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VALIDATION OF SUGGESTION-INDUCED STRESS

Richard F. Bloom

October 1974
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HUMAN ENGINEERING LABORATORY

ABERDEEN PROVING GROUND, MARYLAND

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Sixty college men, divided into three equal groups, each attended two induced stress sessions in which their physiological, psychological and performance reactions were measured. Their responses were compared to determine if valid stress reactions could be induced through suggestion in an altered state (in this case, hypnosis), and also to determine the validity of such reactions if the subject had never before experienced that stress situation.

It was demonstrated that valid stress reactions can be induced in an individual with the aid of suggestions, especially if the real stress situation has been experienced before. If no previous experience with that real situation exists, the subject still exhibits stressful reactions; however, the (continued)

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20. Abstract (Continued)

closest resemblance to real stress is found in the subjective or psychological measures, less similarity is found in the physiological measures and the least similarity is found in the performance measures.

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VALIDATION OF SUGGESTION-INDUCED STRESS

Richard F. Bloom[1]

October 1974

APPROVED:
JOHN D. WEISZ
Director
U. S. Army Human Engineering Laboratory

[1]Dunlap and Associates, Inc., One Parkland Drive, Darien, CT 06820

U. S. ARMY HUMAN ENGINEERING LABORATORY
Aberdeen Proving Ground, Maryland

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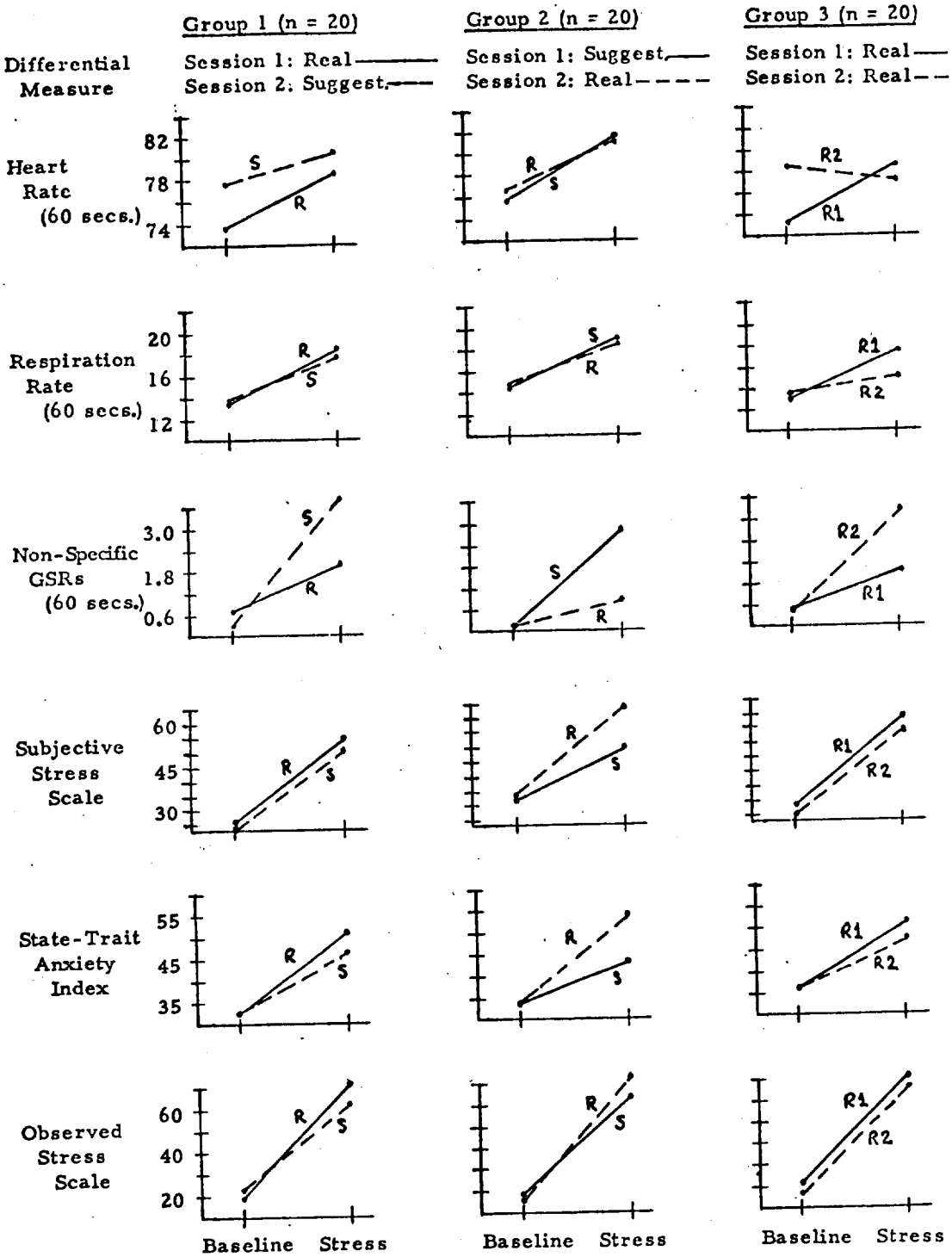
SUMMARY

Sixty college men, divided into three equal groups, each attend two induced stress sessions in which their physiological, psychological and performance reactions are measured. After recording baseline conditions, two types of stress induction are administered, using one type per session: either a hand steadiness task with painful electric shock in the left calf for failure to meet an established performance standard (real stress), or an imagined version of that task and shock penalty administered through suggestion in an altered conscious state (suggestion-induced stress). Subjects in two of the groups attend opposite sequences of the real and suggestion-induced stress sessions, while those in the third group attend two real stress sessions. Their responses are compared to determine if valid stress reactions can be induced through suggestion in an altered state (in this case, hypnosis), and also to determine the validity of such reactions if the subject has never before experienced that stress situation.

The results of the study are summarized in the accompanying chart which portrays six of the eleven quantitative measures employed in the experiment. Analyses of all data show that: (1) the group receiving the real stress in both sessions (Group 3) produces a general diminishing of arousal (especially physiological other than GSR) in the second session, resembling a pattern of adaptation due to repetition; (2) the group experiencing suggestion-induced stress after previously experiencing the real stress (Group 1) most closely duplicates the novel experience of the first session, by showing statistically similar physiological and subjective reactions, but different performance reactions; and (3) the group which experiences suggestion-induced stress in the first session (Group 2) creates a response pattern that shows differences from its later real stress experience--differences which are mostly greater than those found between sessions for the other two groups, especially in the subjective measures.

It is demonstrated that valid stress reactions can be induced in an individual with the aid of suggestions, especially if the real stress situation has been experienced before. If no previous experience with that real situation exists, the subject still exhibits stressful reactions; however, the closest resemblance to real stress is found in the subjective or psychological measures, less similarity is found in the physiological measures and the least similarity is found in the performance measures. In general, task performance (including application of the penalizing electric shock) is less realistic when carried out in the subject's imagination, and it produces fewer penalties. It is speculated that a self-protective process may be operating in the altered state to inhibit imagined actions that could lead to discomfort or harm.

In concluding, further study questions are raised. Their answers could help make the technique of inducing stress through suggestion a more important part of the researcher's repertoire.



Stress Comparison Summary Along Six Experimental Measures

List of Measures and Units Used in This Study

Measure	Units	Abbreviation	Remarks
. Heart Rate	pulses per minute	ppm	A 60-second sample period is used
. Pulse Amplitude Change	positive, negative	+, -	Indicates direction of change in going from baseline to stress conditions ($ampl._S - ampl._{BL}$)
. Respiration Rate	respirations per minute	rpm	A 60-second sample period is used
. Total GSRs	number per minute	GSRs/min	Indicates the total number of momentary drops in resistance over a 60-second sample period
. Non-Specific GSRs	number per minute	NS-GSRs/min	Consists of that subset of total GSRs for which no external stimulus can be identified (e.g., shock, outside noise)
. Subjective Stress Scale	(none)	SSS	Uses scale from 0-94; higher value means greater stress reported by S
. State-Trait Anxiety Index	(none)	STAI	Uses scale from 20-80; higher value means greater anxiety level reported by S. Used for reporting basic trait and for momentary state in screening. Modified version used for reporting state in stress treatment.
. Observed Stress Scale	(none)	OSS	Uses scale from 0-94; higher value means greater stress observed by E

List of Measures and Units Used in This Study (Cont'd)

Measure	Units	Abbreviation	Remarks
. Autonomic Lability Score	standard score	ALS	A corrected stress treatment score for any of the above measures (except pulse amplitude change); standardized such that for each measure the mean across all subjects in Session 1 is 50 with an SD of 10, as are the mean and SD for Session 2. The standardizing procedures take out any variance due to baseline or initial level for each measure.
. Contact Resistance	ohms	(none used)	Indicates electrical resistance of the subject's leg, measured through the stimulus electrode.
. Shock Level	milli-amperes	ma.	Indicates the amount of current passed through the subject's leg to administer shock. For convenience, the values used here are those on the switch settings of the stimulator. Calibration curves are provided to convert to actual stimulus current.
. Hypnotic Susceptibility	(none)	HGSHS	Harvard Group Scale of Hypnotic Susceptibility; scores from 0 (low) to 12 (high); used for initial screening and selection of subjects.
. Hypnotic Depth	(none)	FCSHS	Field's Inventory Checklist of Subjective Hypnotic Experiences; scores from 0 (low) to 38 (high); used for initial screening and self report during experimental session.
. Hypnotic Depth	(none)	OHD	Observed Hypnotic Depth; score from 0 (low) to 10 (high); used for experimenter's rating of hypnotic depth during experimental session.

Measure	Units	Abbreviation	Remarks
. Psychopathology	(none)	C. I. --Form N2	Cornell Index; scores from 0 (low) to 100 (high); used for initial neuropsychiatric screening of subjects.

I. INTRODUCTION

A. General

The purpose of this experiment is to demonstrate and evaluate the potential of using suggestion in the laboratory to produce valid stressful behavior and characteristic responses. It is of interest to learn how responses under suggestion-induced stress compare with responses under the actual stress. It also is important to determine how those suggested-state responses appear when the subject has had no previous exposure to their causative stresses in real life. In making these observations, it is of further interest to consider the effects of repeated exposure to the stress conditions, so the proper interpretations and comparisons of treatments are carried out.

Because the Army is concerned with the ability of troops to successfully utilize equipment and procedures under all conditions (including stress), and because Army laboratories currently are involved in producing stress for evaluation purposes, it is appropriate that this rarely used technique be examined more closely. The present study, begun in January 1973, is a first and elementary evaluation of stress reactions induced by suggestion, while the subject is in an altered state of awareness. Validation of certain specific effects may be sought from later experiments, as they are justified by the feasibility and methodological study described here.

The need for improved laboratory techniques for inducing stress, and particularly for inducing combat or other life-threatening stress, is a continuing one. By definition, the laboratory version of combat stress differs from the real thing, but the differences may be acceptable in many applications if they are understood and accounted for in the interpretation of results. All studies involving life-threatening stress, while requiring realism, must always place the safety and well-being of subjects uppermost. The researcher is faced with the dilemma of producing and measuring the most realistic kind of stress without endangering the subjects.

One example of this dilemma for the Army involves the combat situation in which a soldier on the ground must expose himself to enemy fire while guiding a short range missile flight for 10 or 15 seconds. Analysts would like to measure the degradation occurring in task performance (controlling the wire-guided missile by generating flight path correction signals with a joystick), while the soldier is under stress (anticipation of being killed or wounded while in an exposed position). According to the hypotheses set forth in this proposal, it may be possible to produce the stress state in a laboratory setting by means of suggestion, allowing a soldier in that altered state of awareness to carry out the guidance task under highly controlled conditions for detailed analysis by Army scientists.

The use of suggestion as a means of psychologically inducing stress is potentially of great value in many laboratory stress situations, especially if emotional stress is of importance. One relevant prior study by Dunlap and Associates appears to support the validity of voice changes under suggestion-induced stress (Crystal, Gish and Bloom, 1973). It is intended that the study described in this report provides significant help in further evaluating the validity of suggestion induced stress in its many other manifestations.

Because the subject of stress is quite broad and complex, the next section of this report includes a discussion about various kinds of stress and indicates some of the potential for studying their effects by means of suggestion in an altered state of awareness. That section is supplemented by additional background details in Appendix A.

B. Background

Research scientists interested in investigating human performance under stress are concerned with both the conditions which produce stress and the measures which indicate its presence. In the context of stress research as related to military problems, investigators focus on: 1) identification and delineation of existing or potential stressors, with a view toward controlling or eliminating their impact, or 2) measurement of response patterns in order to improve prediction of human combat performance and stability under combat or adverse conditions. Typically, the experimenter manipulates the environment so as to produce a response, and then measures the extent and/or direction of the behavior change produced. This pattern is common to almost all psychological experiments, with stress studies being distinguished in terms of the stimulus conditions selected. Stress investigators focus on stimulus and environmental conditions which can somehow be postulated as disruptive of perception, behavior or psychological organization and integration.

A listing of possible military-related stressors which have been used or suggested by previous research is shown in Table I. This listing is categorized in terms of the immediate environment within which the performance takes place, the nature of the task involved and the long-term environment. These stressors could also be categorized in terms of physiologic, psychophysiologic, psychologic and psycho-social dimensions, but these latter categories would seem to be more relevant to studies of personality and behavior pathology. The precise nature of the stress factors selected for study are usually a function of the specific interests of the investigator and the sponsoring agency. In most research the factors chosen are quite specific, although the degree to which they are simulated by various laboratory techniques may leave questions about their validity and transferability to real-life situations.

Table I

Potential Stress-Inducing Factors

Immediate Environment

- Vibration/motion/acceleration
- Noise
- Temperature/humidity/odor
- Atmospheric composition--oxygen/air purity/air pressure
- Lighting--flicker, extremes of intensity and color
- Immediate danger--startle, shock, combat
- Sensory deprivation
- Pain, disability, immobilization
- Distortion--perceptual, psychomotor
- Drugs and chemicals
- Radiation
- Other hazards to psychological and physiological stability

Task Induced

- High speed/load--visual, auditory, psychomotor
- Vigilance
- Incompatibility between stimulus-response or feedback (dissonance)
- Reward-punishment-competition
- Frustration tasks

Long-term Environment

- Foreign climate, geography, culture
- Diet/hunger
- Fatigue--loss of sleep, exertion
- Isolation
- Crowding
- Perceived threat--anxiety, guilt, danger, disease
- Time disorientation, diuranal flattening, disruption of circadian rhythm
- Interpersonal relations
- Sustained performance

A review of the literature quickly indicates that studies of stress, stress measurement, and stress induction are well documented. In fact, so much has been written on this topic that only a few relevant remarks are appropriate in the main body of this report. The reader is referred to Appendix A for a more complete summary of recent stress research efforts which have a bearing on the present study.

The Army and other military agencies have long been concerned with stress (Army Symposium on Stress, 1953; Kern, 1966; Weybrew, 1967). One of the best known Army programs was Research Task FIGHTER, completed under the technical supervision of the Human Resources Research Office (HumRRO). In that study, several "disasters" were simulated through rather elaborate staging in the field, and the reactions of subjects were analyzed using physiological, subjective (psychological) and performance measures. It was found that realistic stress effects can be elicited through believable simulations of naturally occuring threats. The main shortcoming of these "apparently real" approaches is probably the cost, complexity and instrumentation restrictions which go along with them.

Laboratory methods for studying stress typically include less-than-"realistic" simulations such as mental tasks, motion pictures, threat of electric shock, physical tasks and environmental modifications. Ideally, one would like to achieve the believability of "apprently real" techniques in a safe way, at reasonable costs in the laboratory setting, where virtually unlimited instrumentation and control exist--one reason for the present study.

The responses of individuals under stress is known to show considerable variability. In general, it can be stated that specific individuals find specific kinds of situations to be stressful, and react in their own specific ways. Individual responses may also be influenced by subjects' existing physical and mental states before the stressful conditions are introduced--an effect formally recognized in Wilder's (1957) Law of Initial Value (LIV). Measurement and evaluation of stress reactions must take into account those effects of response specificity, stimulus specificity, and the LIV. Specificity effects require that work with groups of subjects include a variety of measures, while LIV can be accounted for in the analysis techniques applied to the baseline and stress state measures.

Drawing on the previous research, measures selected for evaluation in this experiment include:

- physiological measures (cardiovascular, respiratory, and electrodermal)
- subjective measures (self report scales, observer report scales)
- performance measures (task scores, penalties received)

One of the self report scales selected is the one developed for use in the HumRRO FIGHTER studies, and is shown in Table II.

Techniques for the induction of stress effects in the laboratory, especially of combat stress effects, are seen as needing improvement. Simulation of stressful circumstances, by definition, is less than realistic. It is the job of the experimenter to insure, however, that the simulation is real enough for his purposes. Among some of the more interesting stress induction techniques are those in which the subject's imagination plays a key role. Sometimes this involves watching frightening motion pictures or other visual stimuli. In other cases, all the "stimuli" can

Table II

Subjective Stress Scale*

Item	Scale value or score
Wonderful	00
Fine	09
Comfortable	17
Steady	27
Didn't bother me	40
Indifferent	48
Timid	57
Unsteady	64
Nervous	69
Worried	74
Unsafe	76
Frightened	83
Panicky	88
Scared stiff	94

*Berkun, Bialek, Kern & Yagi (1962, p. 39).

be developed in the subject's mind, guided by suggestions from the experimenter. Many studies have demonstrated the presence of stress effects produced with the aid of suggestions. Some of these studies provide suggestions while the subject is in the state of hypnosis. Such techniques sometimes involve the re-creation of previous actual stress experiences, although one may also attempt inducing reactions to events never before experienced. The use of hypnosis as a research technique, particularly for stress induction, has been studied and found to be at least as powerful as other laboratory methods (Levitt and Chapman, 1972). Its unusual value as a more general research tool is reviewed by Gidro-Frank and Bull (1950), Levitt, Persky and Brady (1964), and Bloom (1970).

C. Hypotheses

The design of this exploratory study addressing validation of suggestion-induced stress is kept narrowly focused. Its scope is limited to a simple type of stress (with little relation to combat stress) and to a limited but important set of hypotheses. This approach reflects the practical considerations of waiting until basic validity, as suggested by the literature, is confirmed before allocating resources to evaluate more refined experimental issues. In keeping with that approach, the following hypotheses are tested:

1. The physiological and behavioral concomitants of psychological stress can be produced by some subjects with the aid of suggestion while they are in an altered state of consciousness (in this case, hypnosis).

2. Concomitants of certain kinds of stress can also be produced with acceptable validity in some hypnotized subjects, even if those subjects have never experienced the specific stress conditions suggested.

The concomitant responses of suggestion-induced stress are expected to consist of behavior based on similar real stress experiences in the subject's background, on his understanding or guessing of how such a stress might cause him to react (role playing), and on expectancies (demand characteristics) perceived by the subject due to experimenter actions and the total experimental situation. Suggestion-induced concomitants of stress are also expected to be produced with a sufficient similarity to their real counterparts as to permit various kinds of psychophysiological testing to be conducted with confidence in the validity of the stress conditions.

Additional hypotheses may be established for later research once validation is established. For example, it may be hypothesized that subjects produce more realistic stress indications under some conditions than under others.

Stated differently, people can have good days and bad days, or good experimental situations and bad ones, in terms of suggestibility or hypnotizability. Other hypotheses may concern the duration of time over which suggestion-induced experiences are effective, how long an interval can be allowed to elapse between real and suggestion-induced versions of the same stress, or how long it takes to recover from suggestion-induced stress and how that psychophysiological process resembles recovery from real stress. Additional hypotheses may concern the hypnotic induction of different varieties of stress (e.g., physical, social, environmental, emotional, physiological).

II. RESEARCH PLAN

A. Experimental Design

The focus of this experiment is on two major lines of inquiry. The first line deals with stress that has been previously experienced by a subject, and the second deals with stress that has never before been experienced by a subject. In regard to the former line of inquiry we are interested in learning to what degree suggestion-induced stress can reproduce the same psychological, physiological and performance reactions produced by real stress. Perhaps of more interest and value to the Army is the line of inquiry that asks to what extent can suggestions induce never-before-experienced stress in people and produce valid psychological, physiological and performance reactions. If it is valid to employ suggestions in this latter case, investigators would be able to study human reactions and performances in potentially dangerous situations without placing subjects in jeopardy or requiring that they have previous exposure to those situations. Positive results on this topic might facilitate the study of man's reactions to such threatening stresses as result from combat, space walking, skin diving to great depths, air crashes, exposure to fire, falling great distances, and drowning.

Because of the generally incomplete knowledge in the areas of suggestability, hypnosis and stress, and the difficult issue of never-before-experienced stress, a simple, fundamental and classical model of experimental procedure is selected with which to study the questions of interest. The model involves three groups of subjects matched on their hypnotizability. The subjects perform under two treatment conditions of stress: "real" stress induced by an actual performance task in combination with electric

shock; and the equivalent hypnotically-induced stress in combination with suggested electric shock. Two groups of subjects perform under both stress conditions with different orders of presentation. Thus subjects perform only once under each condition of stress. This permits comparison of the experienced with the never-before-experienced stress reaction. The third group of subjects serves as a "control" group and receives two presentations of the real stress condition.

A balanced incomplete block design is used with 60 subjects (in 3 groups), 3 treatment conditions (used 2 at a time), and 2 sessions, as illustrated in Figure 1. The basic measurements for all sessions are the changes in behavioral characteristics when going from relaxed to stressed conditions. In general, decreases as well as increases in physiological measures can be significant as stress indications.

Group 1 is given the real stress treatment in the first session, followed in the second session by the hypnotically-induced version of that stress. Group 2 is given the hypnotically-induced stress first, and the real stress second. Group 3 is given the real stress in both sessions. The fundamental expectation based on the hypotheses is that there will be measurable changes when going from the relaxed to the stress state, regardless of whether the stress is real or suggested, or whether hypnosis is used first or last. The qualities of those measured changes must be compared to determine how suggestion-induced stress resembles, or fails to resemble , the real stress. The comparison of stress reaction qualities includes an examination of the magnitude and pattern of responses. The pattern of responses refers to a "real-to-hypnotic" comparison of the rankings for all stress measures for each subject. It is based on a specificity principle--that specific individuals react in specific ways to specific stressful circumstances.

Experimental Sessions / Groups of Subjects (N=60)	Session #1 Treatments		Session #2 Treatments	
	1st	2nd	1st	2nd
Group 1 n=20	Relaxed State	Real Stress	Relaxed State	Hypnotic Stress
Group 2 n=20	Relaxed State	Hypnotic Stress	Relaxed State	Real Stress
Group 3 n=20	Relaxed State	Real Stress	Relaxed State	Real Stress

Figure 1. Experimental Design for Evaluating Behavior Under a Stress Induced by Hypnotic Suggestion

A measure of adaptation to stress is anticipated from the data of Group 3; that is, Session 2 data for one or more groups may be measurably less pronounced than Session 1 data. It is of interest to see how the use of hypnosis may affect the adaptation to repeated sessions.

The primary objective measures or indicators of stress are pulse rate, pulse amplitude, respiration rate and galvanic skin response, as available on the polygraph. In addition, subjective reports of stress are provided by subjects and the experimenter after each treatment. All of those measures are employed for both the hypnotically-induced and real stress conditions. The performance measures relating to stress are the number of stylus hole contacts made and the number of shocks received. For the hypnotically-induced stress condition, performance counts are obtained by instructing the subject to report verbally as he experiences each contact and shock. Those reports are recorded on the polygraph by the experimenter using a hand-held pushbutton.

The pretest trials are used to develop final protocol, including such details as selection of hole-size and shock level for each subject in the performance task, determination of the rules under which shock stimuli will be given, and the required duration for an effective shock.

Table III lists the primary kinds of data for collection and analysis in this experiment. Included are basic characteristics of each subject, his differential physiological responses to stress and his subjective responses to the experimental treatments.

Table III

Primary Output Data for Analysis

1. Subject characteristics, in terms of scores on:
   - Cornell Index (neuropsychiatric screening)
   - Harvard Group Scale of Hypnotic Susceptibility
   - Field's Inventory Checklist of Subjective Hypnotic Experiences
   - State-Trait Anxiety Index

2. Differential changes from relaxed to stressed (real and suggested) states, as measured by:
   - Physiological responses
     - pulse rate and amplitude
     - respiration rate
     - galvanic skin response (non-specific GSRs)
   - Subjective reports made by experimenter and subject
     - Subjective Stress Scale
     - State Anxiety Index
     - Observer Stress Scale

3. Differential changes between real and hypnotically-induced stress states, as measured by:
   - Physiological responses (as described in 2, above)
   - Subjective reports (as described in 2, above)
   - Task scores
     - number of stylus contacts made
     - number of shocks received

Among the quantitative analytical techniques employed in this experiment is statistical testing as a means of demonstrating the presence or absence of significant differences between real and hypnotically-induced stresses. Changes (Δs) in the physiological responses of subjects are measured, as they go from a resting state to a stress state (real or hypnotically-induced). These differences are shown by the Δ s in Figure 2. First findings are expected to show at least the presence of significant differences between rest and stress states "within subjects." Using the subjects as their own controls, the next comparison focuses on differential responses between real and hypnotically-induced stress within subjects. The construction of this set of tests is shown in Figure 3. If the hypotheses are true, no significant differences should exist between the two stress states. For Group 1, this would indicate that hypnosis can help reproduce stress that has been experienced before. For Group 2, this would indicate that some people can accurately "imagine" and react to a novel stress the way they would when actually exposed to that stress.

Tests within subjects of Group 3 are used to determine if repeated experiences of a stress produce some form of adaptation in the subjects' responses. Evidence of any such adaptation must be considered in the interpretation of data for Groups 1 and 2.

The significance of prior real stress experience is tested by comparing the data from Session 1 for Groups 1 and 2, as shown in Figure 4. The responses with real stress for Group 1 are compared with the hypnotically-induced responses for Group 2. This comparison indicates the degree to which subjects can realistically experience suggested stress under hypnosis, without having prior experience with that stress. The hypotheses state that such realistic stress responses are possible.

Experimental Sessions / Groups of Subjects (N=60)	Session #1 Treatments			Session #2 Treatments		
	1st		2nd	1st		2nd
Group 1 n=20	Relaxed State	Δ	Real Stress	Relaxed State	Δ	Hypnotic Stress
Group 2 n=20	Relaxed State	Δ	Hypnotic Stress	Relaxed State	Δ	Real Stress
Group 3 n=20	Relaxed State	Δ	Real Stress	Relaxed State	Δ	Real Stress

Note: Delta (Δ) is the difference between relaxed and stressed states in each measure.

Figure 2. Model for Obtaining Basic Response Data (Δs) for Differential Comparisons of Stress Behavior

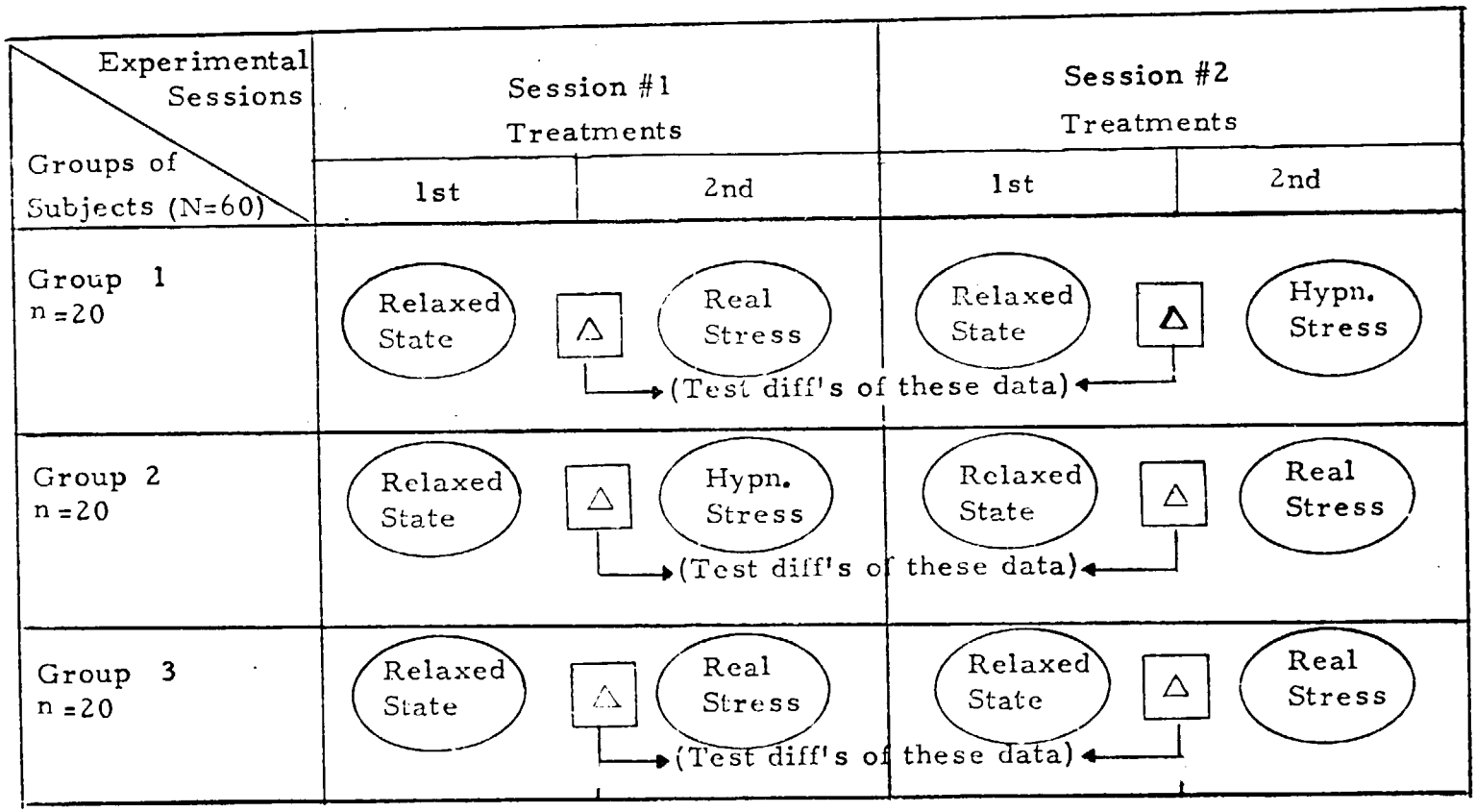


Figure 3. Construction of "Within Subjects" Tests of Significance

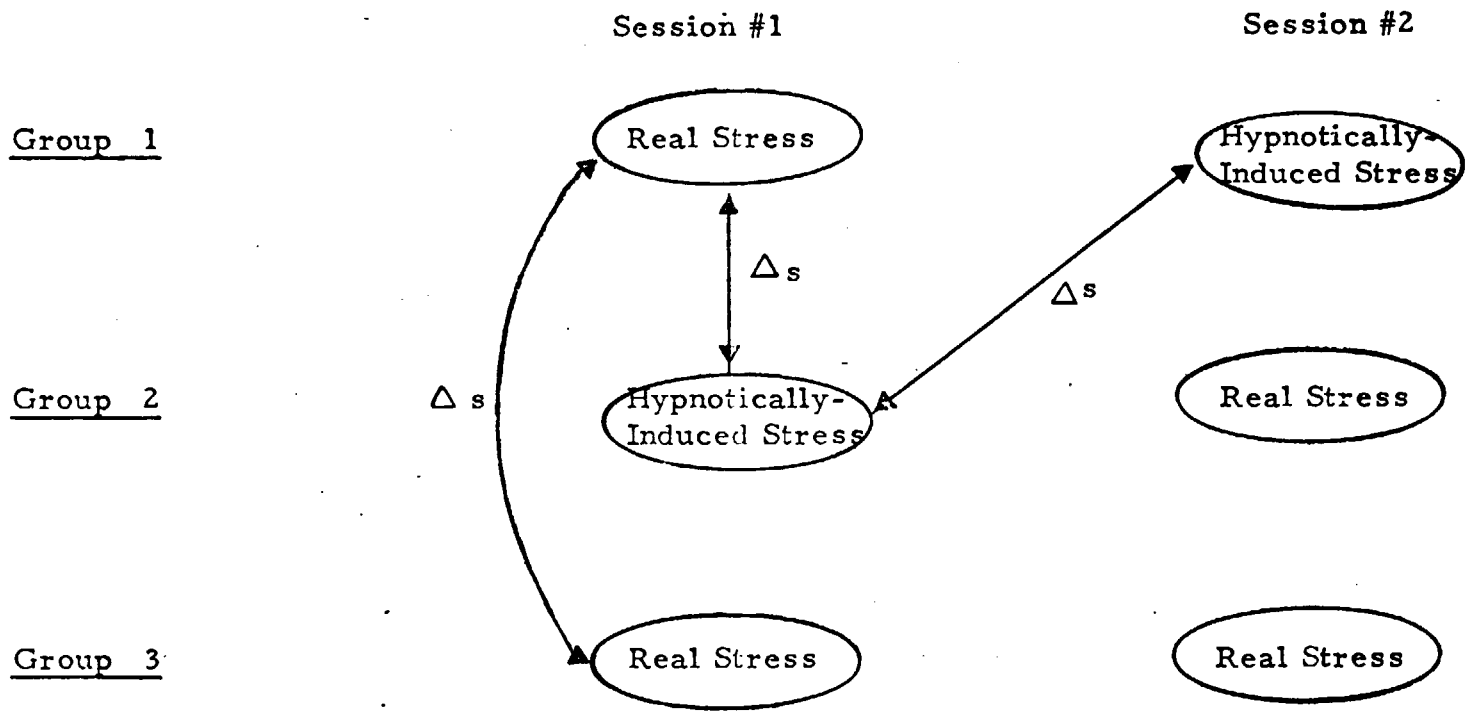


Figure 4. Construction of "Between Subjects" Tests of Significance

Also referring to Figure 4, a comparison of hypnotic experiences between Groups 1 and 2 provides some information regarding the stability of hypnotically-induced stress. One can look for some stable level of hypnotically-induced stress achievable in successive applications.

In summary, the statistical approach for treating the data is to:

1. Describe the distributional characteristics of each physiological and subjective concomitant for each stress condition.

2. Examine the relationship or association between real and hypnotically-induced stress, within and between groups.

3. Establish the boundaries within which real and hypnotically-induced stress can be considered as equivalent.

As a guide in that evaluation, a comparison of first sessions between Groups 1 and 3 would indicate the degree of difference one might expect between groups.

Also referring to Figure 4, a comparison of hypnotic experiences between Groups 1 and 2 provides some information regarding the stability of hypnotically-induced stress. One can look for some stable level of hypnotically-induced stress achievable in successive applications. Other inter-group comparisons can be made to evaluate treatments and the significance of prior experience in terms of realism and adaptation.

In summary, the statistical approach for treating the data is to:

1. Describe the distributional characteristics of each physiological and subjective concomitant for each stress condition.

2. Examine the relationship or association between real and hypnotically-induced stress, within and between groups.

3. Establish the boundaries within which real and hypnotically-induced stress can be considered as equivalent.

B. Equipment and Facilities

The laboratory set up is shown in Figure 5. It is located in an area of low "traffic density," so that background noises are minimal. Further reduction of external stimuli is provided by having the subject's chair located within the acoustically buffered enclosure (open on one side) which was originally built for experimental voice recording.

Figure 6 shows some of the key pieces of equipment including:

- Polygraph (Stoelting, Model 22654X), a four-channel multigraphic recorder which provides tracings of respiration, cardiac response, galvanic skin response, and time and mark indications. (See Figure 7). It is designed for long-term measurement in two ways:
  - The cardiac measurement does not use a blood pressure cuff (which had the time limitation of a few minutes before it has to be released); instead, it uses a finger plethysmograph which can remain attached indefinitely (hours).
  - The cardiac and GSR channels have a selectable automatic-centering mode, permitting long-term tracings to remain on scale without human attention for re-centering. This is an advantage because some traces can drift off-scale over extended periods of time.

  Time and special coded markings are used on the polygraph recording for the purpose of correlating stress indications with the experimental conditions being carried out.

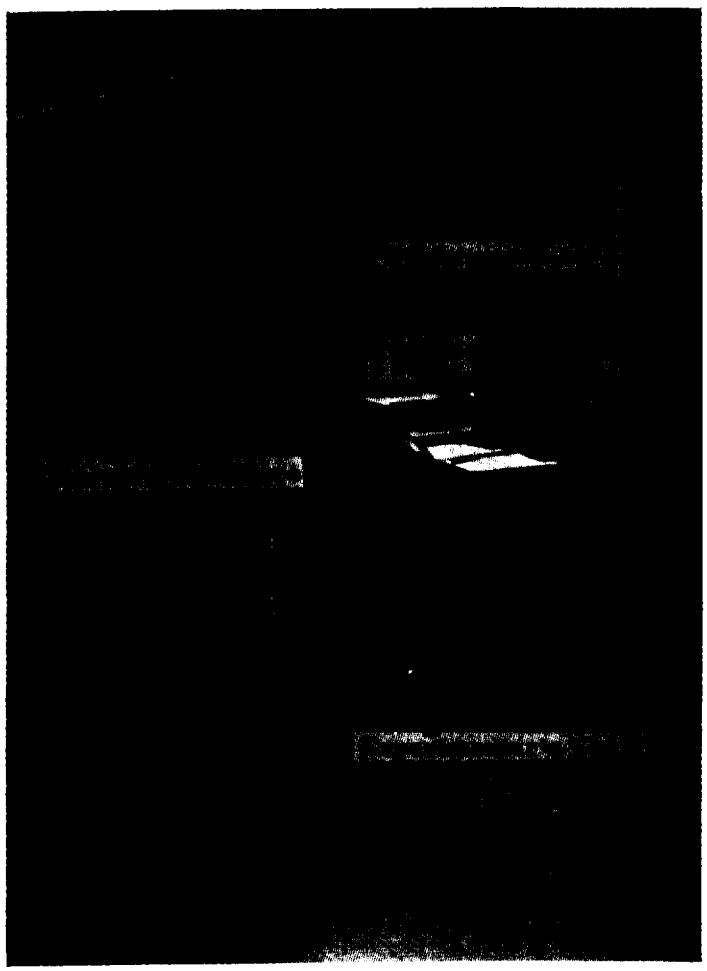


Figure 5. Project Laboratory

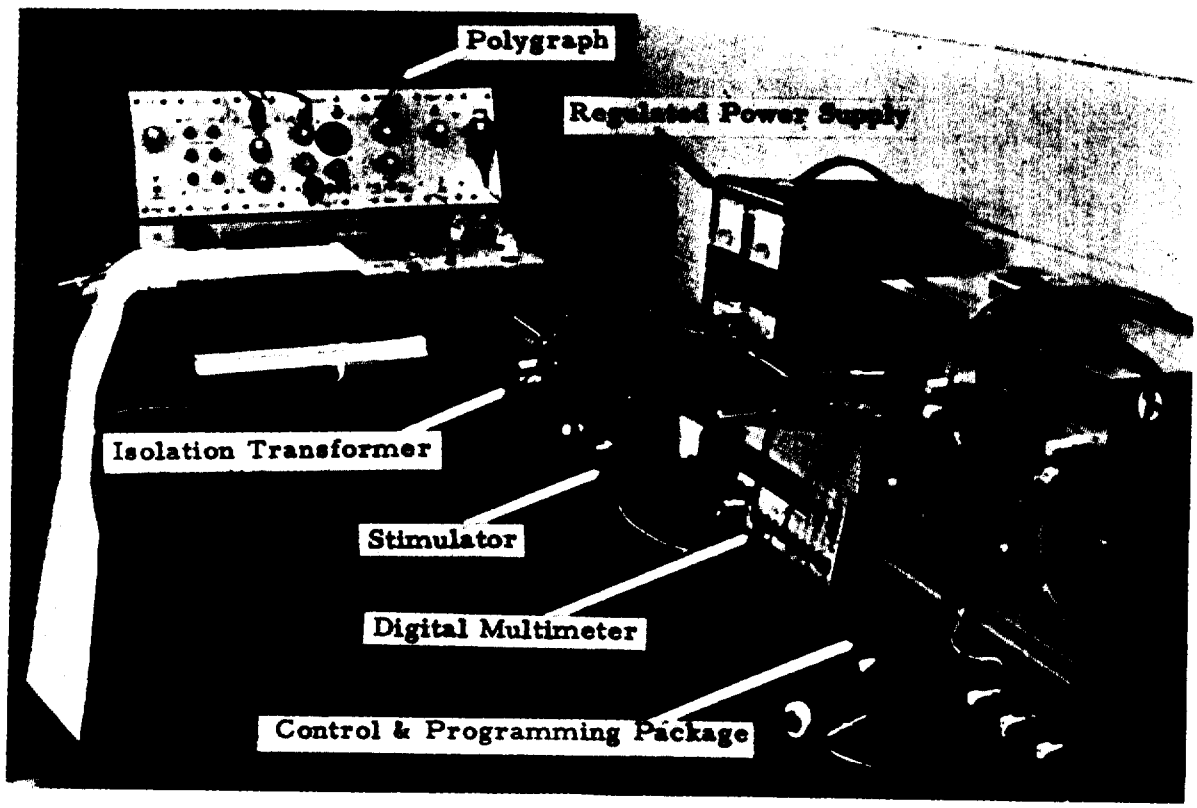


Figure 6. Major Equipment Items Assembled in the Project Laboratory

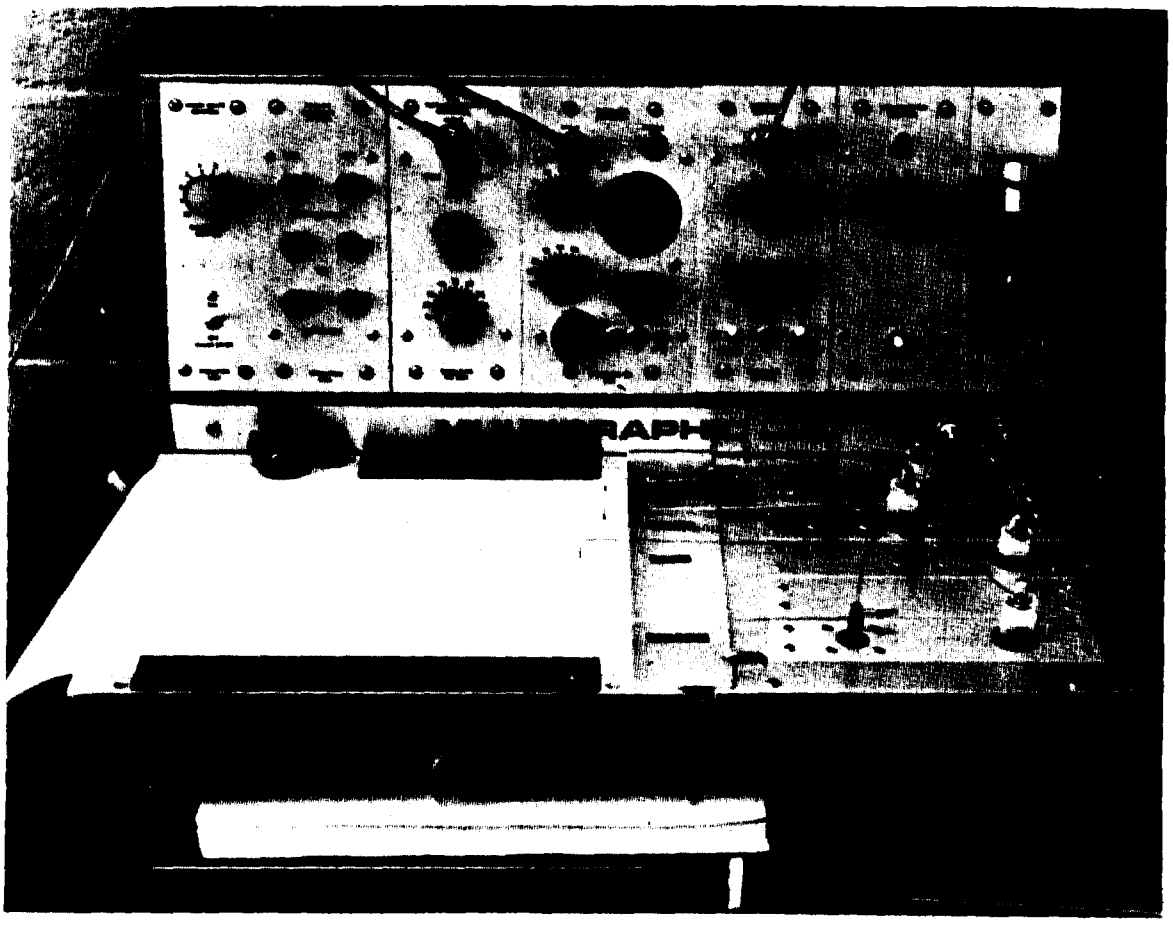


Figure 7. Stoelting Polygraph

- Programming Package (Lafayette Instrument Company, 5800 Series), for keeping event counts and controlling the electric shock (see Figure 8)
- Stimulator with separate Isolation Transformer leading to subject (Bio-Medical Systems Consultants, Tursky Constant Current Stimulator) (see Figures 9 and 10)
- Regulated Power Supply to operate circuit providing event signals to polygraph for marking each stylus contact and each electric shock (see Figure 11)
- Digital Multimeter used to measure each subject's electrical resistance through the stimulator electrode on the mid-calf of his left leg (see Figure 12)
- Electrocardiograph (Burdick, EK-III) for physical examinations by M. D. (see Figure 16)
- Steadiness Tester (Lafayette Instrument Co., Model 32011) (see Figure 18).

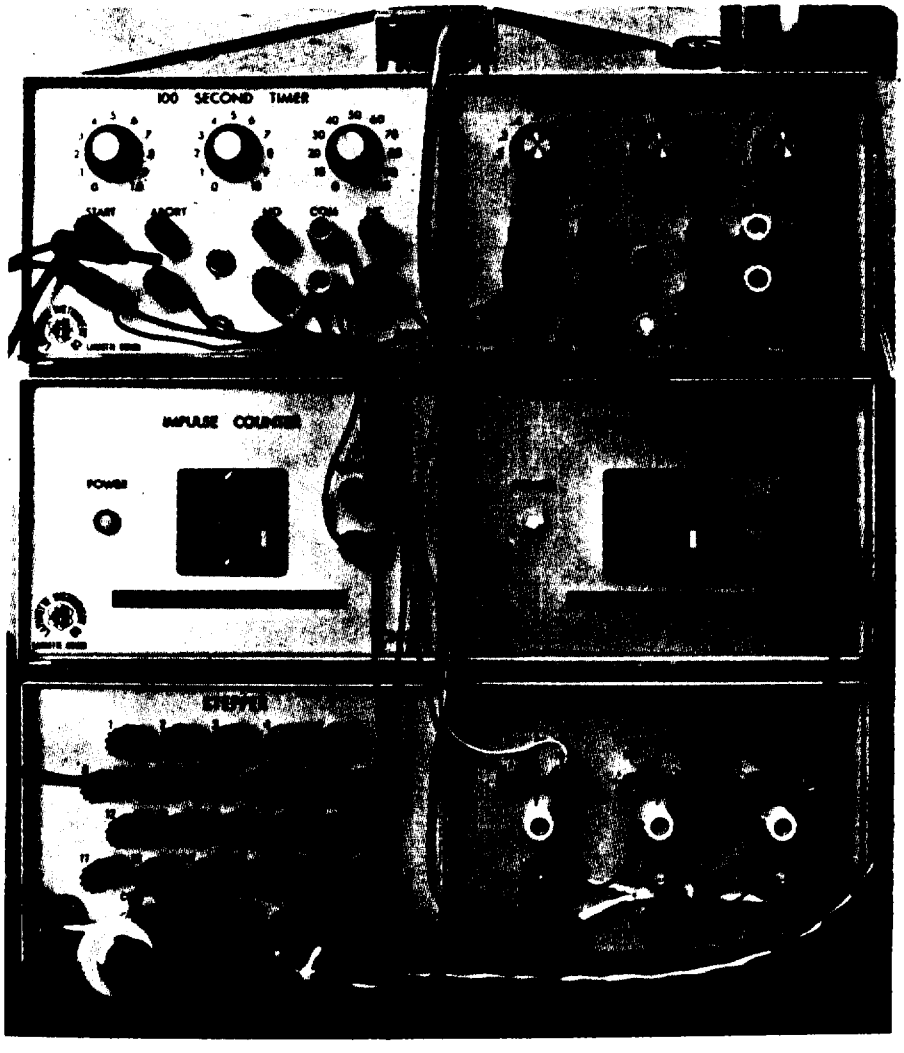


Figure 8. Lafayette Programming Package

Figure 9. Bio-Medical Systems Stimulator

Figure 10. Bio-Medical Systems Isolation Transformer

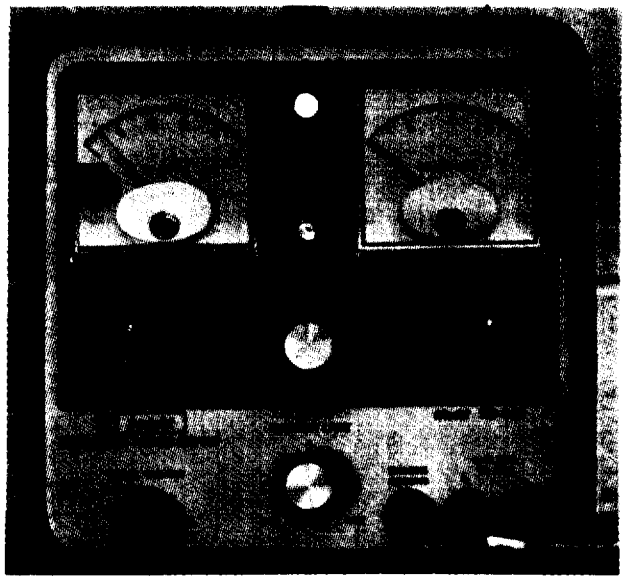


Figure 11. Regulated Power Supply

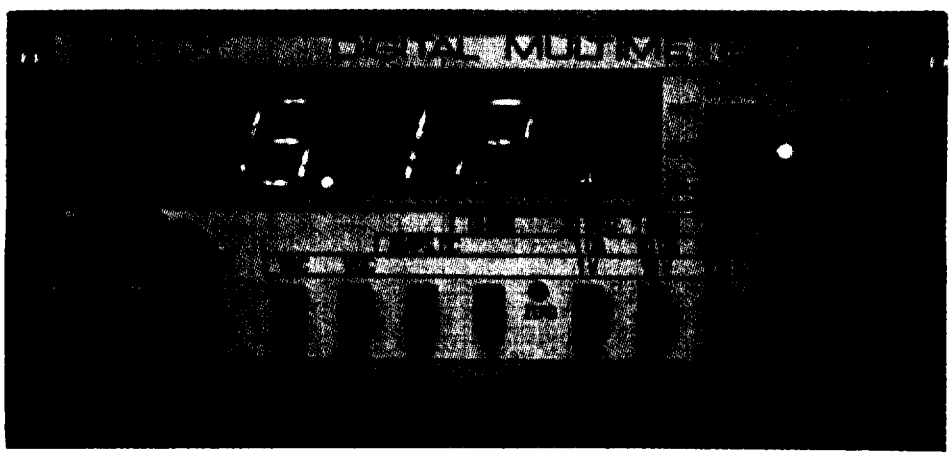


Figure 12. Digital Multimeter

The equipments are arranged to instrument the experimental session using real stress as shown in Figure 13. The subject wears the physiological transducers for respiration (pneumograph), galvanic skin response (pair of GSR electrodes) and peripheral vascular response (finger photoplethysmograph), as indicated in the block diagram. The GSR electrodes are standard nickel-plated brass, as used in lie detector applications. Each has an area of about $6cm^2$, and is curved for maximum finger contact. They are used with "Biogel," a biopotential contact medium manufactured by Biocom, Inc., Culver City, California. Attached to the subject's left leg is the stimulator electrode (concentric disc and ring design with contacts made by saline-moistened cellulose sponges)[1] The subject's leg is prepared for the electrode using "Redux" electrode paste, formerly manufactured by Sanborn, and now supplied by Hewlett-Packard. The subject uses his right hand to carry out the hand steadiness task, trying to hold the stylus tip in a small pre-selected hole for the treatment duration without making contact with the sides of the hole.

A pulse former shapes all contacts of the stylus made in the hole-type steadiness tester, and uses this shaped electrical pulse to advance a stepping relay. Activation of the stimulator follows every third stylus contact, due to a transmitted signal from the pre-selected position of the stepping relay through the shock delay timer and shock duration control. The shock delay timer, which is adjustable from 0.1 to 100 seconds, is set for a 3-second recovery time. During the one-second shock and for two seconds afterward, contacts are counted but do not advance the relay, thereby preventing any additional shocks while the subject recovers. The three-second shock delay timer and the one-second shock duration timer are initiated simultaneously. The stimulator used in this experiment has its own coarse shock duration control, so the shock duration timer module could be by-passed, if desired. However, to obtain better control, the

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[1] This electrode is described by Tursky, Watson and O'Connell (1965).

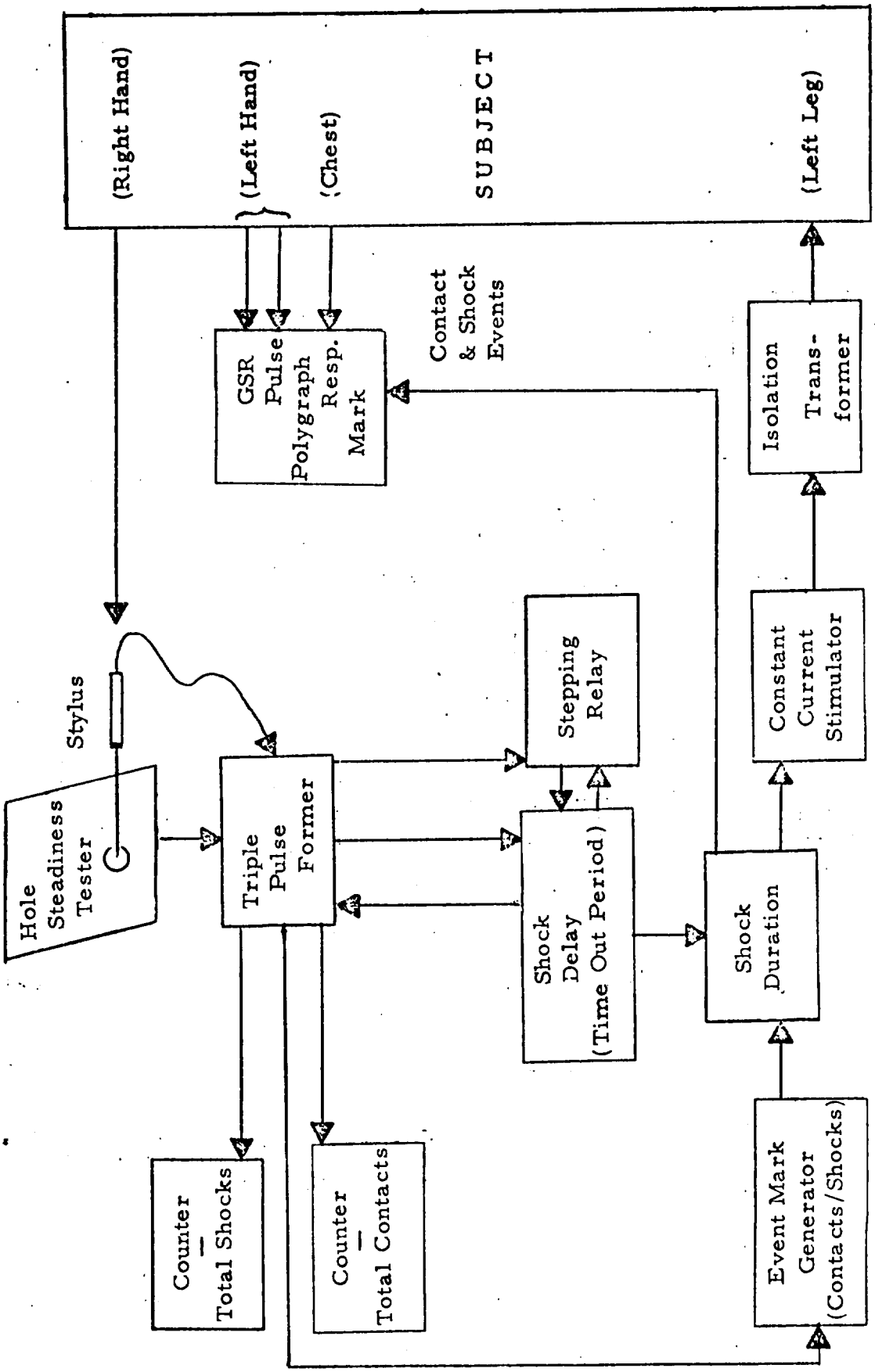


Figure 13. Instrumentation (Real Stressor)

floating relay closure of the shock duration timer is used to trigger and time the stimulator.

As reported by Friedlander (1971), the threshold of human shock perception is approximately 1 milliampere (ma.). At this level, a tingling sensation is generally felt. Discomfort is experienced at around 3 ma. At about 5 ma., many sensory nerves are stimulated and the sensation can become painful. At current levels higher than 5 ma., motor nerves tend to become stimulated and the affected muscles contract. Most subjects experience pain at currents between 5 and 10 ma. Tissue damage and physiological trauma occur as the current begins to exceed about 50 ma. The capacity of the stimulator used here is 21 ma., when used as designed. To protect subjects from accidentally higher currents, the stimulation electrode lead is fused for 1/32 ampere (31 ma.). Further protection is provided by an isolation transformer which reduces any accidental leakage between the electrode and the rest of the system to insignificant levels. The calibration curves showing actual shock levels as a function of subject contact resistance and stimulator switch setting is seen in Figure 14.

Two single impulse counters are used to indicate the total number of stylus contacts made and the total number of shocks administered. The event mark-generator provides coded signals of all contacts (100 milliseconds) and shocks (1 second) to the polygraph for producing a permanent record of these events correlated with the physiological responses. Following the shock delay period, resetting of the stepper is completed and input information is reactivated until the next shock period occurs.

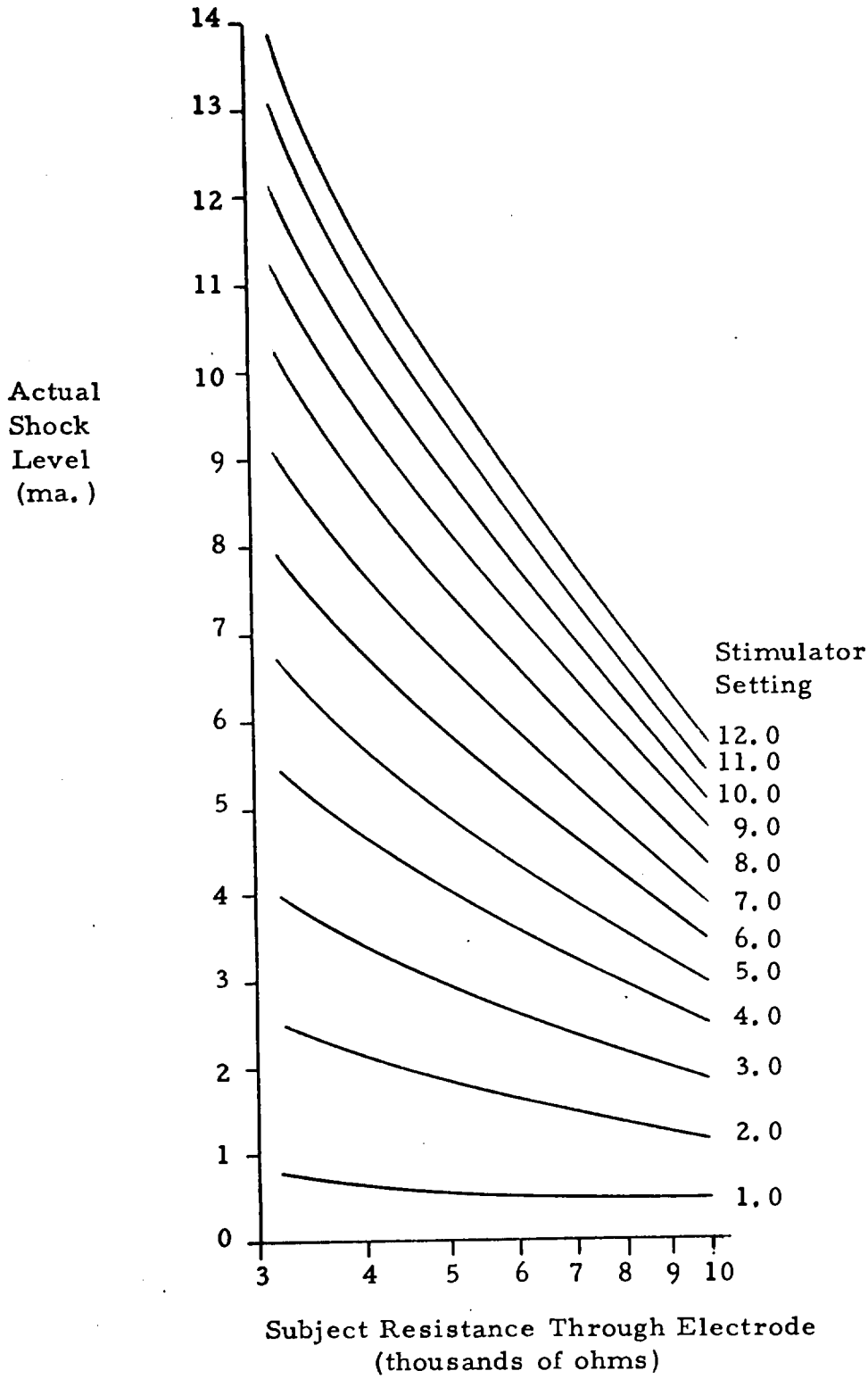


Figure 14. Stimulator Calibration Curves (Empirical)

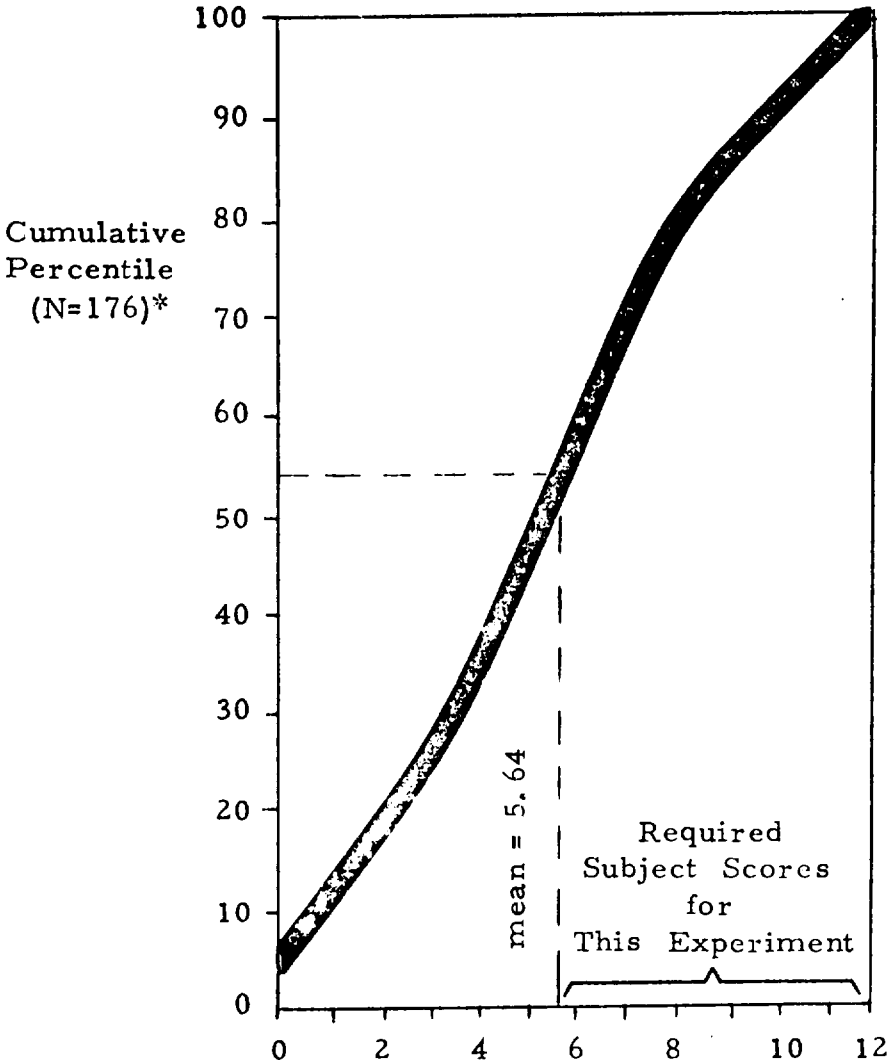
When the apparatus is used for hypnotically-induced stress, the subject does not use the hand steadiness tester, nor is the stimulator electrode attached. Only the polygraph is affixed to the subject in the hypnotic session. However, the imagined contacts and shocks, as reported verbally by the subject during the session, are recorded on the polygraph by the experimenter. He operates a hand-held momentary switch connected to the mark input of the polygraph, replacing the input line shown in Figure 13. Event marks are controlled by the experimenter to resemble those produced automatically during real stress sessions.

C. Subjects

The 60 paid subjects in this experiment are drawn from the male population of college students around southwestern Connecticut. Because of their age, sex and general physical fitness, they are considered sufficiently representative of the Army population to satisfy the objectives of this study. For practical considerations of availability, time schedules, location and administrative ramifications, the use of local college men is considered more feasible than an approach in which Army personnel are sought as subjects.

To help assure discovery of any significant reactions to suggested stress without requiring excessively stringent screening requirements, subjects are required to score above the estimated college population mean in hypnotic susceptibility. That mean, as shown in Figure 15, is about 5.64 on the Harvard Group Scale of Hypnotic Susceptibility (Shor and Orne, 1963).

From the standpoint of attrition due to screening, the requirement for a hypnotizability score above the population mean should result in fewer screening disqualifications for this study than one might first anticipate. Past experience shows that the mean hypnotizability score for college volunteers rises to about 7.39 when the subject recruitment procedures make it clear that the experiment involves hypnosis (Shor and Orne, 1963). The involvement of hypnosis is noted in all recruitment announcements for this experiment, so we would expect to find most candidates to score above our acceptance criterion for hypnotic susceptibility.



*Derived from Shor and Orne (1963): Original Stanford U. Undergraduates (n=124) and Harvard Medical School (HMS) Controls (n=52).

Figure 15. Estimated Percentile Distribution of HGSHS for College Students

Of primary concern at all times in this study is the health and well being of the subjects. Established principles of ethics and subject protection are employed here, including:

- informing the subjects about the general nature of the experiment, and its use of hypnosis and pain from electrical stimulation.
- giving a medical examination, including a standard 12-lead electrocardiogram, to all subjects before the first session.
- having a qualified physician on site during all sessions.
- informing subjects that they are free to remove themselves from the experiment at any time, without explanation.
- applying the doctrine of informed, written and witnessed consent by volunteers.

The guidelines used in the protection of subjects' rights are those established by the Department of the Army (1962), the Department of Health, Education and Welfare (1971), and the American Psychological Association (1973b).

For motivation, all subjects are paid, receiving $10 for participating in the first experimental session and $20 for the second. The differential in rate is intended to provide extra motivation for subjects to complete their participation in the experiment.

D. Protocol

The procedures followed in this experiment are described under four chronologically arranged headings:

- Recruitment
- Group screening
- Medical examination
- Experimental sessions

1. Recruitment. The subject recruitment process involves contacting college men by placing announcements on college bulletin boards and in the newspapers of colleges and communities in southwestern Connecticut. Each inquiry from an interested individual is answered with a descriptive letter about the project, a brief questionnaire, and a postage-free reply envelope (see Appendix B).

2. Group Screening. Each candidate subject who submits a completed and acceptable * questionnaire is invited to attend a group briefing and screening session lasting about two hours. During the briefing, candidate subjects are reminded of the project details (formerly given to them in the descriptive letter). They then complete four tests and a Volunteer's Participation Agreement. In the sequence administered, these are:

a. State-Trait Anxiety Index (Spielberger, Gorsuch and Lushene, Consulting Psychologists Press) to determine proneness to anxiety.

* The primary criteria of acceptability are: male, college student, "yes" to questions 10-13, and a signature.

b. Harvard Group Scale of Hypnotic Susceptibility (Shor and Orne, Consulting Psychologists Press) to determine each subject's hypnotizability.

c. Checklist of Subjective Hypnotic Experiences (Peter B. Field, Ph. D., Morton Prince Center for Hypnotherapy, New York City), to provide a rapidly obtained indication of hypnotic "depth" keyed to the Harvard Group Scale and used for later comparison with the same checklist completed after the experimental hypnotic session.

d. Volunteer's Participation Agreement, to confirm that each subject has been fully informed and consents to participate in the experiment as it has been designed.

e. Cornell Index (Psychological Corporation) to provide a general screening for neuropsychiatric pathology.

The five forms are shown in Appendix C.

Selection of final subjects is based primarily upon scores on the Harvard Group Scale, other scores providing baseline information to be used during medical examination and/or data analysis. The selection criterion is a Harvard Group score of 6 or higher, on the 0-12 range of the whole number scale. Each subject is notified of his screening results. Appointments are made for acceptable subjects, who are assigned to treatment cells in a balanced randomized fashion, by scores on the Harvard Group Scale. Each of the three treatment groups is designed to have about equal representation of each hypnotizability score.

3. Medical Examination. Upon appearing for his first experimental session, each candidate subject is given a medical examination by one of seven (7) physicians available to the project. (A physician

remains on the premises during every experimental session.) Appendix C shows the Medical Examination Form which includes a subject qualification statement. A standard 12-lead electrocardiogram is taken for each subject, as part of this examination. Figure 16 shows this process.

4. Experimental Sessions. All sessions (real and hypnotic) begin with the subject relaxing after the polygraph only is attached. A continuing record of polygraph settings is made on the Polygraph Record shown in Appendix D. When the polygraph is set for desired sensitivities and proper recording, the subject is asked to relax with his eyes closed for several minutes (see Figure 17). Baseline data is taken in this condition for the third 1-minute interval. After the subject is asked to open his eyes, he is requested to complete Part A of the Subjective Stress Scale (SSS). At the same time, the experimenter records his own observed assessment of the subject's relaxed state, using his own copy of the scale.

The Subjective Stress Scale shown in Appendix D, was developed by Kerle and Bialek (1958) for evaluating stress in soldiers under simulated combat conditions. The present study uses the revised version (Berkun, Bialek, Kern and Yagi, 1962), consisting of 14 words, one of which is checked by the subject to indicate how he felt during the experimental treatment. On the basis of field tests, the authors have assigned a rating between 0 and 94 to these words. Soldiers describing their reactions to simulated combat obtain average scale scores ranging from 60 to 75, compared to about 32 in the unstressed state. Use of this scale allows a comparison of stress level data in this study to that of soldiers experiencing simulated warfare.

The experimenter reports his observed stress evaluation on the data sheets shown in Appendix D, items 3 and 4. A summary of

Figure 16. Physician Recording Subject's Electrocardiogram during Medical Examination (Simulated)

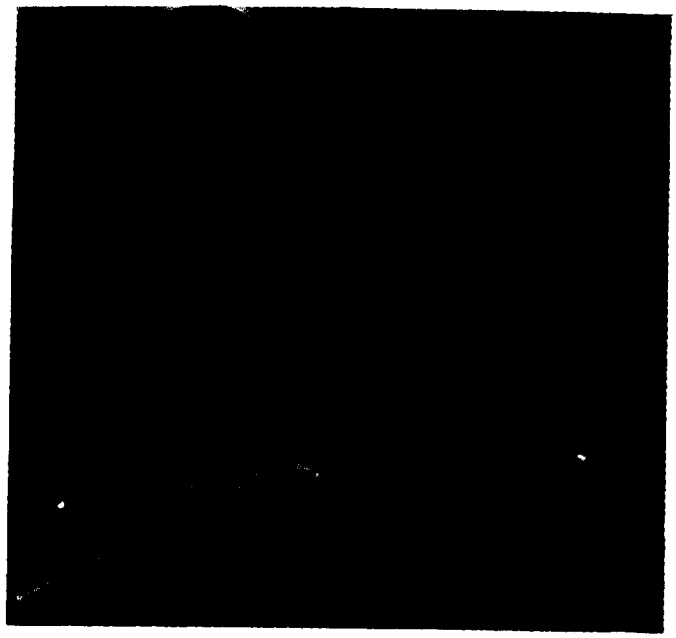


Figure 17. Obtaining Baseline Data with Subject Relaxed and Eyes Closed

Figure 18. Hand Steadiness Task

the data from these multipage forms appears in the blocks at the top of page one of each form. These are the primary data for later analysis, for both real and hypnotic sessions. They include:

- Polygraph data for the relaxed (baseline) and stress conditions:
  - Respiration rate in respirations per minute (rpm)
  - GSR in numbers of non-specific responses exceeding a criterion amplitude (generally 3 mm. of pen deflection)
  - Peripheral Vascular Responses of pulse rate in pulses per minute (ppm), and pulse amplitude in millimeters of pen deflection (mm)
    - -- Pulse amplitude change (+ or -) is noted in going from the relaxed to the stress state (amplitude decrease = minus).
- Subjective Stress Scale scores, as reported by the subject, for relaxed and stress conditions.
- Observed Stress, as reported by the experimenter, for relaxed and stress conditions.
- Modified State-Trait Anxiety Index, as reported by the subject, for the stress condition only. The baseline index is the trait score he received previously during the group briefing and screening session.

For the hypnotically-induced stress session, the summary data also include two measures of hypnotic depth:

- Score on Field's Checklist of Subjective Hypnotic Experiences, which can be compared to the score received during the group briefing and screening session.
- Total score for the observed responses to the five suggested ideomotor and ideosensory experiences. Qualitative comparisons of these experiences can be made with similar experiences elicited previously on the Harvard Group Scale of Hypnotic Susceptibility.

Real Stress Treatment

The real stressor employed in this study is a hand steadiness task, with painful shock each time the subject fails to meet the steadiness criterion of less than three contacts. The subject's performance level is established with the hole steadiness tester. He is instructed to get into a comfortable position with the stylus and adjustable (tripod mounted) hole matrix. He is permitted to rest his elbow on the arm of his chair, but cannot rest his hand on the hole matrix device. His hand must be placed behind a white ring around the stylus handle (see Figure 18). He is then instructed to hold the stylus point in each of several holes, for one minute at a time. His one minute scores for each hole (as counted on the "total contacts" module) are recorded on the data sheet. The hole selected for use in the session is that with the lowest count equal to or exceeding 10 contacts per minute. For subjects receiving real stress in both experimental sessions, this hole selection is done each time.

Next, the stimulator electrode is attached to the subject's left leg so that the apparatus appears as shown in Figures 13 and 19. The electrode is of concentric design, and is described elsewhere (Tursky, Watson, and O'Connell, 1965 & 1969; Tursky, Greenblatt, and O'Connell, 1971; Tursky and Watson, 1964). The subject's skin is prepared using Sanborn Redux electrode paste, as described by Tursky, Watson, and O'Connell (1965). The electrode is placed on the outside of the left leg, as shown in Figure 20, about halfway between the ankle and knee. By avoiding locations where the peroneal nerve is near the skin surface, the likelihood of muscular contraction responses is kept low. The stimulus, which is confined

Figure 19. Instrumentation Affixed for Real Stress Condition

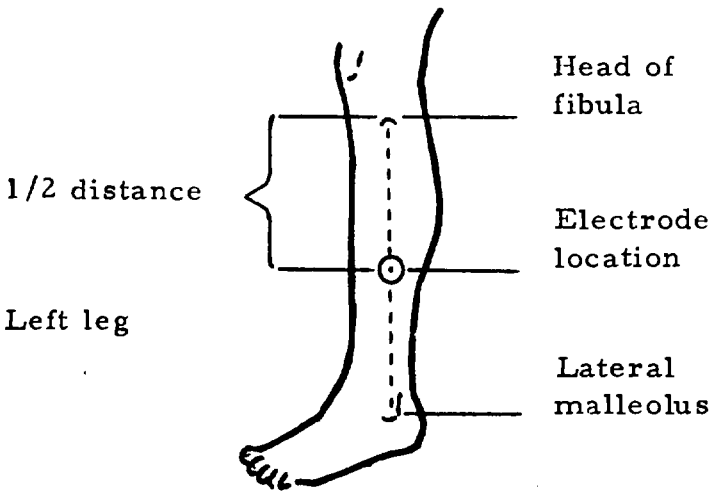


Figure 20.

Stimulus Electrode Placement

to the leg area by virtue of the concentric electrode design, is sinusoidal, 60Hz, of constant current for 1.0 second, as described by Tursky and Watson (1964). Subject skin resistance is prepared to about 5 thousand ohms, as measured through the electrode with the digital multimeter. The subject is then asked to describe his sensations as the experimenter administers gradually increasing amplitudes of shock (beginning at 0 ma.) at 5 to 10 second intervals. He is instructed to report:

First: when he experiences any sensation at all (threshold level)

Second: when the shock begins to feel uncomfortable (discomfort level)

Third: when the shock begins to feel painful (pain level)

Fourth: when he does not want the intensity to go any higher (tolerance level)

This part of the protocol is similar to that describe by Tursky and O'Connell (1972). Because of adaptation and other effects, the shock amplitude used in the experiment is set 0.2 ma. above that fourth (tolerance) level. The duration of all shocks is 1.0 second.

The real stress treatment, seen in Figure 21, takes place with no conversation by the subject or experimenter for 3 minutes following the experimenter's signal to "go". The data used for analysis are those for the second 1-minute interval of that treatment. At the end of the three minute treatment, the subject is asked to report how he felt, using Part B of the Subjective Stress Scale

Figure 21. Real Stress Treatment

Figure 22. Hypnotically-Induced Stress Treatment

and the Modified Self-Evaluation Questionnaire as shown in Appendix D. The experimenter records his own observed assessment of the subject's stress state. Then final equipment settings are recorded, the electrodes and transducers are removed from the subject, and his reactions or comments about the session are solicited. This ends the real stress session.

Hypnotically-Induced (Suggested) Stress Treatment

Hypnotically-induced stress begins with a similar verbal induction of hypnosis for each subject. The entire treatment is carried out with the subject's eyes closed. After the initial induction, deepening is aided by a series of five suggested ideomotor and ideosensory experiences:

- His right arm becomes so heavy that he cannot lift it
- His left leg becomes immobilized so he cannot move it
- His right fist clenches so tightly that he cannot open it
- His head becomes so rigid that he cannot shake it to say no
- His left cheek feels the periodic sticking of a pin.

The subject's responses in trying to overcome challenges for the first four experiences and his report of the fifth experience are recorded on the data sheet. Weighted values are assigned to each observed response as follows:

Good: 2

Fair: 1

Poor: 0

The individual scores are added to produce a score suggestive of the subject's depth in hypnosis. The sum falls in the range from 0 to 10.

Next, the subject is given a set of standard instructions to have him carry out the imaginary hand steadiness test with imagined painful

shock in his leg for failing to perform to the required steadiness level. He is told to expect the sharp pain quite a number of times as he carries out this task. To provide data on "stylus contacts" and "shocks", he is instructed to say the word "touch" or "shock" each time he imagines those events to occur. After the experimenter says "go", and for the entire 3-minute "stress" period, the experimenter remains silent; no suggestions of any kind are given. Figure 22 depicts the hypnotically-induced stress treatment.* The experimenter presses a hand held switch to record all events on the polygraph, as they are announced by the subject. A "touch" is recorded as a brief event (about 100 milliseconds) and a "shock" is recorded as a long event (about 1 second), so as to produce codes on the polygraph's time and event channel which resemble those produced for the real stress condition.

Data used for analysis consist of that recorded during the second 1-minute interval of the three minute suggested ("imaginary") task. Upon completion, the subject is instructed that the task is over, the stress conditions have ended, and he will soon be "awakened" feeling comfortable, alert and refreshed, and able to accurately recall the experience so he will be able to report on it in detail. Upon termination of hypnosis, the subject is immediately instructed to complete Part B of the Subjective Stress scale, the Modified State-Trait Anxiety Index, and Field's Checklist of Subjective Hypnotic Experiences. The experimenter records his independent rating of the subject's stress level.

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* Some subjects raise their hand while imagining themselves to be carrying out the task; others do not. It is left to each one to experience this task in his own way, regarding hand position.

Final apparatus data are noted on the Polygraph Record; the polygraph transducers are disconnected from the subject; his reactions or comments are solicited; and the hypnotic session ends.

III. RESULTS

A. Data Collection and Problem Areas

This study was officially started upon award of contract on 23 January 1973. Recruitment of subjects began in February 1973 with press releases to 15 newspapers in Connecticut's lower Fairfield County. This was followed up by direct contact with 13 local colleges. Those colleges granted permission to place notices on bulletin boards, have classroom and club announcements made by faculty and students, place prepaid inquiry cards in college offices, place articles in student newspapers, and, in one case, have periodic solicitation announcements made by the college's AM radio station during their campus broadcasts.

The recruitment effort yielded a total of 363 inquiries, of which 41 were immediately rejected because they obviously came from women (probably due to newspapers omitting the male requirement stated in the press releases). The 322 other inquirers were each sent a questionnaire accompanied by a cover letter giving all necessary details about the project, including: the sponsoring agency; the experiment's purpose; the involvement of stress, pain, electric shock and hypnosis; the required medical examination; the presence of a physician at each session; the number and duration of sessions; and subject payment. The cover letter and questionnaire are found in Appendix B. A total of 188 questionnaires were returned, of which 172 were fully acceptable, 7 were acceptable for limited pre-testing and 9 were unacceptable. Each of the 179 candidate subjects who returned an acceptable questionnaire was invited to attend a group briefing and screening session where he was tested for hypnotizability, anxiety level and general indications of neuropsychiatric problems. The forms used in that session are found in Appendix C. A total of 102 candidates completed the group

briefing. Of that total, 83 were found to be acceptable subjects, three were acceptable as pre-test subjects, and the rest were unacceptable.

Sixty of the 83 acceptable subjects participated to complete the experiment as designed. A medical examination was given just prior to data collection in the first experimental session. The medical examination and data collection forms used are found in Appendices C and D, respectively. Table IV lists the main items of data collected for each subject. The data collection sessions were conducted during the 6-month period from 26 May to 22 November 1973. No attempt was made to control for the time of day when sessions were held. However, measurements for all 120 sessions were begun at mutually convenient times between about 8:30 A. M. and 4:00 P. M. with the greatest peak in mid-morning and a smaller peak in mid-afternoon. Each group followed that bimodal pattern.

The official completion date under this contract was 22 May 1974. That date includes a 3-month time extension to make up for delays resulting from the illness of the Principal Investigator during June and July, 1973. No other technical or administrative problems were encountered during the conduct of this study.

Table IV

Main Data Items Collected

- Screening Information:
  - Date of Birth
  - College Attended
  - Hypnotic Susceptibility and Subjective Experiences (HGSHS; FCSHE)
  - State and Trait Anxiety Indices (STAI)
  - Psychopathology (Cornell Index)

- Medical Examination Data
  - Heart Rate
  - Sinus Arrhythmia Presence
  - Blood Pressure (systolic/diastolic)
  - Respiration Rate

- Baseline and Stress Measures for Two Sessions, in Terms of:
  - Physiological Data
    - Respiration Rate
    - GSR (total/nonspecific)
    - Pulse Rate and Amplitude
  - Subjective Report:
    - Subjective Stress Scale (SSS)
    - State Anxiety Index (Modified STAI)
    - Subjective Hypnotic Experiences (FCSHE)
  - Observed Report
    - Observed Stress Scale (OSS)
    - Observed Hypnotic Depth (OHD)
  - Performance
    - Hole Size Used
    - Hole Selection Performance (no. of contacts)
    - Electrode Contact Resistance
    - Shock Perception Levels (Threshold, Discomfort, Pain, Tolerance)
    - Stress Performance (no. of contacts, shocks)
  - Anecdotal Report
    - End of Session Interview
    - Experimenter's Impressions, (if any)

B. Data and Statistical Analysis

The quantitative data obtained in the course of this study are described and evaluated here with two objectives. First, the analysis addresses the hypotheses, by providing quantitative descriptions of how suggestion-induced stress resembles (or fails to resemble) its equivalent real stress for both naive and experienced subjects. The second objective is to add clarification and greater depth to the interpretations of what takes place in the experimental stress situation. Qualitative information is used to support those objectives. In particular, anecdotal reports of subjective experiences provide the flavor and texture of personal stress reactions in the actual words of the subjects. The various instruments and measures discussed here are found listed in Table IV. Coding sheets with all raw data are found in Appendix E.

1. Reliability and Interpretation of Measures

A number of correlations are computed to determine the comparability, and in some cases, the reliability of measures used in this experiment. Among the candidate screening instruments, the Cornell Index is found to correlate highly with Trait Anxiety ($r = .56$, $p < .001$). This is expected since both measure related manifestations of psychopathology.

The three scales of hypnotizability are also compared (see Table V). The Harvard Group Scale of Hypnotic Susceptibility (HGSHS) is twice seen to be significantly correlated with Field's Checklist of Subjective Hypnotic Experiences (FCSHE), ($r = .34$; $r = .37$). The FCSHE scores obtained during the screening session are also highly correlated with the scores obtained on the same instrument during the hypnotic experimental session ($r = .77$), thereby providing assurance of reliability. The HGSHS, which is one of the widely used standard instruments of its type, is also found to be a reliable predictor of hypnotic depth achieved in the later experimental

Table V

Correlations of Hypnotic Susceptibility Scales

		Group Screening (n = 60)	Hypnotic Experimental Session (n = 40)	
	Scale	FCSHE	FCSHE	OHD
Group Screening	HGSHS	.34**	.37**	.45**
	FCSHE	--	.77***	.47***
Hypnotic Experimental Session	FCSHE	--	--	.60***

***p < .001
**p < .01

HGSHS: Harvard Group Scale of Hypnotic Susceptibility

FCSHE: Field's Checklist of Subjective Hypnotic Experiences

OHD: Observed Hypnotic Depth

session as measured by the two briefer scales -- FCSHE (r = .37) and the Observed Hypnotic Depth (OHD) (r = .45). Finally, the two hypnosis measures used in the experimental session (FCSHE and OHD) are significantly correlated (r = .60). These results suggest that FCSHE and OHD are both reliable and are probably measuring the same set of hypnotic depth phenomena as the more familiar HGSHS.

The intercorrelations of all physiological and subjective stress measures are described later in this section because of their greater complexity due in part, to response specificity and the Law of Initial Value.

2. Subject and Group Characteristics

Consideration is given next to the subject characteristics and group assignments. In this regard, assurance is necessary that the groups are essentially identical for purposes of the study.

Demographically, the sixty male subjects come from 11 different colleges and universities, mostly in Connecticut. Table VI shows the distribution of subjects by schools. Over half the subjects come from three schools, reflecting to some degree a better recruitment program at certain locations. The average age of the subjects is just over 21 years (standard deviation: approximately 3 years).

All acceptable candidate subjects for this study were invited to attend a group briefing where they were tested for hypnotizability, using the standardized, 45-minute Harvard Group Scale of Hypnotic Susceptibility (HGSHS). A total of 103 candidates took this test, and their scores are

Table VI

College Sources of Subjects

College	Number of Participating Subjects
University of Bridgeport	14
Norwalk Community College	11
Fairfield University	10
Central Connecticut State College	7
University of Connecticut	6
Norwalk State Technical College	5
Sacred Heart University	3
Housatonic Community College	1
Southern Connecticut State College	1
Clark University (Worcester, Mass.)	1
New School for Social Research (N.Y.C.)	1

Total: 60

shown by the histogram in Figure 23. The distribution corresponds closely to published norms for college students who volunteer to participate in experiments which they know to involve hypnosis. As a group, such volunteers have been found to be more hypnotizable than the general population. The mean score for all candidates in Figure 23 is 7.97, compared to a norm of 7.39 for a group of 132 undergraduates who volunteered for hypnosis experiments in the Boston area. In contrast, the HGSHS norm for 176 control students having no prior awareness of hypnosis involvement is about 5.64 (Shor & Orne, 1963).

Figure 24 shows the distribution of HGSHS scores for the 60 subjects finally chosen for this study. Their mean score is 8.93. Group assignments for all subjects were made to counterbalance closely for HGSHS scores. Three carefully matched groups were formed, with approximately equal HGSHS score representations in each, as seen in Table VII. To assure randomness of group assignments in relation to other relevant factors, a series of one-way analyses of variance are made. The results show that there are no statistically significant differences between the groups. Table VIII summarizes these factors. That table includes data from the group screening, the medical examination and the baseline measurements of the first experimental session. All subjects are treated identically up to and through the first baseline measurement, and the analyses confirm that no differences exist between the three groups to that time. The date of group screening and the subsequent time interval until the first experimental session also show no significant differences between the three subject groups. With no evidence of bias or imbalance between groups, further statistical comparisons of the data can be made with reasonable confidence in the validity of outcomes.

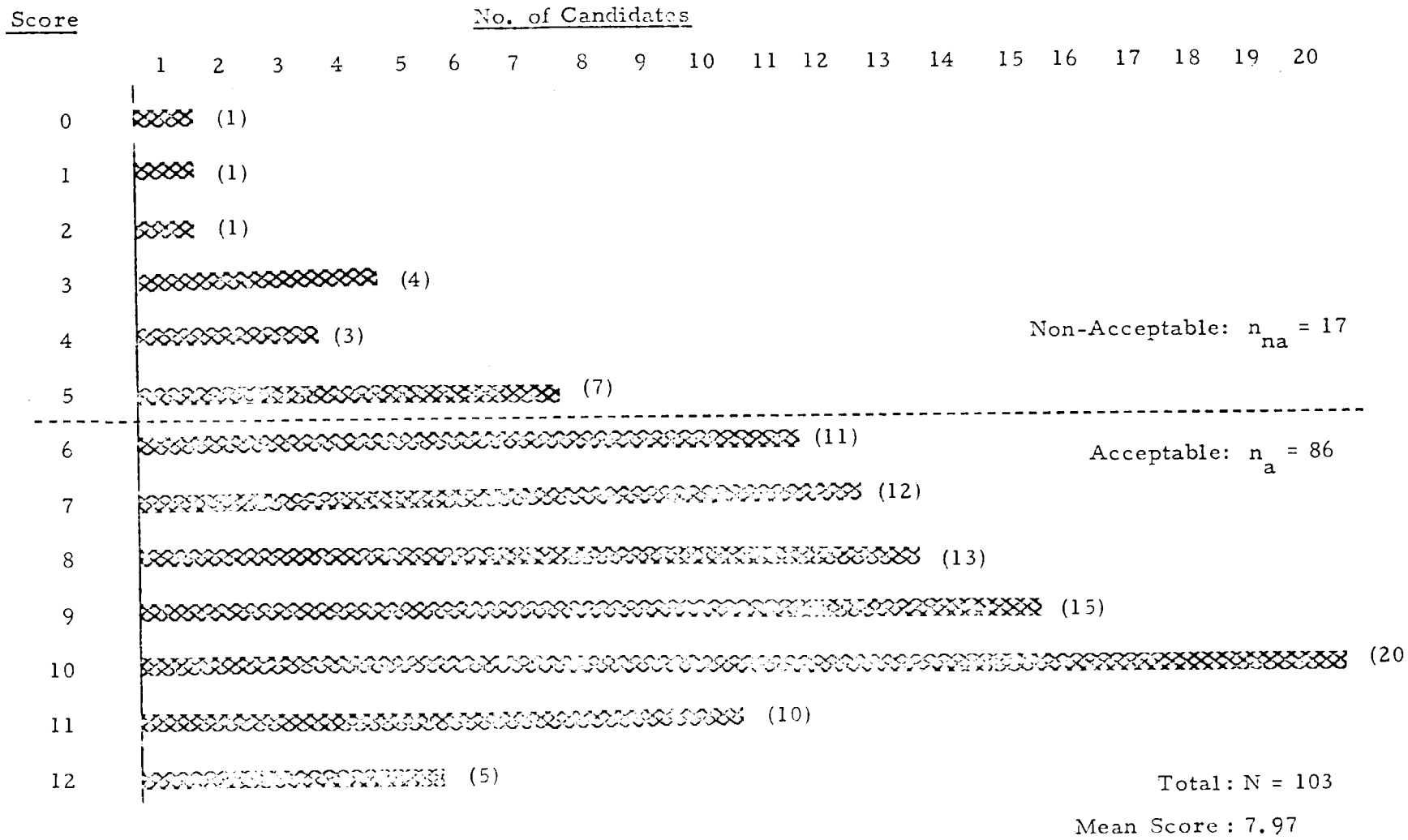

Figure 23. Histogram of HGSHS Scores for all Candidates

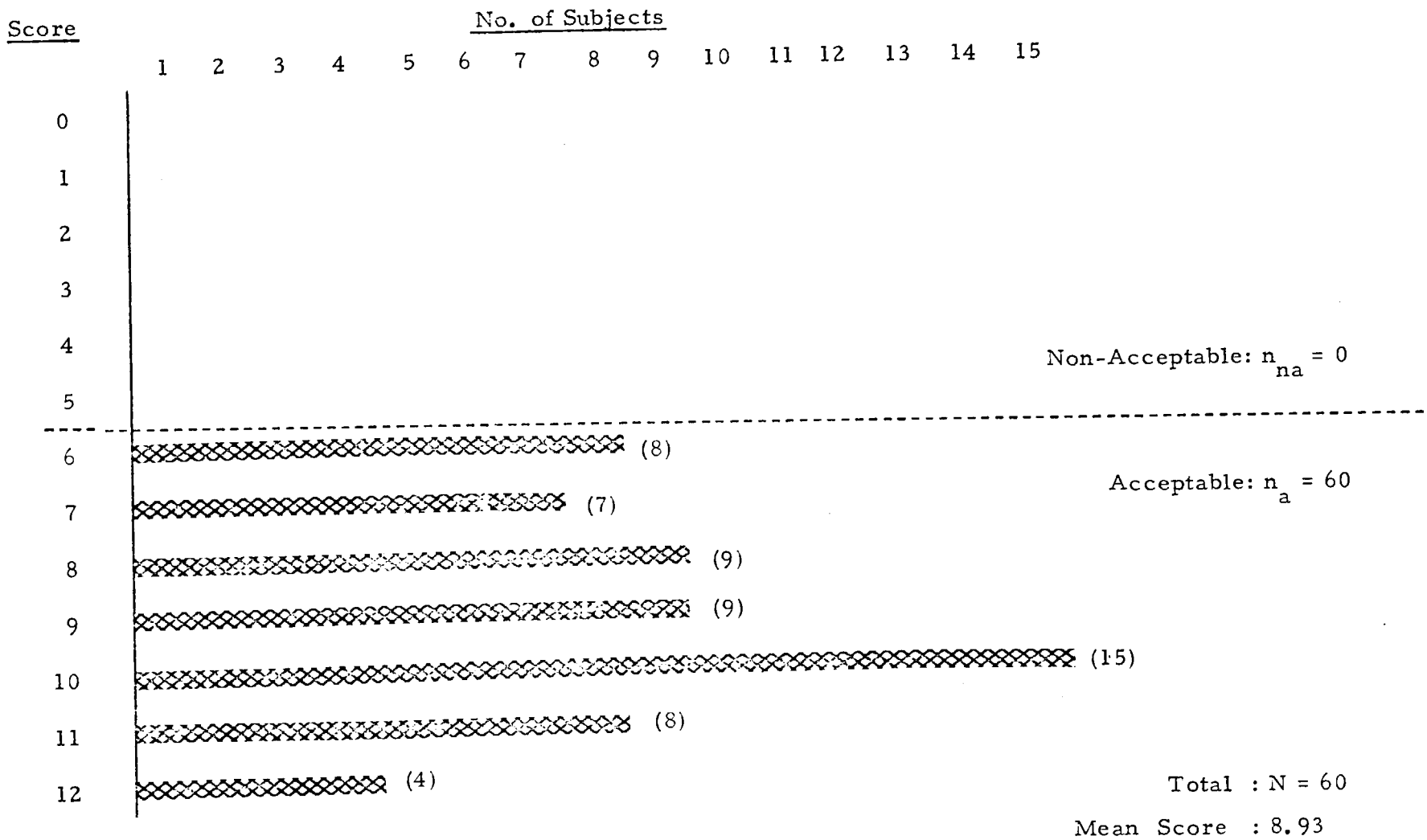

Figure 24. Histogram of HGSHS Scores for all Subjects

Table VII

Subject Group Assignments

HGSHS Score	Number of Subjects in Each Treatment Group			
	Group 1 (Real Stress/ Hypnotic Stress)	Group 2 (Hypnotic Stress/ Real Stress)	Group 3 (Real Stress/ Real Stress)	Total
6	2	3	3	8
7	3	2	2	7
8	3	3	3	9
9	3	3	3	9
10	5	5	5	15
11	2	3	3	8
12	2	1	1	4
Total:	$n_1 = 20$	$n_2 = 20$	$n_3 = 20$	N = 60
Mean Score:	9.0	8.9	8.9	8.93
Std. Deviation:	1.8	1.8	1.8	1.80

Table VIII

Group Means for Various Initial Factors*

Data Set	Factor	Group 1		Group 2		Group 3		All		$F_{2, 57}$ Ratio
		M	SD	M	SD	M	SD	M	SD	
Group Screening	Trait Anxiety	32.6	6.2	34.0	10.2	36.1	6.4	34.20	7.84	0.983#
	State Anxiety (Screening)	34.3	4.5	36.0	7.5	35.4	6.1	35.20	6.08	0.416
	FCSHE	24.1	7.3	24.4	7.4	28.4	4.5	25.62	6.74	2.716
	CI	6.5	8.6	5.9	6.6	5.7	6.0	6.00	7.04	0.065
	Age	21.8	4.8	21.6	1.9	20.4	2.2	21.25	3.25	1.057#
Medical Examination	ECG Pulse Rate	75.7	13.5	78.1	9.1	77.2	14.6	76.98	12.44	0.193
	Systolic Blood Pressure	123.5	13.9	120.6	11.6	121.6	8.4	121.87	11.40	0.339
	Diastolic Blood Pressure	72.4	9.4	71.6	11.2	72.5	8.2	72.13	9.52	0.054
	Respiration Rate	14.8	2.5	14.9	2.1	15.3	2.1	14.98	2.24	0.316
First Session Baseline	Pulse Rate	73.5	11.4	75.7	7.5	73.4	9.8	74.21	9.59	0.367
	Respiration Rate	13.4	4.2	14.2	3.4	12.9	4.6	13.50	4.08	0.493
	Total GSRs	0.7	1.1	0.4	0.7	0.8	1.2	0.60	1.03	0.993#
	Non-specific GSRs	0.7	1.1	0.2	0.5	0.6	1.0	0.45	0.93	1.661#
	SSS	26.4	15.5	30.7	18.4	28.6	18.1	28.53	17.19	0.298
	OSS	19.8	12.1	19.8	14.4	21.4	16.9	20.30	14.35	0.078

Validity of F-test suspect due to non-homogeneity of data, as determined by Cochran's C.

* No significant differences were found between groups on any factor prior to first stress.

3. Descriptive Experimental Data and Significance Tests

The essential quantitative data for statistical testing of hypotheses in this study are the mean measures of arousal for each group under each experimental condition. Those data are tabulated, by group, in Tables IX, X and XI. These same measures are summarized graphically in Figures 25 and 26.

The analysis of these data begins with a comparison of baseline conditions between each group and session, to evaluate starting conditions. Next, the changes in going from baseline to stress treatments are compared for each group, by session. Then selected comparisons of those baseline-to-stress changes are made between groups for opposite sessions to evaluate effects of the same treatment in reversed session order. Finally, the intercorrelations of the six measures shown in Figure 25 are evaluated.

Baseline measures of heart rate, GSR, repiration rate, SSS and OSS tended to remain similar between Sessions 1 and 2 as revealed by t-tests. Only Group 1 shows any significant difference, that being in the baseline heart rate ($p. < .01$). The baseline heart rate for Group 3 is not significantly different between sessions despite its apparently wide spread. What appears to be a discrepancy in the relative significance of baseline heart rate for Groups 1 and 3 is due to the fact that these are paired-data t-tests; thus individual subject differences are being tested--not the overall mean. The summary chart of Figure 25, on the other hand, portrays the difference between two mean group values (in this case, two mean group values of baseline heart rate). No other significant difference between sessions is found for any group in the baseline measures. (One of those measures on Figure 25, STAI, does not show any change because the single group screening value of each subject's trait anxiety is used as his baseline for both sessions.)

Table IX

Mean Measures of Arousal For Group 1

Measures		Session 1 (Real)			Session 2 (Hypnosis)		
		Baseline	Stress	Diff.	Baseline	Stress	Diff.
Physiological	Heart Rate	73.50	78.15	4.65	77.90	80.35	2.45
	Pulse Amplitude Change	--	--	+ 1 -19	--	--	+ 3 - 17
	Respiration Rate	13.38	18.38	5.00	13.83	17.93	4.10
	No. of NS-GSRs	0.65	2.00	1.35	0.30	3.80	3.50
Subjective	SSS	26.40	55.90	29.50	21.80	49.70	27.90
	STAI-State	32.60	50.80	18.20	32.60	46.05	13.45
Observed	OSS	19.75	71.15	51.40	22.50	61.95	39.45
Performance	No. of Contacts		33.60			8.20	
	No. of Shocks		5.40			3.15	
Hypnotic Depth	FCSHE					22.85	
	Observed					5.85	

NS-GSRs: Non-specific GSRs
SSS: Subjective Stress Scale
STAI-State: State-Trait Anxiety Index--State (Modified)
OSS: Observed Stress Scale
FCSHE: Field's Checklist Inventory of Subjective Hypnotic Experiences

Table X

Mean Measures of Arousal For Group 2

Measures		Session 1 (Real)			Session 2 (Hypnosis)		
		Baseline	Stress	Diff.	Baseline	Stress	Diff.
Physiological	Heart Rate	75.73	81.83	6.10	76.45	81.05	4.60
	Pulse Amplitude Change	--	--	+ 3 -17	--	--	+ 0 -20
	Respiration Rate	14.20	19.03	4.83	14.33	18.40	4.07
	No. of NS-GSRs	0.15	2.75	2.60	0.15	0.85	0.70
Subjective	SSS	30.65	49.70	19.05	31.35	63.35	32.00
	STAI-State	33.95	43.80	9.85	33.95	54.55	20.60
Observed	OSS	19.80	63.25	43.45	17.70	73.15	55.45
Performance	No. of Contacts		4.85			40.50	
	No. of Shocks		1.45			5.90	
Hypnotic Depth	FCSHE		22.55				
	Observed		6.55				

Table XI

Mean Measures of Arousal For Group 3

Measures		Session 1 (Real)			Session 2 (Hypnosis)		
		Baseline	Stress	Diff.	Baseline	Stress	Diff.
Physiological	Heart Rate	73.40	78.35	4.95	78.23	77.05	- 1.18
	Pulse Amplitude Change	--	--	+ 2 -18	--	--	+ 0 -20
	Respiration Rate	12.93	17.53	4.60	13.50	15.00	1.50
	No. of NS-GSRs	0.55	1.55	1.00	0.50	3.25	2.75
Subjective	SSS	28.55	58.60	30.05	25.80	54.95	29.15
	STAI-State	36.05	51.40	15.35	36.05	47.60	11.55
Observed	OSS	21.35	71.00	49.65	17.25	66.95	49.70
Performance	No. of Contacts		29.15			18.90	
	No. of Shocks		5.75			3.60	
Hypnotic Depth	FCSHE						
	Observed						

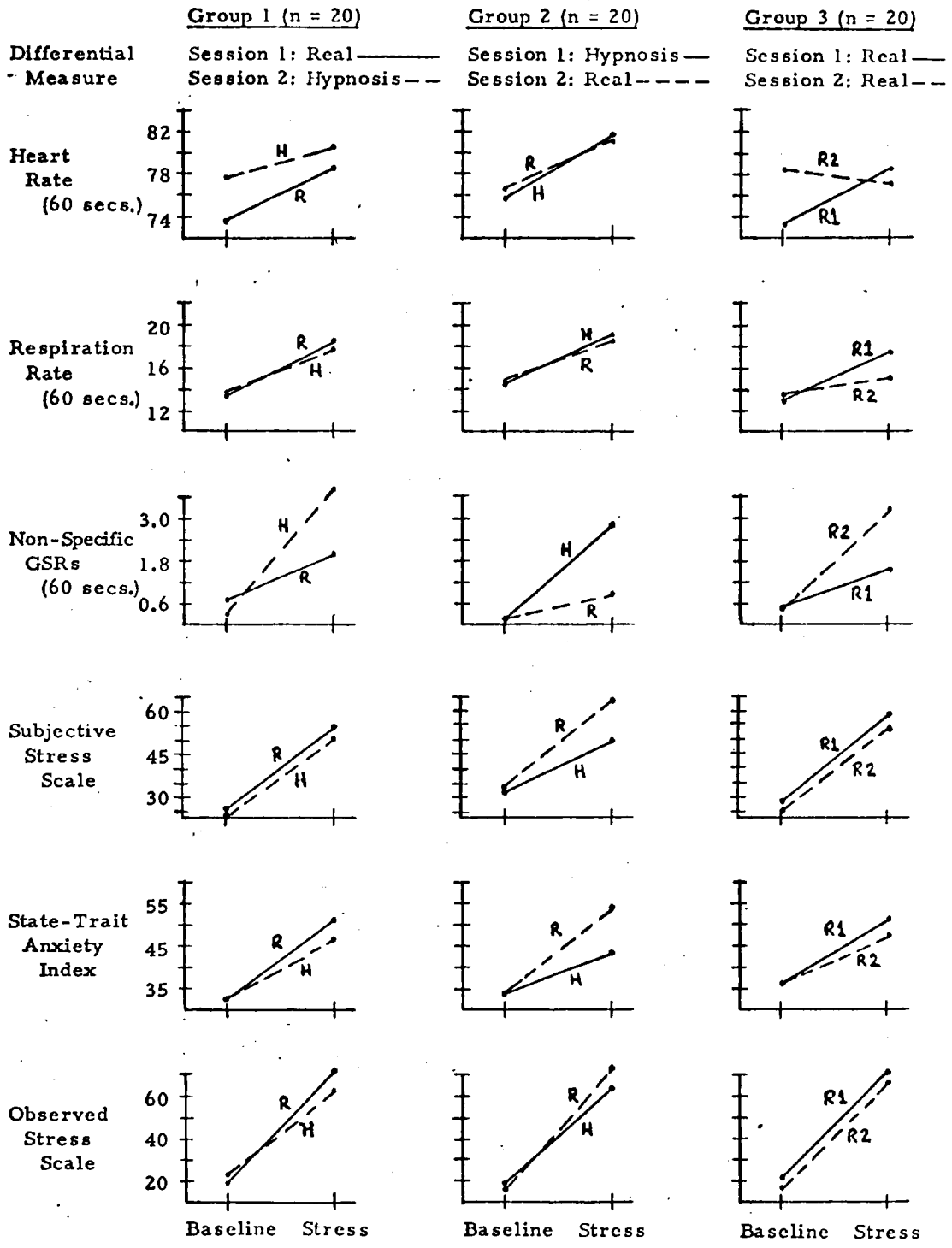

Figure 25. Summary Chart of Six Experimental Measures

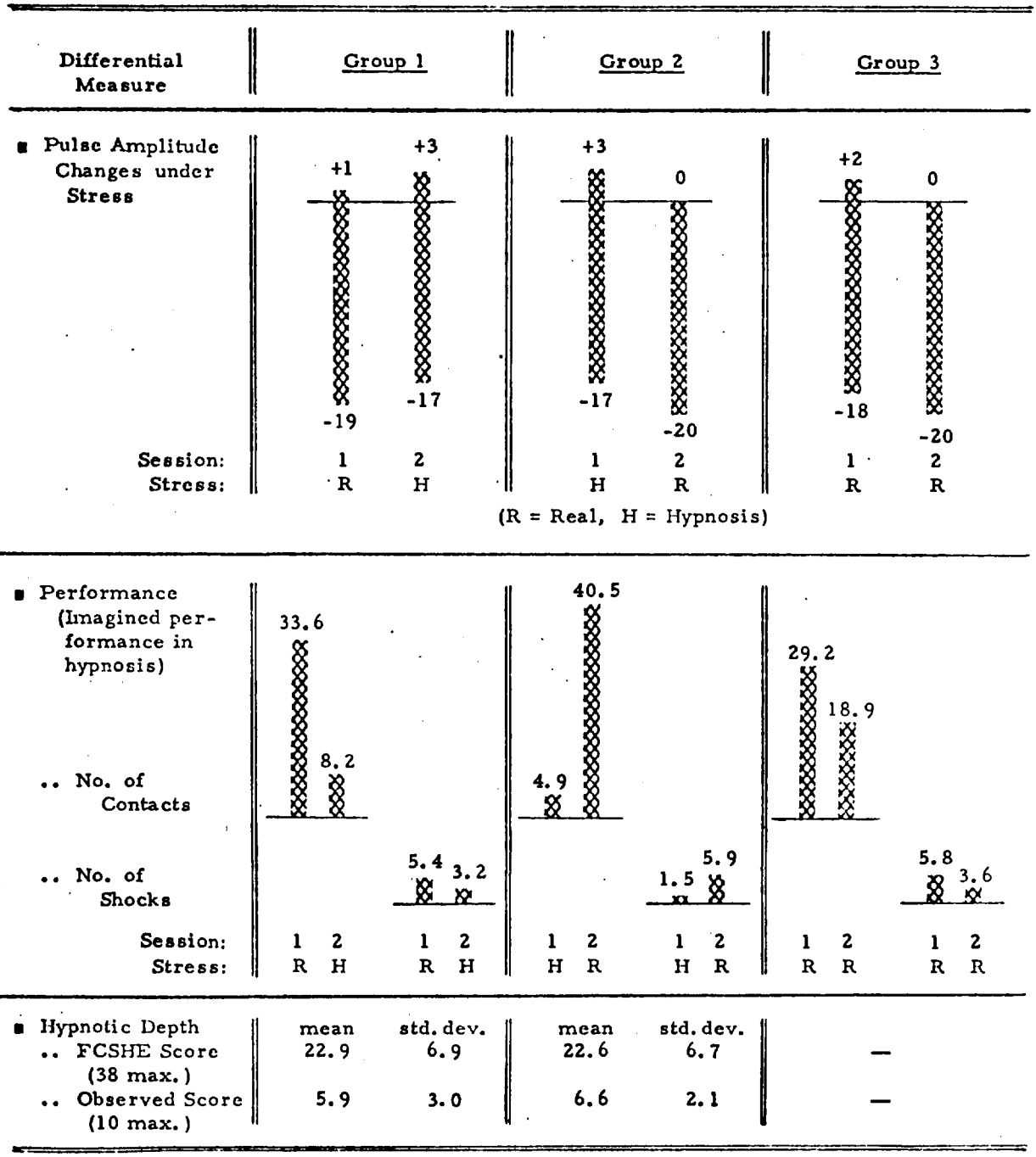

Figure 26. Summary Chart of Five Experimental Measures

To compare baseline measures with stress measures within each session, a paired data t-test is run on each of the 36 curves in Figure 25. The results, seen in Table XII, reveal in general that the arousal level is significantly higher during the stress treatment than during baseline, especially for the three subjective measures where 17 out of 18 differences are significant below the .001 level. On the other hand, the physiological measures do not show such consistent significances of difference, especially in heart rate where no Session 2 change is significant for any group. Although it is important to establish the fact that arousal levels change within sessions (i.e., in going from baseline to stress), it is equally important, for the purposes of this study, to determine how closely those changes resemble each other from one session to the other, and from one group to another.

Changes from baseline to stress measures are next compared between sessions. The change measure is equal to the stress measure minus the baseline measure. Changes are compared using analysis of variance, chi-square and t-tests for each group, by session, yielding the following results:

- Heart rate changes for all 3 groups combined are significantly different between Session 1 and Session 2 ($p < .05$). As seen in Table XIII this is due entirely to differences appearing in Group 3 ($p < .05$), with the other two groups showing no significant difference of heart rate changes (baseline to stress) between sessions.

- Pulse Amplitude changes are overwhelmingly in the negative direction when going from baseline to stress states, as seen in Table XIV. There are no significant effects due to group, session or type of treatment.

Table XII

Baseline to Stress Comparisons for Each Session and Group

t-value (d.f. = 19)

	Group 1		Group 2		Group 3	
	Session 1	Session 2	Session 1	Session 2	Session 1	Session 2
Heart Rate	-2.5*	-0.9	-3.6**	-1.9	-2.2*	0.6
Respiration Rate	-5.0***	-4.2***	-5.5***	-5.0***	-4.6***	-1.2
Non-Specific GSR's	-2.2*	-4.1***	-4.0***	-2.0	-2.3*	-3.6**
Subjective Stress Scale	-6.0***	-4.1***	-2.9**	-6.7***	-4.3***	-4.2***
State-Trait Anxiety Index	-8.5***	-4.0***	-2.9**	-10.3***	-8.4***	-4.7***
Observed Stress Scale	-12.5***	-9.2***	-11.9***	-19.9***	-12.3***	-13.3***

* $p < .05$

** $p < .01$

*** $p < .001$

Table XIII

Heart Rate Change By Sessions and Groups

Group	Mean Change (pulses/min.)				t
	Session 1		Session 2		
	M	SD	M	SD	
1	4.7	8.4	2.5	12.4	0.68
2	6.1	7.6	4.6	10.8	0.59
3	5.0	10.2	-1.2	8.3	2.55*
All	5.2	8.7	2.0	10.7	2.07*
F	0.15		1.52		

*$p < .05$

Table XIV

Pulse Amplitude Change By Sessions and Groups

Group	Number of Subjects Showing Indicated Direction of Change Under Stress #			
	Session 1		Session 2	
	-	+	-	+
1	19	1	17	3
2	17	3	20	0
3	18	2	20	0
All	54	6	57	3

Negative change means a reduction of pulse amplitude under stress. Positive change means amplitude increase in going from base-line to stress treatment.

No subject produced a positive change in <u>both</u> sessions. The 9 cases of positive change in the 120 subject sessions were produced by 9 different subjects.

- Respiration rate changes for the 3 groups show the same significant effects as heart rate, according to Table XV. That is, the significant difference between Sessions 1 and 2 for combined groups can be attributed solely to the significant difference appearing in Group 3 ($p < .05$).

- GSR changes are seen in Table XVI to be considerably different between sessions for each group. Differences are most significant in Group 2 ($p < .01$) and next most significant (and in the opposite direction) in Group 3 ($p < .05$). The Group 1 difference in non-specific GSR, while not significant according to the .05 level criterion, approaches that level ($p < .063$). The hypnosis sessions show larger GSR changes than the real stress sessions for Groups 1 and 2.

- Subjective Stress level changes, seen in Table XVII, differ significantly between sessions only in Group 2 ($p < .05$). The hypnosis sessions show smaller changes in stress level.

- State Anxiety level changes, seen in Table XVIII, are significantly different between sessions for Group 2 ($p < .01$) and Group 3 ($p < .05$). The Group 1 difference, as in the GSR, approaches significance ($p < .076$). The hypnosis sessions show smaller changes than real stress sessions.

- Observed Stress level changes, seen in Table XIX, are significantly different between sessions for Group 1 ($p < .05$) and Group 2 ($p < .01$). The smaller changes are observed in the hypnosis sessions for each group. The smaller change under hypnosis in Group 1 accounts for the significant difference between groups in Session 2 ($p < .05$).

Table XV

Respiration Rate Change By Sessions and Groups

Group	Mean Change (respirations/min.)				t
	Session 1		Session 2		
	M	SD	M	SD	
1	5.0	4.5	4.1	4.4	0.68
2	4.8	3.9	4.1	3.6	0.77
3	4.6	4.5	1.5	5.7	2.59*
All	4.8	4.2	3.2	4.7	2.33*
F	0.04		2.07		

*$p < .05$

Table XVI

GSR Change By Sessions and Groups

Group	Mean Change (nonspecific GSRs/min.)				t
	Session 1		Session 2		
	M	SD	M	SD	
1	1.4	2.8	3.5	3.8	-1.97
2	2.6	2.9	0.7	1.6	2.84**
3	1.0	1.9	2.8	3.4	-2.60*
All	1.7	2.6	2.3	3.3	-1.26
F	2.13		4.43#		

#F test not valid due to non-homogeneity of data

**$p < .01$

*$p < .05$

Table XVII

Subjective Stress Change By Sessions and Groups

Group	Mean Change (SSS score)				t
	Session 1		Session 2		
	M	SD	M	SD	
1	29.5	22.1	27.9	30.6	0.23
2	19.1	29.6	32.0	21.4	-2.42*
3	30.1	31.3	29.2	31.2	0.11
All	26.2	28.0	29.7	27.6	-0.89
F	0.98		0.11		

*$p < .05$

Table XVIII

State Anxiety Change By Sessions and Groups

Group	Mean Change (STAI score)				t
	Session 1		Session 2		
	M	SD	M	SD	
1	18.2	9.6	13.5	15.0	1.88
2	9.9	15.2	20.6	9.0	-3.57**
3	15.4	8.2	11.6	11.0	2.09*
All	14.5	11.8	15.2	12.4	-0.43
F	2.76#		3.19#		

** $p < .01$

* $p < .05$

F test not valid due to non-homogeneity of data

Table XIX

Observed Stress Change By Sessions and Groups

Group	Mean Change (OSS score)				t
	Session 1		Session 2		
	M	SD	M	SD	
1	51.4	18.3	39.5	19.1	2.21*
2	43.5	16.4	55.5	12.5	-3.24**
3	49.7	18.0	49.7	16.7	-0.01
All	48.2	17.6	48.2	17.4	-0.01
F	1.13		4.92*		

*$p < .05$

**$p < .01$

In terms of groups and treatments, the above results can be summarized as follows on the basis of significant differential effects in heart rate, pulse amplitude, respiration rate, non-specific GSRs, subjective stress level, state anxiety and observed stress level:

- For Group 1, only the change in observed stress level (OSS scores) is significantly different between treatments (sessions). The change is smaller when hypnosis is used.

- For Group 2, changes in all three subjective measures are significantly different between treatments, as is the change in the GSR measure. The changes in subjective measures are smaller with hypnosis, while the GSR change is greater.

- For Group 3, the changes in all three physiological measures are significantly different between the two real treatment sessions, as is the change in the state anxiety measure. Except for GSR, those significant effects are due to smaller response changes in Session 2.

- Comparing treatments (real and hypnotically-induced stress), the physiological changes are of the same or greater magnitude under hypnotically-induced stress while the subjective reports depict less aroused change than those same measures for the real stress conditions.

Inter-session comparisons between different groups are examined next to help evaluate the significant effects of reversed order for the same treatment. The particular comparisons described now are those shown by the three arrows (A, B, C) in Figure 27. Baseline-to-stress changes for one group are tested against the same changes for the other group. The measures evaluated in these cross-comparisons are those summarized in Figure 25: heart rate, respiration rate, non-specific GSRs, subjective stress level, state anxiety and observed stress level.

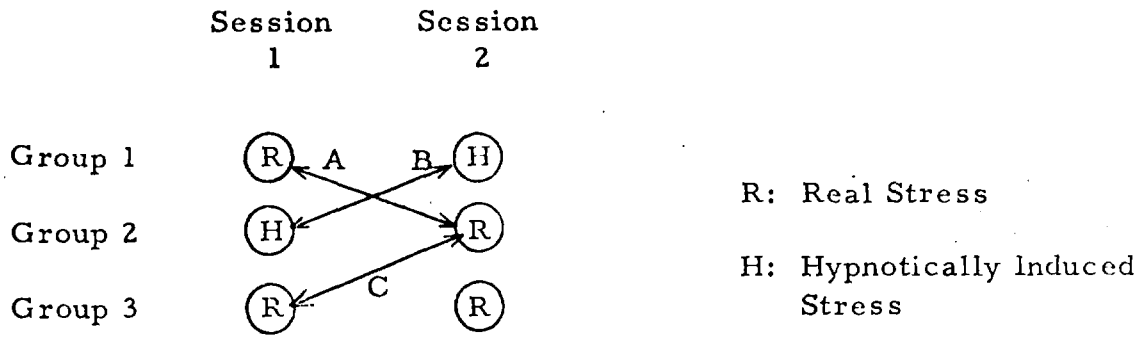

Figure 27. Pattern of Inter-Session Comparisons Between Different Groups

Comparison pattern "A" is examined first in Table XX. For the five measures in which the F test is valid, no significant differences are seen between arousal changes in the real stress sessions of Groups 1 and 2. The GSR change, not subject to the F test, appears to be somewhat smaller in Group 2 data than in Group 1.

Comparison pattern "B", seen in Table XXI, shows no significant differences between five of the six arousal changes in the two hypnotically-induced stress sessions of Groups 1 and 2. The heart rate change under hypnosis, not subject to the F test, appears to be larger in Group 2's first session than in Group 1's second session.

Comparison pattern "C", summarized in Table XXII, indicates no significant differences between the arousal changes in the first real stress sessions for Groups 2 and 3. However, it should be noted that the three subjective measures (SSS, STAI, and OSS) are marginally not significant. That is, the F ratio probability for State Anxiety Level (3.74) is about .058, or just above the .05 criterion, while the other two data sets are just marginally homogeneous in their variances, both falling just above the .05 criterion.

In summary, the comparisons depicted by patterns A, B and C in Figure 27, reveal basic similarity of arousal change in 5 out of 6 measures in the first two cases ("A" and "B") and 6 out of 6 measures in the last case ("C"). The GSR data in Table XX (pattern "A") and the heart rate data in Table XXI (pattern "B") are non-homogeneous and are not subject to F tests. In fact, the variances exhibited on these two measures appear to be of substantially different character for each group.

The intercorrelations of the six measures shown in Figure 25 are found in Appendix F. The results show few significant intercorrelations between the physiological measures.

Table XX

Arousal Change in Groups 1 and 2 under Real Stress

(Comparison Pattern "A" from Figure 27)

Measured Change	Group 1 (Session 1)		Group 2 (Session 2)		F*
	M	SD	M	SD	
Heart Rate (pulses/min.)	4.7	8.4	4.6	10.8	0.00
Respiration Rate (respirations/min.)	5.0	4.5	4.1	3.6	0.52
Non-specific GSRs (number/min.)	1.4	2.8	0.7	1.6	0.82#
Subjective Stress Level	29.5	22.1	32.0	21.4	0.13
State Anxiety Level	18.2	9.6	20.6	9.0	0.66
Observed Stress Level	51.4	18.3	55.5	12.5	0.67

*No significant F ratios

#F test not valid due to non-homogeneity of data

Table XXI

Arousal Change in Groups 1 and 2 under Hypnotically Induced Stress

(Comparison Pattern "B" from Figure 27)

Measured Change	Group 1 (Session 2)		Group 2 (Session 1)		F*
	M	SD	M	SD	
Heart Rate (pulses/min.)	2.5	12.4	6.1	7.6	1.26#
Respiration Rate (respirations/min.)	4.1	4.4	4.8	3.9	0.30
Non-specific GSRs (number/min.)	3.5	3.8	2.6	2.9	0.71
Subjective Stress Level	27.9	30.6	19.1	29.6	0.87
State Anxiety Level	13.5	15.0	9.9	15.2	0.57
Observed Stress Level	39.5	19.1	43.5	16.3	0.51

*No significant F ratios

#F test not valid due to non-homogeneity of data

Table XXII

Arousal Change in Groups 2 and 3 under Real Stress

(Comparison Pattern "C" from Figure 27)

Measured Change	Group 2 (Session 2)		Group 3 (Session 1)		F*
	M	SD	M	SD	
Heart Rate (pulses/min.)	4.6	10.8	5.0	10.2	0.01
Respiration Rate (respirations/min.)	4.1	3.6	4.6	4.5	0.16
Non-specific GSRs (number/min.)	0.7	1.6	1.0	1.9	0.29
Subjective Stress Level	32.0	21.4	30.1	31.3	0.05
State Anxiety Level	20.6	9.0	15.4	8.2	3.74
Observed Stress Level	55.5	12.5	49.7	18.0	1.41

*No significant F ratios

The Combined Groups intercorrelation matrix shows that all four baseline and stress measures of heart rate made in the two experimental sessions are very highly correlated with one another ($p < .001$). The same holds true for all four respiration measures. Except for the correlation between baseline GSR measures in the two sessions ($p < .05$), poor correlations are seen between GSR measures in general. Subjective stress (SSS) scores for the combined groups show high correlations for the two baseline measures ($p < .001$) and for the two stress measures ($p < .01$). All state anxiety (STAI) scores are also highly correlated, with the two scores under stress showing the highest correlation ($p < .001$). No significant correlations are seen for the observed stress (OSS) scores for the combined group, or even for any one group by itself.

Correlations between different kinds of measures for the combined groups, show that heart rate correlates sporadically with some of the other variables, primarily with respiration and observed stress level. Respiration measures show strong correlations ($p < .05$; $p < .01$) with baseline GSR measures, but with nothing else. SSS and STAI measures correlate consistently, especially under stress ($p < .001$), and each shows a strong correlation with Observed Stress in the stress treatment for Session 2 ($p < .001$).

The Group 1 intercorrelation matrix shows that all four baseline and stress measures of heart rate made in the two experimental sessions are very highly correlated with one another, (5 @ $p < .001$, 1 @ $p < .01$). This holds true but somewhat less strongly for all four respiration measures. No correlations are seen between any pair of GSR measures. SSS scores for Group 1 show some correlation for the two baseline

measures ($p < .01$) and for the two stress measures ($p < .05$). All STAI scores are also highly correlated, with the two scores under stress showing the highest correlation ($p < .001$). No significant correlations are seen for the observed stress scores for Group 1.

Correlations between different kinds of measures for Group 1 show that heart rate correlates sporadically with some of the other variables, primarily with observed stress level (6 @ $p < .05$; 1 @ $p < .001$). Respiration measures show a minimum of intercorrelations, those being with heart rate, STAI, and observed stress, but they are few and not very revealing. SSS and STAI measures correlate consistently, especially under stress ($p < .001$), and each shows a strong correlation with Observed Stress in the stress treatment for Session 2($p < .01$).

The Group 2 intercorrelation matrix shows that all four baseline and stress measures of heart rate made in the two experimental sessions are very highly correlated with one another (1 @ $p < .001$; 1 @ $p < .01$; 3 @ $p < .05$). The same holds true, but even more strongly, for all four respiration measures (2 @ $p < .001$; 2 @ $p < .01$; 1 @ $p < .05$). No correlations are seen between any pair of GSR measures. SSS scores for Group 2 show high correlations for the two baseline measures ($p < .001$) and for the two stress measures ($p < .01$). STAI scores show one significant correlation, between baseline and the Session 2 stress measure ($p < .01$). No significant correlations are seen for the observed stress scores for Group 1.

Correlations between different kinds of measures for Group 2 show that heart rate and respiration rate each correlate very sporadically with some of the other variables, primarily with SSS and STAI,

in baseline measures ($p < .05$). SSS and STAI measures correlate consistently, especially under stress ($p < .001$; $p < .05$). STAI also shows correlation with Observed Stress as in the stress treatment of Session 2 ($p < .05$).

The Group 3 intercorrelation matrix shows that all four baseline and stress measures of heart rate made in the two experimental sessions are very highly correlated with one another (3 @ $p < .001$; 1 @ $p < .01$; 2 @ $p < .05$). The same holds true for all four respiration measures. Except for the high correlation between baseline GSR measures in the two sessions ($p < .001$), and a smaller correlation between the stress treatments of those two sessions ($p < .05$), no other correlations are seen between GSR measures. SSS scores for Group 3 show high correlations within Session 1 ($p < .01$) and for the two stress measures ($p < .01$). STAI scores show one significant correlation, between the two scores under stress ($p < .01$). No significant correlations are seen for the observed stress scores for Group 3.

Correlations between different kinds of measures for Group 3 show very few heart rate intercorrelations, those being with SSS and OSS, though not suggestive of important relationships. Respiration measures show strong correlations with baseline GSR measures (2 @ $p < .001$; 2 @ $p < .01$; 1 @ $p < .05$), but with nothing else. SSS and STAI measures correlate, especially in the second session under stress ($p < .001$), and each shows a strong correlation with Observed Stress in the stress treatment for Session 2 ($p < .001$).

4. Law of Initial Value (LIV) Applicability

Statistical analysis of the absolute subject scores already indicates substantial support for the hypotheses of this experiment. However, it is important to recognize that some available and valuable

information about individual differences in initial (baseline) states has not yet been fully considered. Specifically, comparisons of reactivity may need to account for the fact that the momentary change in a given stress measure is related to the momentary level existing at the time of stimulation. If such is the case, one may convert the relevant measures to the Autonomic Lability Scale (ALS) for further testing and interpretation (Lacey, 1956).

Wilder's (1957) Law of Initial Value states that the true response of a variable to a stimulus decreases as the true pre-stimulus level increases. That is, the change under stress has a negative correlation with the initial or baseline level. If such significant negative correlations are found in the experimental data, one can assume applicability of the LIV.

Table XXIII shows the product-moment correlation coefficients for baseline measures with their corresponding changes under stress. Correlations are shown for each group separately and for all groups together. A review of Table XXIII for All Groups shows that five of the six measures have significant negative correlations between baseline and difference scores, indicating that, at least, for those five the Law of Initial Value is operative. One can thereby conclude that some correction can be made to those five measures in order to obtain new and appropriate comparisons of groups. Heart rate is the one measure which does not clearly indicate that the Law of Initial Value is operative. Specifically, across all groups in Session 1 and all groups in Session 2, there is no significant negative correlation. However, for Group 3 in Session 2 the result is quite different; a highly significant negative correlation is found ($p < .001$). On the one hand this correlation

Table XXIII

Correlation Coefficients for LIV Assessment

(Computed for Baseline Level vs.
Difference Between Stress and Baseline Levels)

Measure	Session	Correlation Coefficient			
		Group 1	Group 2	Group 3	All Groups
Heart Rate	1	.22	-.24	-.09	.00
	2	-.19	.40*	-.67***	-.20
Respiration Rate	1	-.15	-.39*	-.33	-.28*
	2	-.77***	-.41*	-.49*	-.52***
Non-specific GSRs	1	-.51*	-.25	-.36	-.41***
	2	-.47*	-.21	-.14	-.19
Subjective Stress (SSS)	1	-.52**	-.55**	-.90***	-.68***
	2	-.52**	-.82***	-.75***	-.64***
State Anxiety (STAI)	1	-.17	-.50*	-.49*	-.41***
	2	-.20	-.45*	-.47*	-.33**
Observed Stress (OSS)	1	-.75***	-.84***	-.96***	-.83***
	2	-.76***	-.84***	-.67***	-.74***

* $p < .05$
** $p < .01$
*** $p < .001$

could be a chance occurence, given that so many correlations were run. Such is probably the case for Group 2 in Session 2 where a value of .40 ($p < .05$) was obtained. For Group 3, though, the significance level is much greater and the finding concurs with earlier findings, especially on the physiological measures, which suggest that Group 3, Session 2 was quite unlike any other group in any condition. Its uniqueness may rest on the fact that Group 3 was the only one to receive the real stress in both sessions, and may have tended to adapt in some way.

Since nothing is lost by correcting for LIV, and Group 3 in Session 2 did have a significant negative correlation in heart rate, corrections are applied to all the heart rate scores in addition to every other measure. Consequently, further tests between groups and treatments are made next on the basis of Lacey's (1956) ALS score for each measure.

5. Autonomic Lability Score (ALS) Analyses

Each of the six measures summarized in Figure 25 is converted to an Autonomic Lability Score (ALS) using the following equation proposed by Lacey (1956, p. 139):

$$ALS = 50 + 10 \left[\frac{y_z - x_z r_{xy}}{(1-r^2_{xy})^{\frac{1}{2}}} \right] \quad , \text{ where } x_z$$

and y_z are the individual's baseline and stress levels, respectively, expressed as standard scores, r_{xy} is the correlation for the sample group between baseline and stress levels, and the constants 10 and 50 translate the resulting scores to a distribution with a mean of 50 and a standard deviation of 10. The values of x_z and y_z are calculated using the means and standard deviations across all subjects for each

session (i.e., 60 subjects for Session 1 and 60 subjects for Session 2). The correlation coefficient r_{xy} is calculated across all Session 1 data and again across all Session 2 data. The correlation coefficients are found in Appendix F for all six measures, by sessions. The ALS score for each measure of every individual subject removes the regression of level attained under stress on baseline level. These scores do not try to remove the regression of change in level on baseline because such an approach leads to complications and inaccuracies. The ALS scores for each subject, on six measures, for each of the two sessions, is found in Appendix G.

The interpretation of each ALS measure is made in terms of its expected value of 50. For example, consider an individual whose ALS for heart rate response to hypnotically-induced stress is 50. The meaning is that the change in heart rate reached during hypnotically-induced stress was exactly the mean level attained by all subjects in that session (hypnotic and real). If his response is 60, the meaning is that his heart rate change measured during stress was 1 standard deviation above the mean level attained by all subjects for that session. Canonical correlation is applied to the ALS scores to determine if stress levels achieved in Session 1 along each of the six measures are valid predictors of stress levels achieved in Session 2. The canonical correlation is the maximum correlation between linear functions of the two sets of measures (Session 1 measures vs. Session 2 measures). To determine that correlation, optimally weighted coefficients are first calculated for each measure.

The overall (N=60) canonical correlation is .60 ($p < .001$), indicating that such a prediction is possible. The canonical correlation is

applied, in the same manner, to each of the three individual groups. The canonical correlation for Group 1 is .98($p < .01$), for Group 2 it is .92 (not significant), and for Group 3 it is .96 ($p < .01$). These results show that Session 1 performance is most predictable of Session 2 performance for Group 1 -- that is, the group's arousal reactions to hypnotically-induced stress are clearly predictable from their earlier reactions to real stress. The least predictable Session 2 performance appears for Group 2 -- that is, the group's arousal reactions to real stress are not significantly predictable from their earlier reactions to hypnotically-induced stress. Somewhere in between lies Group 3, whose Session 2 reactions to real stress are significantly predictable from its earlier reactions to similar real stress.

Of further interest, besides the canonical correlations themselves, are the specific weights determined for each of the variables. These weights (coefficients)are seen in Table XXIV. It can be seen that the subjective measures in Session 1 (SSS, STAI) are the best predictors of overall stress level achieved by individual subjects in Session 2. Physiological responses in Session 1 are not as reliable in predicting subsequent physiological or subjective responses. Except for Group 1, Session 2, there is much similiarity in the rankings of weights for the individual stress measures determined separately for each of the three groups.

A Pearson product-moment correlation is run for each subject's six stress measures, expressed as ALS scores for Session 1 versus the same subject's six stress measures expressed as ALS scores for Session 2. This is done to check on the concept of response specificity, positive correlations indicating that rankings of the measures were consistent from Session 1 to Session 2. For example, a subject whose primary reactivity was exhibited in the same channel for both sessions would tend to show a positive correlation. Table XXV shows that positive correlations are

Table XXIV

Canonical Coefficients for Each Measure by Group and Session

Group	Session 1		Session 2	
	Measure	Canonical Coefficient	Measure	Canonical Coefficient
All	SSS	-1.37	SSS	-0.93
	STAI	1.07	STAI	0.74
	Resp. Rate	-0.31	Resp. Rate	-0.44
	OSS	-0.19	GSR	-0.31
	Heart Rate	0.15	Heart Rate	0.07
	GSR	-0.08	OSS	-0.01
1	STAI	1.46	Heart Rate	0.88
	SSS	-0.93	OSS	-0.67
	Resp. Rate	0.71	STAI	0.39
	OSS	-0.47	GSR	0.35
	Heart Rate	0.35	Resp. Rate	0.17
	GSR	0.25	SSS	-0.12
2	SSS	-1.34	SSS	-0.62
	STAI	0.64	STAI	0.43
	Heart Rate	0.45	Heart Rate	0.30
	Resp. Rate	-0.38	OSS	0.19
	GSR	-0.27	GSR	0.14
	OSS	-0.23	Resp. Rate	-0.08
3	STAI	1.06	STAI	1.12
	SSS	-0.78	SSS	-0.54
	Resp. Rate	-0.65	Heart Rate	-0.33
	Heart Rate	0.27	Resp. Rate	-0.32
	GSR	0.20	OSS	-0.19
	OSS	-0.19	GSR	-0.18

Table XXV

Correlation of ALS Scores for Each Subject

Group 1	Group 2	Group 3
+ .52	- .08	+ .46
- .70	+ .19	+ .22
- .43	+ .13	+ .67
- .78	+ .33	+ .53
+ .78	+ .24	- .02
+ .21	- .09	+ .25
+ .69	+ .52	+ .22
- .42	- .07	- .40
- .49	+ .15	+ .84
+ .22	+ .84	- .49
- .33	+ .64	+ .78
- .61	- .33	+ .29
- .09	+ .46	+ .05
+ .57	+ .36	+ .72
+ .07	+ .49	+ .61
+ .91	- .09	+ .04
+ .27	- .02	+ .63
+ .48	+ .65	+ .89
+ .35	- .71	+ .67
- .60	- .28	+ .89
No. positive: 11	12	17
No. negative: 9	8	3

Note: Subjects correspond to those listed in the Subject Group Assignments table, Appendix E, p. 2.

more common than negative correlations. This is particularly true for Group 3 and least true for Group 1. With regard to Group 1 this is somewhat contrary to the previously reported results that overall level of arousal remained consistent. These preliminary data indicate that while the Group 1 response tends to remain consistent between sessions, individual subject response specificity may be changing. This is only a preliminary indication of response specificity. Further investigation of specificity effects are necessary before any conclusive statement is made.

6. Additional Data and Analyses

To complete the evaluation of quantified reactions taking place in this study, several additional items are reviewed here.

The experience obtained in the recruitment of subjects and interactions with them can provide helpful guidelines for future studies. In particular, it can be useful to estimate how many initial responses of interest by potential subjects are needed if one wants to end up with a required number of final experimental subjects. It can also be useful to know approximately how many of those expressing interest may be lost by attrition at certain points along the way. Table XXVI reports the history of attrition for this experiment. About 42% of the candidate subjects dropped out by failing to return their completed questionnaires, and another 46% of those remaining failed to attend the group briefing and screening session. The screening session resulted in the disqualification of approximately 15% of those tested, on the basis of low-hypnotizability. About 22% of the qualified subjects dropped out when they were requested to attend their first experimental session. No one completing their first session failed to complete the second session. Three candidates were rejected on the basis of the medical examination preceding Session 1, since they were found to have cardiac disorders (recognizable on the electrocardiogram) of which they were unaware. With the consent of each candidate, a copy of his medical examination and electrocardiogram

Table XXVI

Ratio Analysis of Subject Recruitment

Status	N	Ratio of Total
Valid (Male) Inquiries	322	1.00
Questionnaires Returned	188	0.58
Screening Completed	102	0.31
Qualified After Screening	86	0.27
Final Subjects	60	0.19
Extra Subjects	5	0.02
Dropouts	18	0.06
Medical Rejects	3	0.01

record was forwarded with a letter of explanation to his physician for further action. There were five extra subjects run in the experiment, four of whom went through the entire final protocol, while one went through a variety of changing protocols during preliminary testing.

Because hypnotic susceptibility is a fundamental factor in this study, and it is known that the more hypnotizable individuals may differ in certain ways from those who are less hypnotizable, additional statistical evaluations involving hypnotizability are of interest. First, recognizing that volunteers for an experiment which is known to involve hypnosis tend to be the more hypnotizable people, the correlation is examined between hypnotizability (HGSHS score) and promptness of response to the solicitation of subjects (implied by the Candidate Number, assigned sequentially as inquiries were received). A significant negative correlation might support the notion that more hypnotizable people are also more prone to volunteering as subjects. The correlation between HGSHS score and Candidate Number is -0.19 ($p < .08$), and does not fall within the .05 criterion of significance set for this study. However, the real level of correlation may be obscured by the fact that the actual time when each candidate learned of this study is unknown, especially since solicitations were periodic, being made at different times at various locations over a period of several months. A stronger correlation may actually exist and could be examined in other studies with deliberate plans for obtaining less confounded data.

Handedness in relation to hypnotizability is another issue of interest, and for which data is contained in this study. This issue relates

back to the fact that hypnotizability has been found to correlate strongly with the degree of a person's imaginitive involvement. Furthermore, imaginative involvement relates to creative, artistic and emotional functions, which have been linked mainly to the right lobe of the brain, while the left lobe deals more with logical, mathematical and similar cognitive functions. Studies of brain function laterality and right or left lobe dominance suggest that the more hypnotizable people are those whose right brain lobe is dominant--the same people who are likely to be left-handed (Bakan, 1970, 1971).

Keeping in mind that low hypnotizable people were screened out of this study, one can look for an effect here only among the more hypnotizable half of the population. Consequently, the expectation of greater hypnotic susceptibility among the 13 left-handed subjects of this study must be smaller than if the entire population were being sampled. Table XXVII shows the division of left- and right-handed subjects in terms of their hypnotizability scores during the group screening and during the experimental session in which hypnosis is used. Regardless of the hypnotizability measure examined, no significant differences are found between right- and left-handed subjects. It is of interest to note, however, that there were 13 left-handed individuals in the overall group of 60, or about 22%. According to the 1972 Encyclopedia Americana (Vol. 17, p. 163), estimates of the number of left handers range from a low of 2% of the world's population to a high of 30%, but the most widely accepted estimate is 8-10%. The 22% overall figure of this study suggests that a more general survey may demonstrate support for the notion that the more hypnotizible people tend to be left-handed.

Table XXVII

Hypnotizability and Handedness

	Measure	Handedness	No. of Subjects	Mean Score	Standard Deviation	F* Ratio
Group Screening: Gps. 1, 2, 3 (n = 60)	HGSHS	R	47	8.74	1.67	2.43
		L	13	9.62	2.14	
	FCSHE	R	47	25.30	7.00	0.48
		L	13	26.77	5.76	
Experimental Session: Gps. 1, 2 (n = 40)	FCSHE	R	32	22.72	7.10	0.00
		L	8	22.63	5.21	
	OHD	R	32	6.13	2.49	0.14
		L	8	6.50	2.93	

*no significant differences found

HGSHS: Harvard Group Scale of Hypnotic Susceptibility (Max. Score = 12)

FCSHE: Field's Checklist Inventory of Subjective Hypnotic Experiences (Max. Score = 38)

OHD: Observed Hypnotic Depth (Max. Score = 10)

The levels of hypnosis achieved by the groups in this study are shown in Table XXVIII. No significant differences are found between any of the groups, or between the group screening session and the experimental session. In other words, all three subject groups are equally hypnotizable and achieve equal depths of hypnosis throughout this study.

For the real stress treatment, several performance-related measures are of interest: the hole used in the hole-steadiness-test (h-s-t), performance on the h-s-t, electric shock intensity, and the number of shocks received during the h-s-t. First, an examination of the test holes used by subjects yields the data shown in Table XXIX No significant difference is found between the holes used by each group, or between the holes used by Group 3 in its two sessions. Performance on the real h-s-t and its equivalent imaginary version in hypnosis is reported in Table XXX. A number of significant differences are found within and between groups. The most apparent difference shows up between automatically recorded contacts during the real stress treatment (R) and the subjects verbally reported "contacts" during the hypnotically-induced treatment (H). In examining the data used in the t-tests for Groups 1 and 2 on Table XXX it is obvious that the assumption of homogeneity of data is not met. However, the t-test is robust and the differences between sessions are sizable for the two groups. It can be assumed that a real difference exists, although the probability level may be suspect. F-tests between groups on Table XXX show no significant difference between scores in the first real stress sessions for the three groups (i.e. Group 1/Session 1; Group 2/Session 2; Group 3/Session 1). A significant difference is found between the Session 2 data of Groups 2 and 3 ($p < .001$), although here, too, non-homogeneity of the data prevails.

Table XXVIII

Hypnosis Levels Achieved

	Measure	Maximum Possible Score	Mean Scores *							
			Group 1		Group 2		Group 3		Combined Gps.	
			M	SD	M	SD	M	SD	M	SD
Group Screening	HGSHS	12	9.00	1.84	8.90	1.83	8.90	1.83	8.93	1.80
	FCSHE	38	24.10	7.30	24.35	7.43	28.40	4.50	25.62	6.74
Hypnotic Experimental Session	FCSHE	38	22.85	6.88	22.55	6.70			22.70	6.70
	OHD	10	5.85	2.96	6.55	2.06			6.20	2.54

* no significant differences found between groups (F-test), or between the two FCSHE measures (paired t-test)

HGSHS: Harvard Group Scale of Hypnotic Susceptibility

FCSHE: Field's Checklist of Subjective Hypnotic Experiences

OHD: Observed Hypnotic Depth

Table XXIX

Hole Size Used For Steadiness Test

Group	Mean Hole No. Used		Statistic
	M	SD	
1	6.0	0.8	F 2.65 (n.s.)
2	6.5	1.1	
3 (1)	6.2	0.5	t 0.37 (n.s.)
3 (2)	6.1	0.6	

Hole No.	Hole Diameter (in.)	
	Decimal	Fraction
1	0.500	1/2
2	0.312	5/16
3	0.250	1/4
4	0.187	3/16
5	0.156	5/32
6	0.125	1/8
7	0.109	7/64
8	0.093	3/32
9	0.078	5/64

Stylus Diameter: 0.060 in.
approx. 1/16 in.

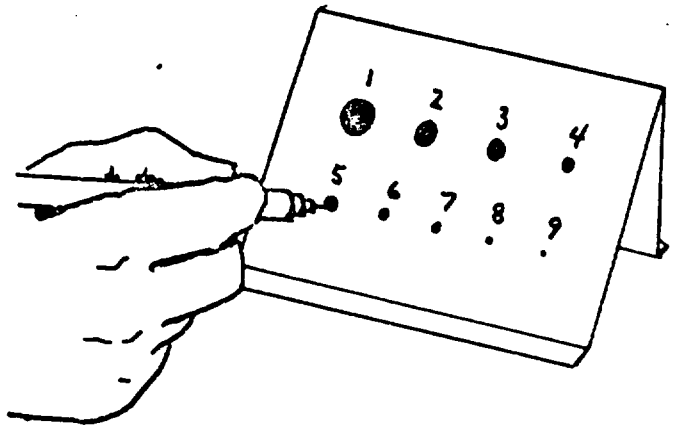

Table XXX

Performance On Hole Steadiness Test

Group	Session	No. of "Contacts" in 60 secs.		t
		M	SD	
1	1(R)	33.60	30.34	$4.15^{**\#}$
	2(H)	8.20	7.05	
2	1(H)	4.85	5.97	$-3.25^{**\#}$
	2(R)	40.50	47.92	
3	1(2)	29.15	21.48	1.96
	2(R)	18.90	18.62	

$^{**}p < .01$

$^{\#}$non-homogeneous data; see text.

The data defining the electric shock level received by each group are shown in Table XXXI. Both the electrical resistance through the electrode contact and the intensity of stimulus current are indicated. The contact resistance was adjusted for each subject to be around 5 thousand (K) ohms, with large deviations ($>$1 or 2 K ohms) permitted only in the higher direction. No significant difference is found between groups or between the two real stress sessions for Group 3. Next, the comparison of shock level settings for the three groups is made. Calibration curves in Figure 14 are used to obtain the actual stimulus current from the stimulator level setting. No significant differences are found between the intensity settings used with Groups 1 and 2 or between the settings used in the two sessions of Group 3. The distribution of Group 3 shock level data is not homogeneous with the distributions of Groups 1 or 2 data, but the mean settings still appear to have no significant differences. The number of shocks received during the 60-second data collection period of the real stress sessions are shown in Table XXXII. Significant differences are found between the two sessions of each group, while the first real sessions for all groups are similar. A comparison of the two real stress treatments given in Session 2 (for Groups 2 and 3) shows a significant difference ($p < .01$), suggesting along with the other findings that some influential change in the direction of adaptation occurred in Group 3 between Sessions 1 and 2. This is supported by data showing a similar reduction in the mean number of contacts for Group 3 (Table XXX).

Finally, the Subjective Stress Scale is reviewed for the purpose of comparing subjects and stress conditions in this study with those of

Table XXXI

Mean Contact Resistance and Intensity Setting for Shock

	Group 1		Group 2		Group 3			
					Session 1		Session 2	
	M	SD	M	SD	M	SD	M	SD
Mean Resistance (K ohms)	5.75	1.27	5.62	0.94	5.88	1.14	5.84	0.83
Mean Shock Level Setting (ma.)	8.01	4.01	6.69	3.93	6.10	1.86	6.26	1.91

Table XXXII

Shocks During Hole Steadiness Test

Group	Session	No. of "Shocks" in 60 Seconds		t
		M	SD	
1	1(R)	5.40	3.22	3.07**
	2(H)	3.15	3.08	
2	1(H)	1.45	2.74	−5.16***
	2(R)	5.90	2.65	
3	1(R)	5.75	2.79	2.97**
	2(R)	3.60	2.46	

** $p < .01$

*** $p < .001$

Berkun, Bialek, Kern and Yagi (1962). Table XXXIII shows that subjects in this study reported relatively lower scores under both baseline and stressed conditions, although the differential changes under stress come closer to resembling the lower range of scores reported by Berkun, et al. for Army personnel in HumRRO's Research Task FIGHTER. As seen previously, the mean hypnotically-induced stress level was lower in absolute value and in its differential above baseline using the Subjective Stress measure.

Table XXXIII

Comparison of Mean SSS Scores With

Those Obtained by Berkun, et al. (1962)

	Berkun, et al. (1962)	Present Study		
		Total	Real Stress	Hypnotic Stress
(Untreated)	32	27.4	28.0	26.2
Stressed	60-75	55.4	58.2	49.7
Difference Between Means	28-43	28.0	30.2	23.5

C. Anecdotal Reports

At the end of each session, after all equipment was returned to a standby condition and all electrodes and transducers were removed from the subject, approximately 5 or 10 minutes were devoted to letting the subject talk about what he experienced, in his own words. The experimenter wrote those comments down, usually in an abbreviated or brief form, producing a "modified verbatim" record of the subjects remarks. The unstructured interview typically began with the experimenter asking: "Would you tell me what your experience was like?" The subject was then permitted to speak about any part of the experience at all, usually without interruption. After he appeared to have no more to say, he was asked any of several typical questions to elicit further descriptions of his reactions. Those questions resembled the following:

- "How about the shock?"
- "How about holding the stylus steady?"
- "Were you aware of anything happening to your body?"
- "Were you aware of your breathing?"
- "Were you aware of any shaking or sweating?"
- "Which word would describe it best?"
- "Did you develop any strategy to help you along?"
- "How vivid was the hypnotic experience?"
- "Did you experience pain?"
- "Did you report all the times in hypnosis when you experienced a shock (or the stylus touching the sides of the hole)?"
- "How did today's experience compare with last time's?"

Often, at the end of the second session's interview, subjects whose treatments included hypnosis were asked:

implications of a stress state. Those reactions do depict a valid stressful state, but they may be at considerable variance in some ways with how that person would react to the real situation. With many possibilities available and few guidelines about expected results, the individual is left to his own expectations, fantasies, fears, and naivete' to create the experience for himself. The resulting distortion is probably most pronounced in task performance and in feeling an unfamiliar effect or condition (like electric shock in this study). Distortion is probably least pronounced in the resulting subjective emotional state. In between, the physiological reactions may show a fair resemblance to responses in the real stress situation.

The hypnosis experience could have different qualities than those described for this study by changing the protocol used with the subjects. For example, suggestions could center on the stress of oppressive heat and humidity, of sleeplessness and exhaustion, of impaired perception, or of warfare. The task of the subject could vary, by requiring more active involvement, perhaps with eyes open and handling actual objects under the imagined conditions. Two or more interacting subjects could be involved in the session, and other emotional states could be induced. The emotional states could be based on actual events in the subjects' lives or on new events. Any of those changes in the experimental procedures could cause marked changes in the data. Indeed, if more intense or elaborate circumstances are suggested, or if the suggestions are repeated more frequently (as during the 3 minute task performance period), some effect on responses would not be surprising. At first, perhaps significant effects may be noted and a plateau may eventually be reached. However, if the suggestions become excessive or confusing one could speculate that a reduction of effect might even occur. The magnitudes of the differences due to varying suggestions on specific individuals or groups are hard to estimate without actually trying them out.

in similar future studies. The use of Autonomic Lability Scores provides one way of correcting for abnormally high subject starting levels in the supposed baseline state. The importance of subjective self reports is also confirmed by this study, where the SSS and STAI measures emerge as most reliable and predictive of future subject responses to stress. Other results support the notion of specificity in the group response patterns across various measures; that is, each group tends to react consistently between sessions, showing similar relative intensities in the same specific physiological and psychological channels. No significant support is evident in these results for using handedness as a predictor of high hypnotizability, but then the use of only high hypnotizable subjects in this study does not provide the best framework to isolate that factor.

With regard to Hypothesis 1 of this study, realistic reactions can be produced in response to suggestions of a stressful situation that was actually experienced before. Some of those reactions can be more like the person's original reactions to the situation than if the actual situation is repeated. That is, in some ways the individual may continue to respond as a naive subject in the "repeated" situation. The present study indicates that naiveté is preserved through the reduction (or possible absence) of adaptation effects and through the subjective emotional experience. Physiological reactions also appear to closely resemble both those in the original and in the subsequent experience. Performance carried out in the person's imagination, on the other hand, can be quite unlike the real performance--especially because the subject may tend to inhibit actions which he imagines to threaten his safety or well-being.

With regard to Hypothesis 2, reactions to suggestions of a stressful situation never before experienced in reality can be pronounced in their

imagined version of the h-s-t ($p < .01$). The anecdotal reports suggest that, while almost all subjects in those two groups readily experience the h-s-t in hypnosis, they do not produce (Group 2) or reproduce (Group 1) the equivalent real levels of contacts, electric shock or pain experiences. Some subjects report that they experienced, but failed to announce, those events. However, the degree of non-reporting according to the anecdotal comments does not seem to account for the large differences found. It may be more likely that subjects, feeling reluctant in their state of anxiety, exercise control over their imaginations to avoid those parts of the experience associated with feared punishment. Such speculation and some alternatives could be tested in other studies. A result of using one protocol variation to examine the processes involved in this inhibition can be found in the data and verbatim anecdotal report in Appendix I. That record includes one modified experimental session with Subject 38, subsequent to the data collection sessions of this study. In that session, the subject performs the real h-s-t with his eyes open, while in hypnosis and imagining the painful electric shock penalty. Although he could not exercise cognitive control over the number of stylus contacts actually made, his verbal report of those "contacts" is lower and, he fails to report as many shock experiences as the apparatus would have administered.

A few significant correlations are found among the six measures of Figure 25. Heart rate measurements under all conditions throughout the study correlate significantly with themselves, as do all the measurements of respiration rate. There is some correlation between heart rate and respiration rate measurements. The two self report measures, SSS and STAI, also correlate strongly with each other. One set of correlations that has important implications is that which shows a significant negative relationship between the subjects' baseline status and their subsequent change increments under stress. That finding shows that the Law of Initial Value is operative in the present study and should be considered

Changes in the physiological measures under real stress are smaller when the subject is in his second real stress session. One measure which is not discernibly different in any session for any group is directional change in pulse amplitude under stress--virtually all subjects show a reduction in pulse amplitude in going from baseline to stress conditions. No one showed an increased amplitude in both sessions.

Cross comparisons of groups having the same stress treatments (real or hypnosis), but in different sessions (one in the first session and one in the second) show few significant differences on the six basic measures of Figure 25. Under the real stress treatment, Group 2 shows no difference with Group 3, but does differ in GSR response with Group 1. Group 3's second real session differs significantly from its first in the three physiological measures and STAI, and is also different from the Group 2's second session (real stress) responses in GSR and STAI. Under hypnotically-induced stress, Groups 1 and 2 differ only in their heart rate responses among the six measures.

The pattern of GSR responses across groups and sessions (Table XVI shows the greatest change for each group occurring under hypnosis or, in the case of Group 3, in Session 2. One can speculate that the deeper internal arousal mechanisms mediating GSR reactions may operate more intensely when the subject experiences hypnotically-induced stress, or when the subject is trying to control the effects of threatening real stimuli that he has previously experienced. Those same mechanisms appear to operate less intensely when the subject experiences the real stress conditions that were previously imagined in hypnosis.

Some of the more pronounced differences occurring in this study are those associated with performance on the hole-steadiness-test (h-s-t). For Groups 1 and 2, large differences are seen between the number of stylus contacts made on the real h-s-t and the number made on the

differences from Session 1 measures, except for heart rate. For Groups 1 and 3 in particular, the paired data t-tests (Table XII) and Figure 25 suggest that the subjects began Session 2 with an aroused heart rate similar to their aroused heart rate at the end of Session 1. Indeed, further t-tests of heart rate data confirm that no significant differences exist between the Session 1 stress level and the Session 2 baseline for Groups 1 and 3. The correlations of each group's relevant heart rates are 0.72 ($p < .001$) and 0.44 (p approaches .05), respectively. The same heart rate data (stress 1 and baseline 2) for Group 2, though significantly correlated ($r = .47$, $p < .05$), are also found significantly different in the t-test ($t = 2.7$, $p < .05$). These results suggest the possibility that a conditioned or orienting cardiovascular response may be operative during the Session 2 baseline measurement.

A comparison of changes from baseline to stress reveals that Group 1 virtually reproduces the same change reaction in Session 2 (hypnosis) as it did in Session 1. Only one of the six Figure 25 change measures for Group 1 is significantly different--that being Observed Stress ($p < .05$). The poorest resemblance between sessions is found in Group 2, which produces 4 out of 6 stress reactions differently through suggestion than the way it produces them later under the real stress conditions. Those reactions are measured by changes in GSR, STAI and OSS (all $p < .01$) and SSS ($p < .05$). Reaction duplication is not quite as poor for Group 3, which also shows significant differences in 4 out of the 6 change measures summarized in Figure 25. They are heart rate, respiration rate, GSR and STAI (all $p < .05$). Group 3 produces its differences mainly with smaller response changes in Session 2 (except for GSR), and mainly in physiological measures (except for state anxiety), while Group 2 produces its differences mainly in the psychological or subjective measures. Changes in subjective measures under stress are smaller when the stress is hypnotically induced.

norm of hypnotic susceptibility for college students is a score of about 5.64 on the HGSHS, it has been found that volunteers for hypnosis experiments tend to be more hypnotizable with a mean score of 7.39. The 103 volunteers screened for the present experiment, who knew in advance that hypnosis would be involved, had a mean score of 7.97, thereby confirming the volunteer bias known to exist. The effects of that bias on personality and performance characteristics is not well understood at present, except for several correlations described by Hilgard (1970). She notes that increased hypnotic susceptibility is accompanied by greater imaginative involvement, greater severity of childhood punishment, and to a lesser extent, a few other personality traits. The implication of these poorly understood relationships for the present study may be that individuals who are above average in hypnotic susceptibility are likely to be above average in compliance to authority. In such individuals, compliance would tend to be more automatic and free of conflict. Those individuals are also more likely to succeed at utilizing psychological dissociation or isolation when they are under stress.

In terms of other biases that could have been introduced by the experimental procedures, examinations of group screening results, medical examination information, group assignments and Session 1 baseline measures show that no statistically discernable differences exist between the three groups up to completion of baseline data collection in Session 1. This is to be expected since every subject is supposed to be treated exactly the same way to that point; that is, the protocol does not begin to vary until stress induction is started in the second half of Session 1. It is of interest to note that the baseline similarity between groups is retained almost entirely when the groups begin their second sessions. All Session 2 baseline measures remain without significant

D. Discussion

The results of this study show how reactions to suggestion-induced stress compare with their equivalent reactions to real stress. Various psychological, physiological and performance measures are used to make the comparison.

Of initial importance in the analysis of results is that confirmation is established regarding the reliability of specific measuring instruments used here. In particular, Field's Checklist of Subjective Hypnotic Experiences (FCSHE) and the Observed Hypnotic Depth (OHD) appear to measure the same kind of hypnotic depth phenomena as the lengthier Harvard Group Scale of Hypnotic Susceptibility (HGSHS). The use of those instruments, and others for which reliability has already been well-established, permits quantification of responses and provides a statistical base for comparing and evaluating the effects under study.

As in most experiments, there is no unique point at which a comparative measure becomes statistically significant. The nature of the data, convention and judgment determine what is statistically significant. For the purpose of this study the .05 level is chosen to separate chance from real differences. Some of the differences and similarities noted are significant at beyond the .001 level. The statistics used include t-tests, F-tests, chi-square tests, correlations and canonical correlations. Where no statistical test is required, frequency diagrams, means and standard deviations are used for descriptive purposes.

The results of recruiting and screening candidate subjects confirm prior findings about the uniqueness of individuals who volunteer for experiments in which they know that hypnosis will be used. Whereas the

Other comparisons of the group remarks on Table XXXIV show little difference between the hypnosis sessions of Groups 1 and 2, and some small reduction of stress effects when Group 3 goes from Session 1 to Session 2. The latter difference is consistent with the suggestion that the subjects in Group 3 adapted to the real stress treatment during the course of their participation in this study.

Table XXXIV

Miscellaneous Anecdotal References to the Experimental Experience

	Group 1		Group 2		Group 3		Totals	
Session Number	1 (R)	2 (H)	1 (H)	2 (R)	1 (R)	2 (R)	Real Sessions (4)	Hypnosis Sessions (2)
anger at self	4	0	0	3	4	2	13	0
anger at equipment	1	0	0	1	0	1	3	0
vision blurred	5	1	0	3	4	3	15	1
awareness of controlled or heavy breathing	4	5	4	7	8	8	27	9
awareness of sweating	4	2	2	4	4	2	14	4
awareness of tension in hand or arm	3	2	1	5	7	1	16	3
awareness of tension in other parts of body	4	6	8	6	1	0	11	14
sense of attempting to control stylus	2	4	1	4	4	5	15	5
adaptation to shocks after a while	9	0	0	3	8	4	24	0
shocks got worse or stayed same	5	0	0	4	0	2	11	0

or adaptation experience may have taken place with Group 3, in a different way than with the others. Group 1, for example, feels they did as well or better in the second (hypnosis) session, with 10 out of 13 comments (77%) describing that feeling. The Group 1 improvement is less likely a matter of adaptation, and more likely one of the hypnotic treatment experienced for the first time. For Group 2, which experienced hypnosis first, 11 out of 16 subjects commenting (69%) feel that they did worse in the second (real) session, while 2 (13%) appear to feel they did better. Of those who appear to feel they did equally well in both sessions, 4 are in Group 1, 3 are in Group 2, and 1 is in Group 3.

Looking at how subjects describe their experience in each session, a number of factors tend to be mentioned more frequently than others. Table XXXIV provides a count of some of those factors which reflect feelings of anger, physiological awareness, and adaptation. A notable difference is apparent in comparing comments made after the real stress with those made after hypnotically induced stress. The hypnosis experience in this experiment is more limited to body feelings, and shows no development of anger when carrying out the performance task. It also shows no involvement with the concept of adaptation to painful shocks. The primary awareness emerging from the hypnotically-induced stress experience concerns feelings of tension in the body; next is the awareness of breathing pattern and control. For subjects remarking about the real stress experience, their primary awarenesses are of breathing and adaptation to painful shock. Physiological effects are next most referred to , including body tension and control, blurred vision and sweating. Where anger develops in the real stress session, it is mainly inward-directed, but for some it is outward-directed at the stylus or "the machine".

stress. The hole steadiness test is the portion easiest and most realistic to experience in the minds of those subjects, and it makes little difference if the h-s-t was ever used before. It is seen that 19 out of 20 people in Group 1, and 16 out of 17 remarking in Group 2, note that they had little difficulty in experiencing the task (h-s-t). Only about one subject in each group explicitly reports no h-s-t experience at all.

The electric shock and its associated pain are more difficult to experience through the imagination, with more subjects noting that they felt a shock, and fewer remarking that they felt an actual pain. In Group 1, 11 out of 18 subjects reporting on this item, claim little difficulty in experiencing electric shock, but only about 3 out of 10 report realistic pain experiences. The balance for each item report that they had no realistic experience. No Group 1 subject reports a lack of stress or tension in the hypnotically-induced experience.

Group 2, in which no prior experience could be drawn upon, is somewhat different than Group 1 in regard to electric shock. While 10 out of 19 report some or no difficulty in experiencing electric shock, half of that group does note that the experience was not very comparable to the subsequent real experience. About 4 out of 7 report experiencing pain. Among the 15 Group 2 subjects remarking about stress or tension in general, only 3 report the absence of those feelings during the hypnotically-induced experience.

Where subjects remark about the comparison between Sessions 1 and 2, the most consistent statement is made by Group 3 in which 13 out of 18 subjects commenting (72%) note that they did better in the second real session than in the first. This supports the notion that a learning

- "Based on your own experience, do you feel that hypnosis can be used to induce realistic stress in a person?"

The results of all 120 post-session interviews are condensed by group, into the summary charts in Appendix H. Between the experimenter's brevity at the time of the interview and preparation of the anecdotal comments for the summary charts, substantial liberties have been taken with the subjects actual presentation. However, an attempt is made to retain the topic, the subject's feelings, and the order of presentation. Some reports are long and others are short, depending upon many subject and experimenter factors during the freely conducted interviews. The latter comments for each subject are more likely to have been elicited through questioning by the experimenter.

Because many of the comments refer to particular items of equipment and protocol, some of the vocabulary and concepts are now reviewed. The hole steadiness test, referred to as the h-s-t, involves holding the point of a stylus in one of nine small holes in a metal plate, without contacting or touching the sides of the hole for three minutes. A painful shock is administered in the calf of the left leg after every third stylus contact with the hole. A three-second grace period accompanies shock initiation, during which time additional contacts do not count toward the three leading to a shock.

A review of the anecdotal responses in relation to the hypotheses of this experiment shows that most subjects who received the hypnotically-induced stress acknowledge that hypnosis can be used to induce realistic

Even the style, sex, or race of the experimenter may affect the subject's ultimate experience. Another important variation in the design is to work with non-hypnotizable subjects as simulators who act "as if" they are hypnotized. In another variation, suggestions can be used without "hypnosis" (i.e. without a formal hypnosis induction). Repeated sessions can be conducted to further evaluate adaptation or learning effects of suggestion-induced states. The protocol options chosen should be those which are relevant to specifically known applications in which laboratory stress induction is sought. From the standpoint of statistical design and analysis, there could also be study variations. A discussion of alternatives for the present analysis is found in Appendix J.

E. Conclusions

The overall conclusion deriving from the present data is that individuals can react to suggested stress by showing physiological, psychological and behavioral characteristics which are similar to their reactions under equivalent real stress conditions. In using suggestions for stress-induction, one may be guided by the findings of this study which indicate the following:

- Under conditions where a subject has previously experienced the real stress, suggestion-induced stress is demonstrated to be a valid simulation and has utility as a research technique.
- It is possible that the individual will exhibit fewer effects of adaptation or learning in response to stress-oriented suggestions, than if he were to re-experience the real stress condition. In other words, the stress may remain novel.
- The individual is likely to exhibit the suggestion-induced stress responses on psychological measures (e.g., SSS, STAI) and physiological measures (e.g., heart rate, respiration rate), rather than through imagined performance which he may distort by inhibiting those occurrences which "threaten" his safety or well-being. If performance under stress is to be studied, the performance task should probably be real. The accompanying emotional stress state may be induced by suggestion.
- If the subject is instructed to experience a stressful situation which he has never before experienced, one may expect an appropriate emotional arousal (measured by subjective self report), a somewhat less appropriate

physiological arousal, and possibly an inappropriate imagined performance (depending on the "task" and the type of instructions given).

- The subjective self report from a prior relevant stress experience is the most reliable predictor of an individual's reactions to suggestion-induced stress. Heart rate and respiration rate also correlate highly between such sessions. Among the least predictable measures is GSR and the observed stress report, as used in the present study.

Being a methodological study, this experiment not only demonstrates that realistic stress reactions can be induced by suggestion, but describes one protocol by which it can be accomplished. It also helps to highlight and clarify important factors related to those stress reactions. Some of the factors concern learning or adaptation, individual and group response specificity, stimulus specificity, and the degree of realism to be expected in the various dimensions of response (psychological, physiological, performance). Speculation is possible to explain the outcomes, especially those resulting from the suggested stress treatment. It appears that suggestion, at least under conditions such as in this study, can be so pervasive as to significantly affect all responses measured here.

In describing the detailed characteristics of suggestion-induced stress, various questions of interest arise. For example, based on apparent adaptation when real stress is experienced in both sessions (Group 3) and on apparent preservation of the "naive" response when suggested stress is used in the second session (Group 1), one begins to wonder which of those two processes will prevail as additional suggested-stress sessions are carried out. It seems that the suggested stress in this study produces a "replay" of responses from the earlier experience.

To some extent, it also can produce a "forecast" of stress reactions to a situation never before experienced (Group 2). To what extent can one expect these "naive" reactions to continue?

One may next wonder what could happen if suggested stress is used with the group that began the adaptation or learning process (Group 3). Would that process continue, would the naive response return, or would something else happen? If the learning process continues, this may have important implications for using suggestions as a possible training vehicle.

Areas for <u>future research</u> employing suggestion or suggestion-induced states in training and other areas are next viewed more generally, under the following headings:

- Learning and training
- Performance under stress
- Adaptation to stress
- The suggestion process
- Studies of physiological processes

In future studies of <u>learning and training</u>, one can study how learning may be facilitated through guided practice or rehearsal of a task partly or wholly in the subject's imagination. In addition to studying performance along the conventional learning curve, suggestion may also be used as a way of examining performance reproduced at a particular defined level (such as in the naive state, the last real performance or some earlier real performance). The researcher can try to determine the degree of control possible in eliciting performance at a particular point on the

learning curve. One may also investigate the time factors associated with learning via suggestion, including speed of perception, consolidation time and retention duration. Additional factors for study in this area include the effects of suggested states on concentration, comprehension, overcoming blocks to learning, and increasing motivation. Among the more specific studies could be one in which training techniques are established with highly suggestible (or hypnotizable) subjects and then are adopted for use with subjects at all levels of suggestibility. Supporting the possibility of using suggestion-induced experiences as learning aids is the growing use of covert imaging (vivid mental imagery) by psychotherapists utilizing the modality of Behavior Therapy (Waters and McDonald, 1973). They use suggested emotional states to help patients learn new reactions and behavior patterns in stressful or otherwise uncomfortable situations. Those techniques are also used with patients who never before experienced the actual situation (e.g., fears of flying, falling from great heights, dying, illness).

Other future research may be more specifically concerned with performance under stress. This can include the measurement of task error rates and error types under different kinds of stress. It can also evaluate the use of suggestion-induced stress in testing new equipment and procedures under "adverse" conditions. Further studies can be made of physiological effects under stress, including voice changes for researchers interested in speaker identification and authentication. Some researchers may be interested in the degree of performance distortion under suggestion-induced stress. The distortion is considered to be caused, in part, by the inhibition of those measures which are under "voluntary" control and/or those imagined events which appear to threaten the subject's safety or well being.

Additional research may examine adaptation to stress, in which the ability to cope with stressful conditions is improved with the aid of arousal-reducing suggestions. One can seek a reduction of deleterious effects under stress and an increase in the tolerance of stressful conditions.

A number of future studies can also be conducted on the suggestion-process itself. The questions of interest include the general applicability of the technique, the comparative validity of various other kinds of induced stress, the predictability of responses, further delineation of measures and response specificity, the effects of protocol variations, and induced change in physiological processes. Applicability studies could be used to determine the degree to which larger segments of the general population can realistically experience suggested states (e.g., low in addition to high hypnotizable subjects, women in addition to men). Comparisons with other kinds of induced stress could involve sensory deprivation, pharmacological agents, physical strain, and other types of painful stimuli in addition to electric shock. Studies on the predictability of responses could be used to identify those factors which serve to forecast the types and intensities of reaction by individual subjects or groups to suggestion-induced stress. Such studies might be related to those on response specificity, where identifiably different subjects or groups are found to exhibit particular reaction patterns such as characteristic response channels, response magnitudes, and lability under particular stress conditions. Besides determining specificity variations between individuals, studies can also be directed at specificity of response by all subjects as a function of stimulus type. Variations in stimulus types leads to studies of alternative protocols and forms of suggestion. The variables that may be studied as alternatives include: experimenter

factors such as sex, age, and race; the stress induction style such as authoritarian versus permissive, and the degree of protocol standardization (e.g. use of tape recordings); and other design variables such as time of day, instructional set, number of sessions, use of simulating (non-nypnotizable) subjects, and the use of suggestions without a formal hypnotic induction. The types of suggestion protocols that can be compared include direct suggestion (as used in the present study), suggested "re-living" of a previous real experience, and paramnesia ("implantation" of a false memory in hypnosis which later produces a post-hypnotic conflict and concomitant set of reactions in the subject).

Studies on the physiological concomitants of suggestion-induced stress can lead to studies of physiological processes themselves. In such studies, suggestion is used to produce a particular emotional state so that physiological measures of interest can be obtained. To date, the physiological systems studied in this fashion include the cardiovascular, gastrointestinal, sensory, renal, respiratory and endocrine systems.

The increasing variety and widespread effects of life stresses bring with them the need for better understanding. In part, greater understanding of stress effects will be achieved in laboratory studies, so the importance of identifying improved and controllable stress-induction techniques can be expected to increase.

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V. APPENDICES

APPENDIX A

Background in Stress Research

1. General

The literature on stress research is so large as to make an area of even limited interest one for which substantial material can be examined. For convenience in reviewing previous research related to this study, the topics are limited and reviewed according to the following categories:

- Military Stress Studies
- General Stress Studies
- Stress Measurement
- Laboratory Stress Induction

Certain military studies are particularly important because of the innovative techniques they used in an effort to achieve realism in military stress simulations. The more general studies are important because they call attention to several unique stress-related phenomena, like specificity and the Law of Initial Value, that require consideration in designing an adequate study. The stress measurement literature is helpful in selecting those variables to be monitored and analyzed. Finally, the literature on techniques for stress induction in the laboratory provides a foundation upon which the present examination of suggestion-based techniques can be built.

2. Military Stress Studies

The disruptive effects of perceived stress on performance is of particular concern to the Army and other military agencies (Army Symposium on Stress, 1953; Kern, 1966; Weybrew, 1967). Although basic questions about the mechanisms of underlying stress adjustment

are often discussed in military publications, Weybrew (1967) reports that a considerable amount of the work produced in military laboratories is concerned in some way with problems of selecting, evaluating or assessing individual differences in stress adjustment potential. Because such laboratory studies are used to help design equipment, develop procedures, and train individuals for more effective adjustment and performance under combat or other stress conditions, there is an ongoing need to improve upon the validity of laboratory stress situations, while maintaining ethical standards and reasonable costs.

Most of the traditional laboratory approaches fall short to some degree in representing life-threatening stress, often because subjects quickly develop a psychological set that no harm can come to them in a responsibly-conducted research study. Their behavior becomes, therefore, less than representative of the real stressful situation about which the experimenter wishes to make inferences. This denial of threat is termed "cognitive defense" by Berkun, Bialek, Kern, and Yagi (1962). Reporting on Research Task FIGHTER for the Human Resources Research Office (HumRRO), those authors describe a series of imaginative studies designed to overcome the cognitive defense by re-creating elements of naturally occurring (including military) disasters that have the fear producing effect. In this manner, cognitive stimuli are used to induce the state which is assumed to characterize the response to combat. Subjects in that series of experiments were provided information of such realism that their assessment of the various events led them to believe that their well-being (or that of others) was actually being threatened. Their performance of previously assigned tasks during "disasters" provided one measure for evaluating behavior under stress. Also used were physiological responses, derived shortly after the stressful situation by means of

urinary corticosteroid and blood eosinophil analyses. Finally, a subjective self-report word list was developed and quantitatively scaled to obtain each subject's own assessment of how he felt during the stressful situation. That Subjective Stress Scale (SSS) is used in the present experiment so that comparisons can be made between stress responses of Army personnel in Research Task FIGHTER and the responses of subjects in the present experiment.

One important point made by Berkun, et al. (1962), is that the psychological stress must induce in the subject a cognitive response resulting in the acceptance of a simulated threat as genuine. Perhaps the greatest problem in designing an experiment to accomplish this end is the complexity and cost required to "stage" the situations, such as the following five that were used in the HumRRO program:

a. Ditching -- The subjects were actual passengers in an aircraft which, they were told, was in "trouble" and was preparing to ditch or crashland. All overheard a pilot-to-tower conversation concerning the emergency and could see crash equipment on the airstrip. These were the supports to the deception.

b. CBR Warfare -- During a staged maneuver, the subject, stationed alone at an isolated outpost was required to radio reports to the command post on the presence of aircraft overhead. He later heard over his radio set that a nuclear accident has resulted in a dangerous fallout of radioactive material in his area. Immediate rescue was possible if the subject were able to report his position over his radio which suddenly went dead. The maneuver was canceled and all activity became concerned with evacuation of personnel from the area. Perceptual confirmation of the hazard was provided by a radiation dosimeter available at the position. In order to be rescued, the soldier needed to repair the failed radio.

c. Forest Fire -- The setting was similar to the CBR setting except that the "accident" was a forest fire surrounding the lone subject's outpost. Perceptual support was provided by artificial smoke generated nearby. A failed radio interfered with rescue and it needed to be repaired by the soldier.

d. Artillery Shell Barrage -- A series of explosions simulated an artillery barrage and the subject heard, via radio, that the barrage had gone astray and shells were hitting outside of the designated target area. He saw also that the shells were falling in a pattern which would hit his position. The explosions constituted the perceptual support. The subject's transmitter inexplicably failed, although he continued to receive messages. Rescue depended on repair of the transmitter.

e. Demolition Explosion -- The subject, as part of a work detail setting up a training problem was instructed in wiring-in explosives placed in a canyon below. Working alone, the subject was instructed to match colored wires with other colored wires already on screw posts, and upon completion, to throw a switch which would have then enabled others in the canyon to use the circuit. Immediately on throwing the switch, a 5-pound charge of TNT exploded in the canyon. The subject was then informed of a man being injured in the accidental blast which may have resulted from incorrect wiring. The subject was instructed to telephone Fort Ord, but the telephone did not work and his calls over the intercom were ignored, making it appear that he could not be heard. The subject, however, received a variety of messages over the intercom for the next 35 minutes, one of which asked about his progress in calling Fort Ord. Another said that the military police want to question him. He also heard urgent messages concerned with keeping the injured man alive.

In each of the 5 experimental situations, the number of subjects exposed ranged from 13 to 27. The most extreme stress indications were obtained in the situation where the subject believed he was responsible for an explosion which injured another soldier. The simulated aircraft emergency aloft and the misdirected artillery barrage, both threatening the subject's life, also produced effects similar to those associated with naturally occurring threats. The CBR task reflected stressful effects only in the subjective self-report and the physiological steroids-level measures, whereas, the forest fire task group showed significance only in the steroids-level measure.

Differences were found between the reactions of experienced versus non-experienced subjects, although they are somewhat complex differences which are partly explained in terms of the former group's attitude ("ennui") toward control test conditions (Berkun, 1964).

These studies yielded a significant result, namely, that a stimulus complex can be installed which simulates the stress effects elicited by naturally occurring threats. Such an "apparently real" approach permits the meaningful study and assessment of various stress levels on operationally performed events. The shortcomings of these techniques lie in the cost and complexity required to employ them. Data collection is difficult because these situations require field setups, the use of deception, and other simulation techniques which limit the use of many available control and monitoring instruments.

One way of collecting stress data without staging combat or other stressful situations is through retrospective studies of critical incidents as related by troops who can provide accurate recollections to an interviewer. Studies of this sort have been described (Weislogel, Flanagan, and Billingsley, 1954; Kern, 1966), but they are obviously limited in

their value -- especially since few objective measures can be obtained. Another study method involves the laboratory induction of stress by means of less-than-realistic techniques, such as through mental tasks, motion pictures, threat of electric shock, physical tasks and environmental modification (e.g., excessive noise, heat, etc.). In studies of this type, it is essential to recognize the limits of data transferability when making inferences about combat behavior based on non-combat type stress situations.

Ideally, one would like to create realistic, combat-type stress situations in the laboratory where the possibilities of unlimited instrumentation and control exist. A recent study in which this was tried involved the use of suggestion-induced stress with combat veterans. Under hypnosis in the laboratory, the subjects were directed to "re-experience" past stressful combat situations while their voices and physiological reactions were recorded for later spectral and graphical analyses. The results of that study support the potential feasibility of the suggestion-based protocol for inducing realistic stress conditions (Crystal, Gish, and Bloom, 1973). Earlier non-military studies lend further general support to this approach (Blum, 1972; Craig, 1968; Damaser, Shor, and Orne, 1963; Gidro-Frank, and Bull, 1950; Hodge, and Wagner, 1964, 1966; and Levitt, Persky, and Brady, 1964).

3. General Stress Studies

The desire to perform controlled studies of realistic stress reactions is by no means limited to the military laboratory. Weybrew (1967) estimated that approximately 10% of the voluminous stress literature originated from the military, with the Department of Defense and the National Aeronautics and Space Administration supporting over 200 contracts listed as stress research in 1965. The general stress literature contains many descriptions of attempts by a variety of behavioral scientists and clinicians to create, measure and evaluate

the effects of stress on the human organism. These references and others on physiology and stress in the attached Bibliography seem to indicate that stress is multidimensional in nature. Difficult to conceptualize, stress is regarded as having internal and external sources which can act as an intervening variable in the shaping of behavior. The conditions which produce stress can relate to tasks or environments, as seen previously in Table I. Perhaps most important for the objective evaluation of stress effects in this study are the measurable changes in physiological factors which often accompany the aroused state. The physiological effects are measurable through biochemical analyses (e.g., urine and blood), electrically (e.g., electrodermal responses, electrocardiograms, and electroencephalograms), pneumatically (e.g., respiration), optically (e.g., peripheral vascular response) and various other ways.

In general, it is found that subjects reacting to stress show characteristic changes in many aspects of psychological and physiological functioning. Basowitz, Persky, Korchin and Grinker (1955) have summarized some of the following findings. At the perceptual level, the threshold for flicker fusion is lowered under stress; recognition of patterns is disturbed; tachistoscopic perception deteriorates. Sensitivity to pain has been found to increase under stress; recall of digits decreases. Among the stress effects on the peripheral organ or system functions are increased needs for oxygen with hyperpnea, widened nasal apertures and increased nasal secretion, increased sweating, rise in blood pressure, tachycardia, changes in cardiovascular dynamics, and alterations in the biochemical substances in the blood. Other researchers have moved from the study of such distant or peripheral late effects of stress to more internal processes closer to the central nervous system, as typified by the work of Selye and others who studied the effects of stress on the pituitary-adrenocortical

axis. Psychosomatic responses and other psychopathological disturbances have also been studied as responses to overwhelming stress (Grinker and Spiegel, 1945). The list goes on and is developed with a specific orientation to this study in the next background section (Stress Measurement).

The enormous quantity of general research findings related to stress is beyond adequate summarization here, but one can gain some overall perspective through the reviews and summaries of others (Appley and Trumbull, 1967; Basowitz, Persky, Korchin and Grinker, 1955; Janis, 1958; Lazarus, Deese and Osler, 1952; Levi, 1971; Levitt, 1967; and Spielberger, 1966b). Appley and Trumbull (1967, p. 11) found that stress studies have revealed the following kinds of general observations:

a. Stress is probably best conceived as a state of the total organism under extenuating circumstances rather than as an event in the environment.

b. A great variety of different environmental conditions is capable of producing a stress state.

c. Different individuals respond to the same conditions in different ways. Some enter rapidly into a stress state, others show increased alertness and apparently improved performance, and still others appear to be "immune" to the stress-producing qualities of the environmental conditions.

d. The same individual may enter into a stress state in response to one presumably stressful condition and not to another.

e. Consistent intra-individual but varied inter-individual psychobiological response patterns occur in stress situations. The notion of a common stress reaction needs to be reassessed.

f. The behaviors resulting from operations intended to induce stress may be the same or different, depending on the context of the situation of its induction.

g. The intensity and the extent of the stress state, and the associated behaviors, may not be readily predicted from a knowledge of the stimulus conditions alone, but require an analysis of underlying motivational patterns and of the context in which the stressor is applied.

h. Temporal factors may determine the significance of a given stressor and thus the intensity and extent of the stress state and the optimum measurement of effect.

As noted earlier, the application of stress-inducing situations for laboratory studies must neither violate ethical considerations in dealing with human subjects nor result in psychological damage that is a residual of the procedure. This issue has become of increased current importance due to recent disclosures of questionable practices by a limited number of investigators. The controversy has reached national importance, resulting in new regulations proposed in 1973 by the Department of Health, Education and Welfare, and in pending Congressional legislation intended to assure "maximum" protection for research subjects (Kennedy Bill S2072). The American Psychological Association (1973b) has already issued its latest comprehensive guidelines for this purpose, and at least one voluminous legally-oriented book has been published on the topic (Katz, 1972). Earlier regulations have been issued by the Department of the Army (1962), the Department of Health, Education and Welfare (1969, 1971), and the various professional societies to which many researchers belong. Some authors, including Havighurst (1970), believe that the ethical responsibility of investigators extends even beyond informed consent and careful design, to some kind of financial protection of research subjects who may suffer harm despite all other precautions. In summary, it has become increasingly important that experimenters employing pronounced psychological or physiological stress account for and safeguard the health and well-being of all participating subjects.

4. Stress Measurement

A rigorous definition of a stressor must include an observable or measurable change in performance and/or behavior (psychological and/or physiological) in order to demonstrate that the individual has indeed experienced some type of stressful condition. The response indices used to define the existence of stress include:

- physiological variables (e.g., heart and respiration rates, galvanic skin response, inspiration/expiration ratios, and blood pressure changes)
- overt emotional responses, discernable to self or others (e.g., tremors, stuttering, and agitation)
- performance changes (e.g. perception, perseveration, increased reaction time, increases in errors of omission and commission, and erratic performance rates)
- biochemical changes (e.g., changes in blood ACTH content or glucocorticoid concentrations)

The examination of physiological variables to evaluate psychological stress reactions is based upon principles of involuntary physiological arousal when a subject tries to cope with external (and sometimes internal) stimuli that in some way threaten his "well-being" or existing homeostasis. The physiological parameters which seem to be most responsive and are readily measured include:

- respiration (upper and lower tract)
- galvanic skin response (GSR) or psychogalvanic reflex (PGR)
- cardiovascular response (blood pressure, ECG, pulse rate, local blood volume)
- skin conductance level (SCL)

Some researchers measure other parameters such as skin temperature, electromyographic response and electroencephalographic changes. For permanence and later analysis, these measurements are usually recorded together on some kind of strip chart with a time index.

One specialized area of stress measurement outside conventional scientific research is the well documented field of deception (or "lie) detection by criminal investigators. Orne, Thackeray and Paskewitz (1972, p. 763) report that there is no present evidence that autonomic changes which accompany deception differ qualitatively from those produced in other emotional states involving sympathetic nervous sytem activation. However, they note that studies have demonstrated differences between various emotional states and the patterns produced. They report that deception responses seem to resemble most closely those characteristic of emotional excitement or fear. An overview of various emotional responses which can be measured with available instruments like the polygraph is presented by Lindsley (1951). He also discusses underlying mechanisms and theoretical considerations of emotional response.

Because of the technical nature of instruments like the polygraph and the complexities of psychophysiological behavior, the preparation and interpretation of polygraph recordings requires knowledge in both instrumentation and psychophysiology. For example, only some pattern changes are psychophysiological in origin, and are the ones being sought by the experimenter. Others are artifacts resulting from subject movements, equipment malfunctions, and other causes. However, the cardinal rule in chart interpretation is "any change from normal requires an explanation" (Ferguson, 1966, p. 161). All changes, whether psychophyiological or artifactual, must be properly interpreted.

Some of the factors affecting pattern changes, all of which should be understood and some of which should be controlled, are:

a. The physiological basis of the function being measured
b. The ability of specific transducers to measure the function of interest
c. The way in which that function may be expected to vary under conditions of relaxation, fatigue, adaptation and arousal (delays, recovery time, directions of change, magnitude of change, etc.)
d. The effect of the experimental setting and protocol on the subject, including his apprehension about outside issues
e. The type and purpose of the stimuli used
f. The placement of each stimulus within the overall protocol
g. The pacing and presentation of stimuli
h. The ability of the subject to perceive (and, if necessary, understand) the stimuli
i. The effects of medication, drugs, illness and other abnormal states in which the subject may appear
j. The Law of Initial Value, which relates the significance of a change to the base level and to base level changes (Wilder, 1957)
k. The characteristics of the transducers and agents like electrode jelly that are used (e.g. linearity, temperature stability, time stability, electrical stability, etc).
l. The effect of transducer placement (e.g., upper vs. lower respiratory area).
m. The characteristics of the amplifier and galvonometer drive circuits (e.g. linearity, automatic centering, time constants, dynamic range, etc.)

n. The characteristics of the pens and moving paper chart (e.g. curvilinear trace, line thickness effects on scaling, chart speed stability, relative pen positions, etc.)

o. The artifacts that may appear on a recording channel as a result of non-psychological factors (e.g., electrical interference, body movements, coughing and similar acts, interactions from other channels, and interference of one pen with another).

Once the experimenter understands what his particular system can measure and its possible distortions, he must assure that the system consistently measures what he expects and wants. This assurance is achieved by a calibration procedure for the polygraph, a carefully developed protocol for working with the subject, a well established technique for continuously monitoring and controlling the polygraph, and use of a valid set of rules for interpreting the chart recordings.

To cope with the problem of outside issues like subject apprehension which can mask "normal" responses in the unstressed or baseline condition, careful protocol design is recommended (Backster, 1969, pp. 58-62; Ferguson, 1966, p. 176). In essence, the protocol should alleviate any subject arousal produced by outside issues without diminishing the experience of arousal to the intended stressful stimuli. Typically, the subject can be given certain clarifying information about the experiment and his confidence can be enhanced with regard to the experimenter and the experiment.

Other protocol considerations for assuring proper measurement and interpretation of physiological chart recordings include appropriate marking of significant events (Ferguson, 1966, pp. 152-160), and pacing of stimulus presentations to account for any recovery time or response buffering

requirements. Recommended recovery times for polygraph reactions seem to range from 15 to 40 seconds (Abrams, 1973; Arther, 1973; Backster, 1969; Ferguson, 1966; Haney, 1972; Heger, 1971).

Because specific subjects react in specific ways, in specific physiological channels to specific stimuli, it becomes reasonable that experiments with more than one "unknown" subject contain a multiplicity of measurements. Yet, some workers in this field have found one particular channel to be of maximum sensitivity in their studies. Those channels include:

- GSR (Abrams, 1973; Kubis, 1973)
- Respiration (Arther, 1973; Barland, 1972a, p. 199)
- Cardiovascular (Ferguson, 1966, p. 177)

In general, however, the existence of response specificities seems to be indicated. They can be divided into two categories:

- stimulus specificity--the tendency for a specific stimulus to evoke characteristic responses from most subjects
- individual specificity--the tendency for a specific individual or group to emit characteristic responses to stimuli

a. Stimulus Specificity

Engel (1972) reviews the work of some researchers in stimulus specificity, reporting on the following studies. Lacey (1959) shows that outward directed attention and inward directed attention evoke different cardiac effects. He also reports that during a reaction time foreperiod heart rate deceleration is consistently evoked (pp. 160-208). Ax (1953) shows that fear and anger evoke different autonomic responses. Edelberg and Wright (1964) show that a prelude stimulus to an orienting response and one to a reaction time response evoke different GSR effects.

At best, the evidence indicating specificity is tenuous, according to Levitt (1967, p. 196). He refers to studies which suggest that adrenaline mediates fear states, whereas noradrenaline is more critically involved in anger and rage. He points to the work of Schachter in the U.S. and Levi's Laboratory for Clinical Stress Research in Sweden as providing the most evidence in favor of specific physiological patterns.

Opposing the specific theories are the general arousal and activation theories of emotion. In support of activation theory, Levitt (1967, p. 196) notes that muscle tension is definitely a characteristic of all aroused states and is unique to no one of them. Yet, on the side of specificity, Clynes (1972) has demonstrated the presence of specific muscular patterns (in the finger tip) for the expression of such emotions as anger, love, sex, hate, grief, joy and reverence. Further, these distinct muscle movements, carried out in a repeated pattern which Clynes calls a "sentic cycle," seem to be much the same from one person to another and from one culture to another.

b. Individual Specificity

Engel (1972) also reviews the work of some researchers in individual specificity, reporting on the following studies. Moos and Engel (1962) show that patients with hypertension react more in blood pressure than patients with rheumatoid arthritis. They also show that the arthritic patients react more in muscles spanning symptomatic joints than do patients with hypertension. Malmo and Shagass (1949) show that psychiatric patients elicit the strongest reactions to pain stimuli in the response measures (or modalities) about which they complain most. Engel and Bickford (1961) show that patients with essential hypertension react more in systolic blood pressure and less in heart rate, skin temperature, and GSR.

Trait anxiety is found by some to correlate with an ability to modulate autonomic behavior. Fenz and Dronsejko (1969) report that medium anxious subjects are able to emit GSRs and show heart rate acceleration by only

imagining a painful event (electric shock). The same group can inhibit GSRs and show heart rate deceleration in anticipation of the real painful event. In that study, high anxious subjects show autonomic excitation, while low anxious subjects show autonomic inhibition under both the imaginary and real conditions. In a different kind of experiment involving "reading about" versus "imagining" fearful scenes, Grossberg and Wilson (1968) find some differentiation in forehead EMG response between high and low anxiety groups (lows show greater changes) but no significant differential effects in heart rate or skin conductance between the two groups.

Brandt and Fenz (1969) suggest specificity of responses for subject groups showing predominance in one of two different kinds of anxiety indicants: high muscle tension (MT) or high autonomic activation (AA). The MT group characteristically rates itself more in terms of having sustained contractions of striated muscles (e.g., backache, neckaches, tremor), while the AA group describes primarily visceral symptoms (e.g., tachycardia, vasomotor reactions, emotionally induced sweating, digestive disorders). Consistent, though not always significant, differences between the two groups are found for mean levels of skin resistance, basal conductance, heart rate, eyeblinks, and number of EMGs. Some decreases rather than expected increases of arousal indicators, especially in the EMG measure, suggest a possible inhibitory control mechanism for subjects under "excessive" stress. The inhibition seems to occur earlier in those measures which are under more voluntary control (e.g., in EMG before visceral measures).

In a comparison between anxious patients and normal controls performing a mental arithmetic task, Kelly et al. (1970) find that forearm blood flow and heart rate at rest correlate significantly with clinical and subjective

anxiety ratings. Those variables also show a differential effect under stress, whereas no significant stress effects appear for measurements of skin resistance, forearm EMG and cutaneous vasomotor status. Greater changes in response (from rest to stress) occur in the normal controls.

A number of other studies suggest that some subjects may have high resting levels of stress indicants and relatively poor physiological response to stress. In 1930, this phenomenon was recognized and formulated by Wilder into the "Law of Initial Value" (LIV) which says: "Not only the intensity but also the direction of a response of a body function to any agent depend to a large degree on the initial level of that function at the start of the experiment (Wilder, 1957, p. 73)." The LIV was studied by many researchers and various techniques are recommended to account for it in data analysis and interpretation (Ax, 1964; Block & Bridger, 1962; Goldwater, 1973; Lacey, 1956, 1959; Schmidt, Rose & Bridger, 1974; Wilder, 1950, 1957, 1965).

The analysis and evaluation of physiological measures is guided by the recurrent findings of numerous studies. Many of those findings and guidelines single out the indications of interest to the present study: respiration, GSR, and cardiovascular measures.

Respiration as a stress measure is focused on by the fewest of those studies. Stein and Luparello (1967) identify some of them which note the following correlations between respiratory changes and specific emotions:

- Rapid respiratory rate upon feeling pleasure
- Irregularity of respirations during hypnotically-induced anxiety and apprehension

- Increased minute volume (tidal volume X rate) during unpleasant ideation
- Increased minute volume in response to painful stimuli and recall of the experience
- Increased diaphragmatic movement upon discussing pleasant life situations; restricted for unpleasant situations
- Ascending (or scaling) pattern, leading to dyspnea during discussion of conflicts
- Increased ventilation and O_2 consumption for hypnotically-elicited anxiety and anger
- Absence of respiration changes for hypnotically-elicited depression

GSR and related electrodermal responses seem to be one of the most often reported measures of arousal and response. Orne, Thackery and Paskewitz (1972, p. 767) find that GSR has been a most effective discriminator in laboratory settings. They also note that GSR is difficult to interpret with extremely anxious subjects; under these circumstances the respiration and cardio tracings remain more easily interpreted by inspection. Investigators measure long-term electrodermal levels or the briefer, momentary fluctuations due to arousal. If a count of brief GSR responses is to be employed, one must set criteria for including a given wave in the count. Jordan and Sipprelle (1972) define a "GSR" as a decrease in resistance of 800 ohms. They measure this response in terms of GSRs per minute using the average for all of the five minutes allocated to their individual experimental treatments. Kaiser and Roessler (1970) define their GSR criterion as a decrease of at least 50 ohms with an onset to peak time of 2 to 6 seconds. The total number and the sum of amplitudes of GSRs become their measured indicators for analysis of psychological stress. Edelberg (1967, pp. 33-34) suggests guidelines for setting the sensitivity and resolution of different types of GSR instruments.

When counting GSR response waves, one should distinguish between specific responses to specific stimuli and all other nonspecific responses. The count of nonspecific waves increases with central activation and provides a useful measure of internal neural activity. The count of specific responses is obviously determined by the number of stimulus presentations, and is often a useless measure (unless one is looking for no response). Nonspecific GSR responses are shown to be positively correlated with rated anxiety and rated overt depression, in a stress experiment by Zuckerman, Persky and Curtis (1968). The measure used is the number of nonspecific GSR fluctuations, of at least 100 ohms, per minute. Often, in practice, nonspecific responses can be confounded by specific responses to stimuli external to the experimental setting. Edelberg (1967, p. 45) suggests that one measure which shows some promise in coping with this problem is the average wave amplitude taken together with the count. The interpretation of these two in conjunction may allow relatively high discrimination of the quality of activation.

Overall quantification of GSR responses to facilitate statistical treatment is discussed by Kelley (1972), who notes that skin resistance is really a derived measure whereas skin conductance is the true measure. Accordingly, he suggests that GSR data be reciprocated to conductance units, and responses be quantified in terms of amplitude changes associated with each independent stimulus. The changes might be expressed as the difference (in micromhos) between a pre-stimulus minimum and its corresponding post-stimulus maximum. Log skin conductance is noted as a possible useful transformation for statistical analysis. He refers to other possible GSR response measures, including latency, duration, frequency and rise time.

Cardiovascular responses to stress include measures of blood pressure, volume, flow, and pulse characteristics. When measurements are to be made for extended periods of time, certain sensors cannot be easily used. Specifically, a blood pressure cuff which restricts upper arm blood flow should not be employed for more than 3 or 4 minutes without deflation for recovery. Fortunately, other instruments have been developed, such as the finger photoplethysmograph, which can be used for indefinitely long periods of time to measure the peripheral vascular response (PVR). Although PVR reactions are not as well understood as electrocardiogram or blood pressure reactions, for simple measurements like pulse rate it is a completely satisfactory device (Grass Medical Instruments, 1973; Statham Instruments, 1971; Van De Werken, 1971, 1973; Weinman, 1967). It is also useful in providing a recording of brief relative changes in blood volume, although those changes are difficult to quantify. Ansley (1973) has attempted to document recent research in which the photoplethysmograph is used.

It is currently held that digital vasoconstriction is evidence of an arousal or alerting reaction. It has been related to the orienting response and to the presence of anxiety. One of the more interesting aspects of the PVR is its presence even during sleep. The PVR shows promise as an indicator of reactivity of the sympathetic nervous system, although the measurement techniques need improvement (especially to provide absolute measures) (Brown, 1972, p. 189). Overall guidelines for interpreting the PVR changes detected by the finger plethysmograph include:

- Inapplicability for quantitative measurement of blood pressure or blood flow (Grass Medical Instruments, 1973).
- Applicability for qualitative changes in pulse amplitude (Grass Medical Instruments, 1973; Orne, et al., 1972, p. 765)

- Applicability for changes in vasomotor tone and activity (Grass Medical Instruments, 1973; Orne, et al., 1972, p. 765)
- Applicability for changes in pulse rate (Grass Medical Instruments, 1973).

Additional measures of physiological arousal, including biochemical measures, are discussed elsewhere and are not described here (Basowitz, Persky, Korchin & Grinker, 1955; Brown, 1967a; Cromwell, Weibell, Pfeiffer & Usselman, 1973; Greenfield & Sternbach, 1972; Pitts, 1969; Venables & Martin, 1967a). Adaptation effects and interactions between physiological systems are reported by various researchers, and need to be considered when interpreting results (Brener, 1967; Grossberg & Wilson, 1968; Lader, 1967; Selkurt, 1971; Van De Werken, 1971; Yankee & Laughner, 1973). The most prominent interaction is that between the respiration and cariovascular measures, showing quite clearly when the subject sighs or coughs. Artifacts can appear on chart recordings as a result of poor attachment of transducers, coughing, gum chewing, other body movements, electrode polarization, ambient temperature changes, electrical interference, and other circumstances. Causes and control of artifacts are discussed further in the literature (Edelberg, 1967; Ferguson, 1966; Geddes, 1967; Grass Medical Instruments, 1973; Novelly, Perona & Ax, 1973; Van De Werken, 1971; Venables & Martin, 1967b).

Besides using physiological reactions to measure stress, researchers also assess psychological reactions as experienced by the subject, reactions as observed by the experimenter, and measures of subject performance in a given task. One reason for requiring measures in addition to the physiological ones is that the patterns of physiological reactivity are so idiosyncratic. Rather than consider physiological measures unsuitable for use, they can be employed

for individual subject analysis, keeping idiosyncratic response specificity in mind. They can be supplemented with the other kinds of measures.

The psychological measures of subject stress can be divided into projective tests and inventories. The best known projective technique is the Rorschach ink-blot test. Unfortunately projective tests make poor instruments for experimental measurements because of difficulties which involve interpretation of responses (which can also be idosyncratic), quantification and combining of data, and test administration (Levitt, 1967, pp. 57-58).

The most popular instrument for experimental purposes appears to be the inventory (or "scale", or "questionnaire"). A typical inventory consists of a series of words or statements that could describe a person's feelings or thoughts. The subject responds by assigning a degree of applicability to each statement, resulting in a quantitative, cumulative score for the total test. In a variation of this test, the subject may select the one item on the list which most closely describes his feeling, and a previously determined quantification of that choice may later be assigned by the experimenter as the test score. Levitt (1969, pp. 58-77) reviews some of the currently used inventories, including:

- Taylor's Manifest Anxiety Scale, including a short form by Bendig, a forced-choice form by Heineman, and a children's form by Castaneda, McCandless and Palermo.
- Minnesota Multiphasic Personality Inventory (MMPI) Derivatives (of which Taylor's MAS is one), including ones by Modlin, Purcell and Welsh.
- IPAT Anxiety Scale, developed by the Institute for Personality and Ability Testing
- S-R Inventory of Anxiousness, as developed by Endler and his associates, and including a short form by Perkins.

- The Fear Survey Schedule, as developed by Geer
- The Assimilation Scales, as developed by McReynolds and Acker
- Affect Adjective Check List, as developed by Zuckerman
- The Subjective Stress Scale (SSS), as developed by Kerle and Bialek for soldiers in simulated combat situations
- Freeman Manifest Anxiety Test
- State-Trait Anxiety Inventory, as developed by Spielberger and Gorsuch.
- Other inventories designed specifically for measuring test anxiety and achievement anxiety in academic settings

The general advantages of the inventory test includes ease and speed of administering and scoring, quantifiability, and high reliability. In fact, Levitt states, its reliability is greater than that of physiological measures or projective psychological tests, meaning that it is less affected by extraneous or trivial factors in the experimental situation (p. 58). He considers physiological measures unsuitable for research use, as of the date of his book, claiming that they are seldom found to be related either to each other, or to psychological indexes of anxiety, or to the intensity of stress (p. 56). In a later publication, he concedes that physiological measures are more suitable than verbal or psychological measures because they are more objective and less subject to voluntary control (Levitt & Chapman, 1972, p. 110). Levitt proclaims the advantages of the inventory test, noting that most psychologists would agree that they outweigh the disadvantages. One of those disadvantages is a susceptibility to response set-- the tendency of a considerable number of people to choose a particular response category. A greater disadvantage may be due to people selecting the socially desirable response-- the one through which they describe themselves as they would like to be seen by others. There may also be a desire to please the experimenter which can bias a subject's response.

The Subjective Stress Scale (Kerle & Bialek, 1958) was used with soldiers in the HumRRO FIGHTER studies along with physiological and performance measures (Berkun, Bialek, Kern & Yagi, 1962). Subjects choose from the checklist of words indicating affect The words have been quantitatively scaled by the original authors, producing an equal-appearing-interval Thurstone scale of 15 words. Table A-I gives the words and their scale values, as used in the FIGHTER studies. The 13th and 14th terms on this list ("Terrible" and "In Agony") were found to produce responses in terms of physical distress rather than to the environmental events. Consequently, Berkun et al. (1962) recommend the substitution of the word "Panicky" (with a scale value of 88) for "Terrible" and the deletion of "In Agony." Their recommendation, yielding a slightly revised 14-word list, was followed in the present study. Words are ordinarily presented in scrambled order rather than as on Table A-I, although the authors do not describe that order explicitly.

The use of performance measures to indicate stress typically requires that the distribution of scores achieved under stress differ significantly from those achieved under control or baseline conditions. In the HumRRO FIGHTER studies, for example, various task-relevant measures involving speed, accuracy, and completeness were obtained, as well as a consolidated measure (composite performance score) which combined a relative speed score with a pass-fail score for the subtasks. The measures were obtained for control and experimental groups, and an interesting finding emerged. High and low performers were found to be distinguishable using a relatively crude personality profile, with an effective performer seeming to function well under stress because of an ability to "lose himself" in the task, thereby reducing the perceived intensity and the imagined harm of the threat (Berkun, Bialek, Kern and Yagi, 1962, p. 35).

Table A-I

Subjective Stress Scale*

Item	Scale value or score
Wonderful	00
Fine	09
Comfortable	17
Steady	27
Didn't bother me	40
Indifferent	48
Timid	57
Unsteady	64
Nervous	69
Worried	74
Unsafe	76
Frightened	83
Terrible	87
In agony	92
Scared stiff	94

* Berkun, Bialek, Kern & Yagi (1962, p. 4).

Depending upon the purposes (or hypotheses) of the study, it appears that experimental stress reactions should be evaluated using some combination of measures. The specificity of individual responses suggests the need for several physiological measures if any are to be used at all. For reliability purposes and the minimization of idiosyncratic reactions, subjective self reports of emotional responses are imperative. These may be supplemented by independent observer reports based on overt subject behavior. If the study has any potential application to human performance under stress, then some kind of performance measures should also be made. Biochemical measures of stress reaction, while interesting and of good reliability, may be less practical to apply in many laboratories because they require different skills and more complex protocol for sampling and analysis than the other kinds of measures.

5. Laboratory Stress Induction

With an interest in studying the effects of psychological stress, and having reasonable methods for measuring those effects, the experimenter is concerned next with inducing the desired type of stress in the laboratory situation. Previous research has found that a common psychological element of stress is the anticipation of something harmful in the future and the interpretation of the personal significance of that harmful something (Lazarus, 1963). Anticipation is a key to the concept of threat, which may be regarded as an intervening variable in psychological stress. Depending upon the specific operational situation, anticipation and threat fit in with other dimensions which are essentially cognitive aspects of a threat situation, as follows:

a. Strength of threat, or the degree of seriousness of the situation as perceived.

b. Informational feedback, or the degree to which the individual can check on the adequacy of his performance relative to the situation.

c. Knowledge of the outcome, or the information that the individual has about the chances of actually being harmed or getting out of the situation.

d. The effect of performance on the outcome, or the amount of control that the individual has on the outcome of the situation through his own actions.

e. The temporal qualities of the situation, or the imminence of the physical threat and its perceived potential duration.

Laboratory studies have typically attempted to simulate stressful events with such stimuli as electric shock, noise, fatigue, unpredictability of consequences, and information overload. Without going outside the laboratory confines, few studies have attempted to simulate combat stress.

The threat of shock as a pain stimulus is often used in psychological experiments, and especially by investigators dealing with questions of stress, fear and anxiety (Bankart & Elliot, 1974; Breznitz, 1967; Deane, 1961, 1969; Fenz & Dronsejko, 1969; Folkins, 1970; Hodges & Spielberger, 1966). Often, the threat of a painful shock is used in conjunction with a difficult task, where failure to meet a preset performance criterion results in the subject receiving the actual shock. Standard stimulation techniques have been developed for this purpose, and pain responses have been studied as a function of numerous variables (Greenblatt & Tursky, 1969; Higgens, Tursky & Schwartz, 1971; Nichols & Tursky, 1967; Staub, Tursky & Schwartz, 1971; Sternbach & Tursky, 1964; Tursky 1974; Tursky, Greenblatt & O'Connell, 1971; Tursky & O'Connell, 1972; Tursky & Watson, 1964; Tursky Watson & O'Connell, 1965, 1969). The effects of threat of shock

on cardiovascular, electrodermal and other physiological responses have been found to be significant (Bankart & Elliot, 1974; Breznitz, 1967; Deane, 1961, 1966, 1969; Deane & Zeaman, 1958; Epstein & Roupemain, 1970; Fenz & Dronsejko, 1969; Hodges & Spielberger, 1966; Jenks & Deane, 1963).

The performance task is also used as a means of stress induction and measurement, though sometimes in conjunction with an aversive periodic stimulus or environmental condition (Bowen, 1968; Burns, Chambers & Handler, 1963;, Corso, 1952; Haggard, 1949; Harris, Mackie & Wilson, 1956; Plutchick, 1959). Cognitive tasks, too, have been used to evoke stressful reactions in experimental subjects (Kahneman, Tursky, Shapiro & Crider, 1969; Tursky, Schwartz & Crider, 1970). Motion pictures or other visual stimuli can produce significant effects (Kaiser & Roessler, 1970), and other studies show that the stress-producing stimuli can even be created in the subject's mind. That is, imagining stressful situations can evoke stress reactions (Craig, 1968; Fenz & Dronsejko, 1969; Grossberg & Wilson, 1968; Marks & Hudson, 1973; Waters & McDonald, 1973).

Since it is possible for subjects to produce stress reactions as a result of imagining a stressful situation, one can consider that added suggestions by the experimenter may be able to intensify the stress experience. This intensification may be especially likely if the subject is in a state of increased suggestibility like hypnosis. Indeed, many studies have already demonstrated various stress effects produced by hypnotized subjects in suggested emotional states (Craig, 1968; Damaser, Shor & Orne, 1963; Darrow, 1929a, 1929b; Erickson, 1944; Gidro-Frank & Bull, 1950; Grosz & Levitt, 1963; Hodge & Wagner, 1964; Hodge, Wagner & Schreiner, 1966; Levitt, den Breeijen & Persky, 1960; Persky, Grosz, Norton & McMurtry, 1959; True & Stephenson, 1963; Zuckerman, 1971). Some additional studies report on specific physiological effects, including:

metabolic and endocrine responses (Black & Friedman, 1968; Levitt, Persky & Brady, 1964; Whitehorn, Lundholm & Gardner, 1930); gastric motility and secretory responses (Eichorn & Tracktir, 1955a, 1955b, 1955c; Ikemi et al. 1959); cardiovascular changes (Bennett & Scott, 1949; Van Pelt, 1968); and respiratory responses (Dudley, Holmes, Martin & Ripley, 1964). Although less common, there have been several studies of physiological stress reactions using hypnotic recall of a previous actual stressful experience (Crystal, Gish & Bloom, 1973; Kline & Linder, 1969; Vandenbergh, Sussman & Titus, 1966). Hypnosis has been found able to help induce specific and differential autonomic, cognitive and other stress responses. However, it is important to note that suggestion without the formal induction of hypnosis has also been found able to help induce similar reactions (Barber, 1962, 1965, 1972; Orne, 1972; Sarbin &Coe, 1972; Shor, 1964). There remains a question as to whether the "unhypnotized" subject (sometimes designated as a "simulator") is also in an altered state (as in "self-hypnosis") or if he is demonstrating a natural control over his organism when taking on the suggested role.

The general guidelines for direct suggestions, as followed in this study, are those originally formulated by Levitt, den Breeijen, and Persky (1960). Those guidelines are repeated and elaborated by Levitt and Chapman (1972, p. 95) who add an additional directive to avoid unduly specifying the subject's reaction.

1. Content of the suggestion should not be based on the subject's personal experiences so as to avoid evoking other emotional responses, or otherwise complicating the subject's reaction.
2. A number of synonyms should be employed in the suggestion to maximize the possibility that the meaning of the stimulus suggestion will have at least some common elements among the subjects.

3. The suggestion itself should not be lengthy so it may remain clear and can be remembered.

4. Key words and expressions should be repeated and paraphrased to maximize comprehension and retention.

5. Nothing in the stimulus suggestion should lead the subject to believe that he is in an artificial situation.

6. The stimulus should specify the subject's reaction as minimally as possible.

Those authors also point out that comparative experimental studies of the effectiveness of different direct suggestions are lacking.

The measurement of hypnotizability, depth of hypnosis or, simply, responses to test suggestions is made with any of the widely used instruments, including:

- Stanford Hypnotic Susceptibility Scale
- Barber Suggestibility Scale
- Harvard Group Scale of Hypnotic Susceptibility
- Field's Inventory Checklist of Subjective Hypnotic Experiences

Those and many other scales are reviewed and compared in the literature by their authors and others (Barber, 1969b; Hilgard, 1968; Tart, 1972). Hilgard (1971) reports that tests of suggestibility with and without hypnotic induction show a small but consistent rise in scores when induction is used, indicating that hypnotic induction is probably not as important as practitioners have thought, but it still has residual effects. Hilgard refers to many kinds of suggestion-behavior, and feels that the hypnotic domain can be differentiated from the total domain of suggestibility.

The value of hypnosis as a general research technique is reviewed by Gidro-Grank and Bull (1950, pp. 93-97), Levitt, Persky and Brady (1964, pp. 8-9), and Bloom (1970), and includes:

- Relative simplicity of experimental settings, except for physiological and other monitoring apparatus
- Absence of self-consciousness in subjects
- Ability to psychologically isolate the phenomena (or states) to be observed, by eliminating spontaneous or complex stress activity
- Feasibility of repeated samplings with a minimum carryover from the past, producing relatively naive-type responses even when amnesia is incomplete
- Narrowed focus of attention in subjects, due to reduced distractability
- Rapid induction and termination of altered stress states which, in addition to being a convenience experimentally, insures control over their duration
- Ability to prolong or intensify the stress state by appropriate reinforcing stimuli (suggestions)
- Relegation of unpleasant or other experiences to forgetfulness (amnesia) through suggestion

The use of hypnosis as a research method for experimental replication and investigation of naturally occurring phenomena is evaluated carefully by Levitt and Chapman (1972). They conclude that hypnosis is a satisfactory method for creating reasonable facsimiles of at least some naturally occurring conditions. The authors note a lack of comparisons with alternative artificial techniques, though available evidence suggests that hypnosis is at least as powerful as other laboratory methods. They question, therefore, why the possibilities of its use are not being explored more extensively, and offer several possible reasons for this neglect. First, some may feel that too much time and effort are required to use a technique of unproven power. Second, there is an unusually high probability of sampling bias (e.g., the most hypnotizable people tend to volunteer for hypnosis experiments). Third, and probably most important, may be the shaky status and uncertain respectability of hypnosis in the community of scientists. "Until the mystical aura of the centuries has been dispelled," they state, "hypnosis will not be afforded a full, fair opportunity to demonstrate its value as a research method (p. 113)."

APPENDIX B

Letter and Questionnaire Used in Subject Recruitment

DUNLAP and ASSOCIATES, INC.
EASTERN DIVISION
ONE PARKLAND DRIVE, DARIEN, CONN. 06820 • 203•655-3971

We greatly appreciate your desire to become a paid volunteer subject in the Stress Research Project. We are conducting this project for the U. S. Army Human Engineering Laboratory at the above address in Darien, Connecticut.

The purpose of the project is to provide the Army with basic information about performance and reactions during conditions of physical or emotional stress. The research conditions include stress induced both physically and psychologically. All experimental sessions will be conducted by a professionally trained and experienced staff, and will include a physician on the premises. If you become a subject, your reactions will be recorded while doing such things as relaxing or performing standard tasks, while under hypnosis or normal conditions. As part of the standard performance task, you may receive safe but uncomfortable electric shock in one of your arms or legs, which you may occasionally experience as painful. You can be assured, however, that all procedures employed will be of a harmless and ethical nature in accordance with accepted psychological research standards. You will have the opportunity to report your reactions as part of the information we collect and analyze.

If you are accepted for participation, you can expect to attend three conveniently scheduled sessions, including:

- One 1-1/2 hour group meeting for preliminary screening and processing.

- Two 1-hour individual research sessions probably less than one month apart. You will be paid $10 for the first session completed and $20 for the second session. If you are a pre-test subject, you will complete one session for $10. You can also expect a brief examination by our physician at the first session.

You may at any time and for any reason withdraw from participation in this research project.

Enclosed is a questionnaire for you to fill out and return in the mailing envelope provided. If your background and availability are compatible with our needs, you will be asked to come here for a more detailed briefing, to complete some required forms, and to check on your ability to experience unusual states of awareness through hypnotic suggestions. All personal records and information will remain confidential. Information about you will appear only in a combined statistical description of all participating subjects.

To be considered as a possible paid volunteer please complete the enclosed questionnaire. Mail it back within one week in the prepaid envelope. You will be notified of the next step shortly afterwards.

Sincerely yours,

Richard F. Bloom, Ph. D.
Principal Investigator
Stress Research Project

RFB:njt

Enclosures

C_____Q_____S_____

STRESS RESEARCH PROJECT
Sponsored by U. S. Army Human Engineering Laboratory
Contract DAAD 05-73-C-0243

Questionnaire for Potential Research Subjects

1. Name:_____ 2. Date of Birth:_____

3. Address:_____ 4. Phone Number:

_____ (home)_____

(work or other)_____

5. Male ☐ Female ☐

6. Are you presently a student? Yes ☐ No ☐

7. If a student, indicate status: Full-time ☐ Part-time ☐
Day ☐ Evening ☐

8. If a student, indicate school:

School Name:_____

Address:_____

9. Are you now under a doctor's care for any medical or psychological problem:

Yes ☐ Please describe briefly (diagnosis, if possible):

_____

_____

No ☐

► (Continue on other side)

10. Do we have your permission to allow our medical doctor to examine you briefly during the sessions,in order to assure your ability to participate in this research?

Yes ☐

No ☐

11. Are you willing to cooperate in using standard laboratory research procedures which involve work, hypnosis and electric shock to help you experience stress for short periods of time?

Yes ☐

No ☐

12. Do you reasonably expect to be available to attend the group screening session and the two paid experimental sessions? (We will arrange mutually convenient times with you.)

Yes ☐

No ☐

13. Have you read and understood the cover letter accompanying this questionnaire, describing the purpose of this research, what experiences you can expect, the number of sessions involved and the amount of money you will receive for the sessions?

Yes ☐

No ☐

Signature:_____ Date_____

➤ Return completed questionnaire to:

Dr. Richard F. Bloom, Principal Investigator
Stress Research Project
Dunlap and Associates, Inc.
One Parkland Drive
Darien, Connecticut 06820

APPENDIX C

Group Screening and Medical Examination Forms

1. Self-Evaluation Questionnaire (State-Trait Anxiety Index)

2. Harvard Group Scale of Hypnotic Susceptibility--Form A (Only the cover page of this 10-page booklet is included.)

3. Field's Checklist of Subjective Hypnotic Experiences (No title appears on this True-False form.)

4. Volunteer's Participation Agreement

5. C.I. -- Form N2 (Cornell Index)

6. Medical Examination Form

SELF-EVALUATION QUESTIONNAIRE

Developed by C. D. Spielberger, R. L. Gorsuch and R. Lushene

STAI FORM X-1

NAME _____ DATE _____

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then blacken in the appropriate circle to the right of the statement to indicate how you *feel* right now, that is, *at this moment*. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

	NOT AT ALL	SOMEWHAT	MODERATELY SO	VERY MUCH SO
1. I feel calm	①	②	③	④
2. I feel secure	①	②	③	④
3. I am tense	①	②	③	④
4. I am regretful	①	②	③	④
5. I feel at ease	①	②	③	④
6. I feel upset	①	②	③	④
7. I am presently worrying over possible misfortunes	①	②	③	④
8. I feel rested	①	②	③	④
9. I feel anxious	①	②	③	④
10. I feel comfortable	①	②	③	④
11. I feel self-confident	①	②	③	④
12. I feel nervous	①	②	③	④
13. I am jittery	①	②	③	④
14. I feel "high strung"	①	②	③	④
15. I am relaxed	①	②	③	④
16. I feel content	①	②	③	④
17. I am worried	①	②	③	④
18. I feel over-excited and rattled	①	②	③	④
19. I feel joyful	①	②	③	④
20. I feel pleasant	①	②	③	④

CONSULTING PSYCHOLOGISTS PRESS
577 College Avenue, Palo Alto, California 94306

SELF-EVALUATION QUESTIONNAIRE

STAI FORM X-2

NAME _____ DATE _____

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then blacken in the appropriate circle to the right of the statement to indicate how you *generally* feel. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

	ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS
21. I feel pleasant	①	②	③	④
22. I tire quickly	①	②	③	④
23. I feel like crying	①	②	③	④
24. I wish I could be as happy as others seem to be	①	②	③	④
25. I am losing out on things because I can't make up my mind soon enough	①	②	③	④
26. I feel rested	①	②	③	④
27. I am "calm, cool, and collected"	①	②	③	④
28. I feel that difficulties are piling up so that I cannot overcome them	①	②	③	④
29. I worry too much over something that really doesn't matter	①	②	③	④
30. I am happy	①	②	③	④
31. I am inclined to take things hard	①	②	③	④
32. I lack self-confidence	①	②	③	④
33. I feel secure	①	②	③	④
34. I try to avoid facing a crisis or difficulty	①	②	③	④
35. I feel blue	①	②	③	④
36. I am content	①	②	③	④
37. Some unimportant thought runs through my mind and bothers me	①	②	③	④
38. I take disappointments so keenly that I can't put them out of my mind	①	②	③	④
39. I am a steady person	①	②	③	④
40. I become tense and upset when I think about my present concerns	①	②	③	④

RESPONSE BOOKLET – FORM A

HARVARD GROUP SCALE
OF
HYPNOTIC SUSCEPTIBILITY

by Ronald E. Shor and Emily Carota Orne

The Scale is a standard procedure for estimating susceptibility to hypnosis. An individual's susceptibility to hypnosis may change, however, over time and with differing circumstances. An individual who appears relatively unsusceptible at this time by these standard procedures will not necessarily still be relatively unsusceptible at a later time or under different circumstances.

PLEASE SUPPLY THE INFORMATION REQUESTED BELOW

Name: _____ **Date:** _____

Age: _____ **Sex:** _____ **School:** _____ **Class:** _____

Occupation: _____

Present Address: _____

_____ **Phone:** _____

Permanent Address: _____

_____ **Phone:** _____

Have you ever been hypnotized? Circle: Yes No
If so, please cite the circumstances and describe your experiences. Please be brief:

DO NOT OPEN THIS BOOKLET until the examiner specifically instructs you to do so

CONSULTING PSYCHOLOGISTS PRESS, INC. PALO ALTO, CALIFORNIA
C-4

Name_____ Date_____

Listed below is a series of numbered statements describing experiences you may have had in hypnosis. Please read the first statement carefully and decide whether it is true (or mostly true) as applied to you, or whether it is false (or mostly false) as applied to you. To record your answer, circle "T" for True or "F" for False just before the statement. Then go on to the rest of the statements. It is essential that every statement be answered, even though some may seem difficult or unclear.

True	False		
T	F	1.	Time stood still
T	F	2.	My arm trembled or shook when I tried to move it
T	F	3.	I felt dazed
T	F	4.	I felt aware of my body only where it touched the chair
T	F	5.	I felt I could have tolerated pain more easily during the experiment
T	F	6.	I could have awakened any time I wanted to
T	F	7.	I was delighted with the experience
T	F	8.	The experimenter's voice seemed to come from very far away
T	F	9.	I tried to resist but I could not
T	F	10.	Everything happened automatically
T	F	11.	Sometimes I did not know where I was
T	F	12.	It was like the feeling I have just before waking up
T	F	13.	When I came out I was surprised at how much time had gone by
T	F	14.	I came out of the trance before I was told to
T	F	15.	During the experiment I felt I understood things better or more deeply
T	F	16.	I was able to overcome some or all of the suggestions
T	F	17.	At times I was deeply hypnotized and at other times I was only lightly hypnotized
T	F	18.	During the final "countdown" to wake me up I became more deeply hypnotized for a moment
T	F	19.	At times I felt completely unaware of being in an experiment

CONTINUED ON BACK OF THIS PAGE

True	False		
T	F	20.	I did not lose all sense of time
T	F	21.	It seemed completely different from ordinary experience
T	F	22.	I was in a medium hypnotic state, but no deeper
T	F	23.	Things seemed unreal
T	F	24.	Parts of my body moved without my conscious assistance
T	F	25.	I felt apart from everything else
T	F	26.	It seems as if it happened a long time ago
T	F	27.	I felt uninhibited
T	F	28.	At times I felt as if I had gone to sleep momentarily
T	F	29.	I felt quite conscious of my surroundings all the time
T	F	30.	Everything I did while hypnotized I can also do while I am not hypnotized
T	F	31.	I could not have stopped doing the things the experimenter suggested even if I tried
T	F	32.	It was a very strange experience
T	F	33.	I felt amazed
T	F	34.	From time to time I opened my eyes
T	F	35.	I couldn't stop movements after they got started
T	F	36.	I had trouble keeping my head up all during the experiment
T	F	37.	My mind seemed empty
T	F	38.	It seemed mysterious

STRESS RESEARCH PROJECT--Dunlap and Associates, Inc., Darien, Conn. 06820

VOLUNTEER'S PARTICIPATION AGREEMENT

Name:_____

Age:_____

Address:_____

Name of Nearest Relative:_____

Address of Nearest Relative:_____

Telephone Number of Nearest Relative:_____

I,_____, have received, read and understand this Volunteer's Participation Agreement, and the general nature of the experiments I have volunteered to participate in have been explained from the standpoint of possible hazards to my health. It is my understanding that the experiments are so designed, based on the results of animal and previous human experimentation, that the anticipated results will justify the performance of the experiment. I understand further that experiments will be so conducted as to avoid all unnecessary physical and mental suffering and injury, and that I will be at liberty to request that the experiments be terminated at any time if in my opinion I have reached the physical or mental state where continuation of the experiments becomes undesirable.

I recognize that in the pursuit of certain experiments transitory discomfiture may occur and when such reactions seem especially likely to occur I will be so advised. I recognize, also, that under these circumstances, I must rely upon the skill and wisdom of the physician supervising the experiment to institute whatever medical measures are indicated to protect me.

There has been no coercion, element of fraud or deceit, undue moral suasion or other adverse pressure brought to bear in my volunteering for this duty. I have done so of my own free will, completely aware of all hazards, rewards and recognition involved.

DATE:_____WITNESS:_____

SIGNED:_____WITNESS:_____

C. I.—FORM N2

Name_____ Age_____ Today's Date_____
(Last) (First) (Middle)

Home Address_____ Are You Married?_____
(Street or RFD) (City) (State)

Occupation_____ Last School Grade Reached_____

Directions: Put a circle around **(YES)** if you can answer YES to the question asked.
Put a circle around **(NO)** if you have to answer NO to the question asked.
Answer all questions. If you are not sure guess.

1. Have you ever had a headache? ..... Yes No
2. Do you frequently feel faint? ..... Yes No
3. Do you have hot or cold spells? ..... Yes No
4. Have you fainted more than twice in your life? ..... Yes No
5. Do strange people or places make you afraid? Yes No
6. Do you often have spells of dizziness? ..... Yes No
7. Do you get all nervous and shaky when approached by a superior? ..... Yes No
8. Does the sight of blood make you want to drop down in a faint? ..... Yes No
9. Does your work fall to pieces when the boss or a superior is watching you? ..... Yes No
10. Are you scared to be alone with no friends near you? ..... Yes No
11. Do you feel nervous or dizzy right at this moment? ..... Yes No
12. Do you always get orders and directions wrong? Yes No
13. Does your thinking become completely confused when you have to do things quickly? ..... Yes No
14. Do you always sweat and tremble a lot during inspections or examinations? ..... Yes No
15. Do you wish that you always had someone at your side to advise you? ..... Yes No
16. Do you have to do things very slowly in order to be sure you are doing them right? ..... Yes No
17. Does it bother you to eat anywhere except in your home? ..... Yes No
18. Do you have an uncontrollable need to repeat the same disturbing actions? ..... Yes No
19. Is it always difficult for you to make up your mind? ..... Yes No
20. Do you usually feel cheerful and happy? ..... Yes No
21. Do you always have a bad time no matter what you are doing? ..... Yes No
22. Do you often feel miserable and blue? ..... Yes No
23. Does life usually look entirely hopeless? ..... Yes No
24. Are your emotions usually dead? ..... Yes No
25. Are you usually quiet and sad while at a party? Yes No
26. Do you often wish you were dead and away from it all? ..... Yes No
27. Are you considered a nervous person? ..... Yes No
28. Do you have any unusual fears? ..... Yes No
29. Do you often have difficulty in falling asleep or staying asleep? ..... Yes No
30. Does every little thing get on your nerves and wear you out? ..... Yes No
31. Does worrying continually get you down? ..... Yes No
32. Did you ever have a nervous breakdown? ..... Yes No
33. Were you ever a patient in a *mental* hospital? Yes No
34. Do you get out of breath long before anyone else? ..... Yes No
35. Do you have pains in the heart or chest? ..... Yes No
36. Does your heart often race like mad for no good reason? ..... Yes No
37. Do you often have difficulty in breathing? ..... Yes No
38. Are you often bothered by thumping of the heart? ..... Yes No
39. Do you often suddenly become frightened while you are thinking? ..... Yes No
40. Do you often shake or tremble? ..... Yes No

(OVER)

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Published by The Psychological Corporation, New York, N. Y.

71-148T

41. Are you often awakened out of your sleep by frightening dreams? Yes No

42. Do you always become scared at sudden movements or noises at night? Yes No

43. Do sudden noises make you jump and shake badly? Yes No

44. Do you tremble or feel weak every time some one shouts at you? Yes No

45. Are you keyed up and jittery every single moment? Yes No

46. Do you have very disturbing or frightening thoughts that keep coming back in your mind? Yes No

47. Do you suffer badly from frequent severe headaches? Yes No

48. Do you sweat a great deal even in cold weather? Yes No

49. Are you repeatedly bothered by severe itching? Yes No

50. Are you troubled by stuttering? Yes No

51. Have you at times had a twitching of the face, head or shoulders? Yes No

52. Were you a bed wetter between the ages of 8 to 14 years? Yes No

53. Do cold hands or feet trouble you even in hot weather? Yes No

54. Do you suffer from asthma? Yes No

55. Are you a bed wetter? Yes No

56. Are you a sleep walker? Yes No

57. Have you ever had a fit or convulsion? Yes No

58. Do pains in the back make it hard for you to keep up with your work? Yes No

59. Do you sometimes find yourself unable to use your eyes because of pain? Yes No

60. Is your body always in very bad condition? Yes No

61. Do severe pains and aches make it impossible for you to perform your duties? Yes No

62. Do you get spells of exhaustion or fatigue? Yes No

63. Do you wear yourself out with worrying about your health? Yes No

64. Do weak or painful feet make you miserable every single day? Yes No

65. Do you frequently get up tired in the morning? Yes No

66. Does pressure or pain in the head make it hard for you to perform your duties? Yes No

67. Are you always in poor health and unhappy? Yes No

68. Are you constantly too tired and exhausted even to eat? Yes No

69. Is your appetite good? Yes No

70. Do you constantly suffer from bad constipation? Yes No

71. Do you often suffer from an upset stomach? Yes No

72. Do you frequently get attacks of nausea (sick to your stomach)? Yes No

73. Do you suffer from indigestion? Yes No

74. Do you always have stomach trouble? Yes No

75. Do your stomach and intestines work badly? Yes No

76. Do bad pains in the stomach double you up after every meal? Yes No

77. Do you usually have trouble in digesting food? Yes No

78. Do you suffer badly from frequent loose bowel movements? Yes No

79. Has any doctor ever told you that you had ulcers of the stomach? Yes No

80. Do people usually misunderstand you? Yes No

81. Do you have the feeling of being watched while you are at work? Yes No

82. Have you usually been treated fairly? Yes No

83. Do you have the feeling that people are watching or talking about you in the street? Yes No

84. Do people usually pick on you? Yes No

85. Are you extremely shy or sensitive? Yes No

86. Are you easily upset or irritated? Yes No

87. Do you make friends easily? Yes No

88. Do you go all to pieces if you don't constantly control yourself? Yes No

89. Were you ever sent to reform school? Yes No

90. Have you ever gotten into serious trouble or lost your job because of drinking? Yes No

91. Have you been arrested more than three times? Yes No

92. Have you ever taken dope regularly (like morphine or "reefers")? Yes No

93. Do your enemies go to great lengths to annoy you? Yes No

94. Does it make you angry to have anyone tell you what to do? Yes No

95. Do you often drown your sorrows in drink? Yes No

96. Do you always do things on sudden impulse? Yes No

97. Do people always lie to you? Yes No

98. Do you flare up in anger if you cannot have the things that you want right away? Yes No

99. Is the opposite sex unpleasant to you? Yes No

100. Do you always have to be on your guard with friends? Yes No

101. Do you often get into a violent rage? Yes No

MEDICAL EXAMINATION FORM

C:_____ S:_____

Name:_____

Address:_____

_____

Phone:_____

Height:_____ Weight:_____

Age:_____ Sex: M F (circle one)

Pulse:_____

Blood Pressure:_____

Heart/Lungs:_____

Oral Temperature:_____

Respiration:_____

Color (General appearance):_____

Throat and Mucous Membranes:_____

Nodes (Neck and throat area):_____

ECG:_____

Comments:_____

_____

Subject is / is not qualified to participate in the Stress Research Project.
(specify one)

Examining Physician:_____ Examination Date:_____
(Signature)

APPENDIX D

Experimental Session Data Forms

1. Polygraph Record

2. Subjective Stress Scale (SSS), used by Subjects. The same form is used for both treatments--Part A (Baseline) and Part B (Stress)

3. Data Sheet -- Real Stress

4. Data Sheet -- Hypnotically-Induced Stress

5. Modified Self-Evaluation Questionnaire (STAI)

STRESS RESEARCH PROJECT
Dunlap and Associates, Inc.
Darien, Connecticut 06820

POLYGRAPH RECORD

Session
Index No.: _____

Subject No: _____ Trial No.: _____ Date: _____

Start Time: _____ End Time: _____

Subject Status: _____

Remarks: _____

_____

_____

Instrument Settings

Chart (number)	Time (secs.)	Respiration (sensitivity)	Plethysmograph (mode;sensitivity)	GSR (mode;sensitivity;bridge)		

SSS Rev. A-1

S:_____

Date:_____

Project Session:_____

Please find and check the one word best describing how you felt during Part _____of this session.

☐	Indifferent	☐	Panicky
☐	Didn't bother me	☐	Steady
☐	Nervous	☐	Fine
☐	Scared stiff	☐	Unsteady
☐	Unsafe	☐	Timid
☐	Worried	☐	Wonderful
☐	Comfortable	☐	Frightened

Data Sheet -- Real Stress

Pulse Amplitude Change

Summary of Data

Measure	Polygraph			SSS (0-94)	Observed (0-94)	STAI (20-80)
	Resp (rpm)	GSR (#pm)	Pleth (ppm/mm)			
Relaxed						*
Stressed						

*Trait; previously measured

C:_____

Date:_____

Project Session:_____

1. Medical Exam:_____
2. Set up (briefing and attach equipment) ☐
3. Polygraph Record Form: Initial settings ☐
4. Treatment 1:

   Relax for 2 minutes, eyes closed, before taking 1 minute of data

   a) Annotated Polygraph Record for Baseline
   Page(s):_____
   resp:_____rpm
   GSR:_____#pm
   pleth:___/____ppm/mm

   Comments:_____

   _____

   b) Subjective Stress Scale (SSS) -- Part A Score:_____

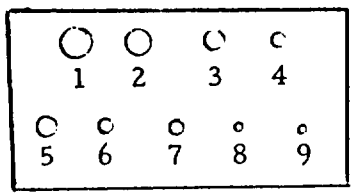
   c) Observer Stress Rating Score: (circle one)

☐ Wonderful	00
☐ Fine	09
☐ Comfortable	17
☐ Steady	27
☐ Didn't bother him	40
☐ Indifferent	48
☐ Timid	57
☐ Unsteady	64
☐ Nervous	69
☐ Worried	74
☐ Unsafe	76
☐ Frightened	83
☐ Panicky	88
☐ Scared stiff	94

5. Treatment 2:

Real Stress for 1 minute before taking 1 minute of data

a) Hole-steadiness-tester (h-s-t) criteria



Hole No.	1	2	3	4	5	6	7	8	9
Contacts/min.									

b) Hole used for Stress: No. _____

c) Duration of h-s-t task: _____ min.

d) Subject's resistance through electrode: _____K ohms

e) Electric shock amplitude criteria: Switch settings

(1) First perception _____ma.

(2) Uncomfortable: _____ma.

(3) Painful: _____ma.

(4) Tells experimenter to stop: _____ma.

f) Electric shock amplitude used for stress: _____ma.

g) Electric shock duration _____secs.

h) Scores:

(1) Total no. of stylus contacts: _____

(2) Total no. of shocks: _____

(3) Annotated Polygraph Record for Stress

resp: _____rpm

GSR: _____#pm

Page(s) _____

pleth: ___/___ppm/mm

Comments: _____

_____

(4) Subjective Stress Scale (SSS) -- Part B Score: _____

(5) State-Trait Anxiety Index (STAI) -- State Score: _____

(6) Observer Stress Rating Score: (circle one)

☐	Wonderful	00
☐	Fine	09
☐	Comfortable	17
☐	Steady	27
☐	Didn't bother him	40
☐	Indifferent	48
☐	Timid	57
☐	Unsteady	64
☐	Nervous	69
☐	Worried	74
☐	Unsafe	76
☐	Frightened	83
☐	Panicky	88
☐	Scared stiff	94

6. Polygraph Record Form: Final settings ☐

7. Subject Comments: _____

_____

_____

8. Experimenter Comments: _____

_____

_____

Data Sheet -- Hypnotically-Induced Stress

Pulse Amplitude Change	Hypnotic Depth	
	FCSHE (0-38)	Observed (0-10)

Summary of Data

Measure	Polygraph			SSS (0-94)	Observed (0-94)	STAI (20-80)
	Resp (rpm)	GSR (#pm)	Pleth (ppm/mm)			
Relaxed						*
Stressed						

*Trait; previously measured

C:_____

Date:_____

Project Session:_____

1. Medical Exam:_____
2. Set up (briefing and attach equipment) ☐
3. Polygraph Record Form: Initial settings ☐
4. Treatment 1:

   Relax for 2 minutes, eyes closed, before taking 1 minute of data

   a) Annotated Polygraph Record for Baseline — resp:_____rpm
   Page(s):_____ GSR:_____#pm
   pleth:___/___ppm/mm

   Comments:_____

   _____

   b) Subjective Stress Scale (SSS) -- Part A — Score:_____

   c) Observer Stress Rating — Score: (circle one)

☐ Wonderful	00
☐ Fine	09
☐ Comfortable	17
☐ Steady	27
☐ Didn't bother him	40
☐ Indifferent	48
☐ Timid	57
☐ Unsteady	64
☐ Nervous	69
☐ Worried	74
☐ Unsafe	76
☐ Frightened	83
☐ Panicky	88
☐ Scared stiff	94

5. Treatment 2:

Hypnotically-Induced Stress

a) Induction of hypnosis

Deepening suggestions:	Observed Response: good (2)	fair (1)	poor (0)
right arm heavy	☐	☐	☐
leg immobile	☐	☐	☐
right fist clenched shut	☐	☐	☐
shake head to say no	☐	☐	☐
pin pricking face	☐	☐	☐

Total (Observed Depth):_____

b) Instructions for imaginary task in hypnosis

- Subject going to have realistic experience; subject to let self react in all ways as he probably would if real; in fact, it will seem real.
- Hole-steadiness device; criteria for performance (3x = shock).
- Electric shock in lower leg; experience of sharp pain for exactly 1 second each time.
- Difficulty of task; expectation of sharp pain several times.
- Note how many times the hole is touched, and how many shocks are gotten; each time subject touches the hole, he is to say "touch"; each time he gets a shock, he is to to say "shock."
- Subject to carry out this task for about 3 minutes after experimenter says "go"; experimenter will announce when 3 minutes are over.

c) Maintain imaginary task for 1 minute, before taking data for 1 minute. Sequence of events (T = touch; S = shock):

d) Removal of stress condition; instructions for complete and accurate recall of the experience and how it felt so it can be reported on in detail a little later; suggestions for feeling comfortable, relaxed and refreshed after removal of the equipment which was attached to body earlier.

e) Scores:

(1) Total no. of "stylus contacts" (subject said "touch"): _____

(2) Total no. of "shocks" (subject said "shock"): _____

(3) Annotated Polygraph Record for Stress

resp: _____ rpm

GSR: _____ #pm

pleth: _____ / _____ ppm/mm

Page(s) _____

Comments: _____

_____

(4) Subjective Stress Scale (SSS) -- Part B Score: _____

(5) State-Trait Anxiety Index (STAI) -- State Score: _____

(6) Field's Checklist of Subjective Hypnotic Experiences (FCSHE) Score: _____

(7) Observer Stress Rating Score: (circle one)

☐	Wonderful	00
☐	Fine	09
☐	Comfortable	17
☐	Steady	27
☐	Didn't bother him	40
☐	Indifferent	48
☐	Timid	57
☐	Unsteady	64
☐	Nervous	69
☐	Worried	74
☐	Unsafe	76
☐	Frightened	83
☐	Panicky	88
☐	Scared stiff	94

6. Polygraph Record Form: Final settings ☐

7. Subject Comments: _____

_____

_____

8. Experimenter Comments: _____

_____

_____

MODIFIED

SELF-EVALUATION QUESTIONNAIRE

C:_____

Date:_____

Project Session:_____

Original Developed by C. D. Spielberger, R. L. Gorsuch and R. Lushene; Modified by R. F. Bloom

STAI FORM X-1, MOD. 1

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then blacken in the appropriate circle to the right of the statement to indicate how you felt during the experimental task. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your feelings best.

	NOT AT ALL	SOMEWHAT	MODERATELY SO	VERY MUCH SO
1. I felt calm	①	②	③	④
2. I felt secure	①	②	③	④
3. I was tense	①	②	③	④
4. I was regretful	①	②	③	④
5. I felt at ease	①	②	③	④
6. I felt upset	①	②	③	④
7. I was worrying over possible misfortunes	①	②	③	④
8. I felt rested	①	②	③	④
9. I felt anxious	①	②	③	④
10. I felt comfortable	①	②	③	④
11. I felt self-confident	①	②	③	④
12. I felt nervous	①	②	③	④
13. I was jittery	①	②	③	④
14. I felt "high strung"	①	②	③	④
15. I was relaxed	①	②	③	④
16. I felt content	①	②	③	④
17. I was worried	①	②	③	④
18. I felt over-excited and rattled	①	②	③	④
19. I felt joyful	①	②	③	④
20. I felt pleasant	①	②	③	④

APPENDIX E

Raw Data Coding Sheets
(listed by subject number within card numbers)

1. Card 1: Screening, Medical and Administrative
2. Card 2: Experimental Session 1
3. Card 3: Experimental Session 2

Subject Group Assignments

Subject Number		
Group 1	Group 2	Group 3
01	03	06
02	04	07
09	05	08
10	12	14
11	13	15
16	19	22
17	20	23
18	21	24
25	28	31
26	29	32
27	30	33
34	39	44
35	40	45
36	41	46
37	42	47
38	43	48
49	51	54
50	52	55
57	53	56
58	59	60

RAW DATA CODING SHEETS--COLUMN HEADINGS

Card 1	Column No.	Cards 2 and 3
Card Number	1	--Card Number
Candidate Number	2, 3, 4	--Candidate Number
Subject Number	5, 6	--Baseline Respiration Rate
Month of Birth	7, 8	--Baseline Total GSRs
Day of Birth	9, 10	--Baseline Non-specific GSRs
Year of Birth	11, 12	
School Attended	13, 14	--Baseline Pulse Rate
HGSHS Score	15, 16	
State Anxiety Index	17, 18	--Baseline Pulse Amplitude
Trait Anxiety Index	19, 20	--Baseline SSS Score
FCSHE Score	21, 22	--Baseline OSS Score
Cornell Index Score	23	--Hole Used in h-s-t
	24, 25	--Criterion Contacts in 60 Seconds
ECG Pulse Rate	26, 27	--Resistance Through Shock Electrode
Sinus Arrhythmia	28	
Systolic Blood Pressure	29, 30, 31	--First Shock Perception (Threshold)
Diastolic Blood Pressure	32, 33, 34	--Uncomfortable Shock (Discomfort)
Respiration Rate	35, 36, 37	--Painful Shock (Pain)

Card 1	Column No.	Cards 2 and 3
Handedness	38	
Group Assignment	39	--Stop Level (Tolerance)
Number of First Experimental Session	40	
	41	
	42	--Stress Shock Used
Date of First Experimental Session	43	
	44	
	45	--FCSHE Score
Number of Second Experimental Session	46	
	47	--Observed Hypnotic Depth
	48	
Date of Second Experimental Session	49	--Number of Stylus Contacts
	50	Under Stress
	51	--Number of Shocks Under Stress
Age at Group Screening	52	
	53	
	54	--Stress Respiration Rate
Date of Group Screening	55	
	56	
Prior Hypnosis	57	--Stress Total GSRs
	58	
	59	--Stress Non-specific GSRs
	60	--Increased GSR Amplitude Sensitivity
	61	
	62	
	63	--Stress Pulse Rate
	64	
	65	
	66	--Stress Pulse Amplitude
	67	--Increased Cardio Amplitude Sensitivity
	68	
	69	--Stress SSS Score
	70	
	71	--Stress OSS Score
	72	
	73	--Stress State Anxiety Index
	74	
	75	
	76	
	77	
	78	
	79	
	80	

CARD # CHRONDATE NUMBER	SUBJECT NUMBER			YEAR OF BIRTH	SCHOOL ATTENDED HIGHEST GRADE	STATE ANXIETY INDEX	TRAIT ANXIETY INDEX	FIELD'S CHECKLIST	CORNELL INDEX	EEG PULSE RATE (HZ)	SINUS ARRHYTHMIA	SYSTOLIC BLOOD PRESS. (HZ)	DIASTOLIC BLOOD PRESS (HZ)	RESPIRATION RATE (HZ)	HANDEDNESS GROUP ASSIGNED	# OF FIRST EXPERIMENTAL SESSION	DATE OF FIRST EXPERIMENTAL SESSION	# OF 2ND SESSION	DATE OF 2ND SESSION	AGE AT OF SCREENING	DATE OF GROUP SCREENING	PRIOR HYPN.
1 202	01		06	12	53	606	32	31	1	1	06	04	50	1	13	8	06	81	1	60	11	0	13	153	03	1	21	2	19	11	0	1
1 270	02		02	02	52	206	37	35	2	9	02	08	00	1	13	0	08	86	1	30	11	0	07	2271	07	9	27	7	21	26	5	1
1 042	03		03	28	52	306	35	40	1	1	04	07	80	2	11	0	06	60	1	80	12	0	49	223	05	3	23	2	20	09	0	1
1 351	04		06	06	48	106	27	24	1	3	01	07	60	1	11	5	07	70	1	40	12	0	83	2198	09	7	30	5	25	29	3	1
1 141	05		01	14	49	506	32	32	2	5	03	09	00	1	12	0	09	90	1	60	12	0	04	1466	01	2	15	2	24	11	0	1
1 106	06		10	21	52	206	32	37	2	3	09	10	30	1	12	0	06	60	1	60	23	0	02	1466	01	4	15	3	20	09	0	1
1 137	07		03	17	53	206	40	36	2	5	02	07	50	2	12	0	08	80	1	40	13	0	09	1526	02	4	16	6	20	11	0	1
1 258	08		05	04	55	106	34	30	2	8	06	07	50	1	12	0	08	80	1	80	23	0	73	2670	07	5	27	0	18	26	5	1
1 290	09		10	12	53	107	35	38	1	4	08	08	00	1	11	8	07	41	1	40	11	0	92	3062	12	6	32	3	18	29	3	1
1 142	10		07	06	49	107	34	40	1	5	04	07	50	1	11	5	07	51	1	40	11	0	21	1566	03	0	21	2	24	09	0	1
1 326	11		02	05	54	307	44	28	2	7	00	08	00	1	13	2	07	21	2	00	11	0	93	3062	10	0	30	6	19	30	0	1
1 251	12		01	15	49	407	34	36	1	1	04	09	60	1	14	0	08	01	1	60	12	0	81	2788	08	3	28	4	24	26	5	1
1 291	13		07	19	51	107	37	40	2	7	12	08	00	1	10	5	07	81	1	20	12	0	87	2918	09	6	30	5	22	29	3	1
1 198	14		10	23	51	507	42	42	2	2	06	07	50	1	11	0	06	01	1	60	13	0	39	2166	06	2	24	3	21	11	0	1
1 311	15		01	11	54	807	29	32	2	8	01	06	00	2	11	5	07	51	1	40	13	1	06	3122	11	8	31	9	19	30	0	1
1 085	16		07	17	51	706	35	44	1	5	13	06	50	2	12	0	07	51	1	80	11	0	44	2119	05	5	23	3	21	09	0	1
1 325	17		04	12	55	106	37	33	2	7	05	05	60	1	10	4	06	41	1	10	11	1	04	3019	12	3	32	0	18	30	0	1
1 267	18		02	25	52	106	43	32	3	0	28	06	50	1	13	0	07	41	1	20	11	0	91	3021	11	2	31	3	21	29	3	1
1 285	19		12	07	51	106	34	29	3	0	04	09	20	1	11	0	06	01	1	80	12	0	89	2978	09	8	30	5	21	29	3	1
1 320	20		08	06	52	806	42	65	3	2	16	09	00	1	14	2	09	01	1	20	22	1	05	3097	12	7	32	3	21	30	0	1
1 172	21		07	15	48	506	30	30	3	4	00	08	00	1	11	2	06	51	1	60	12	0	50	2300	05	9	23	7	24	11	1	1
1 045	22		03	20	49	806	34	36	2	5	10	06	50	1	11	0	08	01	1	60	23	0	16	1556	02	5	16	6	23	11	1	1
1 242	23		07	24	53	206	33	33	2	5	08	12	00	1	13	2	05	81	1	30	11	0	76	2710	08	0	27	3	20	26	5	1
1 343	24		02	16	54	606	38	33	3	4	00	08	80	1	11	0	07	01	1	60	13	0	95	3051	11	0	31	2	19	30	0	1

CARD 1 FORMAT

ONLY NUMBERS MAY BE ENTERED

Sinclair & Associates, Inc. K. F. Bloom
615-3971

JOB 655

1-1

E-5

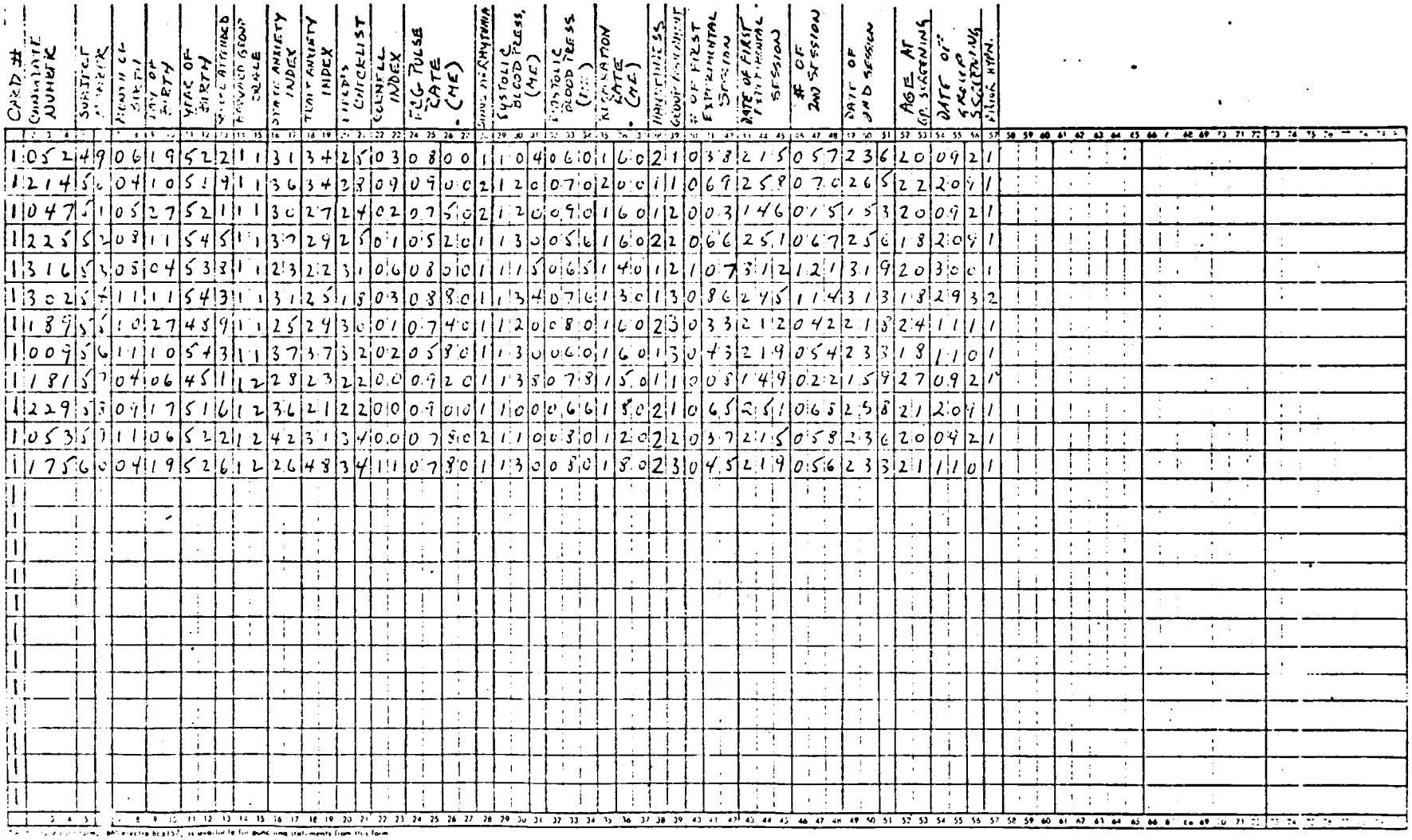
CARD #	SUBJECT NUMBER	MONTH OF BIRTH	DAY OF BIRTH	YEAR OF BIRTH	EDUCATION ATTAINED	MARRIED GROUP CODE	STATE ANXIETY INDEX	TRAIT ANXIETY INDEX	LIFE'S CHECKLIST CONTROL INDEX	EEG PULSE RATE (ME)	SINUS ARRHYTHMIA	SYSTOLIC BLOOD PRESS. (ME)	DIASTOLIC BLOOD PRESS (ME)	RESPIRATION RATE (ME)	HAND DEXTERITY GROOVE PEGBOARD	# OF FIRST EXPERIMENTAL SESSION	DATE OF FIRST EXPERIMENTAL SESSION	# OF 2ND SESSION	DATE OF 2ND SESSION	AGE AT CLOSE OF EXPERIMENT	DATE OF GROUP SCREENING	RISK HYPH.
1	263	2	5	10	20	43	1	09	29	28	1	09	01	10	00	1	16	0	09	01	60	21	10	82	278	08	4	28	4	24	26	5	1
1	134	2	6	08	14	52	5	09	38	38	1	7	31	08	60	1	11	5	07	01	40	11	10	20	156	02	9	21	1	20	11	0	1
1	273	2	7	11	23	32	3	09	30	29	3	4	01	06	80	1	13	0	08	8	30	21	10	90	302	10	2	30	9	40	29	3	1
1	305	2	8	03	15	53	1	09	35	36	2	2	17	07	00	2	11	8	06	4	20	12	12	01	306	12	4	32	1	20	24	3	1
1	314	2	9	07	23	52	8	09	43	32	2	3	04	07	00	1	13	0	08	0	20	11	21	17	319	12	8	32	6	21	30	0	2
1	156	3	0	04	10	53	7	09	39	39	2	4	10	07	50	1	12	0	06	01	60	12	02	23	159	04	0	21	6	20	11	1	1
1	133	3	1	01	23	52	5	09	40	32	2	5	01	08	20	1	12	0	06	01	60	13	00	60	234	06	4	24	3	21	09	2	1
1	282	3	2	11	05	52	1	09	34	38	3	6	04	07	20	1	12	0	07	01	20	13	09	94	302	11	3	31	3	20	29	3	1
1	328	3	3	08	05	55	8	09	43	37	3	5	11	07	00	1	11	5	07	01	40	13	10	09	312	12	0	31	9	18	30	0	1
1	174	3	4	05	07	53	6	10	29	27	1	7	05	06	50	1	12	0	06	01	70	11	10	06	123	99	06	32	4	31	9	1	1
1	152	3	5	01	22	53	5	10	35	41	2	8	06	05	30	2	11	4	06	01	40	11	10	27	114	03	5	21	5	20	09	2	2
1	115	3	6	11	06	51	7	10	34	39	2	9	03	07	00	1	13	0	07	01	80	11	10	05	148	01	8	15	6	21	11	0	1
1	342	3	7	05	15	52	8	10	23	32	3	0	02	06	50	1	13	2	08	6	20	11	11	03	309	11	6	31	4	21	30	0	1
1	276	3	8	07	06	53	3	10	34	25	3	7	02	07	00	1	12	0	06	21	20	11	10	99	306	11	1	31	3	20	30	0	1
1	076	3	9	12	16	48	1	10	52	54	1	6	23	06	50	2	11	2	06	41	60	11	20	26	194	03	2	21	2	24	09	0	2
1	143	4	0	03	13	50	5	10	33	26	1	7	10	06	20	1	10	4	05	81	80	22	00	28	211	05	1	23	2	23	11	1	1
1	113	4	1	03	12	51	2	10	24	29	2	5	00	07	70	1	13	0	08	01	60	11	20	06	149	01	7	15	5	22	09	2	1
1	196	4	2	01	11	53	5	10	37	28	3	1	01	08	00	1	13	2	06	61	40	11	20	34	215	04	6	22	2	20	13	4	1
1	062	4	3	04	01	51	2	10	49	30	3	2	00	06	60	2	13	6	07	21	40	11	20	11	152	01	9	15	6	22	09	2	1
1	257	4	4	05	21	53	5	10	36	51	2	9	24	06	20	1	12	4	07	01	80	13	07	22	267	07	8	27	4	20	26	5	1
1	135	4	5	01	01	46	5	10	31	33	3	1	00	06	40	1	11	0	07	01	50	13	04	41	216	04	8	22	3	27	09	0	1
1	310	4	6	09	27	54	2	10	37	44	3	2	12	07	20	1	13	6	07	01	20	13	11	15	314	12	5	32	3	19	24	3	1
1	319	4	7	03	24	52	8	10	48	38	3	2	00	08	00	2	12	5	07	01	40	13	11	03	312	11	9	31	5	21	30	0	1
1	230	4	8	10	12	51	2	10	27	30	3	5	02	08	00	1	13	0	08	10	20	01	30	71	267	07	4	27	4	21	26	5	1

CARD 1 FORMAT

ONLY NUMBERS MAY BE ENTERED

JOB 655

1-2



CARD #	SUBJECT NUMBER	RESPONDENT SEX	DAY OF BIRTH	YEAR OF BIRTH	MARITAL STATUS	EDUCATION GROUP	STATE ANXIETY INDEX	TRAIT ANXIETY INDEX	HEP'S CHECKLIST	CORNELL INDEX	EKG PULSE RATE (HR)	CARDIAC ARRHYTHMIA	SYSTOLIC BLOOD PRESS. (HG)	DIASTOLIC BLOOD PRESS. (HG)	RESPIRATION RATE (HR)	HANDEDNESS	GROUP ASSIGNMENT	# OF FIRST EXPERIMENTAL SESSION	DATE OF FIRST EXPERIMENTAL SESSION	# OF 2ND SESSION	DATE OF 2ND SESSION	AGE AT SCREENING	DATE OF SCREENING	GROUP SCREENING	PILOT HYPN.
1	052	4	06	19	52	2	11	31	34	2	5	03	08	00	1	10	4	06	01	60	2	1	0	38	215	057	236	20	09	2	1
1	214	5	04	10	51	4	11	36	34	2	3	09	09	00	2	12	0	07	02	00	1	1	0	69	258	070	265	22	20	4	1
1	047	5	05	27	52	1	11	30	27	2	4	02	07	50	2	12	0	09	01	60	1	2	0	03	146	015	153	20	09	2	1
1	225	5	20	11	54	5	11	37	29	2	5	01	05	20	1	13	0	05	16	1	60	2	2	0	66	251	067	256	18	20	4	1
1	316	5	05	04	53	3	11	23	22	3	1	06	08	00	1	11	5	06	51	1	40	1	2	1	07	312	121	319	20	30	0	1
1	302	5	11	11	54	3	11	31	25	1	5	03	08	80	1	13	4	07	61	1	30	1	3	0	86	245	114	313	18	29	3	2
1	189	5	10	27	48	9	11	25	29	3	0	01	07	40	1	12	0	08	01	1	60	2	3	0	33	212	042	218	24	11	1	1
1	009	5	11	10	54	3	11	37	37	3	2	02	05	80	1	13	0	06	01	1	60	1	3	0	43	219	054	233	18	11	0	1
1	181	5	04	06	45	1	12	28	23	2	2	00	09	20	1	13	5	07	81	1	50	1	1	0	08	149	022	159	27	09	2	1
1	229	5	09	17	51	6	12	36	21	2	2	00	09	00	1	10	0	06	61	1	80	2	1	0	65	251	065	258	21	20	4	1
1	053	5	11	06	52	2	12	42	31	3	4	00	07	80	2	11	0	03	01	1	20	2	2	0	37	215	058	236	20	09	2	1
1	175	6	04	19	52	6	12	26	48	3	4	11	07	80	1	13	0	08	01	1	80	2	3	0	45	219	056	233	21	11	0	1

E-7

CARD 1 FORMAT

ONLY NUMBERS MAY BE ENTERED

JOB 655

1-3

Col 66, 67
1 no
2 yes

Col 64 (normal / opposed)

Subject #	Card # (2 or 3)	Candidate Number	Respiration Rate (BL)	GSRs (Total) (BL)	GSRs (Non-Specific) (BL)	Pulse Rate (BL)	Pulse Amplitude (BL)	Subjective Stress Scale (BL)	Observer Stress Scale (BL)	Half Used (RS)	Contacts in 30 Sec. (RS)	Resistance Thru Shock Electrode (RS)	1st Shock Recognition (RS)	Uncomfortable Shock (RS)	Painful Shock (RS)	Stop Level (RS)	Stress Shock Used (RS)	Fields Checklist (HS)	Objective Anxiety Depth (HS)	# of Stylus Contacts	# of Shocks	Respiration Rate	GSRs (Total)	GSRs (Non-Specific)	Intermediate Scale	Pulse Rate	Pulse Amplitude	Intermediate	Subjective Stress Scale	Observer Stress Scale	State Anxiety Index
13	2	202	125	00	00	0480	23	17	09	5	010	507	002	018	030	050	052			004	02	165	07	05	1	0470	07	1	17	57	32
77	2	270	140	00	00	0800	24	17	17	4	013	650	004	022	035	070	072			072	10	250	00	00	1	0930	02	1	69	85	57
49	2	042	170	02	00	0670	17	27	27									09	02	002	00	240	05	05	1	0760	07	1	74	57	70
88	2	351	130	01	00	0520	16	17	17									19	03	000	00	150	05	05	1	0820	15	1	17	57	26
4	2	141	130	00	00	0800	16	17	09									25	06	001	00	130	04	04	1	0800	07	1	27	57	38
2	2	106	140	01	01	0970	09	45	07	6	019	425	006	032	050	064	066			009	03	150	07	04	1	1110	04	1	67	74	44
9	2	139	080	00	00	0770	25	45	07	6	014	575	006	024	050	066	068			006	02	225	06	04	1	0920	03	1	64	69	61
73	2	258	140	00	00	0650	20	48	17	5	014	555	006	027	041	063	065			012	04	210	03	03	1	0720	05	1	64	74	42
92	2	240	140	00	00	0700	30	17	27	6	014	518	002	013	019	070	072			021	00	170	03	00	1	0690	07	1	64	43	57
21	2	142	170	00	00	0750	28	64	07	7	031	475	006	018	038	043	050			043	07	210	09	02	1	0870	01	1	64	69	52
93	2	326	080	00	00	0810	12	40	27	6	020	510	004	028	036	045	047			007	02	170	01	01	1	0810	20	1	64	57	53
81	2	251	220	00	00	0820	32	17	17									16	06	008	03	240	00	00	1	0900	13	1	69	64	51
87	2	291	085	00	00	0780	10	17	27									25	06	008	00	170	00	00	1	0760	19	1	74	40	54
39	2	193	135	00	00	0650	12	17	57	6	013	690	004	025	045	057	059			042	05	110	05	00	1	0700	01	2	64	64	42
106	2	311	170	00	00	0720	15	09	57	6	021	475	010	048	070	090	092			005	02	220	02	00	1	0950	05	1	69	65	52
44	2	085	110	00	00	0570	25	17	17	6	012	665	002	047	073	082	084			003	01	135	01	00	1	0580	07	1	64	57	51
104	2	325	110	03	03	0600	25	27	40	8	031	550	004	034	064	080	082			031	07	080	02	00	1	0580	03	2	69	74	66
91	2	267	230	00	00	0630	20	27	17	6	015	582	004	018	030	044	046			059	03	315	07	00	1	0920	03	2	64	83	56
35	2	235	150	00	00	0920	22	17	27									25	09	005	02	190	03	03	1	0970	07	1	64	64	47
105	2	320	135	02	02	0720	30	69	17									29	07	001	00	255	00	00	1	0900	17	1	27	64	38
50	2	172	095	00	00	0780	25	17	07									30	08	000	00	210	01	01	1	0850	14	1	27	57	51
16	2	045	080	02	02	0720	25	17	09	6	035	480	006	037	039	053	055			050	07	155	05	01	1	0750	05	1	69	76	55
76	2	242	120	00	00	0890	32	40	17	7	031	650	002	012	024	058	060			037	08	235	01	00	1	0830	02	1	27	69	51
95	2	343	115	01	01	0740	19	69	57	6	012	529	022	046	073	087	089			007	02	130	05	04	1	0700	14	1	40	74	46

ONLY NUMBERS MAY BE ENTERED

CARDS 2 AND 3 FORMAT

TAB 6.5.5

Card 2

2-1

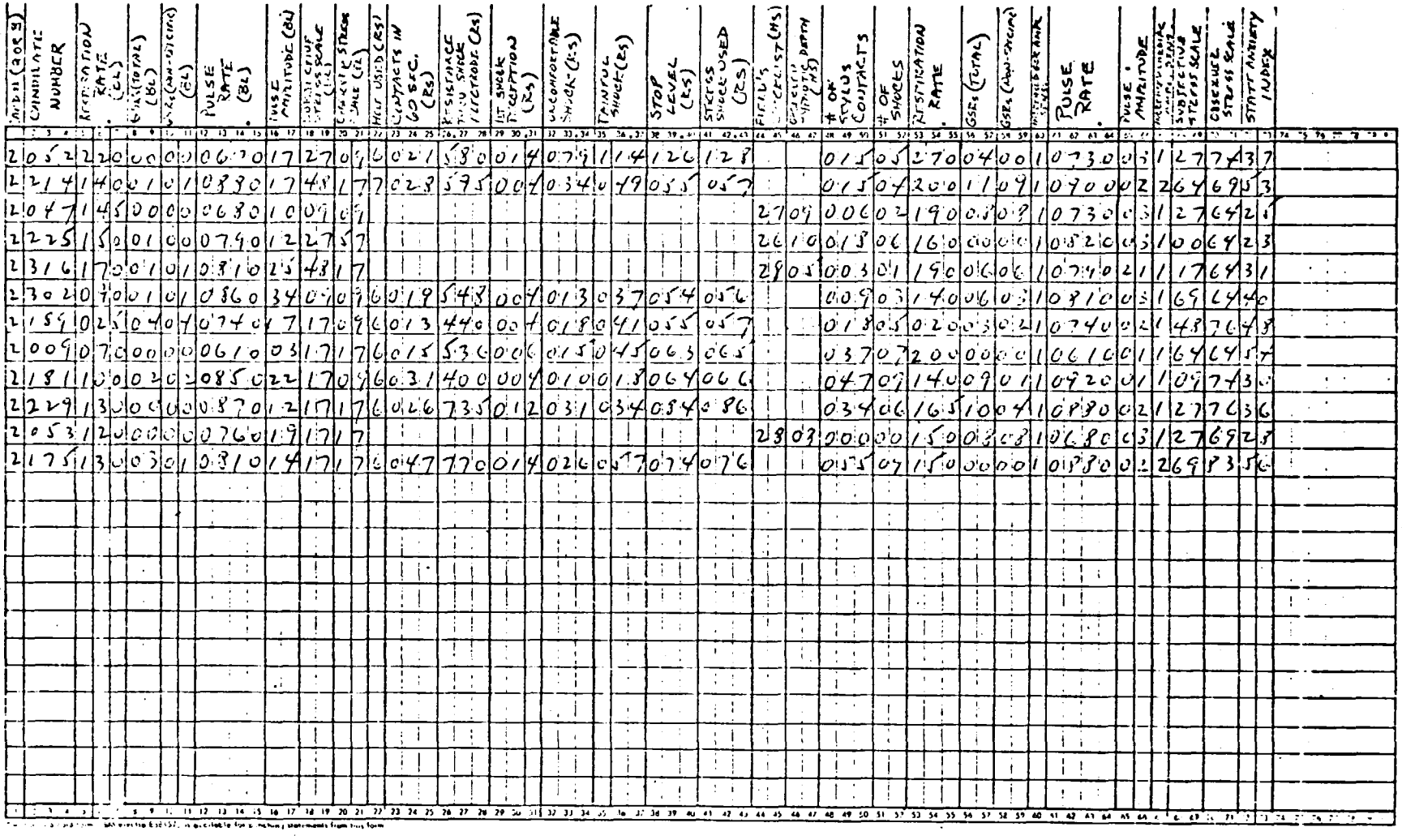
	[illegible] (Card 2)	Candidate Number	Respiration Rate (BL)	GSRs (Total) (BL)	GSRs (Non-specific) (BL)	Pulse Rate (BL)	Pulse Amplitude (BL)	Subjective Stress Scale (BL)	Objective Stress Scale (BL)	Hole Used (RS)	Contacts in 60 Sec. (RS)	Resistance thru Shoe Electrode (RS)	1st Shock Perception (RS)	Uncomfortable Shock (RS)	Painful Shock (RS)	Stop Level (RS)	Stress Shock Used (RS)	Field's Checklist (HS)	Observed Hypnotic Depth (HS)	# of Stylus Contacts	# of Shocks	Respiration Rate	GSRs (Total)	GSRs (Non-specific)	[illegible]	Pulse Rate	Pulse Amplitude	[illegible]	Subjective Stress Scale	Observer Stress Scale	State Anxiety Index
82	2	263	160	03	03	0950	21	17	27	6	058	510	012	116	124	133	135			093	10	245	11	02	1	1120	07	2	69	88	54
20	2	134	140	03	03	0750	22	27	09	6	015	510	006	021	033	039	041			016	04	200	04	01	1	0560	03	2	64	67	48
90	2	273	125	00	00	0690	23	09	17	6	017	598	023	052	060	070	072			084	08	110	10	03	1	0850	09	1	64	88	51
101	2	305	120	00	00	0840	34	17	09									23	07	002	00	200	03	03	1	0890	11	1	69	57	38
117	2	314	110	00	00	0690	37	27	09									19	09	022	11	230	00	00	1	0800	50	1	76	76	46
23	2	156	200	00	00	0715	18	17	17									11	04	001	00	230	00	00	1	0735	07	1	64	64	45
60	2	133	190	02	00	0760	20	09	17	6	011	500	003	042	058	068	070			017	05	170	05	04	1	0660	07	1	69	69	57
94	2	282	175	02	01	0670	15	27	07	6	030	505	004	013	025	040	042			022	06	200	03	02	1	0620	03	1	64	64	53
109	2	328	155	00	00	0630	33	09	17	7	024	727	006	012	018	026	028			073	10	210	10	00	1	0730	04	1	38	74	65
61	2	174	130	01	01	0760	18	09	17	5	011	490	006	039	060	070	072			001	00	165	00	00	1	0700	02	1	69	69	51
27	2	152	040	00	00	0790	15	17	27	6	034	598	00?	080	100	208	210			078	09	215	00	00	1	0830	02	1	74	88	73
5	2	115	135	00	00	0640	09	17	07	6	013	375	006	054	079	104	106			029	07	130	08	04	1	0700	02	2	64	64	51
103	2	342	110	00	00	0690	25	40	17	5	013	618	000	015	015	076	078			003	01	130	04	03	1	0630	10	1	45	69	49
99	2	276	140	00	00	0740	14	17	57	6	010	434	004	019	031	043	045			007	02	160	07	05	1	0660	04	1	64	57	56
26	2	076	140	00	00	0610	15	69	07									11	05	007	01	140	01	01	1	0730	18	1	64	69	50
25	2	143	130	00	00	0720	13	45	57									17	07	001	00	220	01	01	1	0710	01	2	69	69	47
6	2	113	100	00	00	0690	21	40	07									25	06	004	00	120	00	00	1	0370	05	1	74	69	51
34	2	196	150	00	00	0840	14	43	27									27	07	000	00	230	04	04	1	1050	01	1	64	83	72
11	2	062	140	00	00	0690	20	45	07									31	07	008	03	160	06	06	1	0730	12	1	64	57	43
72	2	257	150	00	00	0630	16	17	17	6	021	565	004	022	031	054	056			065	10	170	00	00	1	0620	04	2	64	65	50
41	2	135	110	00	00	0620	11	40	17	7	027	740	008	023	030	038	040			027	06	160	07	02	1	0700	01	1	48	76	47
115	2	310	190	00	00	0720	02	45	40	0	021	785	004	011	024	042	044			006	02	220	01	00	1	0690	03	1	27	74	57
109	2	319	110	00	00	0700	09	17	17	6	026	727	004	013	021	032	034			053	07	160	07	00	1	0790	11	1	64	69	67
71	2	230	210	00	00	0820	17	48	07	7	020	540	006	048	056	076	098			033	07	250	01	00	1	0740	02	2	27	69	44

ONLY NUMBERS MAY BE ENTERED

CARDS 2 AND 3 FORMAT

TAB 6.55

2-2



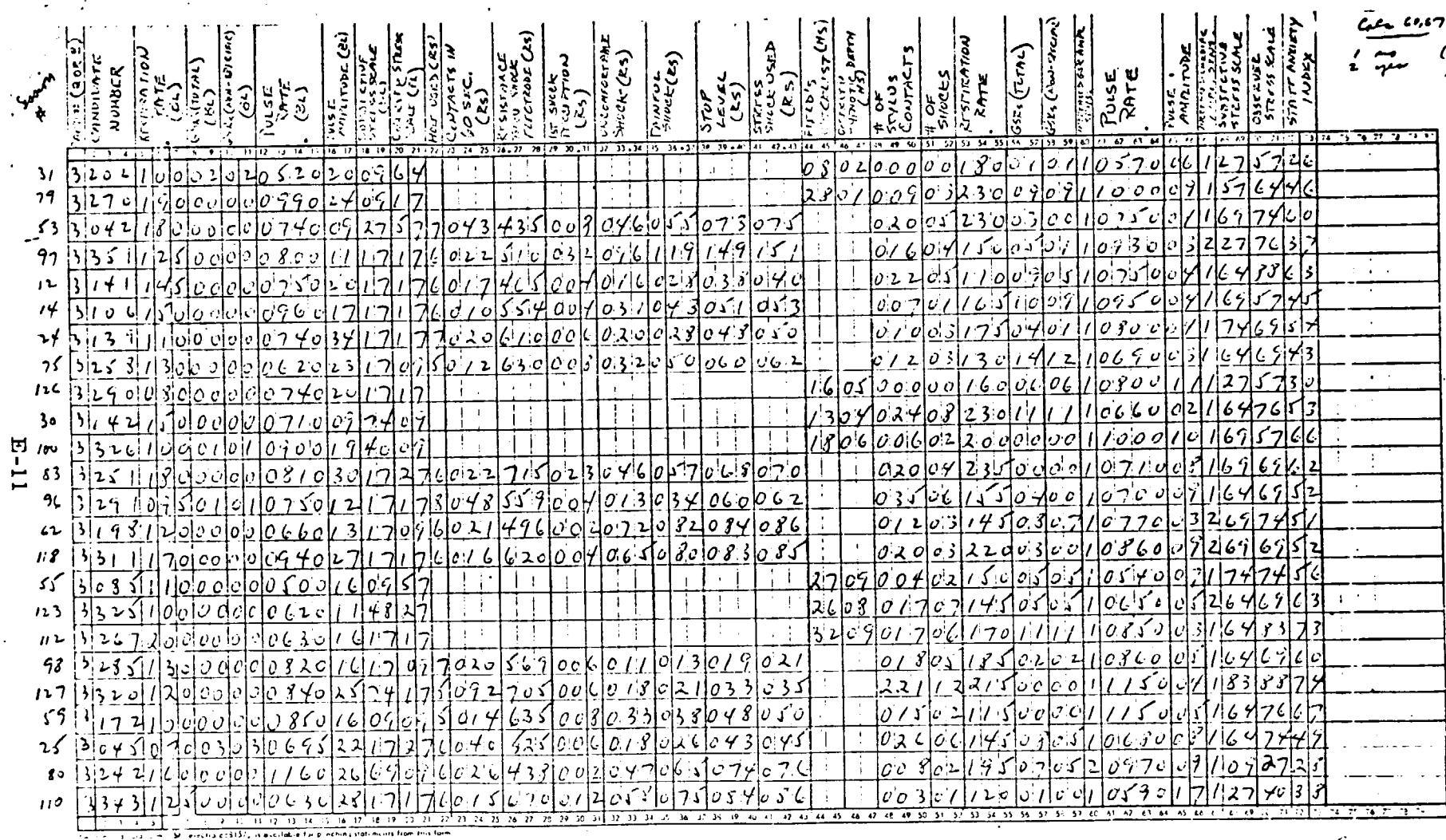
E-10

ONLY NUMBERS MAY BE ENTERED

CARDS 2 AND 3 FORMAT

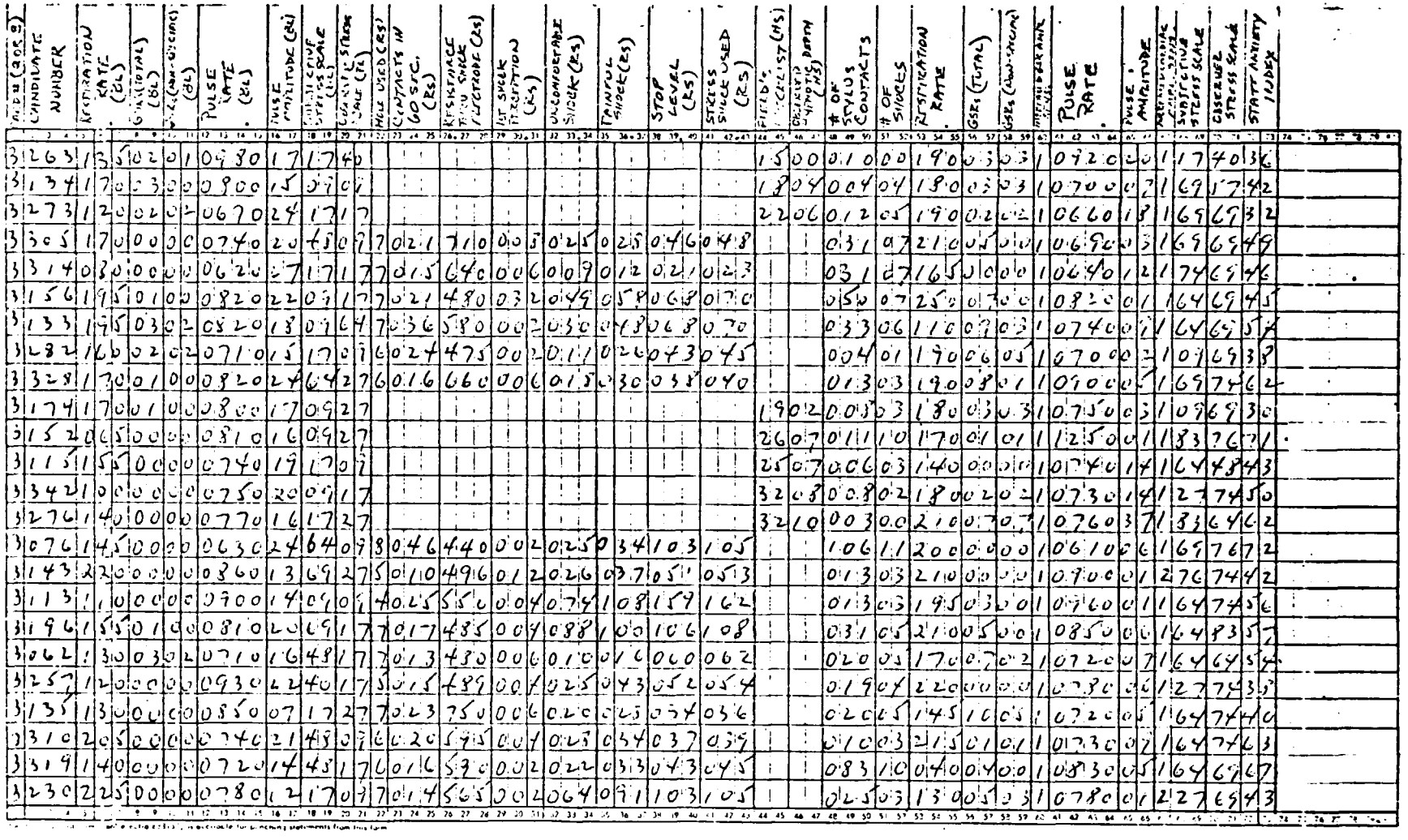
JOB 655

2-3



CARDS 2 AND 3 FORMAT

CARDS ONLY NUMBERS MAY BE ENTERED



E-12

CARDS 2 AND 3 FORMAT

ONLY NUMBERS MAY BE ENTERED

Card 3

3-2

	Card # (2 or 3)	Candidate Number	Respiration Rate (BL)	GSRs (Total) (BL)	GSRs (Non-specific) (BL)	Pulse Rate (BL)	Pulse Amplitude (BL)	Subjective Stress Scale (BL)	Observer Stress Scale (BL)	Hole Used (RS)	Contacts in 60 sec. (RS)	Resistance thru Shock Electrode (RS)	1st Shock Perception (RS)	Uncomfortable Shock (RS)	Painful Shock (RS)	Stop Level (RS)	Stress Shock Used (RS)	Field's Checklist (HS)	Hypnotic Depth (HS)	# of Stylus Contacts	# of Shocks	Respiration Rate	GSRs (Total)	GSRs (Non-specific)	Intermediate Stress	Pulse Rate	Pulse Amplitude	Intermediate Stress	Subjective Stress Scale	Observer Stress Scale	State Anxiety Index
57	3	052	210	00	00	0750	19	27	17									19	06	003	00	210	00	00	1	0670	07	1	27	40	25
70	3	214	150	01	00	1000	21	43	17									31	05	002	00	170	05	05	1	1000	13	1	17	48	42
15	3	047	170	00	00	0610	19	17	09	7	011	698	002	005	010	032	034			017	05	140	05	03	1	0600	04	2	64	64	43
67	3	225	160	00	00	0770	20	17	17	6	023	554	004	022	025	090	072			019	04	160	07	04	1	0930	01	2	27	69	51
121	3	316	150	00	00	0710	15	48	07	8	046	510	006	012	042	033	040			057	09	220	00	00	1	0770	04	1	64	69	57
114	3	302	120	01	01	0800	25	17	07	6	020	475	002	019	050	063	065			002	01	135	07	06	1	0830	01	1	74	64	41
42	3	189	015	02	02	0730	15	17	07	6	016	660	014	044	060	066	065			021	05	020	04	02	1	0770	04	1	64	76	56
54	3	009	075	00	00	0580	20	17	17	7	022	690	000	033	044	062	064			045	08	190	03	00	1	0580	02	1	64	74	43
22	3	181	170	00	00	1000	12	17	09									25	10	021	07	120	00	00	1	0330	14	1	09	45	35
68	3	229	150	00	00	0900	19	17	17									25	08	002	01	180	02	02	1	0940	13	1	74	69	40
58	3	053	105	00	00	0750	17	17	27	6	045	607	007	013	026	035	037			055	04	155	05	00	1	0700	02	2	64	74	44
56	3	175	110	00	00	0760	12	17	09	5	015	610	004	022	046	076	078			005	01	120	00	00	1	0740	03	1	64	74	47

ONLY NUMBERS MAY BE ENTERED

CARDS 2 AND 3 FORMAT

JOB 655

Card 3

3-3

APPENDIX F

Intercorrelation Matrices for Stress and Baseline Measures

1. Group 1
2. Group 2
3. Group 3
4. Groups 1, 2 and 3

TABLE F-1. INTERCORRELATION MATRIX FOR STRESS AND BASELINE EXPERIMENTAL MEASURES (EXCEPT PERFORMANCE SCORES) -- GP. 1

			HEART RATE				GSR				RESPIRATION RATE				SUBJECTIVE STRESS SCALE				STAI			OBSERVED STRESS SCALE			
			BASELINE		STRESS		BASELINE		STRESS		BASELINE		STRESS		BASELINE		STRESS		BASE	STRESS		BASELINE		STRESS	
		SESSION	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1,2	1	2	1	2	1	2
HEART RATE	BASE.	1	—	.91***	.85***	.71***	.31	-.22	.12	-.01	-.07	.22	.28	.18	.18	.12	.12	-.16	-.39*	.08	.00	.08	-.46*	.39*	-.28
		2		—	.72***	.72***	.27	-.22	.17	-.14	-.12	.28	.24	.14	.10	.06	-.02	-.30	-.41*	-.03	-.13	.01	-.50*	.30	-.46*
	STR.	1			—	.59***	.29	-.06	-.03	.17	.21	.40*	.53***	.22	.15	.12	.16	-.06	.22	.07	.03	-.14	-.45*	.65***	-.20
		2				—	-.03	-.20	.02	-.07	-.34	-.08	.36	.06	.35	-.05	.20	.06	-.15	.38*	.33	.18	-.32	.41*	-.04
GSR	BASE.	1					—	-.06	-.11	-.11	-.04	.09	-.14	-.32	-.12	.08	.07	-.27	-.15	.03	-.10	.09	-.61	.20	-.35
		2						—	.23	-.31	-.12	-.31	-.20	.15	-.25	-.10	-.17	-.06	-.25	-.22	-.31	-.08	.40*	.05	-.15
	STR.	1							—	-.10	-.01	-.05	-.16	.03	.10	.19	-.17	-.11	-.24	-.25	-.18	.03	.06	-.19	-.26
		2								—	.46*	.24	.34	.37	.19	.33	.44*	.23	.25	.37	.38*	.21	-.05	.11	.50*
RESP. RATE	BASE	1									—	.72***	.62***	.32	-.15	-.16	-.09	-.19	-.02	-.26	-.22	-.22	-.13	.15	-.15
		2										—	.57***	.24	-.22	.01	-.20	-.18	-.21	-.40*	-.22	-.38*	-.36	.33	-.23
	STR	1											—	.41*	.21	-.02	.10	-.06	.17	.05	.08	-.25	-.15	.40*	-.13
		2												—	.24	.23	.20	.18	-.03	.09	.01	.09	-.10	.16	.09
SUBJ. STR. SCALE	BASE	1													—	.61**	.21	.17	.41*	.36	.49*	-.05	-.28	.06	.23
		2														—	.14	.06	.11	.16	.21	.05	-.33	-.10	-.01
	STR.	1															—	.38*	.45*	.39***	.49*	.41*	-.10	.13	.32
		2																—	.26	.44*	.66***	.32	-.09	.08	.53***
STAI	BASE	1,2																	—	.43*	.21	-.23	.11	-.14	.17
	STR.	1																		—	.66***	.57***	-.08	.19	.39*
		2																			—	.47*	-.10	.13	.59***
OBS. STR. SCALE	BASE	1																				—	.13	-.13	.15
		2																					—	-.18	.07
	STR.	1																						—	.15
		2																							—

* $p < .05$ ** $p < .01$ *** $p < .001$

TABLE F-2. INTERCORRELATION MATRIX FOR STRESS AND BASELINE EXPERIMENTAL MEASURES (EXCEPT PERFORMANCE SCORES) -- GP. 2

			HEART RATE				GSR				RESPIRATION RATE				SUBJECTIVE STRESS SCALE				STAI			OBSERVED STRESS SCALE			
			BASELINE		STRESS		BASELINE		STRESS		BASELINE		STRESS		BASELINE		STRESS		BASE	STRESS		BASELINE		STRESS	
		SESSION	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1,2	1	2	1	2	1	2
HEART RATE	BASE.	1	—	.38*	.61**	.22	-.03	-.16	.07	.17	.05	-.03	.05	-.09	-.41*	-.14	-.21	-.30	-.39*	-.10	-.06	.19	-.22	-.11	.06
		2		—	.47*	.75**	.13	-.17	-.39*	-.20	.09	.11	.12	.21	.02	-.04	.03	-.05	-.04	.24	.11	.32	.06	-.01	.36
	STR.	1			—	.41*	.16	-.27	-.29	.08	.03	-.07	.30	.22	.05	.11	.13	.00	.01	.36	.34	-.02	-.25	.30	.32
		2				—	.45*	-.20	-.36	-.09	-.13	-.13	.18	-.04	.21	.07	-.35	-.13	.09	.02	.28	.24	-.11	.00	.47*
GSR	BASE.	1					—	-.10	-.09	-.18	.04	-.12	.34	.27	.55**	.48*	.34	.32	.53**	-.20	.44*	-.06	-.10	.03	.41*
		2						—	.14	.10	-.19	-.22	-.21	-.15	.12	.09	.23	.02	-.02	.07	-.04	-.11	-.02	-.44*	-.36
	STR.	1							—	.25	.01	.05	-.23	-.25	-.19	.02	-.33	-.13	-.41	-.30	-.30	-.23	.13	.00	-.13
		2								—	-.02	.08	-.44*	-.57**	-.29	-.27	-.49*	-.44*	-.26	-.46*	-.05	.12	-.16	-.17	.03
RESP. RATE	BASE	1									—	.81**	.46*	.67**	.07	.17	.08	.06	-.02	.08	-.02	.32	.37	.26	-.15
		2										—	.32	.54**	.03	.29	.10	.04	-.07	.08	-.16	.48*	.32	.12	-.11
	STR	1											—	.54**	.07	.27	.26	.47*	.27	.35*	.12	.16	.36	.21	.03
		2												—	.39*	.41*	.47*	.35	.31	.38*	.11	.17	.30	.29	-.10
SUBJ. STR. SCALE	BASE	1													—	.82**	.09	.34	.47*	.22	.49*	.08	-.07	.38*	.36
		2														—	.12	.46*	.37	.21	.30	.18	-.01	.32	.34
	STR.	1															—	.55**	.17	.74**	.03	-.10	.22	.07	-.21
		2																—	.45*	.46*	.46*	-.29	.11	.17	.16
STAI	BASE	1,2																	—	.19	.61**	-.18	.11	-.10	.39*
	STR.	1																		—	.38	.03	.46*	.14	.21
		2																			—	-.23	-.05	-.02	.48*
OBS. STR. SCALE	BASE	1																				—	.33	.07	-.04
		2																					—	-.07	.09
	STR.	1																						—	.18
		2																							—

*p < .05 **p < .01 ***p < .001

TABLE F-3. INTERCORRELATION MATRIX FOR STRESS AND BASELINE EXPERIMENTAL MEASURES (EXCEPT PERFORMANCE SCORES) -- GP. 3

			HEART RATE				GSR				RESPIRATION RATE				SUBJECTIVE STRESS SCALE				STAI			OBSERVED STRESS SCALE			
			BASELINE		STRESS		BASELINE		STRESS		BASELINE		STRESS		BASELINE		STRESS		BASE	STRESS		BASELINE		STRESS	
		SESSION	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1,2	1	2	1	2	1	2
HEART RATE	BASE.	1	—	.50*	.66**	.54**	.20	.01	.24	.22	.03	.18	-.02	-.11	.25	-.03	-.22	-.07	-.26	-.24	-.21	-.23	-.12	.12	-.54**
		2		—	.44*	.80**	-.17	-.17	-.18	.03	.23	.34	.26	.35	-.06	.46*	-.16	-.28	.01	-.01	-.30	-.12	.08	.03	-.47*
	STR.	1			—	.70**	-.02	-.30	-.04	.09	.11	.24	.17	.04	.12	.08	.15	.26	-.18	.04	.15	-.13	-.14	.26	-.18
		2				—	-.12	-.23	-.16	.15	.16	.31	.15	.13	-.16	.51*	.09	.04	-.07	.10	.09	-.17	-.08	-.04	-.29
GSR	BASE.	1					—	.64**	.17	.03	-.58**	-.67**	-.71**	-.54**	-.12	-.25	-.01	.06	-.23	-.17	.04	-.25	-.16	.35	.08
		2						—	.20	.14	-.22	-.32	-.39*	-.30	-.37	-.33	.17	-.02	-.26	.05	.05	-.35	.36	.00	.20
	STR.	1							—	.49*	-.15	-.10	-.19	-.25	.42*	-.50*	.15	.15	-.47*	-.31	-.17	-.18	.26	.07	-.20
		2								—	.04	.02	-.06	-.05	.22	-.22	.05	.06	-.35	-.61**	-.33	-.21	-.11	.06	-.13
RESP. RATE	BASE	1									—	.92**	.59**	.42*	.12	.13	-.14	-.20	.21	.01	.02	.24	.18	-.11	.01
		2										—	.68**	.39*	.22	.27	-.25	-.26	.01	.07	.05	.18	.19	-.18	-.18
	STR	1											—	.69**	.23	.34	-.12	-.29	.09	.24	-.15	-.06	.01	-.24	-.15
		2												—	.07	.26	.04	-.21	.35	.01	-.30	.21	-.08	-.26	-.09
SUBJ. STR. SCALE	BASE	1													—	-.03	-.61**	-.34	-.11	-.31	-.31	.12	-.28	.21	-.89*
		2														—	-.18	-.26	.27	.44*	.14	-.01	-.14	.02	-.32
	STR.	1															—	.52**	.13	.33	.30	-.16	.33	-.05	.44*
		2																—	-.09	.14	.64**	.04	.22	.21	.54**
STAI	BASE	1,2																	—	.32	.13	.15	-.11	.18	.27
	STR.	1																		—	.59**	-.16	.36	.12	.20
		2																			—	.11	.22	.17	.55**
OBS. STR. SCALE	BASE	1																				—	-.09	-.08	-.16
		2																					—	.04	.12
	STR.	1																						—	.08
		2																							—

* $p < .05$ ** $p < .01$ *** $p < .001$

TABLE F-4. INTERCORRELATION MATRIX FOR STRESS AND BASELINE EXPERIMENTAL MEASURES (EXCEPT PERFORMANCE SCORES) -- GPS. 1,2,3

			HEART RATE				GSR				RESPIRATION RATE				SUBJECTIVE STRESS SCALE				STAI			OBSERVED STRESS SCALE			
			BASELINE		STRESS		BASELINE		STRESS		BASELINE		STRESS		BASELINE		STRESS		BASE	STRESS		BASELINE		STRESS	
		SESSION	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1,2	1	2	1	2	1	2
HEART RATE	BASE.	1	—	.66**	.74**	.52**	.19	-.12	.15	.05	.01	.16	.14	.01	.05	.01	-.10	-.12	-.32**	-.09	-.04	-.02	-.30**	.14	-.25*
		2		—	.56**	.70**	.09	-.17	-.09	-.04	.05	.26*	.22*	.21	.02	.15	-.03	-.26*	-.13	.06	-.14	.02	-.19	.18	-.35**
	STR.	1			—	.55**	.12	-.22*	-.05	.04	.14	.24*	.36**	.14	.12	.12	.11	.09	-.11	.10	.16	-.10	-.31**	.38**	-.06
		2				—	.02	-.21	-.14	-.03	-.12	.02	.26*	.08	.16	.12	-.08	.02	-.03	.14	.27*	.09	-.18	.17	.02
GSR	BASE.	1					—	.29*	-.06	.05	-.27*	-.27*	-.31**	-.30**	-.01	-.01	-.01	-.14	.00	.00	-.05	-.08	-.05	.26*	-.17
		2						—	.13	.03	-.20	-.30**	-.30**	-.22*	-.21	-.15	.11	-.06	-.13	.03	-.15	-.21	.27*	.00	-.04
	STR.	1							—	.07	-.01	-.01	-.15	-.09	.08	-.02	-.21	.00	-.38**	-.33**	-.15	-.14	.12	-.14	-.12
		2								—	.14	.07	.02	-.08	.05	-.10	.13	-.03	-.09	.02	-.05	.00	-.04	.16	-.01
RESP. RATE	BASE	1									—	.83**	.58**	.46**	.03	.16	-.07	-.15	.04	-.10	-.06	.12	.10	.06	-.04
		2										—	.56**	.39**	.04	.20	-.11	-.14	-.08	-.10	-.09	.10	.01	.10	-.15
	STR	1											—	.55**	.17	.19	.06	-.03	.15	.17	.05	-.06	.02	.15	-.08
		2												—	.20	.29*	.16	.05	.17	.08	-.02	.15	.05	-.01	-.01
SUBJ. STR. SCALE	BASE	1													—	.50**	-.09	.05	.28*	.09	.26*	.31	-.22*	.14	.01
		2														—	.02	.09	.28*	.17	.26*	.08	-.18	.01	.05
	STR.	1															—	.38**	.24*	.72**	.20	.02	.13	.14	.13
		2																—	.19	.23*	.63**	.06	.01	.01	.53**
STAI	BASE	1,2																	—	.27*	.31**	-.07	.02	-.05	.24*
	STR.	1																		—	.38**	.12	.20	.25*	.11
		2																			—	.12	-.03	-.03	.59**
OBS. STR SCALE	BASE	1																				—	.09	-.03	-.03
		2																					—	-.06	.02
	STR.	1																						—	-.02
		2																							—

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

APPENDIX G

Autonomic Lability Scores

- 60 Subjects (1-60)
- 6 Measures (HR, GSR, Resp., SSS, STAI, OSS)
- 2 Sessions (1, 2)

	HR1	HR2	GSR1	GSR2	RESP1	RESP2	SSS1	SSS2	STAI1	STAI2	OSS1	OSS2
SUBJECT 1	42.83	48.73	61.76	44.19	47.31	56.16	31.03	37.20	35.62	31.32	38.03	40.46
SUBJECT 2	58.93	52.59	40.98	70.11	65.52	59.31	56.34	51.27	57.47	46.76	69.91	47.16
SUBJECT 3	54.32	48.51	61.76	41.89	57.83	60.33	59.30	56.07	67.79	56.65	38.41	55.12
SUBJECT 4	44.00	60.91	61.76	45.02	42.76	46.20	31.03	36.83	32.53	43.64	38.20	57.44
SUBJECT 5	44.00	47.72	57.61	57.57	37.86	34.29	35.90	54.18	40.85	62.54	38.03	67.72
SUBJECT 6	60.09	50.20	58.25	70.11	41.02	47.35	57.97	56.53	44.65	45.07	55.42	41.17
SUBJECT 7	61.22	53.27	57.61	45.02	69.86	53.90	57.97	58.87	60.84	53.18	50.31	51.45
SUBJECT 8	52.02	52.26	61.76	79.52	55.72	40.75	55.54	54.18	45.29	46.27	55.59	51.57
SUBJECT 9	42.84	53.27	40.98	60.70	45.92	53.26	53.91	36.83	56.40	31.83	29.20	41.17
SUBJECT 10	57.77	42.31	49.29	76.38	50.48	63.39	56.38	51.55	51.03	50.67	50.31	57.56
SUBJECT 11	44.00	59.69	45.14	41.47	56.39	61.09	55.11	55.46	59.05	66.77	38.41	41.29
SUBJECT 12	53.19	39.18	40.98	41.89	49.11	61.57	56.34	56.53	51.53	60.03	45.36	51.29
SUBJECT 13	41.70	42.96	40.98	41.47	55.52	50.50	58.77	54.18	52.89	49.81	21.02	51.45
SUBJECT 14	49.73	56.72	40.98	63.84	32.09	45.48	53.91	56.53	41.00	48.12	46.19	55.85
SUBJECT 15	70.40	43.21	40.98	41.89	52.93	58.89	55.92	56.53	53.89	53.14	51.31	51.45
SUBJECT 16	45.13	47.45	40.98	57.57	42.58	47.73	53.91	59.24	48.67	51.57	38.20	55.12
SUBJECT 17	41.69	48.45	42.92	57.57	29.10	47.52	56.86	52.75	66.57	62.13	56.07	51.29
SUBJECT 18	71.54	66.70	40.98	76.38	65.74	43.48	54.43	54.18	57.61	71.10	69.91	63.43
SUBJECT 19	49.75	52.67	53.45	48.16	49.07	54.33	53.91	54.18	50.30	61.23	45.57	51.57

	HR1	HR2	GSR1	GSR2	RESP1	RESP2	SSS1	SSS2	STAI1	STAI2	OSS1	OSS2
SUBJECT 20	64.66	78.70	42.27	41.89	67.62	62.75	38.63	60.46	29.05	58.23	45.36	67.72
SUBJECT 21	52.04	77.91	45.14	41.89	63.57	40.11	35.90	54.55	53.67	66.80	38.03	57.56
SUBJECT 22	47.44	45.40	46.43	56.32	52.71	50.58	56.34	54.18	55.25	48.91	57.47	55.58
SUBJECT 23	37.12	36.33	40.98	57.57	65.33	53.74	37.11	25.98	52.60	32.20	50.47	15.60
SUBJECT 24	39.40	41.95	58.25	41.89	40.48	32.80	44.96	36.83	47.94	40.75	56.42	26.61
SUBJECT 25	63.53	45.77	51.23	50.88	60.80	55.05	50.34	32.14	57.18	41.12	70.12	26.26
SUBJECT 26	53.18	39.02	47.08	51.29	53.27	49.01	54.43	56.90	48.02	42.09	50.31	41.29
SUBJECT 27	62.36	45.46	53.45	47.32	33.83	56.58	53.49	56.53	54.03	37.28	60.91	51.45
SUBJECT 28	49.74	42.80	53.45	41.89	56.76	56.42	56.34	55.09	39.42	48.91	38.03	51.57
SUBJECT 29	56.62	47.50	40.98	41.89	65.85	54.50	60.27	58.87	48.30	48.01	57.47	51.45
SUBJECT 30	52.03	48.87	40.98	41.89	50.15	63.74	53.91	54.55	44.86	44.24	45.36	51.45
SUBJECT 31	32.52	41.25	57.61	50.46	37.19	29.18	55.92	54.55	58.55	54.85	50.47	50.73
SUBJECT 32	38.25	46.12	40.94	56.73	47.16	52.50	54.43	28.39	52.67	38.67	45.19	51.57
SUBJECT 33	78.43	56.48	40.98	45.02	53.10	51.48	65.17	54.35	64.21	59.61	55.59	55.58
SUBJECT 34	37.11	43.78	41.63	51.29	46.44	49.01	55.92	28.76	54.75	36.40	50.47	51.29
SUBJECT 35	48.59	90.59	40.98	45.02	74.39	57.26	60.88	63.46	70.23	65.64	70.12	57.29
SUBJECT 36	50.88	47.56	57.61	41.89	49.24	40.67	53.91	54.18	50.45	42.53	45.19	33.58
SUBJECT 37	37.10	45.82	53.45	43.16	41.35	56.16	47.33	37.20	51.09	51.43	50.47	55.73
SUBJECT 38	34.81	47.10	61.76	63.84	43.47	59.48	53.91	63.09	60.12	64.60	39.03	47.01

	HR1	HR2	GSR1	GSR2	RESP1	RESP2	SSS1	SSS2	STAI1	STAI2	OSS1	OSS2
SUBJECT 39	57.76	43.86	45.14	41.89	38.57	56.50	56.64	54.35	44.16	61.09	50.31	57.56
SUBJECT 40	42.85	53.33	45.14	41.89	51.19	51.31	57.97	57.40	53.24	47.08	51.31	55.58
SUBJECT 41	66.95	55.88	40.98	41.89	40.65	58.84	59.98	54.55	54.03	57.81	50.31	55.85
SUBJECT 42	68.11	52.51	57.61	41.89	58.87	57.95	55.54	51.78	73.95	59.08	65.00	63.43
SUBJECT 43	48.58	48.02	65.92	47.32	43.47	50.63	55.54	52.75	46.22	55.68	38.03	47.16
SUBJECT 44	42.84	36.38	40.98	41.89	49.07	63.99	53.91	35.77	45.23	33.26	50.47	55.73
SUBJECT 45	53.17	36.98	49.29	57.57	48.70	44.46	47.33	54.18	48.87	42.46	57.63	55.58
SUBJECT 46	40.55	46.61	40.98	45.02	49.44	54.08	37.53	52.75	51.46	57.55	56.07	55.85
SUBJECT 47	54.32	57.70	40.98	41.89	48.70	17.52	53.91	52.75	65.71	63.47	50.47	51.45
SUBJECT 48	57.78	48.21	40.98	51.29	53.30	31.06	37.53	36.83	47.15	46.27	50.31	51.57
SUBJECT 49	50.88	40.11	40.98	41.89	56.46	52.33	36.42	36.37	39.20	29.22	55.42	26.61
SUBJECT 50	46.30	51.81	79.04	57.57	53.27	48.59	55.54	30.71	54.10	43.76	50.47	33.46
SUBJECT 51	49.73	44.48	74.23	51.29	49.95	39.14	35.48	54.18	30.53	47.52	45.19	47.29
SUBJECT 52	47.44	63.28	40.98	54.43	41.72	45.10	23.28	36.83	27.95	53.53	46.19	51.45
SUBJECT 53	41.71	54.68	66.57	41.89	45.58	60.93	32.66	52.75	37.90	61.57	45.36	51.57
SUBJECT 54	38.27	51.40	54.10	60.29	47.29	43.01	55.92	58.87	45.21	46.64	45.19	47.29
SUBJECT 55	44.00	51.20	51.88	47.32	29.23	25.34	46.12	54.18	51.24	57.81	57.47	57.56
SUBJECT 56	43.98	44.95	40.98	41.89	65.48	61.18	53.91	54.18	53.96	43.36	45.36	55.73
SUBJECT 57	52.04	40.38	46.43	41.89	45.55	34.20	27.14	28.39	36.62	42.34	55.42	33.58

	HR1	HR2	GSR1	GSR2	RESP1	RESP2	SSS1	SSS2	STAI1	STAI2	OSS1	OSS2
SUBJECT 58	45.15	53.98	57.61	48.16	46.44	51.05	35.00	58.87	42.02	47.45	57.63	51.45
SUBJECT 59	34.81	42.96	74.23	41.89	44.51	49.48	35.00	54.18	31.89	46.71	50.47	55.58
SUBJECT 60	52.04	45.98	41.63	41.89	42.76	40.33	56.34	54.18	51.89	42.21	64.79	55.85

APPENDIX H

Summarized Anecdotal Reports

- Group 1 (Real Stress/Hypnotically-Induced Stress)
- Group 2 (Hypnotically-Induced Stress/Real Stress)
- Group 3 (Real Stress/Real Stress)

Arranged by subjects, in ascending order of hypnotizability (HGSHS score).

The Session 1 and Session 2 reports are placed side by side for each subject.

Summarized Anecdotal Reports -- Group 1

Subject	Session 1: Real Stress	Session 2: Hypnotically-Induced Stress
1	got used to shock could have tolerated more felt stressed	some challenges worked tried hard didn't want to let stylus touch didn't want shock didn't feel shock realistic
2	shock seemed to get worse frustrated unsteady aware of sweating blurred vision more nervous after grace period	anticipated inability to be hypnotized experienced shock experienced stylus contacts couldn't stop from touching aware of heavy breathing aware of sweating aware of dry mouth real stress more vivid real stress more painful hynosis valid stress inducer
9	disappointed in performance hand shook enjoyed it disliked shock adapted a little to shock anxious blurred vision held breath for steadiness concentrated on task tried to relax expects to be steadier next time	relaxed and limp felt could have opened eyes but didn't couldn't counter head or leg challenges leg muscle jumped when equipment clicked did not experience shock did not feel stylus or contacts hand shook unsteadily more relaxed this time concentrated better this time body functions felt slowed down (pulse and breathing) hypnosis definitely could induce stress hypnosis definitely could induce shock

Summarized Anecdotal Reports -- Group 1

Subject	Session 1: Real Stress	Session 2: Hypnotically-Induced Stress
10	performance worse due to shock	difficult to experience pain
	blurred vision	experienced stylus entering hole
	stressed	felt hair on leg stand up
		difficult to keep stylus in hole
11	after 2 contacts touched on purpose	more real than real session
	felt challenge	more stress than real session
	concentrated intensely	more anxious than real session
	tightening in chest after shock	more palm sweating than real session
	delayed feeling of being flushed	more flushed than real sesssion
	adapted to shock at end	leg twitched with shock
	tried to control stylus hand and arm	more concentration than real session
	easier than expected	stylus task same as real session
	counted time	more emotional reaction than real session
		felt heart beat faster
		hypnosis very much a way to induce stress
		surprised at high degree of reaction
		more realistic because E was quiet
16	it was funny (strange)	weird
	worried	felt self spinning around at end
	confident in his selected limit of shock	felt self sitting sideways at end
	definitely under stress	difficult to picture stylus
	did not want shock	cognitive more than sensory experience
	adapted to shock with more stress	made task hard for self with small hole
	apprehension worse than shock	wanted to use 2 hands
		more difficult than first session
		harder to avoid contacts than first session
		felt pin prick in cheek as suggested

Summarized Anecdotal Reports -- Group 1

Subject	Session 1: Real Stress	Session 2: Hypnotically-Induced Stress
17	lost confidence later in session hand went crazy after shock concentrated to avoid third contact felt good about grace period shock got worse near end fearful of shock but not scared confident of no harm by experimenter strategy didn't work for steadiness aware of sweating aware of breath control angry at self after a while	it felt crazy really got into hypnosis (more than screening) felt self drifting and tumbling, nowhere experienced shock better than h-s-t felt leg move sometimes lost track of counts steadier than last time, less rattled aware of deep breathing sometimes time went fast experienced pain easily real pain felt and hurt more imagined today's shock from first session didn't realize hand was elevated hypnosis can induce valid stress hypnotic stress less real than the real expects it would be better if prior stress experienced
18	wanted to beat machine tried to avoid it felt hysterical and upset moved a lot hand stiffened grimaced with clenched teeth aware of faster heart beat hole seemed smaller than was unsteady shock worse when frequent anxious about shock leg felt on fire strategy failed lost sense of count because of grace period raised leg after shock more aware of left leg	experienced touching hole saw stylus moving felt hand shaking experienced shock even when not touching could not keep up with touch reports shocks kept coming aware of leg and moving it hole seemed too small aware of heavier breathing became more high strung couldn't wait for end pulled stylus in and out frequently got harder toward end relieved when over leg recovery prolonged

Subject	Session 1: Real Stress	Session 2: Hypnotically-Induced Stress
18 Continued		felt uneasy moved around frequently body tightened up splitting of performer from body; in void felt like a long time under pressure diabolical, like torture felt stylus in detail felt shock electrode and strap pain lasted longer than 1 second burning sensation shock very real whole experience like 2/3 of real experience stylus part same as real experience saw just the holes, as part of the air hypnotic stress present but different than real other suggestions could make it more real without prior experience, pain would have differed hynposis can induce stress fascinated by whole experience
25	adapted to pain didn't like pain anxious stressed tried to avoid pain could have adapted eventually tried to be steady used grace period to relax aware of sweating aware of tension in limbs became a mind game at end	felt compelled to say "touch" own voice sounded far away stressed wanted to do a good job for E experienced no shock would have avoided touching if shock felt hypnotic stress a lot less real with longer induction could have been more real enjoyed hypnosis

Summarized Anecdotal Reports -- Group 1

Subject	Session 1: Real Stress	Session 2: Hypnotically-Induced Stress
26	hard task annoyed when touched felt it unfair and immoral at times adapted to shock when regular annoyed	really relaxed felt close to floor in seat visualized stylus did not feel stylus cheek felt tingley afterwards felt shock vividly at first leg became stiff and tense later felt twitching in leg sometimes raised hand would have improved effect distrusted E who might touch S's leg or cheek
27	Did not want shock not afraid of permanent damage shock effect was accumulating became more stressful less control as time went on unnerved tense strained concentrated to exclusion of all else stressful did not adapt to shock "it's a great way to start your heart in the morning"	felt could be better subject sensed touching altered thinking to experience shock led by polygraph timer sounds experienced stylus realistically experienced shock less realistically could make it real by switching thinking recalled Session 1 and may have resisted shock experience different than Session 1 not as tense today; reconciled realism depended on prior experience disappointed that it wasn't more real
34	aware of sweating not overly nervous hand moved hand gripped stylus hard concentrated on hole aware of shock shock not painful feels can tolerate unusual pain took advantage of grace period aware of deep breathing time seemed long adapted to shock	felt conscious all the time felt hand was up and steady no pain experience knew when pain was to come felt self not cooperating completely not too different from real stress less concentration on h-s-t today less tense today sometimes drifted off in hypnosis

Summarized Anecdotal Reports -- Group 1

Subject	Session 1: Real Stress	Session 2: Hypnotically-Induced Stress
35	most concerned about h-s-t less concerned about shock it was rattling at first tried to ignore shocks later shocks seemed far off	like the real h-s-t all over again pain wasn't there, but in mind aware of tremors tried to take mind off shocks felt sensation of shock, but not travelling up leg, as before felt resigned, as before
36	concentrated most on h-s-t adapted to shock at end by shifting attention could have tolerated stronger shock	left leg became tense ("Charlie-horse") compelled to perform in sequence of threes felt pin suggestion in left instep instead of cheek weird felt mind falling, like pre-sleep knew there would be no pain because electrode not hooked up lots of tension no mental stress since no shock
37	vision blurred worried knew would not be harmed irritated at performance tried to relax using pleasant thoughts tried to control breathing concentrated on h-s-t, so shock seemed to weaken aware of shocks told self to slow down and relay hand muscles	aware of facing h-s-t equipment concentrated and kept hand steady vision blurred hand became unsteady felt shock and jolt, no pain jittery euphoric mind felt empty and deep own voice sounded strange touched hole when thoughts drifted
38	angry at self dissatisfied with performance tempted to make third contact on purpose tried but could not cool down beginning of shock hurt most	aware of whole body shaking left leg felt like different part whole body felt pulled to side to stay away from shock scared to say "shock," so didn't felt self touch side of hole

Summarized Anecdotal Reports -- Group 1

Subject	Session 1: Real Stress	Session 2: Hypnotically-Induced Stress
38 Continued	shocks at end of period hurt most attention focused on shocks at end vision blurred aware of intense pulse in left hand biggest thing was self anger	knew shock was supposed to occur felt self fall over to stay away from it felt as if sitting above chair trying to hold steady didn't want to feel shock could see and feel shock coming down cord to leg left calf felt really tight, like cramps felt tilted over stylus experience became more real not aware of saying touch at end seemed very realistic entire body felt like it was shaking same test as real in many ways different in some ways, like floating above chair more intent on leg today wouldn't let self feel shock really avoided intense pain hypnosis can induce valid stress, provided it was experienced before
49	felt could take more shock concentrated on not touching treated it as a game ignored pain	felt steady, no strain it was realistic time passed more quickly than last time more confident this time not as tense not too similar to real stress couldn't really see the machine don't know what would have happened if I got shock; if I would have hit the ceiling or not did not try to imagine shock

Summarized Anecdotal Reports -- Group 1

Subject	Session 1: Real Stress	Session 2: Hypnotically-Induced Stress
50	sort of nervous	felt like it was really happening
	angry at self over unsteadiness	did feel holding stylus and h-s-t
	shock felt like burning sensation	did not feel shocks
	shock became more painful	tense during h-s-t
		not as tense as in real task
		similar in feeling to real session
		prior experience was helpful
57	could have tolerated higher shock level	probably same feeling as Session 1
	knew when to expect shock	increased tension on shock
	kept touch and shock separate	breathing interfered with shock and touch pattern
	intellectually pleasant	
	physically tiring	
	not repulsive	
58	knew it was coming	could feel belt around leg
	tried to be steady	body reacted to shock
	tried to avoid third contact	could not feel burn
	overcompensated	heard counter clicks
	shock more painful after long day	more worried about shock than last time
	not worried	felt no control this time
	confident	more tension today
	tense	if steadiness were suggested it would happen, like a rock
	some anxiety	took deep breath prior to shock
	knew would not be hurt	tensed up leg
	it was painful	enjoyed it; "cool"
	tensed leg to reduce pain	without prior experience would probably feel shock differently
	1-second shock seemed long	actual shock produces lingering pain
	felt like a slow burn	tension probably same in both sessions
	tried to position hand for control	
	performance got better with time	
	pretended there was no grace period	

Summarized Anecdotal Reports -- Group 2

Subject	Session 1: Hypnotically-Induced Stress	Session 2: Real Stress
3	difficult to visualize equipment tension in legs expected shock didn't experience shock experienced holding stylus aware of heavy breathing	poor resemblance to hypnotic stress tense at beginning and thereafter tried to use hypnosis to disregard pain without success
4	felt relaxed light-headed did not relate to task concentrated on E's voice some anxiety at first liked personal hypnosis better than group	thought I could do better more difficult at end vision blurred breathed lightly to avoid moving shock became more aggravating tried without success to ignore shock equally relaxed as in Session 1 angry with self over poor performance H probably can induce stress in some shock different than expected
5	not worried about shock felt steady	pain in resting elbow not as bad as expected stress increased before shock relieved after shock seemed like a long time couldn't control arm at times in H, couldn't imagine shock in H, could imagine contacts
12	weird experience definitely pressure situation did not experience pain difficult task felt asleep sometimes hole size seemed to change tension uncertain expectations	felt pressure wanted to avoid shock concentrated on task definite similarity between real and hypnosis sessions stylus experience very similar to first shock had similar muscle contraction as in hypnosis

Summarized Anecdotal Reports -- Group 2

Subject	Session 1: Hypnotically-Induced Stress	Session 2: Real Stress
13	experienced increasing tension weird task experience unsteady did not experience shock vividness changed from time to time deeper hypnosis than in screening felt pin pricking cheek when suggested by E	started to hate the machine did not tire as expected anticipated shock shock got worse at end more attentive to shock at end no one can make me feel pain if I don't want to greater tension in hypnosis greater concentration in hypnosis relaxed today less tension and unsteadiness today hypnosis can induce stress, not pain
19	difficult to hold steady hole just large enough shock felt like a pin sharp jab, not intense not bad some pain experienced touching became more nervous in task aware of right hand sweating aware of unsteady and erratic breathing more sensitive to pain because relaxed	adapted to pain not too nervous or apprehensive not in control aware of pain hand shook after shock tried ignoring pain more real than Session 1 shock different than imagined in Session 1 more burning sensation more tense and nervous today more control of stylus in hypnosis aware of more sweating today not aware of breathing this time less tuned into inner-self this time real more difficult task than imagined prior experience would make it different (in pain and number of contacts) hypnosis easily can induce stress (including pain only if felt before)

Summarized Anecdotal Reports -- Group 2

Subject	Session 1: Hypnotically-Induced Stress	Session 2: Real Stress
20	felt relaxed, content, good kept stylus steady rest of body shaking whole body jumped on touch experienced no shock not scared felt no pain experienced stylus insertion could not overcome challenges fear of hypodermic needles	weird fear of needles adapted to shocks after a while concentrated anticipated coming shock disturbed by irregularity of performance h-s-t just impossible just took the pain; resigned to it nervous as hell scared frightened aware of sweating confused hand only shook aware of holding breath to fight pain unique experience never felt shock before knew would get no shock in hypnosis less relaxed than in hypnosis hypnosis can induce stress would be more realistic if real stress was experienced
21	different experienced inserting stylus experienced touching would not report touches experienced no shocks steady tensed up at shock times aware of fast breathing	interesting aware of cold hands very shaky, more than Session 1 aware of holding breath to keep calm pain in leg glad of grace period more realistic than Session 1 difficult to imagine shock could be more real if pain were described more in hypnosis glad it's over

Summarized Anecdotal Reports -- Group 2

Subject	Session 1: Hypnotically-Induced Stress	Session 2: Real Stress
28	felt deep into it at end confused about h-s-t instructions not really nervous expectant h-s-t became very real near end experienced no shock experienced hand moving experienced touching felt must be touching between real and not real definite tingling in legs on third touch conscious of leg under stress	not as bad as expected shorter than expected, longer than 3 minutes less complicated than expected breathing caused contacts arm did not tire aware of pain in leg pain seemed to get worse pain blossomed and spread pain lasted a couple of seconds thought E was increasing pain tried to avoid pain pain more real than Session 1 the rest was similar to Session 1 stylus experience similar to Session 1 imagined larger hole in Session 1 more nervous in Session 1 (thought shock would be paralyzing) more anxiety in Session 1 hypnosis can induce stress realistically the experience one creates differs from the real because of all the possibilities available
29	worked and got into it shock was real some shocks less intense shock interval increased at end h-s-t not real felt self slower felt jerky movements aware of faster breathing aware of holding breath before shock aware of heart during shock became tense	interesting disappointed in own performance arm became tense tried to control arm tried to control breathing shock became more painful and frequent had more control over pain in hypnosis pain worse today--hot white knife pain was disruptive

Summarized Anecdotal Reports -- Group 2

Subject	Session 1: Hypnotically-Induced Stress	Session 2: Real Stress
29 continued	aware of controlling shock rate pain resembled using every muscle until they hurt would be more apprehensive if E controlled shock	confused h-s-t instructions in hypnosis less relaxed than Session 1 totally stressful today more urgency today hypnosis can induce stress hypnosis would be better if prior shock were experienced could improve suggestions to to improve stress
30	not as deeply hypnotized as in screening h-s-t not real at times felt stylus touch no sense of shock	less complicated than expected tension increased before third contact aware of hand shaking more confident today more stressful in hypnosis
39	shock experience not vivid imagined shock once was jumpy a couple of times less relaxed more tense slightly uneasy	time seemed long concerned about poor performance felt as if failing in test tried to block out pain but failed aware of tension in leg hypnosis experience was far removed from real one
40	felt stiff wanted to avoid touching and shock fairly realistic deepening challenges were really rough, except clenched fist felt heaviness	told self it would hurt wanted first shock for learning reaction became worried tried to keep count, but lost it more real than Session 1 felt determined hole seemed smaller as determination increased
41	aware of shaking never experienced shock felt something when told to get ready became steadier since no shock was felt	shock worse when doing h-s-t tried to keep, but lost count felt jittery shakier than normal 3-second recovery period not enough

Summarized Anecdotal Reports -- Group 2

Subject	Session 1: Hypnotically-Induced Stress	Session 2: Real Stress
42	felt a lot of pressure sweat got into eyes stylus got very big felt like trying to get it into wall not concerned about failing determined to avoid shock very real did not report touches or shocks too busy concentrating saying words too much like a game this was too serious felt like adrenalin was flowing felt eyes blinking fast	pretty challenging improved when held breath difficult exhaling got pretty rattled frustrating and aggravating reprimanded self over failures calmer today than in hypnosis regret it being over so soon
43	conscious of hole felt and reacted to shock aware of some, not others much time seemed to pass it was realistic to a level of 5 on a 0-10 scale (this S had prior experience with shock in psychology laboratory)	felt dizzy wanted to change eye focus
51	shock not that real would have been better if experienced it before stylus and hole seemed smaller	adapted to shock rattled by shock at first used Kung Fu training to successfully eliminate pain sensation
52	h-s-t was like threading a needle stylus point like flexible thread shock not felt to be that important concentrated on hole felt self improve at h-s-t very realistic calm no real fear	challenging expected pain from shock concentrated on hole ignored shock felt more confronted today hypnosis was like looking at lion in cage; in with lion today

Summarized Anecdotal Reports -- Group 2

Subject	Session 1: Hypnotically-Induced Stress	Session 2: Real Stress
52 continued	left hand and leg felt unconscious dissociated right hand allowing it to perform in calm way without worrying about left side shock period was short no "aftertaste" it was nice, good	fun worried about performance hypnotic shock less real if had real first, could imagine better blurred vision higher tension today stress increased before third contact could not evaluate passage of time seemed longer than 3 minutes held breath to remain steady aware of hand sweating like a game used grace period for relief
53	kind of strange felt an impulse in left leg not a true electric shock could feel probe touch sides now very interested in hypnosis very realistic experience felt stylus touch sides of hole cringed when stylus touched tensed arm to avoid touching, but it didn't work could not wait for end knew would get shock calm and anxious at same time	did not like knowing would get shock nothing could be done about it became tense after shock; worse more anxiety today anger at shocks could have broken stylus in anger adapted to shocks at end concentrated on stylus definitely more real than Session 1 shocks similar to hypnotic ones angry attitude at stylus different than last time watery eyes today felt warm, tense and perspiring less relaxed today hypnosis can induce stress would be more vivid if real stress
59	felt performance was good no trouble never made contact or got shock somewhat realistic felt tension in leg remained ready just in case	felt could have done better not nervous or tense but compelled started shaking after while h-s-t was main objective in hypnosis felt I could do it

Subject	Session 1: Hypnotically-Induced Stress	Session 2: Real Stress
59 continued		today determined and frustrated able to imagine it well last time thought could do better, so did last time today arm prevented good performance mind still felt it could do it today felt E was disappointed by performance

Summarized Anecdotal Reports -- Group 3

Subject	Session 1: Real Stress	Session 2: Real Stress
6	tried to control self tried to control breathing	knew what to expect, so worried less than Session 1 less nervous than Session 1 satisfied with performance tolerated shock better this time
7	anticipation worse than shock	less anxious than Session 1 more comfortable than Session 1 knew what to expect
8	felt good angry at self over performance vision blurred, blinking concentration increased before shock	able to restore confidence when rattled less bothered by shock this time bothered more by contacts than shocks adapted to shock by rationalizing time passed faster this time
14	didn't bother me adapted to pain enjoyed somewhat mind elsewhere to keep steady	confident of better performance than first session more pain this time no strategy developed this time pressured could do better with practice concentrated on keeping stylus still
15	nervous not worried hand shook tried to keep steady aware of rapid breathing "disgusted" at self over performance	knew what to expect performance poorer than Session 1 instigated third touch rather than wait aware of slower irregular breathing aware of faster pulse hand shook no strategy except keep steady shock felt same as Session 1
22	not what was expected not very stressed not nervous adapted to stress	less nervous than last time not apprehensive about shock shock less intense than when tested for levels

Summarized Anecdotal Reports -- Group 3

Subject	Session 1: Real Stress	Session 2: Real Stress
23	felt in control of situation	nervous on arrival
	experienced pain from shock	calmed down after shock testing
	felt performed well	no problems
	surprised by shock occurrence	controlled tendency to over-react on h-s-t
	adapted to shock	confidence grew
	used equipment sound to stay calm	shock today felt stronger
	could have taken more pain	similar feeling to Session 1
		handled it better than Session 1
24	nervous at first	felt more challenged this time
	calmed down after few shocks	less worried about shock
	aware of hand shaking	not nervous because knew what to expect
	adapted to shock by ignoring	last week really nervous
	aware of irregular breathing	no shaking this time
	aware of sweating in right hand	ignored body state
	interesting	began worrying at end
	fun	arm got tired
		shock more painful than Session 1
31	angry at self	not angry at self this time
	felt stressed	failed at using breathing to control steadiness
	felt nervous	much calmer this time
	very anxious	less afraid of machinery today
	hand became tense	felt pressure
	held breath to steady self	ready to quit experiment
	blurred vision	became impatient and frustrated
	blinking eyes caused hand to move	felt he could do nothing more
		directed anger toward machinery
32	hand became tense	improved by paying less attention
	tension did not help	easier to hold arm steady
	did not want to relax	less anxiety due to past experience
	pain lessened when busy	less outside stress today (no school
	concentrated on stylus to avoid pain sensation	shock more intense today
		remained aware of shock all the the time
		definite difference from Session 1
		less bothered this time

Summarized Anecdotal Reports -- Group 3

Subject	Session 1: Real Stress	Session 2: Real Stress
32 continued		concentrated less today, so less mistakes more relaxed today aware of pulse in finger
33	in state of worriness could not control hand unsteady and very nervous felt ready to break into cold sweat started to feel cold felt shaky could not control breathing at end wanted to hold right hand with left one to steady it	less nervous than last time felt a little jumpy more control of hand this time a little tense felt good when it ended held breath to steady hand tensed body to get steady a lot calmer than last time paid little attention to shock felt shock less than last time concentrated on steadying hand adapted to shock early
44	felt jittery became more nervous as tried harder aware of right hand shaking felt as if not breathing tried to modify h-s-t angles didn't mind shock when set for it shock was jolt when unexpected wished for larger hole	better this time because knew what to expect more confident feels performance was better felt breathing to be slower than usual tried not to breathe easier than last time not as stressed used strategy of looking at larger adjacent hole to be steady
45	frustrated at being unsteady used grace period to get steady couldn't hold it steady felt self become tense eyes strained	more anxious this time eyes strained more strain this time wanted to avoid touching felt challenge feels did better this time

Summarized Anecdotal Reports -- Group 3

Subject	Session 1: Real Stress	Session 2: Real Stress
46	determined to avoid touching not nervous tried to stay calm became aware of arm sweating amazed at mind's involvement did not try to beat system kept pain in leg objective felt detachment of leg from body focused on stylus, not shock	not as good as last time nervous over outside issue (school) knew shock was possible determined to control nervousness feel terrible over poor performance disappointed in self felt as if sweated more breathing caused unsteadiness no detachment of leg this time leg and shock experienced fully amazed at lack of detachment less mechanical about it today unable to control hand shock felt more powerful today feels may have tried to punish self for poor performance adapted to shock today and last time
47	lost sight of the thing blurred vision adapted to shock angry at self over performance trouble getting steady after shock tried to steady arm hand tightened on stylus	became resigned h-s-t got more difficult due to shocks eyes watered couldn't do anything about shock aware of holding breath aware of increased sweating time seemed longer more sweating at end knew what to expect today up tight over outside issue (school) adapted to shock and pain
48	determined to avoid touching felt despair for moment began to lose control at end sometimes felt upset	went faster than last session surprised at unexpected steadiness felt better prepared

Summarized Anecdotal Reports -- Group 3

Subject	Session 1: Real Stress	Session 2: Real Stress
48 continued	tried to keep eyes clear, unblurred felt heart racing used grace period to rest hand not all that painful	went faster than last session surprised at unexpected steadiness felt better prepared no despair today paid no attention to shock anxious at one point aware of not breathing consciously re-started breathing
54	interesting not overly nervous aware of hand perspiring controlled breathing to remain steady adapted to shock after a while	felt self trying not nervous feels did better than Session 1 knew what to expect concerned about shock concentrated on h-s-t hurt more today did not adapt to shock today could take more shock with practice aware of breathing which broke concentration, causing touch tried to control breathing
55	slightly uncomfortable from poor performance mistakes keyed to breathing tried to control breathing by yoga type exercise adapted to pain apprehension diminished at end slightly anxious and nervous	more frustrated than last time could not master h-s-t more conscious of pain all session felt heart rate increased heart beat more noticeable vision blurred blinking caused stylus contacts
56	enjoyed it interesting like a game force shock and start again clean became uncomfortable at end not rattled or scared eyestrain near end	it was all right felt could have done better upset at unsteadiness in h-s-t angry at self similar to Session 1 stress did not cause upset, hypertense knew would get pain

Summarized Anecdotal Reports -- Group 3

Subject	Session 1: Real Stress	Session 2: Real Stress
56 continued		tried to beat the counter (contacts) did not try to beat the pain calmer than Session 1 knew what to expect
60	not as bad as expected adapted to shocks not bothered by shocks thought shocks would go up leg and body	not as bad as last time shock less intense or less bothersome not scared completely calm inside still did not like shock

Appendix I

Results of Using Suggested Stress in a Modified Protocol with One Subject

- Baseline and Stress Measures
- Anecdotal Report (verbatim)

Baseline and Stress Measures for Three Sessions with Subject 38 (Group 1)

		Previous Real Session 1		Previous Hypnosis Session 2		Modified Hypnosis Session 3	
		Baseline	Stress	Baseline	Stress	Baseline	Stress Hypnosis
Physiological	Heart Rate	74.0	66.0	77.0	76.0	69	67
	Pulse Amplitude Change		(—)		(+)		(—)
	Respiration Rate	14.0	16.0	14.0	21.0	14.0	15.0
	No. of NS-GSRs	0	5	0	7	0	0
Subjective	SSS	17	64	17	83	48	69
	STAI-State	25	56	25	62	25	55
Observed	OSS	57	57	27	64	17	69
Performance	No. of Contacts		7		3		27 (actual) 21(rep't'd)
	No. of Shocks		2		0		6(actual) 1(rep't'd)
Hypnotic Depth	FCSHE				32		34
	Observed				10		9

SUBJECT REACTIONS TO HYPNOTICALLY-INDUCED STRESS:

Modified Protocol With Eyes Open and Performing a Task

Stress Research Project: Post-Experimental Session No. 1 6 April 1974
(Transcript of end-of-session interview only)

Introduction

This modified hypnotically-induced stress protocol involves the use of real hole-steadiness testing of the hypnotized subject (with his eyes open), and an imagined electric shock penalty. The de-activated electrode for administering the shock is actually attached to the left leg. Following the regular baseline measurement process, the hole selection procedure and contact resistance measurement are completed, as in the standard real-stress treatment for this experiment. The subject is hypnotized using a verbal induction and the five deepening challenges, as in the standard hypnotically-induced stress treatment in this experiment. He is instructed to carry out the actual hole steadiness test with his eyes open while remaining hypnotized, and to experience a painful electric shock in his left leg after every third time his stylus touches the side of the hole. The electric shock is not actually administered. The subject is also instructed to provide a verbal report of each "touch" and "shock" that he experiences by saying each of those words when appropriate. The automatic recording equipment generates polygraph marks for those same two events from the experimental programmer, as they are actually triggered by the apparatus. The subject's verbal reports are recorded in pen by the experimenter on that same polygraph chart.

The subject is Candidate No. 276 (Subject 38), who is one of the twenty subjects in Group 1. His hypnotizability score (HGSHS) is 10 out of 12 (high).

Transcript

(Very minor liberties have been taken in transcribing this dialogue to make the material easier to read.)

Legend: E = Experimenter
S = Subject

E: Can you describe the experience for me; what it was like?

S: I think it was a lot different than last time.

Note 1: --"Last time" refers to his experimental session using hypnosis on 11/9/73.

E: In what way?

S: Last time I did get to the point where my mind was empty (as one of the questions was) but this time it wasn't. I was thinking a lot during the whole thing; all sorts of thoughts running through my head.

E: Can you give me an example?

S: Well, you started telling me that it was going to be really hard for me to do the... you know, I was going to keep touching. When you started doing that, you know, I started saying "its not going to be that hard because I've done it before, and now I'm really concentrating on it. I'll do even better than I did before." And that pretty much, through the end of that, that's what I was thinking about. And before that I was just thinking to myself, like with the fist, when you started to say keep squeezing tighter and make a tighter fist... I really felt like "come on you could make a tighter fist; you could do better than that." But I felt all the... everything, except for the pins in the cheeks, and that bothered me.

Note 2: --"Squeeze" refers to earlier challenge to try to open closed fist.

Note 3: --"pin" refers to earlier suggestion to "feel" pin pricking left cheek periodically.

E: That was interesting. It transferred to your leg.

S: But I did feel it there. Everytime you said "stick", I felt a... it was like somebody was thumping on my leg and really pricking it with a pin. And then during those times when I really didn't have anything that I was supposed to be thinking about, my leg was stiff and my neck was stiff.

Note 4: --Stiff leg and neck refer to two earlier immobilization suggestions and challenges.

I was thinking about my fiancée cause just recently I got engaged, I was thinking about her.

(Pause).

E: So your mind was pretty active?

S: Yeah, it was very active. Last time the mind relaxed with the body; this time my head kept on going. (laughs).

E: Now, what about the portion when you're eyes were open and you were going through the hole-steadiness test?

S: When I first started I thought I'd have a couple of...three touches before I'd get the pain, but then all of a sudden I realized that "when he said 'go' that time that was it. Now, you know, you're supposed to be getting a shock". And I got, I think, twice but I never said it. And I felt that because I didn't say the [word] "shock" when I got it, when I was supposed to get it, I was cheating on the experiment. And so everytime it got a little bit worse. And then towards the end I didn't get a shock and all...like I got two or three in the very beginning. And then towards the end I just felt--I could see the wires bulging with all the electricity that was going to come through. It felt like I was really going to get one big one.

E: When you say that you saw the wires bulging with electricity, you say that it was bulging but not able to reach your leg?

S: Yeah, it was trying to get down there but it couldn't get there 'cause I kept moving away farther. Because I kind of felt like I was cheating on the experiment by not saying when I was supposed to get a shock.

Note 5: --S refers to feeling as if he had physically moved his entire leg away from the stimulus.

E: The times that you did experience the shock--what was it like?

S: It felt more like a shock just on the very outside. It was different than the shock that I actually had the first time I got it. It was like just a rim around where that belt was strapped on the leg. It just felt like it ran around the outside, but that it didn't make it all the way. It was just about half way around the leg.

E: Were you worried that the bulging wire full of electricity was trying to break through and get to you?

S: Yeah, and then I really started concentrating. Then I couldn't really...the touching bit...every now and then I noticed that I wasn't saying the "touch". And everytime...I said it loud...everytime I said "touch"...it just kind of echoed. That I think, was the strangest part of holding the stylus up there. Every now and then, when I said "touch", I felt like I was (snaps fingers)

wide awake... you know, somebody woke me up out of a real deep sleep. It was kind of shocking the way it came back at me. I knew I had said it, but then it came back.

E: Like a real echo? Like it was bouncing off the walls or something?

S: Yeah, and then coming back a lot louder than when I said it. And just kind of... woke me up like that. But then as quick as I woke up, it went away. And then I'd stop saying the touching... you know, I was saying it but it wasn't coming out. And all of a sudden I'd say the "touch" loud again.

E: So you feel... it's your impression that you actually touched more times than you were able to say?

S: Yeah, I didn't say it all the time. I was thinking it everytime I hit it... I was thinking it, but there were a couple of times I couldn't keep up with the touches.

E: Do you think... do you recall that you said the word "shock" two times or so, a number of times?

S: No, I don't think I said it at all.

E: You didn't say the word "shock" at all?

S: No.

E: Although you experienced shock?

S: Yeah. I did feel it, and... I don't know, maybe it was that I didn't want to admit that I was feeling shock.

E: How many times would you say you felt it?

S: I think it was about three times, and then the potential shock started.

E: Was the potential shock as threatening to you as the real shock when it reaches your leg?

S: It was worse. You know, I really thought it was going to hurt really bad. To the point where I was going to say "O.K., that's it. The experiment is over." I knew that was coming--I knew that's how bad it was going to be. In the whole time I was... I thought, that when you hooked up the electrode that the shock.... The first time I did it without the electrode on my leg, so that was like the second one. When I felt the shock then, I remember

that I was really imagining it, but this time I thought... that...I did feel it. I thought that I was actually getting it, because there was the pressure on my leg and everything. But it was a different shock.

Note 6:--"first time" refers to the experimental session using hypnosis on 11/9/73.

E: Do you think you got shocks here?

S: I don't know. It felt like it twice. But I didn't know if I got one or not now. I was expecting one in the beginning when you first put it on. But I don't know if I got one or not now. I'd felt like I did. It really...I could feel it...and then that last one.... I didn't want to feel that one.

E: Before I tell you whether you did or not, do you have any other comments or reactions to the whole experience?

S: I did feel that sensation of, you know, lifting up and moving away from my leg.

E: What was doing the lifting?

S: You know, my body was pulling away from it. Like when I saw that...I actually could see the wires bulging. Out of the corner of my eye I saw that the little digital meter was building up all sorts of amps and everything to throw at me. I could see the whole visual thing without taking my eye off the hole. But I could see out of the corner of my eye all the little machines going. 'Cause I really...I felt that one was going to come and that it...'cause it was really going to bring me out of it. But it never did. But during that time I felt myself lifting up off the chair and moving away from that.

E: So how would you describe your state of mind when you were concerned about that potential shock?

S: I was scared. I was really scared, and anxious to have the three minutes up. It seemed like an awful long three minutes.

E: Would you like to estimate how long it felt to you?

S: I don't think I could put an estimate on it. It wasn't like an hour, but then again it wasn't like three minutes. It was more than three minutes and less than half an hour. It was a longer time than I thought it would take.

E: Do you think in terms of..."it seemed to be like five minutes" or "it seemed like twenty minutes"?

S: I think it seemed to be like about fifteen or twenty minutes.

E: It did seem that long?

S: Yeah.

E: Any other reactions that you can recall?...(Pause)...O.K., it really was close to three minutes. It might have been a little longer. It could have been between three and four minutes. It was limited to that much. And you did not get a real shock today.

S: It sure felt like I did, a couple of times.

E: That was the objective of today's experiment to see just to what extent you would be able to experience a threat and an actual shock, even though it doesn't actually get applied.

S: Was there a point in waiting this long to have it?

Note 7: --S refers to five month period since he completed the experimental sessions.

E: Yes. Well the question...we've been analyzing the results of the experiment. We ended the experiment around December or so, in terms of collecting...having all the sessions. The results are really quite interesting and there are various additional questions as to what is possible, in terms of what we did. The question did come up about having eyes open, which you did.

S: Oh, that was really strange. Because when I opened my eyes and looked, I...I thought that when I first opened them, that I was going to wake up and come out of the hypnotic state. But I went so farther into it when I opened my eyes. It was kind of like falling off a cliff because initially, with all the brightness and everything (because I wasn't aware of how bright the room was)...but I really went into a deeper hypnotic state when I opened them. And it was just like the whole little world was right here, except I could see everything that was going on around it.

E: So that surprised you?

S: Yeah, I thought that when I opened my eyes, that was going to be it. The initial feeling was that I'm awake again. But then, all of a sudden, when I started looking and concentrating on holding the stylus in the hole I just went "whew!"

E: Well, so that was the one thing that was different. So, your feeling then is that eyes open doesn't make any difference.

S: It didn't. I think it made the experience better for me. I could imagine everything a lot better. And also, I don't remember...I don't think you had the tape with the electrode on my leg when I imagined it the last time.

E: That's correct.

S: But this time, with it on there, the whole thing was...it was a lot closer to having the actual shock.

E: O.K. So the other thing that happened, also, is that part of what you were doing was real--the stylus and the hole.

S: Yeah.

E: And part of what you were experiencing was imagined--that is, the shock part. As far as you are concerned, what was the experience?

S: It was quite real. And the thing that I could experience the most, besides the things that I was actually doing, was the grace period that I had after three touches.

Note 8: --S refers to the three-second grace period accompanying the one-second shock during which time the S is not penalized for any stylus contacts.

E: Oh yes, I didn't even mention that, did I?

S: No. That you didn't mention, but I remember that grace period. Although I didn't really keep track of the three ticks...the three touches...I did know when I had a grace period, and then I'd just shake a little and then say "O.K., now you've got to hold it", but the grace periods were definitely there when you could touch all you wanted without a shock.

E: So you did recall that part?

S: (Looking at the contact tally counter) Did I rack up 138?

E: No, because I didn't reset to zero after we did the testing on there. So if you wanted to find out what you racked up, subtract out about 30 which would account for... No, it would be more than 30, because before you started there were...I would guess that 60 or so is what you actually racked up.... Anything else that you could think of that would be helpful or interesting to talk about?

S: Not really.

E: O.K. Any questions?

S: Has your experiment been successful?

E: I think so. The results, I think, have been very interesting. They show that what we are attempting to demonstrate, is in fact happening. That hypnosis can be used to create stressful feelings in people... stressful behavior... so they will act as if they are really under stress even though they are not for real. They are just imagining it. You get that feeling?

S: Yes, because there were a couple of times when I really got intent on not touching. (Pause).

E: O. K. That's it.

END

APPENDIX J

Statistical Data Analysis: Alternate Strategies

(Prepared by David Preusser, Ph. D.)

Statistical Data Analysis: Alternate Strategies

The overall strategy for statistical data analysis in this study is based on two considerations. First, there were specific hypotheses which we felt should be tested directly. This is essentially a paired comparison approach with the comparisons determined by the study objectives, as outlined in the original proposal and in Section II of this Final Report (Figs. 2, 3, and 4). The specific comparisons are run in a sequential fashion. The second consideration in our approach is that correlational analyses are more appropriate to the study objectives than are the analyses of differences. Specifically, the similarities between the suggested and real stress reactions are of greater interest than their differences, though both, of course, are important.

In light of the above two considerations, data analysis was conducted as a 3-phase effort. The first phase of the analysis was to determine that the three groups start off as equivalent on all those relevant variables for which data are available, and that the measures used to determine reactions are reliable. These analyses are shown in the first two parts of Section III B:

1. Reliability and Interpretation of Measures
2. Subject and Group Characteristics

The second phase was to run those planned comparisons of specific interest. They are shown in the next section:

3. Descriptive Experimental Data and Significance Tests

The last phase was to conduct correlational analyses. These can be found beginning in Section III B 3 and they continue through the remainder of the Results section.

Another approach to analyzing this data could have been to start with an overall analysis of variance procedure. For those interested in what this other approach may have shown, six 2-way analyses of variance are computed for the six measures summarized in Figure 25. The results of those analyses are summarized in Tables J-1 to J-6. The means, by session and by group, are also shown in those tables so that the reader will not have to refer back to the main body of this report.

The first analysis is conducted for change, baseline to stress, in heart rate. The results, shown in Table J-1, indicate that there is a significant difference due to session. Specifically, heart rate changes tend to be lower in Session 2 than in Session 1. Table XIII of the main report shows that this decrease is significant for Group 3 but not for the remaining groups.

Table J-2 summarizes the results for change in non-specific GSR's. These results show a significant group by session interaction. Table XVI of the main report indicates the nature of this interaction. Group 1 shows a nearly significant increase in GSR's going from Session 1 to 2 ($p < .10$ two tailed), Group 2 shows a significant decrease, and Group 3 shows a significant increase. Thus, a significant interaction is found in the overall analysis of variance.

Table J-3 summarizes the results for changes in respiration rate. The only significant effect is due to sessions. All three groups show a decrease in the change in respiration rate when going from Session 1 to Session 2. Table XV of the main report indicates that this effect is significant in Group 3 but not significant in Groups 1 and 2. While all three groups show a decrease, it is most pronounced in Group 3.

Table J-4 summarizes the results for change, baseline to stress, on the Subjective Stress Scale. No significant differences are found in this overall analysis. However, Table XVII of the main report shows that the specific comparison of Group 2, Session 1 versus Session 2 is statistically significant. This fact is contributing to the interaction term in Table J-4 but is not sufficient to produce statistical significance.

Table J-5 summarizes the results for the State-Trait Anxiety Index (STAI). It can be seen from this table that there is a significant group by session interaction. Table XVIII of the main report indicates the source of this interaction. Group 2 shows a significantly greater change in anxiety level in Session 2 compared to Session 1, while Group 3 shows a significantly smaller change in going from Session 1 to Session 2.

Table J-6 summarizes the results for the baseline to stress change an the Observed Stress Scale. These results show a significant group by session interaction. The nature of this interaction is indicated in Table XIX of the main report. Group 1 shows a significant decrease in change in observed stress level when going from Session 1 to Session 2 while Group 2 shows a significant increase.

Table J-1

Two-Way, Repeated Measures, Analysis of Variance for Change in Heart Rate (Stress Minus Baseline) by Groups and Sessions

Mean Heart Rate Change

	Group			
	1	2	3	M
Session 1	4.65	6.10	4.95	5.23
Session 2	2.45	4.60	-1.18	1.96
M	3.55	5.35	1.89	3.60

F-Table

Source	df	SS	MS	F
Groups	2	239.9	120.0	1.05
Subjects	57	6,517.6	114.3	---
Sessions	1	321.8	321.8	4.24*
Groups x Sessions	2	124.3	62.1	0.82
Sessions x Subjects	57	4,324.1	75.9	---
Total	119	11,527.6		

*$p < .05$

--- not tested

Table J-2

Two-Way, Repeated Measures, Analysis of Variance for Change (Stress Minus Baseline) in Non-Specific GSR's by Groups and Sessions

Mean GSR Change

	Group			
	1	2	3	M
Session 1	1.35	2.60	1.00	1.65
Session 2	3.50	0.70	2.75	2.32
M	2.42	1.65	1.88	1.98

F-Table

Source	df	SS	MS	F
Groups	2	12.7	6.4	0.69
Subjects	57	524.2	9.2	---
Sessions	1	13.3	13.3	1.92
Groups x Sessions	2	99.6	49.8	7.17**
Sessions x Subjects	57	396.0	6.9	---
Total	119	1,046.0		

** $p < .01$

--- not tested

Table J-3

Two-Way, Repeated Measures, Analysis of Variance for Change in Respiration Rate (Stress-Baseline) by Groups and Sessions

Mean Respiration Rate Change

	Group			
	1	2	3	M
Session 1	5.00	4.82	4.60	4.81
Session 2	4.10	4.08	1.50	3.22
M	4.55	4.45	3.05	4.02

F-Table

Source	df	SS	MS	F
Groups	2	56.3	28.1	1.07
Subjects	57	1,504.5	26.4	---
Sessions	1	75.2	75.2	5.47*
Groups x Sessions	2	34.6	17.3	1.26
Sessions x Subjects	57	783.9	13.8	---
Total	119	2,454.5		

* $p < .05$

--- not tested

Table J-4

Two-Way, Repeated Measures, Analysis of Variance for Change on Subjective Stress Scale (Stress Minus Baseline) by Groups and Sessions

Mean Change on Subjective Stress Scale

	Group			
	1	2	3	M
Session 1	29.50	19.05	30.05	26.20
Session 2	27.90	32.00	29.15	29.68
M	28.70	25.52	29.60	27.94

F-Table

Source	df	SS	MS	F
Groups	2	366.6	183.3	0.16
Subjects	57	63,467.5	1,113.5	---
Sessions	1	364.0	364.0	0.80
Groups x Sessions	2	1,346.7	673.4	1.48
Sessions x Subjects	57	26,023.8	456.6	---
Total	119	91,568.5		

--- not tested

Table J-5

Two-Way, Repeated Measures, Analysis of Variance for Change in State-Trait Anxiety Index (STAI) by Groups and Sessions

Mean Change in STAI

	Group			
	1	2	3	M
Session 1	18.20	9.85	15.35	14.47
Session 2	13.45	20.60	11.55	15.20
M	15.82	15.22	13.45	14.83

F-Table

Source	df	SS	MS	F
Groups	2	122.0	61.0	0.29
Subjects	57	12,005.7	210.6	---
Sessions	1	16.1	16.1	0.26
Groups x Sessions	2	1,509.5	754.8	12.06***
Sessions x Subjects	57	3,567.4	62.6	----
Total	119	17,220.7		

*** $p < .001$

--- not tested

Table J-6

Two-Way, Repeated Measures, Analysis of Variance for Change in Observed Stress Scale (Stress Minus Baseline) by Groups and Sessions

Mean Change in Observed Stress

	Group			
	1	2	3	M
Session 1	51.40	43.45	49.65	48.17
Session 2	39.45	55.45	49.70	48.20
M	45.42	49.45	49.68	48.18

F-Table

Source	df	SS	MS	F
Groups	2	457.5	228.8	0.68
Subjects	57	19,249.6	337.7	---
Sessions	1	0.0	0.0	0.00
Groups x Sessions	2	2,868.0	1,434.0	6.02**
Sessions x Subjects	57	13,584.9	238.3	---
Total	119	36,160.1		

** $p < .01$

--- not tested