in rank order, in Table VII. The initial predictor was selected by correlating all vectors with the vector representing SIRS scores, and beginning the prediction by using the vector with the highest correlation with SIRS scores. From this point, each vector was selected on the basis that it would lead to the largest increase in $R^2$. Vectors were then selected one at a time.

### TABLE VII

**THE MOST EFFICIENT PREDICTORS OF SERIOUSNESS OF ILLNESS SCORES USING STEPWISE REGRESSION**

<table>
<thead>
<tr>
<th>Step</th>
<th>Variable</th>
<th>Multiple $R$</th>
<th>$R^2$</th>
<th>Increase $R^2$</th>
<th>df</th>
<th>$F$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>STAI</td>
<td>.46</td>
<td>.209</td>
<td>.209</td>
<td>1/186</td>
<td>49.08**</td>
</tr>
<tr>
<td>2</td>
<td>SEX</td>
<td>.56</td>
<td>.319</td>
<td>.110</td>
<td>1/185</td>
<td>29.80**</td>
</tr>
<tr>
<td>3</td>
<td>SRRS</td>
<td>.60</td>
<td>.362</td>
<td>.043</td>
<td>1/184</td>
<td>12.37**</td>
</tr>
<tr>
<td>4</td>
<td>BETTS</td>
<td>.61</td>
<td>.374</td>
<td>.012</td>
<td>1/183</td>
<td>3.61</td>
</tr>
<tr>
<td>5</td>
<td>SS</td>
<td>.62</td>
<td>.384</td>
<td>.010</td>
<td>1/182</td>
<td>2.86</td>
</tr>
<tr>
<td>6</td>
<td>TENDAT</td>
<td>.63</td>
<td>.393</td>
<td>.009</td>
<td>1/181</td>
<td>2.74</td>
</tr>
<tr>
<td>7</td>
<td>TENN</td>
<td>.63</td>
<td>.394</td>
<td>.001</td>
<td>1/180</td>
<td>0.23</td>
</tr>
<tr>
<td>8</td>
<td>DAT</td>
<td>.64</td>
<td>.404</td>
<td>.010</td>
<td>1/179</td>
<td>3.29</td>
</tr>
<tr>
<td>9</td>
<td>GUY</td>
<td>.64</td>
<td>.405</td>
<td>.001</td>
<td>1/178</td>
<td>0.27</td>
</tr>
<tr>
<td>10</td>
<td>TENGUY</td>
<td>.64</td>
<td>.406</td>
<td>.001</td>
<td>1/177</td>
<td>0.43</td>
</tr>
</tbody>
</table>

* $F = 3.91, p = .05$ with 1/150 df
** $F = 6.81, p = .01$ with 1/150 df
and placed in the regression model, in a stepwise manner, regardless of the variables represented. It should be noted that on step 6 an interaction vector entered the regression model prior to the variables interacted, which would be difficult to interpret. However, the last significant contributor to the model was in step 3, with the introduction of SRRS; so no interpretation is necessary. The most efficient predictors, those that reached significance in this model, were STAI, SEX, and SRRS. The beta weights for this model were these: STAI was 9.691; SEX was 139.257; SRRS was .301, with a constant of -366.29. There was no interaction term reaching significance in this model. Therefore, null Hypothesis 11 was retained.
Summary

This research study was developed to investigate the relationships between imagery, self-concept, anxiety, stress and seriousness of disease, and to determine the potential of cognitive mediating variables, such as anxiety, self-concept, and imagery, to significantly increase the efficiency of stress as a predictor of seriousness of disease.

A total of 202 subjects, a sample of convenience, was selected from six freshmen psychology and two freshmen biology classes from a small suburban junior college. Fourteen of the subjects were dropped from the study due to an inability to complete the battery of tests, leaving a total of 188 subjects. Sample data for the 188 subjects were 44.7 percent males and 55.3 percent females; 91 percent Caucasian, 4 percent Black and 1 percent American Indian; 88 percent were under 30 years of age, with 80 percent under 25 years of age and an average age of 23. Classroom instructors, all with knowledge of testing procedures, administered the battery of tests. The following instruments were randomly ordered and administered by each instructor with the exception that the Seriousness of Illness Rating Scale was administered last:
a. the **Social Readjustment Rating Scale** (SRRS),
b. the **Tennessee Self-concept Scale** (TENN),
c. the **State Trait Anxiety Inventory** (STAI),
d. the **Betts Questionnaire on Vividness of Imagery** (BETTS),
e. the **Guy Emotive Imaging Scale** (GUY),
f. the spatial relations section of the **Differential Aptitude Test** (DAT),
g. the subjective evaluation of stress (SS),
h. the **Seriousness of Illness Rating Scale** (SIRS).

Hypotheses 1 through 4 were treated statistically, using correlation and a *t* test for significance of correlation. Hypotheses 5 through 11 were treated statistically by using multiple linear regression.

Results

Hypothesis 1 stated that there would be a significant positive correlation between the variables of stress and the seriousness of disease as determined by scores on the **Social Readjustment Rating Scale** and the **Seriousness of Illness Rating Scale**. The results from the correlation supported this hypothesis, and the hypothesis was accepted.

Hypothesis 2 stated that there would be no significant correlation between imagery and self-concept as determined by scores on the **Tennessee Self-concept Scale** and
a. Betts Questionnaire on Vividness of Imagery,
b. Guy Emotive Imaging Scale,
c. spatial relations section of the Differential Aptitude Test.

The results from the correlations supported Hypothesis 2b and 2c, and these sections of Hypothesis 2 were accepted. Hypothesis 2a was not supported by the correlational data; therefore, Hypothesis 2a was rejected.

Hypothesis 3 stated that there would be no significant correlation between imagery and anxiety as determined by scores on the State Trait Anxiety Inventory and

a. Betts Questionnaire on Vividness of Imagery,
b. Guy Emotive Imaging Scale,
c. spatial relations section of the Differential Aptitude Test.

The results from the correlations supported Hypothesis 3b, which was accepted. Hypothesis 3a and 3c were not supported by the correlational data; therefore, sections 3a and 3c of Hypothesis 3 were rejected.

Hypothesis 4 stated that there would be a significant negative correlation between self-concept and anxiety as determined by scores on the Tennessee Self-concept Scale and the State Trait Anxiety Inventory. The results from the correlations supported this hypothesis, and Hypothesis 4 was accepted.
Hypothesis 5 stated that, using stress as a predictor of illness, no significant increase in $R^2$ would be obtained when trait anxiety was added to the model. The results from the multiple linear regression did not support this hypothesis, and the hypothesis was rejected.

Hypothesis 6 stated that, using stress as a predictor of disease, no significant increase in $R^2$ would be obtained when subjective stress (SS) was added to the model. The results from the multiple linear regression did not support this hypothesis, and the hypothesis was rejected.

Hypothesis 7 stated that, using stress as a predictor of disease, a significant increase in $R^2$ would be obtained when self-concept was added to the model. The results from the multiple linear regression supported this hypothesis, and the hypothesis was accepted.

Hypothesis 8 stated that, using stress as a predictor of disease, no significant increase in $R^2$ would be obtained when imagery was added to the model. Imagery was determined by scores on

a. Betts Questionnaire on Vividness of Imagery,

b. Guy Emotive Imaging Scale,

c. spatial relations section of the Differential Aptitude Test.

The results from the multiple linear regression supported Hypothesis 8a and 8b. Sections a and b of Hypothesis 8 were accepted. Hypothesis 8c was not supported by the data and was rejected.
Hypothesis 9 stated that, using stress as a predictor of disease, no significant increase in $R^2$ would be obtained when a vector discriminating sex was added to the model. The results from the multiple linear regression did not support this hypothesis, and Hypothesis 9 was rejected.

Hypothesis 10 stated that, using stress as a predictor of disease a significant increase in $R^2$ would be obtained when a multiplicative combination of imagery and self-concept was added to the model. That is, there would be a significant interaction between self-concept and imagery. Imagery was determined by scores on

a. *Betts Questionnaire on Vividness of Imagery*,

b. *Guy Emotive Imaging Scale*,

c. spatial relations section of the *Differential Aptitude Test*.

The results from the multiple linear regression supported Hypothesis 10b, and Hypothesis 10b was accepted. The results did not support Hypothesis 10a and 10c; therefore, sections a and c of Hypothesis 10 were rejected.

Hypothesis 11 stated that the most efficient model in predicting disease would include some combination of imagery and self-concept. The results from the multiple linear regression did not support this hypothesis, and Hypothesis 11 was rejected.
Discussion

Hypothesis 1 investigated the correlation between stressful life events and the seriousness of illness, and a significant positive correlation was found. This supports the findings of Holmes and Rahe (4), Wyler, Masuda, and Holmes (13) and Garrity, Marx, and Somes (3), that stressful life events are associated with disease and seriousness of disease. These results also support using as the basic model, stress as a predictor of disease in Hypothesis 5 through 11. The direction of the correlation indicates that subjects with high scores on one measure tended to score high on the other measure.

The relationship between self-concept and imagery was examined in Hypothesis 2. There was no rationale that a raw measure of imagery should be related to one's self-concept, so the experimental hypothesis was stated in the null form. A significant correlation between self-concept and vividness of imagery was found. Several interpretations of this relationship are possible. Di Vesta (1) stated that introspective measures of imagery, such as the Betts Questionnaire on Vividness of Imagery, were confounded with social desirability. It is possible that individuals who want to be viewed as having "good" imagery also desire to be seen as having "good" self-concept, or possibly individuals with "good" self-concepts perceive themselves as having "good" imagery. The results found can be interpreted as supporting
the hypothesis that the Betts Questionnaire on Vividness of Imagery is confounded with social desirability. It should be noted that, even though the correlation is -.21, the relationship is positive, due to the fact that on the Betts Questionnaire on Vividness of Imagery low scores indicate high imagery and high scores indicate low imagery abilities. Another possible interpretation is that the Betts Questionnaire on Vividness of Imagery is measuring some dimension of imagery which is different from that measured by the spatial relations section of the Differential Aptitude Test and the Guy Emotive Imaging Scale. McKelvie and Rohrberg (8) state that the Betts Questionnaire on Vividness of Imagery measures static imagery; therefore there may be some relationship between self-concept and static imagery apart from any confounding variable. However, a more direct interpretation of the results supports the hypothesis that the Betts Questionnaire on Vividness of Imagery is confounded with social desirability.

Hypothesis 3 examined the relationship between the imagery measures and trait anxiety, and since there was no rationale for a relationship between these variables, no relationship was hypothesized. A significant correlation was found between vividness of imagery and trait anxiety, in that the higher the vividness of imagery, the lower the trait anxiety. Since trait anxiety and self-concept are highly correlated, this can be interpreted as further evidence that the Betts Questionnaire on Vividness of Imagery measure
is confounded with social desirability. Those individuals with high trait anxiety tend to worry and perceive themselves in a negative manner, which could relate to a dimension of social desirability and account for the correlation found between vividness of imagery and trait anxiety.

The correlation found between visual imagery and trait anxiety is not as easy to explain. Di Vesta (1) included the spatial relations section of the Differential Aptitude Test in his factor analytic study and did not find it confounded with social desirability. In addition, there does not appear to be a definite trend in this study toward a relationship between self-concept and visual imagery. The direction of the relationship is such that high visual imagers tend to be low in trait anxiety. Perhaps if individuals can accurately perceive and manipulate their environment, they tend to respond to that environment with less frustration and worry. Perhaps the instrument itself is a difficult and frustrating task, and those individuals with high trait anxiety tend to become frustrated and to react emotionally, and as a result perform poorly on the test. If so, this instrument could serve as a measure of task frustration evaluation: a situation in which trait-anxiety individuals would respond with situational or state anxiety, worry, and frustration, and as a result perform poorly. Therefore, the correlation could be between task frustration due to the difficulty of the visual imagery measure and the tendency of high trait-anxiety individuals to react with
frustration. This is not intended to exclude the possibility of some direct relationship between visual imagery and trait anxiety.

A high negative correlation was found between self-concept and anxiety, which is in line with the research of Thompson (12), Mukherhee, (9), Lauer (6) and Donovan, Smyth, Paige, and O'leary (2). Measures of anxiety were used to validate the Tennessee Self-concept Scale. Therefore, significant negative correlations would be expected. These results support the hypothesis of a negative relationship between self-concept and trait anxiety.

The basic model for testing Hypotheses 5 through 11 was using life events, the Social Readjustment Rating Scale (SRRS), as a predictor of seriousness of illness, the Seriousness of Illness Rating Scale (SIRS). Since the correlation between SRRS and SIRS was significant, the measure of stressful life events was a significant predictor of seriousness of illness. Hypothesis 5 was investigated by adding trait anxiety to the model. Since anxiety is seen as a response to stress, and some theorists, such as Selye, (11), do not consider it necessary to investigate cognitive mediating variables, it was hypothesized that anxiety would not increase the predictive efficiency of stress. Stressful events alone accounted for 6 percent of the variance between the scores. When trait anxiety was added, the
combination accounted for 27 percent of the variance, or an increase of 21 percent over using stressful events alone to predict seriousness of illness. This lends support to the position of Lazarus (7) that cognitive mediating variables are important in the process between stress and illness. In this model, life crisis explained 6 percent, while trait anxiety accounted for an additional 21 percent of the variance predicting seriousness of illness. It appears possible that the mediating variables, the interpretations of the stressful events, are more important than the events themselves in predicting seriousness of illness, which lends support to an phenomenological interpretation of stress.

Hypothesis 6 was tested by adding the one-item measure of subjective stress into the model along with the life events measure as a predictor of seriousness of illness. Several questions led to the development of this hypothesis. Since external life events have been correlated with seriousness of illness, would subjects be aware of these stressful life events and be able to rank, on a scale, their subjective evaluation of stress? Since life events are seen as leading to illness, frequently without cognitive mediation, again the null hypothesis was offered. The hypothesis was rejected because the subjective evaluation did significantly add to the predictive efficiency of life events. In fact, the subjective evaluation of stress correlated more highly with seriousness of illness than did the stressful life events
measure, and when placed in the model after life events, subjective stress more than doubled the proportion of variance explained. Again, this lends support to the phenomenological interpretation of stress. That is, individuals' subjective evaluation of stress is just as important, if not more so, than a measure of the events taking place in those individuals lives. It appears that one can just as accurately, possibly more so, predict illness by simply asking the person, "How much stress have you experienced" than by giving the 43-item measure of stressful life events.

Next, for a test of Hypothesis 7, self-concept was added to the basic model of stress as a predictor of seriousness of illness, and again a significant increase in prediction was found. Given a constant life event score, individuals with high self-concept scored significantly lower on seriousness of illness than individuals with low self-concept scores. This could be interpreted to mean that self-concept is a significant variable in how well an individual can cope with stressful life events, and therefore, how seriously ill that individual might become. Individuals with positive self-concepts are less likely to worry and concern themselves over stressful life events and as a result are less likely to experience the autonomic reactions that lead to illness. Individuals with negative self-concepts are likely to use external events in a manner consistent with their self-concept; that is, they will use events to punish themselves with worry and concern and thus
increase the likelihood of illness. This suggests that individuals with high self-concepts can experience more stress and stay healthier than individuals with lower self-concepts; and, to the extent that psychotherapy or training can increase self-concept, the individual's chance of being healthier is increased.

In Hypothesis 8, it was hypothesized that imagery, as a raw score, would not be a predictor of seriousness of illness regardless of whether the imagery measure was emotive imagery, vividness of imagery or visual imagery. As hypothesized, emotive imagery and vividness of imagery did not significantly add to life change scores as a predictor of seriousness of illness. However visual imagery, as measured by the DAT, significantly increased the ability to predict seriousness of illness. The nature of this relationship is such that, given a constant stress score, the higher the imagery abilities, the lower the seriousness of illness score. The ability to visually manipulate objects in an accurate manner appears to be related to less serious illnesses when compared to individuals with lesser imagery abilities. The increase in predictive efficiency may in fact be due to visual imagery abilities, in that individuals who accurately image their life events and accurately manipulate those images may be more objective and confident in their evaluation of their life events and thus experience less anxiety. Taking the spatial relations section of the DAT is a difficult task. It is possible that those individuals
who became frustrated during the test scored low on the test. Thus the DAT could actually tap a tendency to become frustrated and anxious, which in itself could lead to an increase in predictive efficiency of that measure. This is supported by the correlation between the spatial relations section of the DAT and trait anxiety.

It is interesting that the other measures of imagery did not produce significant increases in predictive efficiency when added to the basic model. The measure of emotive imagery was significantly correlated with seriousness of illness, as was the measure of spatial relations or visual imagery. It would seem that if any measure of imagery would correlate with illness, it would be emotive imagery. That would indicate that the more individuals emotively interacted with imagery, the more potential for autonomic involvement. Even though the correlation was significant, emotive imagery did not attain significance when added to the basic model. Further investigation is needed to understand the relationship of visual and emotive imagery to illness.

To test Hypothesis 9, a vector discriminating sex was added to the basic model of stress as a predictor of seriousness of illness. Past studies using the life event scale had found mixed results when breaking down the data by sex. The results of this study strongly support the hypothesis that sex is an important variable in predicting the seriousness of illness. When sex was added to the model, it accounted for over 14 percent.
of the variance, with female subjects scoring significantly higher on seriousness of illness than male subjects, given equal stress scores. It is interesting to speculate as to why women score higher on the seriousness of illness measure than men. Perhaps college women experience more illnesses than college men. Since the illness measure is summed, one could inflate the seriousness dimension with many minor illnesses. Perhaps women report more minor illnesses than men; ailments that college women think of as illness may be seen by college men as of little consequence. Regardless of the reason, sex seems an important variable when predicting seriousness of illness or, possibly, number of illnesses.

In testing Hypothesis 10, adding the interactions of self-concept and measures of imagery to the basic model of stress as a predictor of illness produced mixed results. The interaction of self-concept and vividness of imagery and the interaction of self-concept and visual imagery did not produce significant results, whereas the interaction of self-concept and emotive imagery produced results which were significant at the .05 level.

The interaction of the Tennessee Self-concept Scale and the Guy Emotive Imagery Scale (TENGUY) was not in the direction expected, even though the interaction was significant. Those subjects with high emotive imagery displayed very little change in seriousness of illness regardless of their self-
concepts. However, low emotive imagery subjects varied greatly in seriousness of illness depending upon self-concept. For low emotive imagery subjects, the more positive their self-concept, the lower their seriousness of illness; the more negative their self-concept, the higher their seriousness of illness. This seems to indicate that if one's emotive imagery is low, self-concept will determine the seriousness of illness. However, if one's emotive imagery is high, self-concept has little influence on seriousness of illness. It appears that low imagery accentuates the effects of self-concept, whereas high imagery constrains the effects of self-concept. According to this interaction, the least seriously ill individual would have a positive self-concept and low emotive imagery. The most seriously ill individual would have low self-concept and low emotive imagery. Thus low emotive imagers become more seriously ill as self-concept varies. High imagers stay within the same range of seriousness of illness. In order to help high imagers gain health, changing self-concept would do very little. To gain health, high imagers must abandon emotive imagery while maintaining a high self-concept. That is, in remembering events or constructing events in imagery, it would benefit health if one did not emotionally relate to these images. However, if this were accomplished while the self-concept remains low, the individual could possibly become more seriously ill. For low imagers this could
reflect the difference between relaxation and repression. Individuals with negative self-concepts and low imagery could represent individuals prone to tension, worry, and denial. Before constructing a theory around emotive imagery, it should be remembered that this interaction accounts for less than 2 percent of the variance, as compared to other variables, which account for significantly more.

Hypothesis 10c, regarding the interaction of visual imagery and self-concept, was rejected because the interaction did not significantly add to stress as a predictor of seriousness of illness. Although this interaction was not significant, for purposes of discussion, the interaction is examined. In order to facilitate communication the abbreviated notations for the instruments and interactions are used.

The TENDAT, with an $R^2$ of .0175, came close to that of TENGUY, with .0191, indicating it did approach significance. For the purpose of discussion, the interaction of the Tennessee Self-concept Scale and the Differential Aptitude Scale is presented in Figure II. The interaction was determined by using the beta weights for raw scores, which are as follows: SRRS is .368; TENN is 1.029; DAT is 24,507; TENDAT is -.081 with a constant of -44.723. By holding constant average values for SRRS (300) and STAI (40), high
and low values for the TENN (400, 240) and the DAT (50, 10), the nature of the interaction between TENN and DAT can be determined by using predicted SIRS scores.

By examining Figure 2, it can be noted that subjects with high imagery scores and high self-concept scores have low seriousness of illness ratings compared to subjects with high imagery scores and low self-concept. Although this interaction was not significant, it is in the direction predicted. That is, individuals with high imagery abilities would use those abilities in a manner consistent with their
self-concepts. If their self-concepts were positive, their visual imagery would be positive even in the light of stressful events. Therefore, their illness would be less serious. If their self-concepts were low, their visual imagery would be aversive, which could increase autonomic involvement and increase seriousness of illness. Those individuals with low visual imagery varied little as to seriousness of illness. If any direction at all can be noted, they tended to experience more serious illnesses as their self-concepts increased.

In order to determine if this interaction was consistent, SRRS, STAI, and the interaction between TENN and DAT were used to predict seriousness of illness. The vectors were added all at one time and the results, along with the $F$ values, are in Table VIII. The interaction TENDAT was significant at the .05 level of confidence, with an $R^2$ of .017.

<table>
<thead>
<tr>
<th>Variable</th>
<th>$R^2$ Increase</th>
<th>beta weights</th>
<th>df</th>
<th>$F$</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRRS</td>
<td>.064</td>
<td>.3658</td>
<td>1/182</td>
<td>16.50**</td>
</tr>
<tr>
<td>STAI</td>
<td>.202</td>
<td>11.4311</td>
<td>1/182</td>
<td>32.75**</td>
</tr>
<tr>
<td>TENN</td>
<td>.002</td>
<td>2.9859</td>
<td>1/182</td>
<td>4.69*</td>
</tr>
<tr>
<td>DAT</td>
<td>.013</td>
<td>25.0835</td>
<td>1/182</td>
<td>3.65</td>
</tr>
<tr>
<td>TENDAT</td>
<td>.017</td>
<td>-0.0796</td>
<td>1/182</td>
<td>4.41*</td>
</tr>
</tbody>
</table>

Constant = -1184.153

* $F = 3.91$, $p = .05$ with 1/150 df
** $F = 6.81$, $p = .01$ with 1/150 df
In order to determine the nature of this interaction, SRRS and STAI were held constant and TENN and BETTS were varied from high to low, using the same values as for Figure 2 except that STAI was assigned an arbitrary value of 40, which was close to the mean value found in the sample. The results of this interaction are found in Figure 3.

![Graph showing predicted SIRS scores for different TENN scores and DAT scores](image)

Fig. 3—After adding trait anxiety interaction found holding high and low visual imagery constant and varying self-concept predicting seriousness of illness.
The only difference between the models which led to the interactions displayed in Figures II and III is that trait anxiety was added to the model used in Figure III, and with trait anxiety, the interaction reached significance. High visual imagers vary in a similar manner in both models, in that those with high self-concepts experience less serious illnesses than those with low self-concepts. The range of seriousness of illness becomes more constricted for high imagers when trait anxiety is added to the model. The behavior of low imagery subjects, as shown in Figure III was unexpected and difficult to explain. The least seriously ill were those individuals with low imagery and low self-concept; the most seriously ill were those with low imagery and high self-concept. Somehow in this model, the effects of self-concept are reversed for low imagery. Self-concept taken alone is an excellent predictor of seriousness of illness; what would occur with low visual imagers to reverse this relationship is difficult to conceive. This change, concerning low imagers from Figure II to Figure III, seems to have been brought about by the addition of trait anxiety to the model.

If one does assume that the DAT measure is confounded with frustration, a possible hypothesis is that frustration and low performance interact with self-concept in the following manner. Individuals who are frustrated, perform poorly on tasks, and perceive themselves in a negative
manner are performing in a manner consistent with their self-concepts, which could lead to lower levels of subjective stress. Individuals who become frustrated and perform poorly on tasks and perceive themselves in a positive manner are performing in a manner inconsistent with their self-concepts. This could lead to an internal discrepancy, which could result in higher perceptions of subjective stress and therefore in illness.

In order to determine the effect of adding trait anxiety to other interactions, SRRS, STAI, TENN, GUY, and TENGUY were placed in a model with all vectors added at one time. Table IX contains the $R^2$ increase and beta weights used in the formula to graph the interaction between TENN and GUY. Scores for SRRS (300) and STAI (40) were fixed, and TENN (400, 240) and GUY (200, 100) were varied from high to low to compute the predicted SIRS scores. The results of that interaction are found in Figure IV.

In this interaction the low emotive imagery subjects vary according to their seriousness of illness scores, in a manner consistent with self-concept. Low emotive imagery subjects with high self-concept are healthier than low emotive imagery subjects with low self-concept. For the high emotive imagers, the effects of self-concept are reversed. High emotive imagers with high self-concepts experience more serious illnesses than high emotive imagers with low self-concepts.
TABLE IX

SIGNIFICANCE OF INTERACTION OF SELF-CONCEPT AND EMOTIVE IMAGERY ADDED TO LIFE STRESS AND ANXIETY AS PREDICTORS OF SERIOUSNESS OF ILLNESS

<table>
<thead>
<tr>
<th>Variable</th>
<th>Increase</th>
<th>beta weights</th>
<th>df</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRRS</td>
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<td>.3175</td>
<td>1,182</td>
<td>12.19**</td>
</tr>
<tr>
<td>STAI</td>
<td>.135</td>
<td>11.7196</td>
<td>1,182</td>
<td>34.79**</td>
</tr>
<tr>
<td>TENN</td>
<td>.063</td>
<td>-4.0745</td>
<td>1,182</td>
<td>3.08</td>
</tr>
<tr>
<td>GUY</td>
<td>.013</td>
<td>-8.3494</td>
<td>1,182</td>
<td>3.34</td>
</tr>
<tr>
<td>TENGUY</td>
<td>.019</td>
<td>.0266</td>
<td>1,182</td>
<td>3.96*</td>
</tr>
</tbody>
</table>

Constant = 1034.430

*F = 3.91, p .05 with 1/150 df
**F = 6.81, p .05 with 1/150 df

There now appear to be two conditions which reverse the predictibility of self-concept and seriousness of illness when trait anxiety is in the model. Those are high emotive imagers and low visual imagers. The processes involved here can only be speculated about. Perhaps these interactions somehow tap that element when high self-concept individuals make greater demands on themselves and increase their anxiety, thereby increasing their illness probabilities. Could high emotive imagers with high self-concepts expect more of themselves than high emotive imagers with low self-concepts? At this point, no adequate explanation for this phenomenon is known.

These data suggest that the relationship of imagery to illness is complex, and imagery may interact with other
cognitive mediating variables in a manner so as to reverse expected trends. It should be noted that the increases in $R^2$ for the interactions are generally in the .02 range or less. Using visual imagery alone, with life events as a predictor of seriousness of illness, resulted in a unique contribution to the variance of .034, which is a greater

![Graph](image)

**Fig. 4**—After adding trait anxiety interaction found holding high and low emotive imagery constant and varying self-concept predicting seriousness of illness
increase than any interaction term. Perhaps interaction of visual imagery and emotive imagery with other variables would lead to greater increases in predictive efficiency, or might help to disclose information which would help to develop a theoretical position concerning the interactions found in this study.

The final hypothesis dealt with finding the most efficient model in predicting seriousness of illness. The initial predictor used in this model was the one that had the highest initial correlation with seriousness of illness. Then variables were added to this model, one at a time in a stepwise manner.

Each variable selected was selected on the basis that it would add the greatest contribution to the predictive efficiency of the model in comparison to all the other possible variables. Three variables resulted in a high degree of predictive efficiency, and these variables were, in order of importance, trait anxiety, sex, and stressful life events. The addition of more variables contributed little to increases in predictive efficiency; therefore these three variables were selected as comprising the most efficient model using the fewest variables.

The single most efficient variable in predicting the seriousness of illness, found in this study, was trait anxiety, a cognitive mediating variable. Trait anxiety was found to be a more efficient predictor than the external
measure of stress. This lends support to the theoretical position that cognitive variables, especially variables which would lead to the evaluation of life events as threatening or not threatening, are very important in predicting seriousness of illness.

The knowledge of the sex of individuals was the next variable entered into the most efficient model (Table VII) in predicting seriousness of illness. This knowledge was important in that females in this sample had higher scores on seriousness of illness than did their male counterparts. Much of the existing research at the time of this study, using the Social Readjustment Rating Scale to predict illness, had not taken into consideration sex as a variable. Since it was the second most efficient variable in predicting illness in this study, it appears that discriminating sex should be considered in any study attempting to explain illness.

The final variable making a significant contribution to this model was the Social Readjustment Rating Scale, a measure of stressful life events. The contribution was not as great as that concerning trait anxiety in predicting illness; however, external events were significantly involved. This seems to suggest that external life events cannot be completely ignored in the prediction of illnesses. Therefore, a purely phenomenological point of view concerning stress is not supported by this data. It seems that both
internal and external variables should be considered in predicting seriousness of illness.

The interaction variables in Table VII did not enter the model until step six, and then the interaction entered prior to either interacted measure alone, which would be difficult to interpret. Even then the unique contribution of the interaction in the model at that point was small. It appears that the types of imagery measured in this study are not among the more important cognitive variables relevant to the prediction of seriousness of illness. However, emotive imagery and visual imagery do appear to be involved in the cognitive mediating process, in some manner.

Implications

The results of this study relate to several different areas of stress and illness. In the theoretical area, support can be given to the cognitive mediating theory of stress. Also, the results can be utilized to conceptualize a model showing the relationship of stress and illness. These results support the use of the Social Readjustment Rating Scale in predicting illness, especially when used in conjunction with cognitive mediating variables. Finally, the results of this study can be related to the work of Simonton, using imagery in the treatment of cancer.

The cognitive mediating theory of stress (7) proposes that between the external event and the autonomic
reactions that possibly lead to disease, cognitive and resulting affective variables mediate. This study found significant correlations between seriousness of illness and trait anxiety, self-concept, emotive imagery, visual imagery, and a subjective evaluation of stress by the subjects, all of which could potentially mediate between the external event and autonomic reactions.

In order to discover if these variables did mediate between stress and disease, they were added, using multiple linear regression, to stress as a predictor of disease, in an attempt to increase the predictive efficiency. Five variables made a significant contribution to stress as a predictor of disease; these were trait anxiety, self-concept, visual imagery, an interaction of emotive imagery and self-concept, and a subjective evaluation of stress. The addition of these cognitive variables significantly altered the relationship between external stress and the disease process. Not only must one consider whether individuals are under external stress, but are those individuals prone to worry and reacting to situations with anxiety? Do those individuals feel positively about themselves? That is, do those individuals' self-concepts seem high enough that they will not allow worry and tension to result due to external factors. Do they see themselves as being under a great deal of stress? Whether or not the external events are present, individuals could increase their chances for illness by their subjective
evaluations and feelings. Visual imagery was found to be involved in the stress disease process. The extent to which these individuals perceive events clearly and manipulate those events in an accurate manner with minimal frustration was found to be predictive of health. Finally, emotive imagery is involved. The ability to remember and construct events and then to respond affectively to those inner events interacts with self-concept and relates to illness in a complex way. Individuals who do not emotionally react to these internal events, if they feel positively about themselves, remain healthy. Individuals who do not emotionally react and feel negatively about themselves are highly prone to illnesses. In short, cognitive mediating variables are as important, if not more so, than simply evaluating the external life events. Evaluation of not only external events but of internal events appears necessary in order to assess the probability of seriousness of illness in individuals. In fact, it appears that trait anxiety is actually more predictive of seriousness of illness than is external stress.

Further implications regarding the use of the Social Readjustment Rating Scale are involved. This measure explains only about 6 percent of the variance in predicting seriousness of illness, and this measure is exclusively concerned with external events. In order to increase the predictive efficiency using this measure, it appears that cognitive mediating
variables must not be omitted. If they are omitted, a significant portion of the variance between the events and the illnesses will remain unexplained.

There is a subtle presupposition involved in the use of the external measures of stress while omitting any cognitive mediating variables. That is, if individuals are under a great deal of external stress, they may mechanically fall ill. There is no theoretical possibility in this presupposition for teaching people stress management. In the cognitive mediating theory, if these variables can be changed in individuals, it would theoretically be possible to reduce the chance of serious illness without altering the external events. Individuals could be trained to manage stress by identifying and altering mediating variables. For example, if trait anxiety individuals could be taught to respond to external events with relaxation and calm instead of tension and worry, the chance of serious illness could be reduced.

Much of the research using the Social Readjustment Rating Scale does not take into consideration sex as a variable; some researchers apparently assume that life stress leads to illness regardless of whether one is male or female. In this study sex was found to be an important variable in predicting seriousness of illness; therefore sex should be discriminated whenever the Social Readjustment Rating Scale or the Seriousness of Illness Rating Scale is used.
The possibility of empirically constructing a model, similar to that of Kagan and Levi (5), predicting disease by using stress and mediating events, appears feasible. Using measures of external stress, cognitive mediating variables, exposure to noxious agents, disease history, genetic factors, diet, blood analysis, personality measures, certain habits such as exercise, smoking, and the like, one could use linear regression to predict illness and disease and closely discover the percent of variance each variable or cluster of variables contributed to the overall variation of illness and disease. Granted, this would be an ambitious task; however, it is within the realm of possibility, and the rewards would be great. Individuals could be informed of the likelihood of avoiding disease and remaining healthy if certain variables were changed. For example, the regression formula could be used to predict the increased or decreased likelihood of becoming ill if certain variables were changed, such as stopping smoking, beginning exercise, learning to relax, and learning cognitive management to reduce subjective evaluation of stress. The probabilities of avoiding specific illnesses could be investigated, and the healthy management of high-stress work situations would be possible, given the significant mediating variables.

A major thrust of this study was to evaluate the possibility of imagery's being a mediating cognitive variable in the stress and disease process. Imagery is currently
used in the treatment of cancer by Simonton (10), with the backing of very little empirical research. The findings of this study are mixed concerning support for imagery's being involved in the stress and disease process. Visual imagery appears to be related to health and disease, high visual imagers being able to cope with more stress and experiencing less serious disease. Based on this, individuals with high visual imagery could be expected to do well in Simonton's treatment, whereas individuals with low visual imagery would not; this would not involve content of imagery at all, but simply the ability to image visually. So whether they imaged their bodies' immunodefense systems attacking and destroying the cancer or not, the ability to image was found to be directly related to health and disease. This result is possibly confounded by the frustration involved with the instrument and not the visual imaging abilities that contributed to the low visual imagery scores and the significant prediction.

This does not appear to be the manner in which imagery is used when Simonton treats cancer patients. The visual imagery must work in a positive manner in order to be associated with health, and thus remission or lack of disease. In order to achieve this positive valence, imagery was interacted with self-concept. The initial results were not significant;
however, when trait anxiety was added, the interaction was significant. The results indicated that low visual imagers comprised the healthiest and the sickest groups. As their self-concept became worse, the low visual imagers became healthier, the healthiest group being low visual imagery with low self-concept. The high visual imagers did tend to gain health as their self-concept improved, but the low visual imagers covered a wider range of seriousness of illness. This relationship is difficult to explain in the light of Simonton's work. Several things are suggested; the relationship of visual imagery and self-concept to disease interacts in unusual ways and is not simple. Low visual imagers should receive more research attention, since they were included in both the sickest and the healthiest groups. There is a possibility that the assumption that interacting imagery with self-concept would lead to positive imagers and negative imagers was in error. There is a possibility that the visual imagery measure is contaminated with frustration. Finally, the interactions between all the measures of imagery and self-concept accounted for a very small percentage of the variance. Other variables such as trait anxiety appear to be much more important than imagery in predicting and possibly achieving health or disease.

Also, visual imagery appears to differ from emotive imagery. Low emotive imagers interact with self-concept in a different manner than that of low visual imagers.
It is very probably that the imagery used in cancer treatment would be emotive in nature as well as visual. The data do not lead to a simple explanation of the treatment used by Simonton. However, this fact in itself should lead to the use of extreme caution in implying that to visualize positively will help in the remission of any disease. This idea also leaves little hope for low visual imagers, unless of course they could quickly learn to image in order to rid themselves of disease.

Finally, imagery, as it interacts with self-concept, accounts for very little of the variability in predicting disease. It might be more advisable to emphasize variables that contribute to more variance, such as trait anxiety and plans to reduce external stress in order to facilitate health. Also, the possibility that the measures used here do not reflect the proper aspects or dimensions of imagery, or other variables, must be admitted. Better measures of imagery or different measures of imagery, such as cognitive or auditory imagery might reflect different results. The intent of this study was to begin to examine imagery, and the results indicate that further examination is warranted.

Recommendations

As a result of the findings of this study, the following recommendations have been formulated.
1. A similar research study should be conducted using cancer patients as subjects and remission or worsening of the disease process as the dependent variable.

2. A similar research study should be conducted using a different dependent measure of illness, e.g. medical evaluations, history of illness over the following six months, number of days ill or visits to medical doctors, or some similar measure.

3. A similar research study should be conducted using a prospective measure of health and illness instead of a concurrent measure, as used in this study.

4. A similar research study should be conducted using different measures of imagery.

5. A new research study should be conducted using more variables as predictors, e.g. genetic evaluation, blood workup, past health problems, exercise levels, type of work, other personality variables, etc., in the prediction of illness or future illness.

6. A new research study should be conducted to study low visual imagers and low emotive imagery, especially as they interact with self-concept, in an attempt to determine low visual imagers' basic cognitive learning style, whether it is auditory or kinesthetic, and their cognitive strategies in coping with stress and problems.

7. A new research study should be conducted interacting imagery with other variables in order to attain the positive and negative valence concerning the use of imagery.
8. Counseling programs in health centers, hospitals, and university campuses should be aware of the influence of trait anxiety, self-concept, and other cognitive mediating variables on physical illnesses.

9. More emphasis should be placed on stress management using relaxation techniques and training in cognitive evaluation to reduce subjective stress, and less emphasis should be placed on external stress that cannot be controlled.

10. Further research should be conducted involving the spatial relations section of the Differential Aptitude Test to determine if it is confounded with frustration.


12. Thompson, W., *Correlates of the Self Concept* (Research Monograph No. 6), Dede Wallace Center, 2410 White Avenue, Nashville, Tennessee, June, 1972.

APPENDIX A

SOCIAL READJUSTMENT RATING SCALE

1. Under "number of Occurrences" indicate how many times in the past year each of the events has occurred.

2. Multiply the number under "Scale Value" by the number of occurrences of each event and place the answer under "Your Score."

3. Add the figures under "Your Score" to find your total for the past year.

<table>
<thead>
<tr>
<th>Life Event</th>
<th>Number of Occurrences</th>
<th>Scale Value</th>
<th>Your Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death of spouse</td>
<td></td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Divorce</td>
<td></td>
<td>73</td>
<td></td>
</tr>
<tr>
<td>Marital separation from mate</td>
<td></td>
<td>65</td>
<td></td>
</tr>
<tr>
<td>Detention in jail of other institution</td>
<td></td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>Death of a close family member</td>
<td></td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>Major personal injury or illness</td>
<td></td>
<td>53</td>
<td></td>
</tr>
<tr>
<td>Marriage</td>
<td></td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Being fired at work</td>
<td></td>
<td>47</td>
<td></td>
</tr>
<tr>
<td>Marital reconciliation with mate</td>
<td></td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>Retirement from work</td>
<td></td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>Major change in the health or behavior of a family member</td>
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<td>44</td>
<td></td>
</tr>
<tr>
<td>Pregnancy</td>
<td></td>
<td>40</td>
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</tr>
<tr>
<td>Sexual difficulties</td>
<td></td>
<td>39</td>
<td></td>
</tr>
<tr>
<td>Gaining a new family member (e.g., through birth, adoption, oldster moving in, etc.)</td>
<td></td>
<td>39</td>
<td></td>
</tr>
<tr>
<td>Life Event</td>
<td>Number of Occurrences</td>
<td>Score Value</td>
<td>Your Score</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>-----------------------</td>
<td>-------------</td>
<td>------------</td>
</tr>
<tr>
<td><strong>Total from page 1</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major business readjustment (e.g., merger, reorganization, bankruptcy, etc.)</td>
<td></td>
<td>39</td>
<td></td>
</tr>
<tr>
<td>Major change in financial state (e.g., a lot worse off or a lot better off than usual)</td>
<td></td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>Death of a close friend</td>
<td></td>
<td>37</td>
<td></td>
</tr>
<tr>
<td>Changing to a different line of work</td>
<td></td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>Major change in the number of arguments with spouse (e.g., either a lot more or a lot less than usual regarding child-rearing, personal habits, etc.)</td>
<td></td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>Taking on a mortgage greater than $10,000 (e.g., purchasing a home, business, etc.)</td>
<td></td>
<td>31</td>
<td></td>
</tr>
<tr>
<td>Foreclosure on a mortgage or loan</td>
<td></td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Major change in responsibilities at work (e.g., promotion, demotion, lateral transfer)</td>
<td></td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>Son or daughter leaving home (e.g., marriage, attending college, etc.)</td>
<td></td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>In-law troubles</td>
<td></td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>Outstanding personal achievement</td>
<td></td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>Wife beginning or ceasing work outside the home</td>
<td></td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>Beginning or ceasing formal schooling</td>
<td></td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>Major change in living conditions (e.g., building a new home, remodeling, deterioration of home or neighborhood)</td>
<td></td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>Life Event</td>
<td>Number of Occurrences</td>
<td>Score Value</td>
<td>Your Score</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------</td>
<td>-----------------------</td>
<td>-------------</td>
<td>------------</td>
</tr>
<tr>
<td>Total from page 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Revision of personal habits (dress, manners, associations, etc.)</td>
<td></td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Troubles with the boss</td>
<td></td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Major change in working hours or conditions</td>
<td></td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Change in residence</td>
<td></td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Changing to a new school</td>
<td></td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Major change in usual type and/or amount of recreation</td>
<td></td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>Major change in church activities (e.g., a lot more or a lot less than usual)</td>
<td></td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>Major change in social activities (e.g., clubs, dancing, movies, visiting, etc.)</td>
<td></td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Taking on a mortgage or loan less than $10,000 (e.g., purchasing a car, TV, freezer, etc.)</td>
<td></td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>Major change in sleeping habits (a lot more or a lot less sleep, or change in part of day when asleep)</td>
<td></td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Major change in number of family get-togethers (e.g., a lot more or a lot less than usual)</td>
<td></td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Major change in eating habits (a lot more or a lot less food intake, or very different meal hours or surroundings)</td>
<td></td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Vacation</td>
<td></td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Life Event</td>
<td>Number of Occurrences</td>
<td>Scale Value</td>
<td>Your Score</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>------------------------</td>
<td>-------------</td>
<td>------------</td>
</tr>
<tr>
<td>Total from page 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Christmas</td>
<td></td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Minor violations of the law (e.g., traffic tickets, jaywalking, disturbing the peace, etc.)</td>
<td></td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Total life change score for the past year</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

"Stress: Concepts and Management" A symposium, Chicago, Ill., Nov. 18, 1978, developed by Thomas H. Holmes, M.D., Department of Psychiatry and Behavioral Sciences, University of Washington School of Medicine, Seattle, Washington, 98195
APPENDIX B

THE BETTS QMI VIVIDNESS OF IMAGERY SCALE

Name______________________________

Instructions for doing test:

The aim of this test is to determine the vividness of your imagery. The items of the test will bring certain images to your mind. You are to rate the vividness of each image by reference to the accompanying rating scale, which is shown at the bottom of the page. For example, if your image is 'vague and dim' you give it a rating of 5. Record your answer in the brackets provided after each item. Just write the appropriate number after each item. Before you turn to the next page, familiarize yourself with the different categories on the rating scale. Throughout the test, refer to the rating scale when judging the vividness of each image. A copy of the rating scale will be printed on each page. Please do not turn to the next page until you have completed the items on the page you are doing, and do not turn back to check on other items you have done. Complete each page before moving on to the next page. Try to do each item separately independent of how you may have done other items.

The image aroused by an item of this test may be:

<table>
<thead>
<tr>
<th>Description</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perfectly clear and as vivid as the actual experience</td>
<td>Rating 1</td>
</tr>
<tr>
<td>Very clear and comparable in vividness to the actual experience</td>
<td>Rating 2</td>
</tr>
<tr>
<td>Moderately clear and vivid</td>
<td>Rating 3</td>
</tr>
<tr>
<td>Not clear or vivid, but recognizable</td>
<td>Rating 4</td>
</tr>
<tr>
<td>Vague and dim</td>
<td>Rating 5</td>
</tr>
<tr>
<td>So vague and dim as to be hardly discernible</td>
<td>Rating 6</td>
</tr>
<tr>
<td>No image present at all, you only 'knowing' that you are thinking of the object</td>
<td>Rating 7</td>
</tr>
</tbody>
</table>

An example of an item on the test would be one which asked you to consider an image which comes to your mind's eye of a red apple. If your visual image was moderately clear and vivid you would check the rating scale and mark '3' in the brackets as follows:

<table>
<thead>
<tr>
<th>Item</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. A red apple</td>
<td>(3)</td>
</tr>
</tbody>
</table>

Now turn to the next page when you have understood these instructions and begin the test.
Think of some relative or friend whom you frequently see, considering carefully the picture that rises before your mind's eye. Classify the images suggested by each of the following questions as indicated by the degrees of clearness and vividness specified on the Rating Scale.

<table>
<thead>
<tr>
<th>Item</th>
<th>Item Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The exact contour of the face, head, shoulders and body</td>
<td>( )</td>
</tr>
<tr>
<td>2. Characteristic poses of head, attitudes of body, etc.</td>
<td>( )</td>
</tr>
<tr>
<td>3. The precise carriage, length of step, etc. in walking</td>
<td>( )</td>
</tr>
<tr>
<td>4. The different colours worn in some familiar costume</td>
<td>( )</td>
</tr>
</tbody>
</table>

Think of seeing the following, considering carefully the picture which comes before your mind's eye; and classify the image suggested by the following question as indicated by the degree of clearness and vividness specified on the Rating Scale.

| 5. The sun as it is sinking below the horizon | ( ) |

Rating Scale

The image aroused by an item of this test may be:

- Perfectly clear and as vivid as the actual experience Rating 1
- Very clear and comparable in vividness to the actual experience Rating 2
- Moderately clear and vivid Rating 3
- Not clear or vivid, but recognizable Rating 4
- Vague and dim Rating 5
- So vague and dim as to be hardly discernible Rating 6
- No image present at all, you only "knowing" that you are thinking of the object Rating 7
Think of each of the following sounds, considering carefully the image which comes to your mind's ear, and classify the images suggested by each of the following questions as indicated by the degrees of clearness and vividness specified on the Rating Scale.

<table>
<thead>
<tr>
<th>Item</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. The whistle of a locomotive</td>
<td>( )</td>
</tr>
<tr>
<td>7. The honk of an automobile</td>
<td>( )</td>
</tr>
<tr>
<td>8. The mewing of a cat</td>
<td>( )</td>
</tr>
<tr>
<td>9. The sound of escaping steam</td>
<td>( )</td>
</tr>
<tr>
<td>10. The clapping of hands in applause</td>
<td>( )</td>
</tr>
</tbody>
</table>

Rating Scale

The image aroused by an item of this test may be:

- Perfectly clear and as vivid as the actual experience Rating 1
- Very clear and comparable in vividness to the actual experience Rating 2
- Moderately clear and vivid Rating 3
- Not clear or vivid, but recognizable Rating 4
- Vague and dim Rating 5
- So vague and dim as to be hardly discernible Rating 6
- No image present at all, you only 'knowing' that you are thinking of the object Rating 7
Think of 'feeling' or touching each of the following, considering carefully the image which comes to your mind's touch, and classify the images suggested by each of the following questions as indicated by the degrees of clearness and vividness specified on the Rating Scale.

<table>
<thead>
<tr>
<th>Item</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>11. Sand</td>
<td>(</td>
</tr>
<tr>
<td>12. Linen</td>
<td>(</td>
</tr>
<tr>
<td>13. Fur</td>
<td>(</td>
</tr>
<tr>
<td>14. The prick of a pin</td>
<td>(</td>
</tr>
<tr>
<td>15. The warmth of a tepid bath</td>
<td>(</td>
</tr>
</tbody>
</table>

Rating Scale

The image aroused by an item of this test may be:

- Perfectly clear and as vivid as the actual experience Rating 1
- Very clear and comparable in vividness to the actual experience Rating 2
- Moderately clear and vivid Rating 3
- Not clear or vivid, but recognizable Rating 4
- Vague and dim Rating 5
- So vague and dim as to be hardly discernible Rating 6
- No image present at all, you only 'knowing' that you are thinking of the object Rating 7
Think of performing each of the following acts, considering carefully the image which comes to your mind's arms, legs, lips, etc., and classify the images suggested as indicated by the degree of clearness and vividness specified on the Rating Scale.

<table>
<thead>
<tr>
<th>Item</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>16. Running upstairs</td>
<td>( )</td>
</tr>
<tr>
<td>17. Springing across a gutter</td>
<td>( )</td>
</tr>
<tr>
<td>18. Drawing a circle on paper</td>
<td>( )</td>
</tr>
<tr>
<td>19. Reaching up to a high shelf</td>
<td>( )</td>
</tr>
<tr>
<td>20. Kicking something out of your way</td>
<td>( )</td>
</tr>
</tbody>
</table>

Rating Scale

The image aroused by an item of this test may be:

- Perfectly clear and as vivid as the actual experience  Rating 1
- Very clear and comparable in vividness to the actual experience  Rating 2
- Moderately clear and vivid  Rating 3
- Not clear or vivid, but recognizable  Rating 4
- Vague and dim  Rating 5
- So vague and dim as to be hardly discernible  Rating 6
- No image present at all, you only 'knowing' that you are thinking of the object  Rating 7
Think of tasting each of the following considering carefully the image which comes to your mind's mouth, and classify the images suggested by each of the following questions as indicated by the degrees of clearness and vividness specified on the Rating Scale.

<table>
<thead>
<tr>
<th>Item</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>21. Salt</td>
<td>( )</td>
</tr>
<tr>
<td>22. Granulated (white) sugar</td>
<td>( )</td>
</tr>
<tr>
<td>23. Oranges</td>
<td>( )</td>
</tr>
<tr>
<td>24. Jelly</td>
<td>( )</td>
</tr>
<tr>
<td>25. Your favorite soup</td>
<td>( )</td>
</tr>
</tbody>
</table>

Rating Scale

The image aroused by an item of this test may be:

- Perfectly clear and as vivid as the actual experience Rating 1
- Very clear and comparable in vividness to the actual experience Rating 2
- Moderately clear and vivid Rating 3
- Not clear or vivid, but recognizable Rating 4
- Vague and dim Rating 5
- So vague and dim as to be hardly discernible Rating 6
- No image present at all, you only 'knowing' that you are thinking of the object Rating 7
Think of smelling each of the following, considering carefully the image which comes to your mind's nose and classify the images suggested by each of the following questions as indicated by the degrees of clearness and vividness specified on the Rating Scale.

<table>
<thead>
<tr>
<th>Item</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>26. An ill-ventilated room</td>
<td>( )</td>
</tr>
<tr>
<td>27. Cooking cabbage</td>
<td>( )</td>
</tr>
<tr>
<td>28. Roast beef</td>
<td>( )</td>
</tr>
<tr>
<td>29. Fresh paint</td>
<td>( )</td>
</tr>
<tr>
<td>30. New leather</td>
<td>( )</td>
</tr>
</tbody>
</table>

Rating Scale

The image aroused by an item of this test may be:

- Perfectly clear and as vivid as the actual experience Rating 1
- Very clear and comparable in vividness to the actual experience Rating 2
- Moderately clear and vivid Rating 3
- Not clear or vivid, but recognizable Rating 4
- Vague and dim Rating 5
- So vague and dim as to be hardly discernible Rating 6
- No image present at all, you only 'knowing' that you are thinking of the object Rating 7
Think of each of the following sensations, considering carefully the image which comes before your mind, and classify the images suggested as indicated by the degrees of clearness and vividness specified on the Rating Scale.

<table>
<thead>
<tr>
<th>Item</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>31. Fatigue</td>
<td>( )</td>
</tr>
<tr>
<td>32. Hunger</td>
<td>( )</td>
</tr>
<tr>
<td>33. A sore throat</td>
<td>( )</td>
</tr>
<tr>
<td>34. Drowsiness</td>
<td>( )</td>
</tr>
<tr>
<td>35. Repletion as from a very full meal</td>
<td>( )</td>
</tr>
</tbody>
</table>

Rating Scale

The image aroused by an item of this test may be:

- Perfectly clear and as vivid as the actual experience: Rating 1
- Very clear and comparable in vividness to the actual experience: Rating 2
- Moderately clear and vivid: Rating 3
- Not clear or vivid, but recognizable: Rating 4
- Vague and dim: Rating 5
- So vague and dim as to be hardly discernible: Rating 6
- No image present at all, you only 'knowing' that you are thinking of the object: Rating 7
APPENDIX C

GUY EMOTIVE IMAGING SCALE

Instructions: The aim of this test is to determine how vividly you image emotions. Think of each of the following emotions. In order to image the feeling, think of yourself in each of the six situations and rate your experience of the emotion you are asked to feel according to the scale found on the bottom of the page.

Example: Emotion—Shame Situation—At a party

If the emotional feeling you experience while thinking of feeling shame at a party is 'vague and dim', give the item a rating of 3.

Rating Scale: The image aroused by an item of this test may be:

Perfectly clear and as vivid as the actual experience 7

Very clear and comparable in vividness to the actual experience 6

Moderately clear and vivid 5

Not clear or vivid, but recognizable 4

Vague and dim 3

So vague and dim as to be hardly discernible 2

No feeling present at all, you only 'knowing' that you are thinking the feeling 1

Now turn to the next page and begin the test.
<table>
<thead>
<tr>
<th>1. Emotion—Enjoyment</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Situation— (a) At a party</td>
<td></td>
</tr>
<tr>
<td>(b) In class</td>
<td></td>
</tr>
<tr>
<td>(c) With a friend</td>
<td></td>
</tr>
<tr>
<td>(d) Alone</td>
<td></td>
</tr>
<tr>
<td>(e) Watching a ballgame</td>
<td></td>
</tr>
<tr>
<td>(f) With your family</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Emotion—Surprise</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Situation— (a) At a party</td>
<td></td>
</tr>
<tr>
<td>(b) In class</td>
<td></td>
</tr>
<tr>
<td>(c) With a friend</td>
<td></td>
</tr>
<tr>
<td>(d) Alone</td>
<td></td>
</tr>
<tr>
<td>(e) Watching a ballgame</td>
<td></td>
</tr>
<tr>
<td>(f) With your family</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3. Emotion—Interest</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Situation— (a) At a party</td>
<td></td>
</tr>
<tr>
<td>(b) In class</td>
<td></td>
</tr>
<tr>
<td>(c) With a friend</td>
<td></td>
</tr>
<tr>
<td>(d) Alone</td>
<td></td>
</tr>
<tr>
<td>(e) Watching a ballgame</td>
<td></td>
</tr>
<tr>
<td>(f) With your family</td>
<td></td>
</tr>
</tbody>
</table>

Rating Scale: The image aroused by an item of this test may be:

- Perfectly clear and as vivid as the actual experience 7
- Very clear and comparable in vividness to the actual experience 6
- Moderately clear and vivid 5
- Not clear or vivid, but recognizable 4
- Vague and dim 3
- So vague and dim as to be hardly discernible 2
- No feeling present at all, you only 'knowing' that you are thinking of the feeling 1
4. Emotion—Distress

Situation—
(a) At a party
(b) In class
(c) With a friend
(d) Alone
(e) Watching a ballgame
(f) With your family

Rating

5. Emotion—Fear

Situation—
(a) At a party
(b) In class
(c) With a friend
(d) Alone
(e) Watching a ballgame
(f) With your family

Rating

6. Emotion—Anger

Situation—
(a) At a party
(b) In class
(c) With a friend
(d) Alone
(e) Watching a ballgame
(f) With your family

Rating

Rating Scale: The image aroused by an item of this test may be:

Perfectly clear and as vivid as the actual experience 7
Very clear and comparable in vividness to the actual experience 6
Moderately clear and vivid 5
Not clear or vivid, but recognizable 4
Vague and dim 3
So vague and dim as to be hardly discernible 2
No feeling present at all, you only 'knowing that you are thinking of the feeling 1
# APPENDIX D

## SERIOUSNESS OF ILLNESS RATING SCALE

Name or S.S.#________________________

Please read the following list of illnesses and circle the number of any illness or problem that you have experienced in the past twelve months only. Circle only those problems you have experienced. Accuracy is very important; carefully circle the appropriate number.

Please be assured of the confidentiality of these records.

| 1.  | Dandruff                     | 33. | Bed sores                  |
| 2.  | Warts                        | 34. | Increased menstrual flow   |
| 3.  | Cold sore, canker sore       | 35. | Painting                  |
| 4.  | Corns                        | 36. | Measles                    |
| 5.  | Hiccups                      | 37. | Painful menstruation       |
| 6.  | Bad breath                   | 38. | Infection of the middle ear|
| 7.  | Sty                          | 39. | Varicose veins             |
| 8.  | Common cold                  | 40. | Psoriasis                 |
| 9.  | Farsightedness               | 41. | No menstrual periods       |
| 10. | Nosebleed                    | 42. | Hemorrhoids               |
| 11. | Sore throat                  | 43. | Hayfever                   |
| 12. | Nearsightedness              | 44. | Low blood pressure         |
| 13. | Sunburn                      | 45. | Eczema                     |
| 14. | Constipation                 | 46. | Drug allergy               |
| 15. | Astigmatism                  | 47. | Bronchitis                 |
| 16. | Laryngitis                   | 48. | Hyperventilation           |
| 17. | Ringworms                    | 49. | Shingles                   |
| 18. | Headache                     | 50. | Mononucleosis              |
| 19. | Scabies                      | 51. | Infected eye               |
| 20. | Boils                        | 52. | Bursitis                   |
| 21. | Heartburn                    | 53. | Whooping cough             |
| 22. | Acne                         | 54. | Lumbago                    |
| 23. | Abscessed tooth              | 55. | Fibroids of the uterus     |
| 24. | Colorblindness               | 56. | Migraine                   |
| 25. | Tonsillitis                  | 57. | Hernia                     |
| 26. | Diarrhea                     | 58. | Frostbite                  |
| 27. | Carbuncle                    | 59. | Goiter                     |
| 28. | Chickenpox                   | 60. | Abortion                   |
| 29. | Menopause                    | 61. | Ovarian cyst               |
| 30. | Mumps                        | 62. | Heatstroke                 |
| 31. | Dizziness                    | 63. | Gonorrhea                  |
| 32. | Sinus infection              | 64. | Irregular heart beats      |
## Seriousness of Illness Rating Scale

<table>
<thead>
<tr>
<th>65. Overweight</th>
<th>96. Epilepsy</th>
</tr>
</thead>
<tbody>
<tr>
<td>66. Anemia</td>
<td>97. Chestpain</td>
</tr>
<tr>
<td>67. Anxiety reaction</td>
<td>98. Nervous breakdown</td>
</tr>
<tr>
<td>68. Gout</td>
<td>99. Diabetes</td>
</tr>
<tr>
<td>69. Snake bite</td>
<td>100. Blood clot in blood vessels</td>
</tr>
<tr>
<td>70. Appendicitis</td>
<td>101. Hardening of the arteries</td>
</tr>
<tr>
<td>71. Pneumonia</td>
<td>102. Emphysema</td>
</tr>
<tr>
<td>72. Depression</td>
<td>103. Tuberculosis</td>
</tr>
<tr>
<td>73. Frigidity</td>
<td>104. Alcoholism</td>
</tr>
<tr>
<td>74. Burns</td>
<td>105. Drug addiction</td>
</tr>
<tr>
<td>75. Kidney infection</td>
<td>106. Coma</td>
</tr>
<tr>
<td>76. Inability for sexual intercourse</td>
<td>107. Cirrhosis of the liver</td>
</tr>
<tr>
<td>77. Hyperthyroid</td>
<td>108. Parkinson's disease</td>
</tr>
<tr>
<td>78. Asthma</td>
<td>109. Blindness</td>
</tr>
<tr>
<td>79. Glaucoma</td>
<td>110. Mental retardation</td>
</tr>
<tr>
<td>80. Sexual deviation</td>
<td>111. Blood clot in the lungs</td>
</tr>
<tr>
<td>81. Gallstones</td>
<td>112. Manic depressive psychosis</td>
</tr>
<tr>
<td>82. Arthritis</td>
<td>113. Stroke</td>
</tr>
<tr>
<td>83. Starvation</td>
<td>114. Schizophreniz</td>
</tr>
<tr>
<td>84. Syphilis</td>
<td>115. Muscular dystrophy</td>
</tr>
<tr>
<td>85. Accidental poisoning</td>
<td>116. Congenital heart defects</td>
</tr>
<tr>
<td>86. Slipped disk</td>
<td>117. Tumor in the spinal cord</td>
</tr>
<tr>
<td>87. Hepatitis</td>
<td>118. Cerebral palsy</td>
</tr>
<tr>
<td>88. Kidney stones</td>
<td>119. Heart failure</td>
</tr>
<tr>
<td>89. Peptic ulcer</td>
<td>120. Heart attack</td>
</tr>
<tr>
<td>90. Pancreatitis</td>
<td>121. Brain infection</td>
</tr>
<tr>
<td>91. High blood pressure</td>
<td>122. Multiple sclerosis</td>
</tr>
<tr>
<td>92. Smallpox</td>
<td>123. Bleeding in the brain</td>
</tr>
<tr>
<td>93. Deafness</td>
<td>124. Uremia</td>
</tr>
<tr>
<td>94. Collapsed lung</td>
<td>125. Cancer</td>
</tr>
<tr>
<td>95. Shark bite</td>
<td>126. Leukemia</td>
</tr>
</tbody>
</table>
APPENDIX E

SUBJECTIVE FEELING OF STRESS

Name ________________________________

Please answer the following by circling the appropriate number.

How much stress have you experienced during the past twelve months?

<table>
<thead>
<tr>
<th>Very little</th>
<th>moderate</th>
<th>great deal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX F

Testing Instructions

The following tests will be given in a random order to your classes:

1. The Questionnaire on Vividness of Mental Imagery,
2. spatial relations section of the Differential Aptitude Test,
3. the Guy Emotive Imaging Scale,
4. the State Trait Anxiety Inventory,
5. the Tennessee Self-concept Scale,
6. the Seriousness of Illness Rating Scale,
7. the Schedule of Recent Experience, and
8. the subjective feeling of stress question.

Specific instructions concerning each test are printed in the test manual or on the test itself. Prior to administration of the tests, the researcher will go over each instrument with the classroom instructor. Only one test is timed, the spatial relations section of the DAT. Students will be given sufficient time to complete each test within the classroom setting.

No information concerning the nature of this study is to be given to the students. Prior to the beginning of testing, students will be read the following statement.

"We would like you to participate in a research project. This will require your filling out several questionnaires which will be given over a period of several days. After the questionnaires have been filled out, the purpose of this research will be explained to you. If you are interested, the results of your questionnaires will be available to you at the counseling center. Thank you very much for your participation."
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