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The effect of conflict-producing stress on sensory, perceptual and cognitive functioning.

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THE EFFECT OF CONFLICT-PRODUCING STRESS ON SENSORY, PERCEPTUAL AND COGNITIVE FUNCTIONING

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Introduction

In the present study novice parachutists are used as subjects not only to investigate conflict in its own right, but also to explore the more general relationship between intensity of stress on the one hand, and degree of physiological activation and performance deficit, on the other. Performance is sampled over a wide range of responses, varying from simple sensory functions at one extreme to complex cognitive processes at the other.

A difficulty that arises in investigating the effects of anxiety and conflict on performance is that the external criterion on which the selection of subjects is based is often no better than the dependent variable that is being evaluated. In the laboratory, on the other hand, where the variables under investigation are under adequate control, the conflict and anxiety that can be elicited is often not sufficiently intense and ego-involving to produce meaningful results. A solution is provided by selecting certain real-life situations which can be manipulated in a controlled manner and involve intense levels of conflict. Such an approach retains the advantage of laboratory experimentation, and at the same time involves an intensity of emotion that rivals and even exceeds the intensity of emotion observed in the behavior disorders.

A number of years ago, Professor Luria (1932) measured behavior disorganization of students facing an important examination, and of apprehended criminals facing trial. His results showed a breakdown of normal functioning upon presentation of relevant stimuli. In a more recent series of studies, using an approach similar to Luria's (Epstein and Fenz, 1962; Fenz and Epstein, 1962), the reactions of novice and experienced parachutists were investigated at different points in time in relation to an approaching parachute jump. Hypotheses were formulated within a framework of an approach-avoidance conflict theory. The parachute jump was noted to be extremely ego-involving and capable of eliciting intense affect. Additional advantages were that subjects could be tested in the laboratory, and level of conflict varied by manipulating the frequency and timing of the jump in relation to the testing session.

The experience of a first jump remains one to be talked about for many months to come. Only the most hardy continue the sport and become proficient parachutists. Follow-up statistics gathered in a large parachuting center (Istel, 1961) indicate that of 2800 first-time jumpers less than 15 per cent made a second jump, and only a small fraction of these continued beyond the first steps of training. In a candid moment a beginning parachutist confided to the writer: "It was one of the most exciting experiences in my life, but I sure would never, never ever want to go through it again." There is little question that parachuting involves an intense state of stress and conflict for the novice jumper.

Major Contributions to a Theory of Approach-Avoidance Conflict

The concept of conflict has proven fruitful for over half a century in a variety of independent theoretical formulations. While most modern psychological theorists have in some way provided for conflict in their theoretical formulations, the review to be presented will limit itself to some key figures who have given it major status in their systems, namely Pavlov, Luria, Lewin, Hull, and Miller. A modification of Miller's (1959) model of approach-avoidance conflict constitutes the theoretical framework for the present study.

Pavlov (1927, 1941) may be considered the forefather of modern conflict theory. In his analysis of physiological processes, he followed essentially a conflict model, and assumed excitation and inhibition to be the two fundamental processes in the central nervous system. Behavior, and change in behavior, are explained by the respective dominance of excitation or inhibition on the effective areas of the cerebral cortex. Relevant to conflict theory is Pavlov's concept of neurosis, which he considered to be a chronic disturbance of higher nervous processes, whatever the immediate causes. His analysis of neurosis resulted in the concept of protective inhibition, which he uses to account for sleep and hypnosis. Various forms of irradiating protective inhibition are assumed to occur in the cells of the hemispheres when, for example, they are subjected to emotionally strong stimuli which exceed the bounds of endurance; or, when there is too sharp a clash between excitatory and inhibitory tendencies.

Luria (1932) raised the question of whether or not it is fruitful to consider cortical excitation and inhibition in neurological terms, and questioned the value of using quasi-physiological terms; in general his experimental technique made extensive use of a word-association test coupled with a motor response that was to be made simultaneously with the verbal response. He applied his technique to the study of vitally important conflicts and emotional disturbances. As an index of confusion or disorganization he took the inability of the subject to coordinate his verbal and kinesthetic behavior. Emotional disturbance was found to occur when a word connected with a critical situation was presented, and betrayed itself in a disruption of what under normal conditions was a simple and easily controlled action. Luria sought his theoretical explanation for this phenomenon by assuming that the strong affect that was aroused upset the inhibitory functions of the cerebral cortex, permitting an unobstructed flow of excitation into the motor spheres of the brain, thereby distorting and disorganizing behavior. Disorganization of behavior was attributed to the breakdown of a hypothetical "functional barrier" between perception and association on the one hand and motor behavior on the other. It may be noted that Luria's neurologizing is more extreme than

Pavlov's, despite his criticism of the latter. A major theoretical difference lies in Luria's functional conception of the nervous system, and in his disregard for morphological elaborations.

Lewin (1931) used spatial diagrams of field forces to illustrate the dynamics involved in various types of conflict. He divided conflict into driving and restraining forces as related to positive and negative valences. One important contribution of Lewin's analysis was that it indicated how approach-avoidance conflict could produce a stable state of equilibrium which was characterized by indecision and vacillation. In his analysis of field force situations, Lewin (1933) noted that the strength of a field force of negative valence diminishes more rapidly with increasing spatial distance from a goal than the strength of a field force of positive valence. Lewin's work stimulated considerable research. Fajans (1935), investigated the behavior of children within a framework of field theory, and was able to demonstrate that the strength of a driving force toward or away from an object of positive or negative valence is directly related to the child's physical distance from the object. It is interesting that when one takes the data and plots them, as the present author did, the negative gradient is steeper than the positive gradient. These results are in line with Lewin's (1933) analysis, although he and his students failed to notice at that time the theoretical importance of this aspect of his analysis, and to look for an empirical confirmation of it.

Hull (1938) translated Lewin's analysis into the terminology of the goal gradient, and worked out detailed deductions. Following his concept of a goal gradient, he assumed that reactions near the goal get conditioned most strongly to the stimuli immediately preceding them, and that conditioning becomes progressively weaker as stimuli are more remote from the goal.

The formulation of the goal gradient model served as the basis of Miller's (1959) conflict model. Miller elaborated on it, and stimulated considerable experimental work on conflict. The experiments began with simple situations involving spatial approach and avoidance, and eventually encompassed more complicated aspects of conflict.

In Miller's initial analysis of conflict (Miller, 1944; Dollard and Miller, 1950; Miller, 1959), four assumptions are made: (1) the tendency to approach a goal is stronger the nearer the subject is to it; (2) the tendency to avoid a feared stimulus is stronger the nearer the subject is to it; (3) the strength of avoidance increases more rapidly with nearness than the strength of approach; and (4) the strength of the tendency to approach or to avoid varies with the strength of the drive upon which they are based, i.e., an increase of drive raises the height of the entire gradient.

A considerable number of studies have tested and extended Miller's 1944 position. In 1948, Brown described the results of a test of Miller's third and fourth hypotheses. He measured strength of pull of albino rats and found that reducing the strength of hunger or shock lowered the height of approach and avoidance gradients. He also demonstrated that the slope of the gradient of approach to food was less steep than the gradient of avoidance of shock.

Both Miller (1944) and Brown (1948) assumed that the difference in steepness of the approach and avoidance gradients is due to approach being a primary drive and avoidance a learned drive. They argued that the primary drive remains active in situations where the secondary drive lacks cues to elicit it. Accordingly they predicted that the gradient of generalization of an avoidance habit based on learned fear would be found to be steeper (i.e., fall off more rapidly) than the gradient of an avoidance habit based on a primary drive such as pain. Miller and Murray (1952) confirmed this prediction, and further demonstrated that with the age of habit and the number of trials held constant, the generalization gradient for avoidance motivated by fear is steeper than the generalization gradient for approach motivated by hunger.

According to Miller (1944), behavior is a function of the algebraic summation of two opposing tendencies, and the more nearly equal these tendencies are in a given situation, the greater the conflict. Andreas (1958) measured conflict as a function of the absolute and relative strength of competing response tendencies. Competing tendencies were brought to different strength by manipulating the amount of training and the motivational level of the college students who served as subjects. When measured in terms of decrement in speed of response, conflict did appear to be greater for higher values of competing tendencies, especially when they were raised by training. No evidence was found for the assumption that conflict, as indicated by speed of response, increases as unequal competing tendencies approach equality. The evidence was rather that the absolute level of avoidance tendencies is the primary determinant of conflict.

By extending the concept of distance to include stimulus dissimilarity, Miller (1951) was able to account for the clinical phenomenon of displacement. Following the assumption that the gradient of stimulus generalization of the inhibiting response is steeper than that of the inhibited response, the strength of the inhibiting response at the goal should be stronger than that of the inhibited response, and displacement should occur. In a test of this derivation, Miller and Kraeling (1952) trained male albino rats to an approach-avoidance conflict in one alley, and then tested them in two other alleys which were increasingly less similar to the training alley. Avoidance was found to produce less generalization than approach.

Murray and Berkun (1955) have proposed a three dimensional model to account for the simultaneous operation of conflict and displacement. They assume that strength of approach and avoidance are a joint function of nearness to the goal and similarity of cues to the goal. To test deductions from this model, rats were first trained to get food at one end of an alley and then were shocked while eating until they no longer approached the food cup. They then left this alley, and entered other alleys differing slightly from the original one. Here they went closer to the food than in the original alley. Tracings of their movements followed a pattern predicted from the model. After making goal responses in the generalized alleys, the rats returned to eat in the original alley, showing a "therapeutic" effect, i.e., responses to a displaced goal lowered the avoidance gradient to the original goal.

Rigby (1954) investigated the first three of Miller's basic assumptions regarding spatial conflict. Using the Bijou (1942) conditioning apparatus for rats, he conditioned approach reactions to a light by pairing it with food and avoidance reactions to a buzzer by pairing it with mild electric shock. Measurements were taken of the rat's activity during the 10 second period between onset of the conditioned stimulus and presentation of the food or shock. After appropriate responses were established, a conflict situation was arranged by presenting both conditioned stimuli simultaneously. Both approach and avoidance conditioning resulted in monotonic gradients, but the evidence did not support the hypothesis that the gradients differed in slope. The findings thus supported Miller's first two hypotheses, but failed to support his third.

All in all, despite failures to substantiate some of Miller's assumptions, the positive array of evidence is impressive, and the models proposed by Miller have demonstrated their utility in stimulating research on conflict.

A Model for the Measurement of Conflict with Specially Devised Projective Techniques

In 1956, Epstein presented a theoretical model of approach-avoidance conflict as applied to responses to projective techniques. His theoretical position essentially represents a synthesis of Miller's (1948, 1951) models of conflict and displacement with the psychoanalytical theory of thinking (Rapaport, 1951). Following the psychoanalytical model, the assumption is made that with every drive state there is a tendency for drive-related imagery to occur (primary process), and there is also an inhibitory process that is aroused. Drive-related expression is assumed to be analogous to approach, and drive-related inhibition to avoidance. Following Miller (1948), the assumption is made that the gradient of inhibition as a function of drive-relevant cues is normally steeper than the gradient of expression. Thus, verbal expression and inhibition are substituted for approach and avoidance, and a dimension of similarity of cues to the goal object is substituted for spatial distance.

Central to Epstein's (1956, 1962) formulation is the concept of drive, defined as a force with directive and energizing components. Conflict is viewed as an interaction of opposing drives. In this respect, Epstein's position is closer to Lewin's (1931) than to Miller's, whose gradients of approach and of avoidance represent responses or motor response tendencies. Epstein's concept of drive has the theoretical advantage of postulating a single concept from which two kinds of predictions and measurements can be derived, one relating to the activating component of drive, and the other to its directive component. Activation is considered a basic concomitant of all emotional states, and is measured on an intensive dimension of physiological reactivity. Directionality relates to the qualitative distinction between approach and avoidance, and can be inferred from content of verbal response, i.e., the degree to which thoughts and their verbal expression move toward or away from a given area.

According to Epstein, conflict can be measured by three general indices, one based on the net directive component of the two drives, one on the activating component, and one on both. More specifically, it is assumed that conflict is indicated by any of the following responses to a stimulus dimension of goal-relevant cues: (1) a relative increase in strength of approach responses to stimuli of low relevance, and a relative decrease in strength of approach (or increase in strength of avoidance) responses to stimuli of high relevance; (2) a sharp rise in activation as a function of increasing stimulus relevance; (3) a decrease in adequacy of performance as a function of increasing stimulus relevance. This last hypothesis follows both from the assumption that high levels of activation are cognitively disruptive, and that the directive effects of strong expressive and inhibitory drives produce inappropriate overemphasis upon certain stimuli and avoidance of others. The qualification that the conflict must be of sufficient magnitude is added as it is assumed that the curve of adequacy of performance as a function of activation is inverted U-shaped (Malmo, 1959).

Epstein developed his theoretical formulation by first investigating simple drives, such as hunger (Epstein and Smith, 1956; Epstein, 1961) and sleep (Nelson, 1961), and then extending the investigations to more complex drives, such as sex (Epstein and Smith, 1957; Leiman and Epstein, 1961), hostility (Salz and Epstein, 1962), and nurturant needs in schizophrenics (Lebow and Epstein, 1962). The results of these investigations, all of which emphasized verbal content of response, were equivocal so far as the model is concerned. However, investigations which applied the theoretical model to an acute situational conflict and emphasized measures of activation, produced very promising results. Epstein and Fenz (1962) tested the model's major hypotheses by investigating responses of sport parachutists to stimuli of various degrees of relevance to parachuting at various times from a parachute jump. Their findings indicated that three effects were useful as indicators of conflict: (1) selective approach and avoidance to parachute-related words as revealed by perceptual sensitization and defense, or by content of association; (2) increasing activation along a stimulus dimension, as indicated by a physiological measure, such as GSR; (3) increasing performance deficit along a stimulus dimension, as indicated by formal (non-content) measures, such as reaction time. The findings confirmed the hypotheses on activation and response deficit, but the results on content, while significant, were not as predicted. It was found, instead, that with increasing proximity to a jump the content of associations showed an increasing focus of attention on the area of conflict, and a relative insensitivity to other areas.

Statement of the Problem

The present study represents a replication and refinement of previous work on conflict over parachuting, and includes a wider range of measures of the dependent variables.

The experimental design requires a three dimensional model of conflict similar to the ones described by Murray and Berkun (1955) and by Epstein and Fenz (1962), as conflict is considered in relation to both a temporal and a cue dimension. The temporal dimension enters, as testing is undertaken on three occasions, two weeks from a jump, the day before a jump, and the morning of a jump. The cue dimension is created by varying the parachuting relevance of stimuli in a word-association test. The study extends the time dimension from the two points investigated in earlier studies (Epstein and Fenz, 1962; Fenz and Epstein, 1962) to three points, and substitutes a scaled dimension of stimulus relevance for the previous ordinal scale, thereby permitting a more detailed description of the form of the curves than simply noting whether they are monotonic gradients.

Three response characteristics, presumed to be associated with conflict, are investigated: (1) activation, (2) performance deficit, and (3) directionality, i.e., approach and avoidance. The theoretical model represents approach as stronger at the goal than avoidance, since subjects, by their own choice, advance to the goal. Such a model, adapted from Miller (1948), is presented in Figure 1. The model, so far, is two dimensional, as time is held constant. With regard to activation it is assumed that the magnitude of conflict-produced activation can be represented by the sum of the magnitudes of the approach and avoidance drives, disregarding algebraic sign (see Figure 2). The three dimensional model of conflict, as applied to activation, is taken from an earlier study (Epstein and Fenz, 1962) and presented in Figure 3. It will be noted that activation as a function of a time dimension is represented on the x-axis, and a similar curve of activation as a function of a stimulus dimension is represented on the z-axis. Four points are arbitrarily selected along the time dimension. The relationship of level of activation to the stimulus dimension at these four points in time is represented on the surface of the figure. The four resulting curves are extracted and presented as a family of curves in Figure 4. It is apparent that the gradients become higher and steeper as the time for the jump approaches. In a previous study

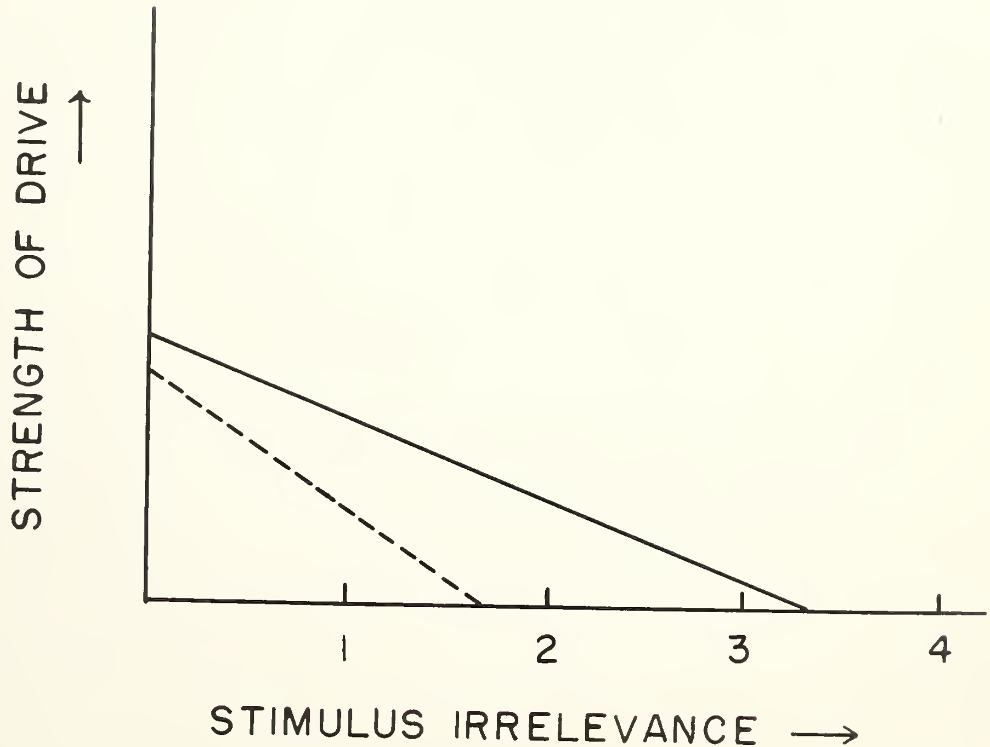


Figure 1. Strength of approach and avoidance drives as a function of a stimulus dimension of cues relevant to parachuting.

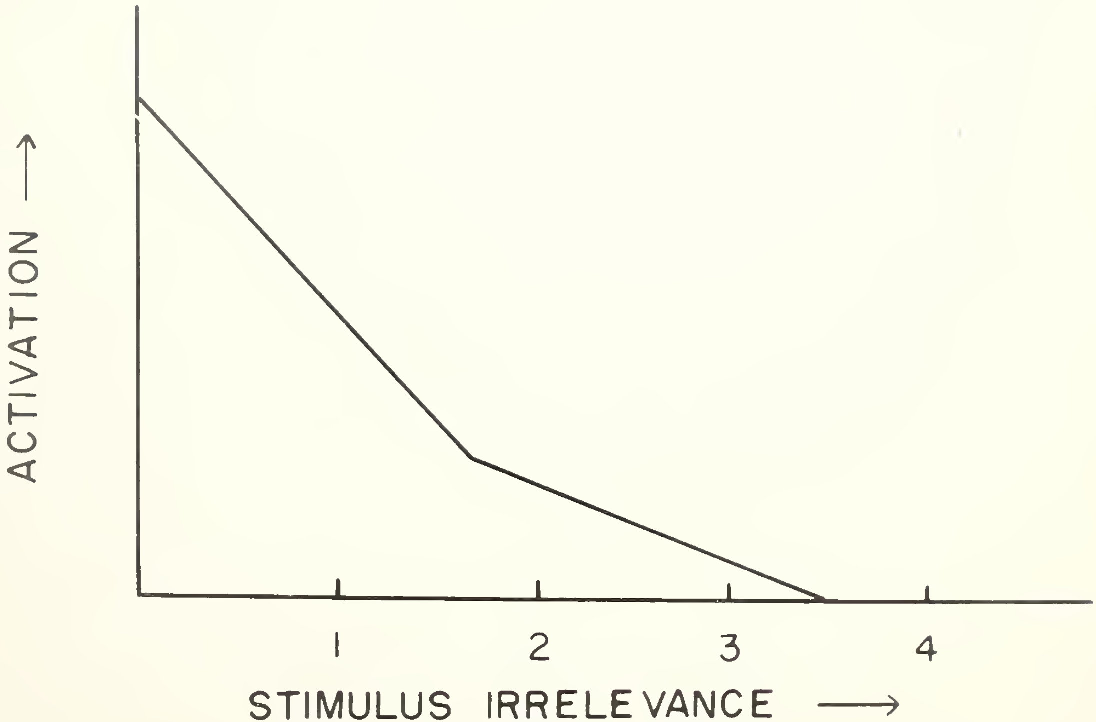


Figure 2. Activation as a function of a stimulus dimension of cues relevant to parachuting.

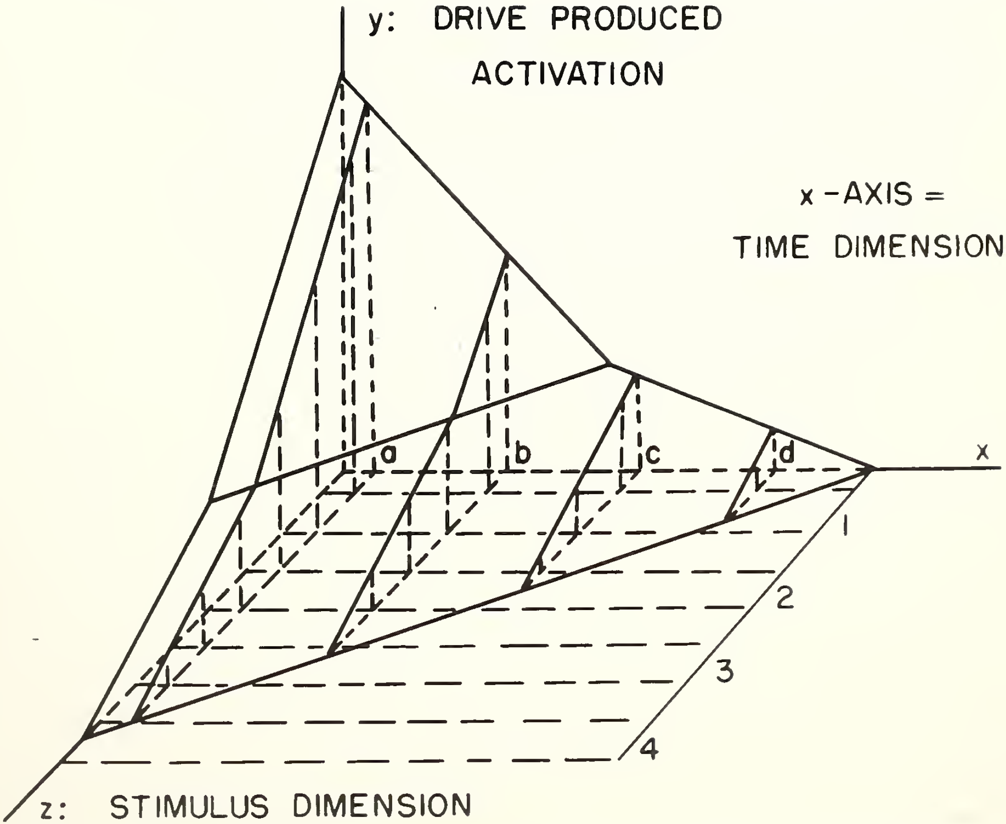


Figure 3. Activation as a function of a stimulus and a time dimension.

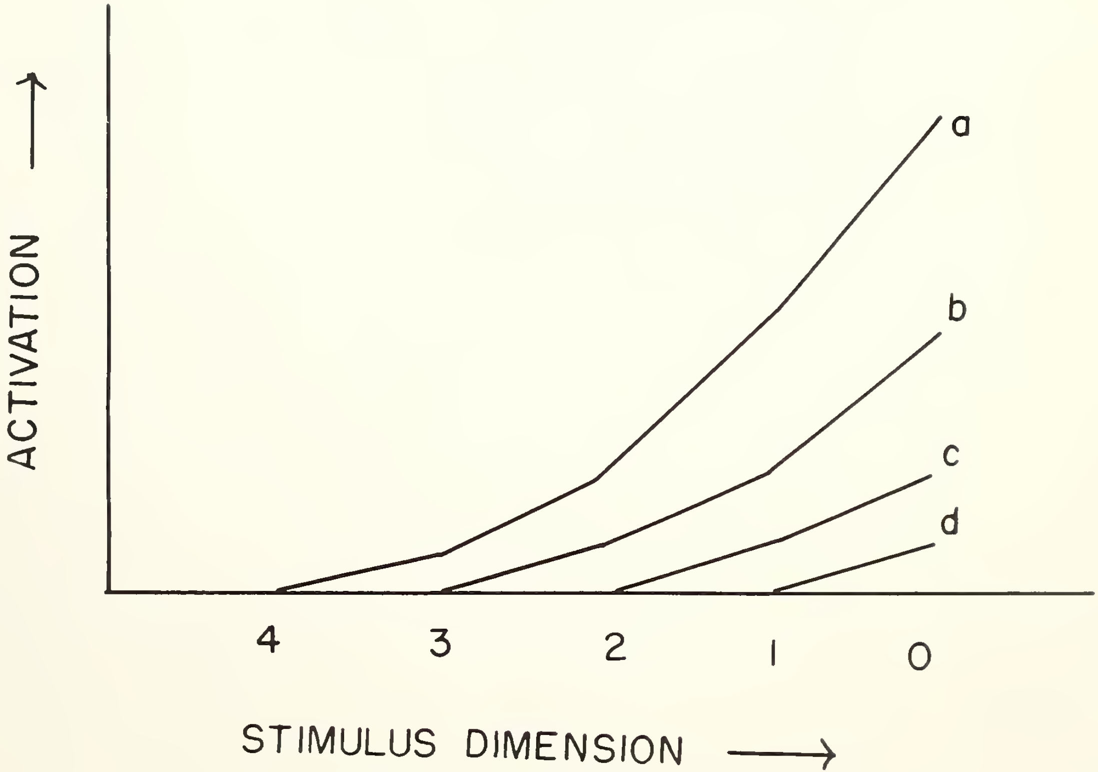


Figure 4. Activation as a function of a stimulus dimension with time treated as a parameter.

(Epstein and Fenz, 1962), it was found that parachutists produced positive gradients of GSR as a function of a parachute-relevant stimulus-dimension, and that the gradients were steeper on the day of a jump than on a control day, consistent with hypothesis. Control subjects produced no gradients. The results were markedly reliable, remaining constant for every single subject.

Turning now to performance deficit, it is assumed that degree of deficit is a direct function of activation, at least when the latter is within a range of high magnitude. Thus the curves of deficit as a function of cues and time should follow the theoretical curves for activation. In a previous study (Epstein and Fenz, 1962), response latency was used as a measure of performance deficit, and gave results which were closely parallel to those for autonomic reactivity, as measured by GSR. The present study will investigate several measures of performance varying widely in degree of complexity and relevance to the area of conflict. This aspect of the study will yield information of general significance on the relationship between performance and activation, apart from its value for the measurement of conflict.

With regard to directionality of response, it is assumed that the magnitude of the drive-produced increment in net approach can be represented by the algebraic sum of the approach and avoidance drives (see Figure 5). The three dimensional model of net approach as a function of time and

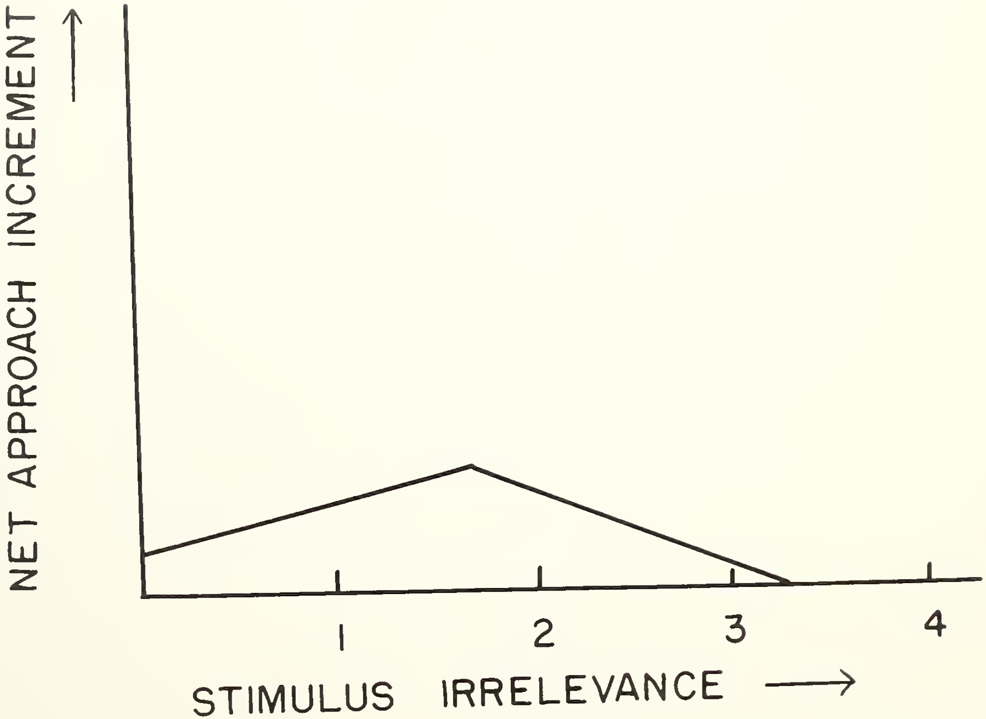


Figure 5. Net approach increment as a function of a stimulus dimension.

cues (Epstein and Fenz, 1962; Fenz and Epstein, 1962) is presented in Figure 6. The curve for net approach increment as a function of the time dimension appears on the x-axis, and a similar curve for net approach increment as a function of the stimulus dimension is presented on the y-axis. The figure produced differs from the one for activation, in that the addition of the avoidance to the approach gradient results in a change in the direction of the slope rather than simply a change in its steepness. Four planes parallel to the yz plane represent the same four time intervals as in the figure for activation (see Figure 3). The intersection of these planes with the surface of the figure represents the relationship of the net approach increment to the stimulus dimension for the time intervals in question. The curves are extracted from Figure 6 and presented as a family of curves in Figure 7. On the basis of this model, it had been predicted in earlier work (Epstein and Fenz, 1962; Fenz and Epstein, 1962) that parachutists on the day of an anticipated jump would produce stronger approach responses on a projective test to stimuli of low parachuting relevance, and weaker responses to stimuli of high parachuting relevance than on a day two weeks from a jump. However, contrary to prediction, an increase in strength of approach was noted for responses to both levels of stimuli, with the increase in response to stimuli of high relevance being the greater. These results would seem to support the assumption that the gradient of approach is steeper than the gradient of

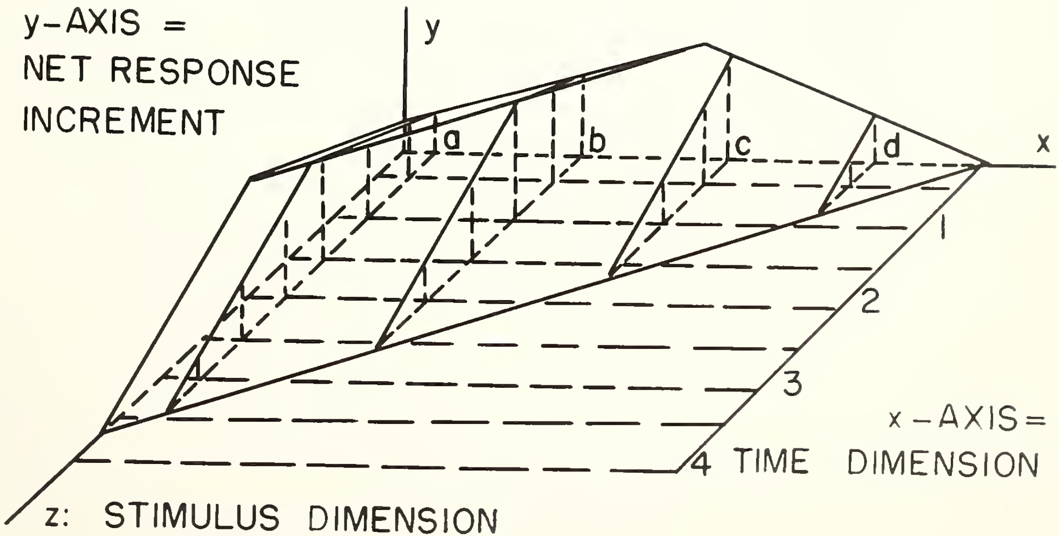


Figure 6. Conflict produced net approach increment as a function of a stimulus and a time dimension.

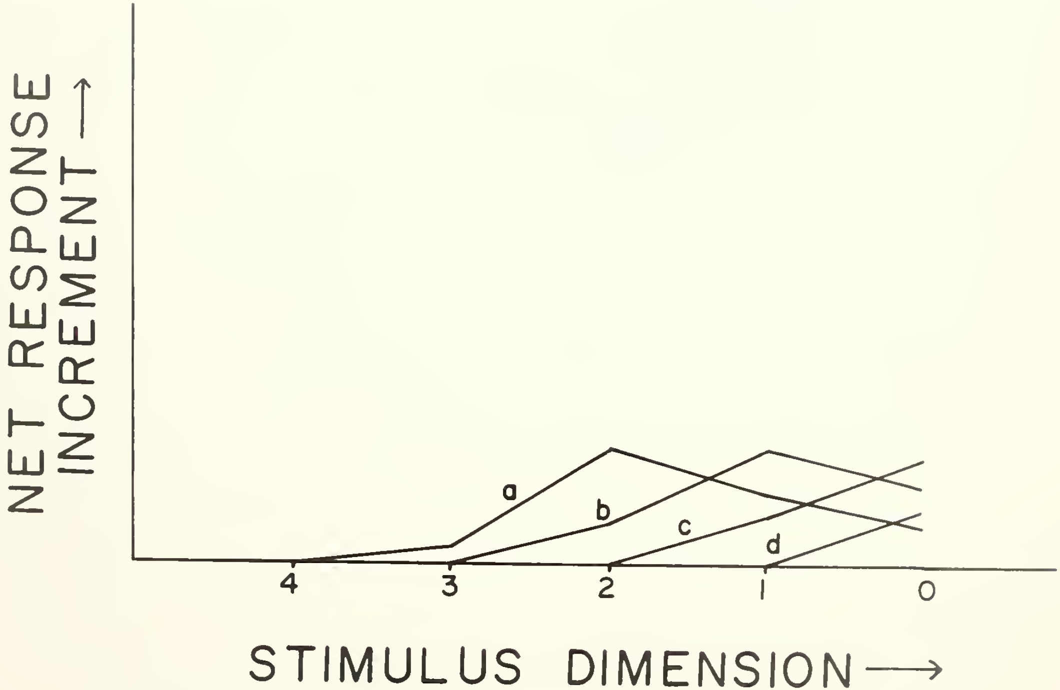


Figure 7. Net approach increment as a function of a stimulus dimension with time treated as a parameter.

avoidance, rather than the reverse. However, other evidence indicated that this is not so. The apparent discrepancy was resolved with the realization that projective tests measure expression and inhibition of verbal tendencies, rather than approach and avoidance in time or space. Such an expression-inhibition conflict in regard to the expression of fear of parachuting arises from the adaptive need to control and inhibit fear responses. Following the assumption that the gradient of inhibition of verbal expression of fear is steeper than the gradient of its expression, results were consistent with the hypothesis, i.e., fear responses on the day of a jump increased to stimuli unrelated to parachuting and decreased to stimuli directly related to parachuting. The present study separately evaluates changes in feelings of approach and avoidance to parachuting as a function of time, and expression and inhibition of fear on a projective test as a function of cues in an attempt to demonstrate their functional independence.

Formulation of Hypotheses

The following hypotheses stem from both the theoretical model described above, and previous empirical findings (Epstein and Fenz, 1962; Fenz and Epstein, 1962).

Galvanic skin response as a measure of reactivity.

(1) Parachutists become increasingly reactive physiologically, as indicated by GSRs to neutral words, as the time to a jump approaches.

(2) Parachutists produce increasingly steep gradients

of GSR to parachute relevant and anxiety words as time to a jump approaches.

Both of these hypotheses follow directly from the model, and were substantiated in earlier work (Epstein and Fenz, 1962).

Absolute level of skin conductance as a measure of activation. It is assumed that basal, or absolute level of skin conductance varies directly with the emotional state of the organism. Unlike GSR, basal conductance does not involve an immediate response to stimulation (Woodworth and Schlosberg, 1954), but changes more gradually over time. It therefore does not provide a measure of the immediate impact of cues in a stimulus dimension. Nevertheless, since a measure of basal conductance was available, it was decided to investigate it as this variable has too often been ignored (Woodworth and Schlosberg, 1954).

On the assumption that basal conductance is a measure of physiological activation, it should be relatively high prior to testing, and should further rise while the subject is worrying about the nature of the test. After testing begins, absolute conductance will rise or fall, depending upon whether the test is anxiety provoking, or upon whether it is not, and adaptation occurs. Because of the nature of the items, the test is assumed to be stressful for parachutists but not for controls. It is further assumed that testing is more stressful for parachutists on the day of a jump than at a more remote time, as the parachutist is under greater conflict, and the completion of the test brings him one step closer to the actual jump. The following hypotheses are indicated:

(1) Parachutists become increasingly reactive physiologically, as indicated by a rise in basal conductance, as the time to a jump approaches.

(2) Parachutists and controls demonstrate a rise in absolute conductance during a three minute waiting period prior to testing.

(3) During the testing itself, parachutists demonstrate a rise in absolute conductance level, with the sharpest rise occurring on the day of a jump.

(4) Control subjects demonstrate a decline in absolute conductance during all testing sessions.

Auditory threshold as a measure of performance deficit. Changes in activation produced both by proximity to a jump and cues relevant to parachuting are assumed to raise sensory threshold. In the earlier study (Epstein and Fenz, 1962),it was found that parachutists on the day of a jump exhibited perceptual deficit for neutral and anxiety words. The question may be raised as to whether the deficit, particularly for neutral words, was directional, and due to focussing on parachute relevant cues, or whether a more general sensory deficit was involved. It was decided to test this further by the use of a measure of auditory threshold, which is relatively independent of the directional elements of the approach and avoidance drives, since the responses, involving recognition of a pure tone, cannot be classified according to relevance to parachuting.

The following hypotheses are indicated:

(1) Parachutists show increasing sensory deficit, for tones presented after neutral words, as the time to a jump approaches.

(2) Parachutists produce increasingly steep gradients of sensory deficit to pure tones as a function of the parachuting relevance of preceding cues, as the time to a jump approaches.

Response latency as a measure of performance deficit. The question may be raised as to whether response latency should be considered a measure of deficit or of directionality. In animal studies (Kimble, 1961) reaction time is frequently used as a measure of approach. However, it is also known that strong states of tension may disrupt thinking and produce blocking (Luria, 1932). Previous findings (Epstein and Fenz, 1962) support the latter interpretation of elevated reaction times in a word-association test. Accordingly, the following hypotheses are indicated:

(1) Parachutists show increasingly long reaction times to neutral words as the time to a jump approaches.

(2) Parachutists produce increasingly steep gradients of reaction time to parachute relevant and to anxiety words as the time to a jump approaches.

Perception as a measure of approach and avoidance and performance deficit. Observation of parachutists indicates that in order to jump successfully they must control their fear. At some parachuting centers it is common practice to sing forceful parachuting songs during ascent in the plane. It is assumed that this does not allow the beginning jumper time for frightening thoughts. There is often jovial conviviality and much reassuring patting on the helmet and shoulders, which makes the beginning jumper feel that the jumpmaster is right with him, and that he has nothing to fear. To the extent that parachutists are attempting to emphasize their approach reactions to parachuting, and deemphasize their fear reactions, they should demonstrate perceptual sensitization to parachute relevant stimuli, and perceptual defense to anxiety producing stimuli. Earlier findings (Epstein and Fenz, 1962) were consistent with this analysis, demonstrating the appropriate selective effects which were superimposed upon a more general perceptual deficit associated with an approaching jump. Thus, selective perception provides an index of approach and avoidance and can be used to measure degree of approach to parachute relevant cues, and of avoidance of anxiety cues. In addition, non selective deficit can be measured by perception of stimuli unrelated to parachuting.

The following hypotheses are indicated for the degree of approach and avoidance manifested in the perceptual response:

(1) Parachutists exhibit perceptual sensitization for parachute relevant stimuli, i.e., they produce fewer errors of

perception in responding to parachute relevant stimuli than in responding to unrelated stimuli.

(2) Parachutists exhibit perceptual defense for anxiety stimuli, i.e., they produce more misperceptions of anxiety stimuli than of neutral stimuli.

(3) The effects indicated in the above two hypotheses become increasingly pronounced as the time to a jump approaches.

Two classes of hypotheses are indicated for general perceptual deficit, unrelated to the selective content of the response, one for neutral words as a function of decreasing time to a jump, and one for neutral words as a function of parachute relevant cues preceding the word. It should be recalled that both time and cues influence activation and thereby performance. It was found in an earlier study (Epstein and Fenz, 1962) that perception of neutral words following parachute relevant words showed significant deficit. Similar findings were reported for other forms of conflict by Luria (1932), and Jung (1919). On the assumption that parachute relevant cues influence activation more so than non-parachute relevant cues, a difference should be noted in the perception of neutral words following parachute relevant words from neutral words following neutral words, as earlier studies have indicated.

The following hypotheses for performance deficit in perception are thus indicated:

(1) Parachutists demonstrate increasing misperceptions

of neutral stimuli as time to a jump approaches.

(2) Parachutists produce more misperceptions of neutral words following parachute relevant words than of neutral words following neutral words.

(3) The effect indicated in the preceding hypothesis becomes increasingly pronounced as time to a jump approaches.

<u>Memory as a measure of approach and avoidance and performance deficit</u>. Memory, like perception, is assumed to reveal both selective effects and the effects of general deficit. The effects of sensitization (approach) can be demonstrated by selective recall of parachute relevant material, of defense (avoidance) by selective forgetting of anxiety arousing material, and of general deficit by a failure to recall neutral stimuli.

Following are the hypotheses for directionality and general deficit in regard to memory:

Directionality:

(1) Parachutists recall more parachute relevant stimuli than neutral stimuli relative to control subjects.

(2) Parachutists recall fewer anxiety arousing stimuli than neutral stimuli relative to control subjects.

(3) The effects indicated in the preceding two hypotheses become increasingly pronounced as time to a jump approaches.

Performance deficit:

(1) Parachutists show increasing memory deficit for neutral stimuli as time to a jump approaches.

Content of association as a measure of approach and avoidance. Content of association is assumed to reflect the adaptive needs of the parachutist in coping with cues relating to parachuting and fear of parachuting. In an earlier study (Epstein and Fenz, 1962), it was found that it was difficult to evaluate reliably the relevance to parachuting of verbal responses of subjects. Accordingly, all parachute relevant responses were combined into one overall score. On the basis of findings in the earlier study, and consistent with the theoretical analysis of expression and inhibition of approach and avoidance in projective tests, the following hypotheses are indicated:

(1) Parachutists produce more parachute relevant associations than control subjects.

(2) Parachutists produce an increasing number of parachute relevant associations as time to a jump approaches.

(3) Parachutists produce fewer anxiety responses as time to a jump approaches.

Self-ratings as a measure of approach and avoidance. In order to test observations that novice parachutists seem highly motivated to jump at a time remote from a jump, but not at all eager when getting strapped into the harness and during ascent in the plane, a formal test was made requiring subjects to rate their feelings of approach and avoidance along a sequence of events before and after a jump. Frequently a beginning jumper reports how, after having arrived at the airport, and while getting ready to make his jump, and especially during ascent in the plane, he wondered why he ever got himself into this predicament, and how he could possibly get out of it without losing face. On the assumption that the gradient of avoidance is steeper than the gradient of approach, the following hypothesis for self-ratings of approach and avoidance is indicated:

(1) Parachutists report a decrease in feelings of approach and an increase in feelings of avoidance as time to a jump approaches, so that the degree of dominance of approach over avoidance steadily diminishes.

Content of thematic responses as a measure of approach and avoidance. Earlier studies on parachuting (Epstein and Fenz, 1962; Fenz and Epstein, 1962) indicated that parachutists express rather than inhibit parachute-relevant thoughts, despite their anxiety-arousing potential. Such a reaction tendency is obviously adaptive, as the parachutist must be prepared to deal with such cues. It was found that with increasing proximity to a jump, in addition to an increase in expression of approach responses to jumping, there was an increase in defensive operations involving fear, such as displacement and denial. In this respect, subjects were inclined to express fear to stimuli unrelated to parachuting and to deny fear to stimuli strongly related to parachuting. The present hypotheses for the directional content of the thematic responses are derived from these findings. Since in the present study a thematic apperception test is administered only once, no comparisons on time effects can be made, and the following hypotheses relate only to the differential effect of the stimulus dimension:

(1) Parachutists obtain higher scores of approach to parachute relevant stimuli at all levels of relevance than control subjects. However, the difference is greater for stimuli of higher relevance to parachuting than for stimuli of moderate relevance.

(2) Parachutists obtain lower scores of fear on stimuli highly related to parachuting and higher scores of fear on stimuli unrelated to parachuting than control subjects.

Method

Subjects

Twenty seven college students who had expressed an interest in sport parachuting constituted the experimental group in this study. They were recruited at parachuting centers in the Boston area, and were remunerated for the cost of training up to, and including, their second parachute jump, in exchange for taking part as Ss in the experiment. All experimental Ss at the time of testing had been instructed in the rudiments of parachuting, had made one jump prior to testing, and had agreed to make at least one more jump as part of the research program. Parachutists were not tested prior to their first jump, because in the earlier studies on parachuting it had been observed that the experience of having made a first jump increased apprehension at the next jump. The experimental group was matched with a comparable group of 27 control Ss selected from students in an introductory course in psychology at the University of Massachusetts who volunteered to take part in experiments. The age of experimental and control Ss in the experiment ranged from 18 to 23, and all Ss were enrolled as full-time college or university students at the time of testing.

Research Instruments

Word-association test. It was necessary to select words along a dimension of increasing relevance to a critical event (the parachute jump) to be used as stimuli in the word-association test. Since the test was to be administered to both experimental and control Ss, it was important that both groups of Ss perceive the stimulus words as equally relevant to parachuting, or else any differences between the two groups could be attributed to this factor alone. Furthermore, as all Ss were to be tested three times, it was necessary to prepare three parallel forms of the word-association test.

The method used in scaling the stimulus dimension had the advantage of utilizing the judgments of the experimental groups themselves, thereby assuring that the experimental and control groups perceived the stimuli in the same manner. Finally a scale of quasi-interval type could be obtained, which allowed for a more refined statistical analysis than would otherwise be possible.

The procedure used in scaling can be classified among the methods of subjective estimate, in which Ss are instructed to estimate quantitatively the value of a number of stimuli (Woodworth and Schlosberg, 1954). The subjective estimates were scaled by the method of successive intervals, as described by Edwards (1957). A detailed account of the various steps in obtaining the final scale values and categorical boundries is presented in the appendix. Figure 8 presents the empirical means obtained through the judgment method, the scale values for the four classes of stimuli and the boundries of the respective stimulus categories. An

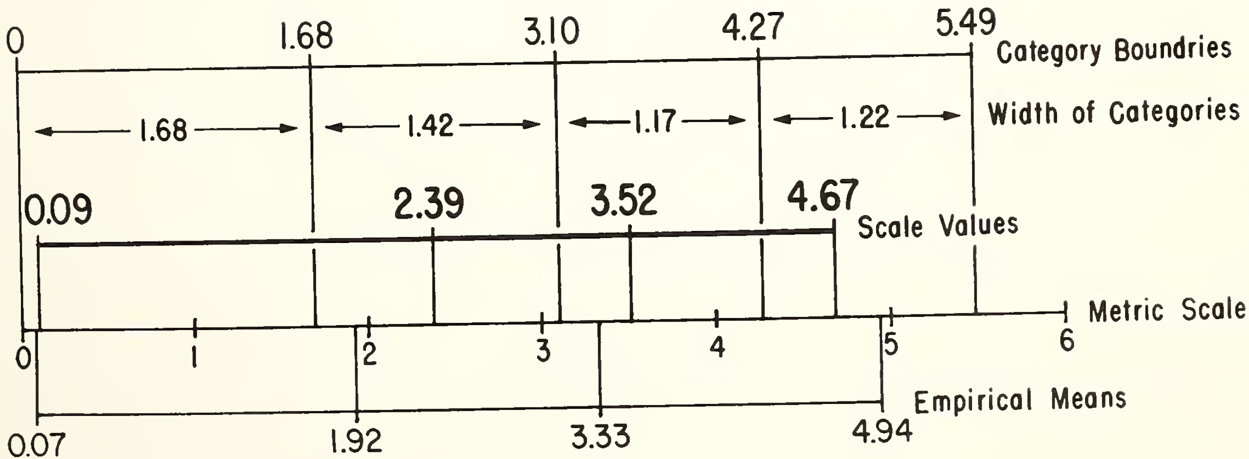


Figure 8. Empirical means, estimated scale values, and category boundaries of stimuli rated for relevance to parachuting.

internal consistency check, described by Edwards (1957), and presented in the appendix, yields an average error of .015, which is fairly typical of the values reported for the average error obtained when this method of attitude scaling is used. Edwards and Thurstone (1952), for example, report an average error of .025 for 10 stimuli scaled into 9 categories, and Edwards (1952) reports a value of .021 for 17 stimuli scaled into 10 categories.

Each word list contains three words per stimulus category, that is, three neutral, three low, three medium and three high relevant words, and, in addition, three anxiety words. The words are arranged randomly, and are interspersed among non-scaled "buffer" words. Five practice words occur at the beginning of the list.

Following are the word lists with the scaled stimuli designated by the letter N for neutral, L for low, M for medium, H for high, and A for anxiety.

Word list A: fun, dark, wish, smooth, spider, OPENED-M, castle, SKY-L, word, KILLED-A, moon, girl, MUSIC-N, spoon, HURT-A, pink, PARACHUTE-H, sun, SWIFT-L, woman, ocean, STOVE-N, lion, PAPER-N, hippopotamus, AIRCRAFT-M, horse, AIRPORT-L, baseball, RIPCORD-H, fireplace, book, ANXIETY-A, heavy, FLYING-M, face, FALL-H.

Word list B: joy, cheese, fun, school, slow, HEIGHT-M, river, COVERALLS-L, table, FEAR-A, light, pen, SALT-N, day, INJURY-A, chicken, SKYDIVER-H, hungry, TAXI-L, radiator, happy, BICYCLE-N, carpet, BLACK-N, green, ALTITUDE-M, beautiful, TAKE-OFF-L, child, BAIL-OUT-H, football, man, BLACKOUT-A, number, PILOT-M, rhinoceros, JUMPMASTER-H.

Word list C: wall, red, happy, desk, fox, AIRPLANE-M, uncle, WINGS-L, ride, ACCIDENT-A, memory, thirst, CHAIR-N, sea, FATALITY-A, tiger, PARATROOPER-H, elephant, RESERVE-L, read, tennis, LAMP-N, king, PENCIL-N, cab, STREAMER-M, radiator, FAST-L, watch, JUMP-H, soft, eat, PANIC-A, town, ALTIMETER-M, letter, FREEFALL-H.

Words were presented by a tape-recorder at 30 second intervals after having first been screened for clarity of pronunciation. Subjects were instructed to respond as quickly as possible with the first word that occurred to them. Response-words were recorded by the examiner.

Thematic apperception test. This test consisted of 6 pictures constructed by a professional artist, 4 unrelated to parachuting, one slightly related to parachuting and one strongly related to parachuting. The pictures are presented in Figure 9. All of these pictures were previously used in a study by Fenz and Epstein (1962).

The six pictures were presented in the following order: neutral, neutral, slight-relevance, neutral, high-relevance, and neutral. The purpose of the first neutral picture was to allow for adaptation, while the other 3 neutral pictures served as buffers.

Parachutists were administered the set of pictures only on the day of the jump. The thematic test was presented after the word-association test, so that there was no

Picture 1 (neutral)

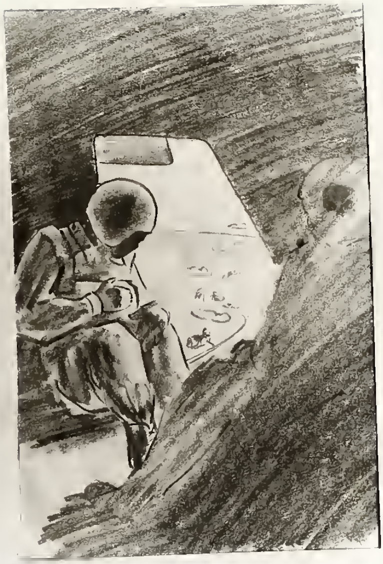
Picture 2 (neutral)

Figure 9. Thematic Picture Stimuli (cont.).

Picture 3 (low relevance)

Picture 4 (neutral)

Figure 9. Thematic Picture Stimuli (cont.).



Picture 5 (high relevance)

Picture 6 (neutral)

Figure 9. Thematic Picture Stimuli.

possibility of contaminating the latter. Control Ss were tested in sessions corresponding in time to the sessions for the parachutists. Responses of Ss were tape-recorded, transcribed, coded, and scored blindly.

Measures

The following dependent variables were investigated:

I. Galvanic skin response.

1. Response to neutral words.
2. Response to words on a dimension of relevance to parachuting.
3. Response to anxiety words.

II. Absolute level of skin conductance.

1. Level of conductance preceding each of the three testing sessions.
2. Level of conductance during a three minute interval immediately prior to the beginning of the word-association test.
3. Level of conductance during course of testing.

III. Auditory threshold.

1. Auditory threshold following stimulation by neutral words.
2. Auditory threshold following stimulation by words on a dimension of relevance to parachuting.
3. Auditory threshold following stimulation by anxiety words.

IV. Response latency.

1. Response latency to neutral words.
2. Response latency to words on a dimension of

relevance to parachuting.

3. Response latency to anxiety words.

V. Perception.

1. Misperception of neutral words.

2. Misperception of parachute relevant words.

3. Misperception of anxiety words.

4. Misperception of neutral words following relevant words.

VI. Memory.

1. Recall of neutral words.

2. Recall of parachute relevant words.

3. Recall of anxiety words.

VII. Association.

1. Parachute relevant associations.

2. Anxiety relevant associations.

VIII. Subjective estimates.

1. Approach estimated along a time dimension.

2. Avoidance estimated along a time dimension.

IX. Thematic responses.

1. Net approach content.

2. Fear of parachuting.

3. Displacement and denial of fear of parachuting.

Apparatus

Recordings of skin resistance were obtained from a direct current Hunter GSR apparatus, Model No. 300, operating on the principle of a Wheatstone bridge. The apparatus was adapted for finger electrodes, and resistance was registered by an automatic recording pen. Reaction time was recorded by a pen-marker controlled by the examiner.

Absolute auditory thresholds were obtained by using a frequency of 800 cycles per second. The output control of a General Radio beat-frequency oscillator (Type No. 1304-AO) was placed at its 0 decibels (db) setting (ref. level of 1 mw. into 600 ohms) and the output was led into a Hewlett-Packard attenuator (350 B). An attenuator setting for each S was chosen so as to be near his binaural absolute threshold, under the environmental conditions available. The output was finally led into the earphones (Permoflux Corp.) worn by S, and also into a rectifying circuit whose output led into an oscillograph. S changed the loudness of the tone by moving the output control of the oscillator. The rectifying circuit allowed a record of S's absolute threshold to be displayed on the oscillograph. The record was calibrated in db.

Office space was provided at the Mansfield Municipal Airport. Temperature was kept constant at 70 degrees Fahrenheit.

Experimental Procedure

The choice of an experimental design required consideration of the following: (1) the effect of sequence, since all Ss were tested three times, (2) the conditions of testing, that is, whether testing was on the day of a jump, the day before a jump, or two weeks before a jump, and (3) possible differences in the three word lists. These three variables were counterbalanced according to the design shown below, where A stands for condition of testing (A_1 = day of jump, A_2 = day before jump, and A_3 = two weeks from jump), B stands for sequence (B_1 = first testing, B_2 = second testing, and B_3 = third testing), and C for word list used (C_1 = word list A, C_2 = word list B, and C_3 = word list C).

Ss 1 - 3	$A_1B_1C_1$	$A_2B_2C_2$	$A_3B_3C_3$
Ss 4 - 6	$A_1B_1C_2$	$A_2B_2C_3$	$A_3B_3C_1$
Ss 7 - 9	$A_1B_1C_3$	$A_2B_2C_1$	$A_3B_3C_2$
Ss 10 - 12	$A_1B_3C_1$	$A_2B_1C_2$	$A_3B_2C_3$
Ss 13 - 15	$A_1B_3C_2$	$A_2B_1C_3$	$A_3B_2C_1$
Ss 16 - 18	$A_1B_3C_3$	$A_2B_1C_1$	$A_3B_2C_2$
Ss 19 - 21	$A_1B_2C_1$	$A_2B_3C_2$	$A_3B_1C_3$
Ss 22 - 24	$A_1B_2C_2$	$A_2B_3C_3$	$A_3B_1C_1$
Ss 25 - 27	$A_1B_2C_3$	$A_2B_3C_1$	$A_3B_1C_2$

All 27 parachutists were tested once on the day of a jump, once the day before a jump, and once two weeks before a jump. Of these, 9 Ss were tested first on the day of a jump, 9 first on the day before a jump, and 9 first on a day two weeks from a jump. Of the 9 Ss who were tested first on the day of a jump, 3 were first tested with word list A, 3 with word list B, and 3 with word list C. Testing of control Ss followed a parallel design, with the only difference that condition of testing had no specific meaning, except in regard to the time interval between sessions.

Upon entering the experimental room and being seated, a brief explanation was given about the word-association test, during which S was told that the purpose of the test was to measure emotions in relation to parachuting. Instructions included three points: the requirements of the word-association test, the method of continuously manipulating the intensity of a pure tone at threshold, and the information that S would be asked to recall the stimulus and response words at the end of the test.

Having put on the earphones, S was told to report "Yes" when he heard a tone, and to indicate "No" when he was no longer able to hear it. He was told to disregard incidental audible noises such as might be emitted by the apparatus or the surrounding environment. The experimenter manipulated stimulus intensity prior to the actual experiment in order to determine the S's absolute threshold. During the word-association test, S continuously manipulated the intensity level of the tone by raising it from just above to just below threshold and vice versa. The procedure can best be described by the actual instructions:

> "You are to turn this knob clockwise, slowly, and in small fractions, up to the point when you clearly hear the sound; having reached that point, start turning the knob anticlockwise, down to when you no longer hear it. You are to continue this operation without interruption throughout the testing."

When the experimenter had assured himself that the S was able to follow the instructions, he placed the GSR electrodes on the left hand index and middle fingers. After three minutes, to permit the electrodes to polarize, and S to adapt to them, the tape-recorded list of words was introduced with the following comment:

> "Now we will begin a test of speed of association to words. After you have heard a word--and not before you have heard a whole word--say the first word that occurs to you as quickly as possible. If you are not sure of a word, respond to what you think it was. At the end of the test you will be asked to remember as many of the stimulus and the response words as you can.
> While responding to the word heard, you are to continue to slowly turn the knob up until you clearly hear the tone, and down until you no longer hear it, throughout the testing. Please do not make any comments, or ask any questions between words, but save them for the end of the test. Do you have any questions now?"

Scoring of Responses

Figure 10 shows the record of a parachutist on the day of a jump. Reaction time represents time from end of stimulus to beginning of response. Since the recording paper moved at a constant speed of 5 mm per second, 8.5 mm represents a reaction time of 1.70 seconds.

Galvanic skin response was measured by the magnitude of the increase in conductance immediately following presentation of a stimulus word. A represents base level of conductance, B prestimulus, and C poststimulus levels. The reactivity measure was obtained by subtracting C from B.

The psychophysical method used was a modified method of limits. All values of the ascending order were averaged, and all values of the descending order were averaged. The obtained averages in turn were averaged, giving the final threshold measures. The time limit with which changes were scored was from immediately after presentation of the stimulus to 15 seconds later, i.e., the half-way point between

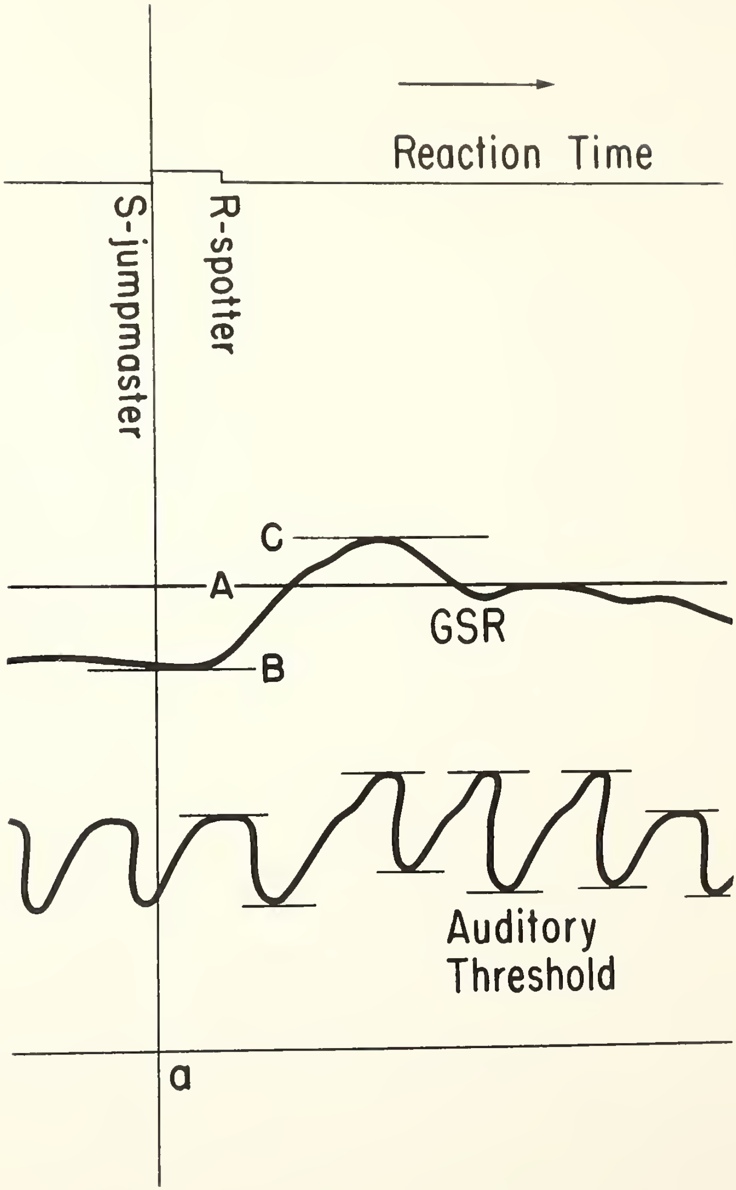


Figure 10. Sample of galvanic skin response, reaction time, and auditory threshold recordings (enlarged).

stimuli. This included about 3 to 5 ascending and descending series following each stimulus presentation. In Figure 10, a represents the zero point; the ascending order moves toward the center of the paper, and the descending order away from the center.

Scoring of measures involving verbal content will be described in the section on results.

Statistical Procedures

Where distributions permitted, the data were analyzed by analysis of variance. In one analysis experimental Ss were used as their own controls, and non-parachutists were omitted. This permitted an orthogonal arrangement of experimental condition and sequence. In a parallel analysis, non-parachutists were used as their own controls and compared on first, second, and third testings. In a third analysis, which included parachutists and non-parachutists, it was necessary to sacrifice information on the interaction of sequence and experimental condition, as this was meaningless for the non-parachutists.

Results

Galvanic Skin Response

As had been hypothesized, it was found that GSR is directly related to the relevance of the eliciting stimulus to parachuting, and to closeness in time to a jump. As may be seen in Figure 11, parachutists produce gradients of GSR, the steepness of which varies directly with proximity to a jump. Control Ss fail to produce a gradient.

Three analyses were performed: one using parachutists as their own controls, one comparing control Ss at the three testing sessions, and one comparing parachutists with control Ss. These are shown in Tables 1, 2 and 3 in Appendix A. The increase in steepness of gradients as a function of time to a jump is highly significant (.001 level), while the corresponding source of variance for the control Ss does not approach significance.

Trend analysis of the significant interaction demonstrated by the parachutists on the variables of experimental condition (time) and stimulus dimension (cues) indicates that the significance can be attributed to a combination of linear, quadratic and cubic components. Individual analyses carried out for each experimental condition reveals increasing linear, quadratic and cubic functions from control day to day of jump. As may be seen in Figure 11, the gradients, apart from becoming generally steeper, become increasingly

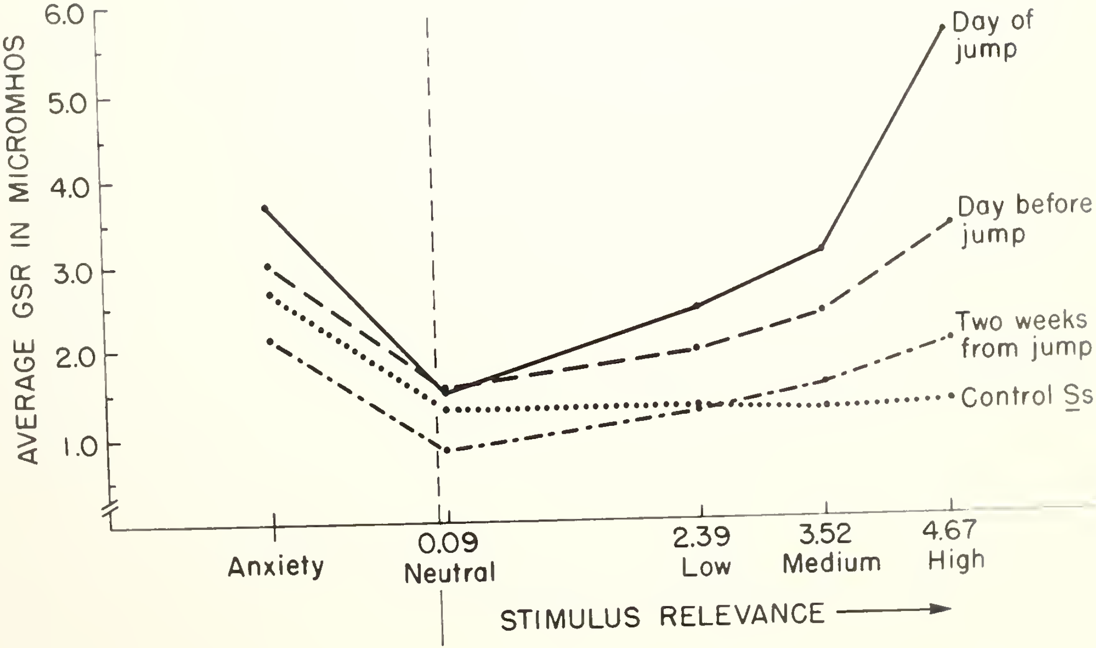


Figure 11. GSR of parachutists and control Ss to a stimulus dimension and anxiety words.

positively accelerated as time to a jump approaches. The analyses are summarized in Tables 4 through 7, which are presented in Appendix A.

Turning back to Figure 11, it can be seen that parachutists react more strongly to neutral words on the day of a jump and the day before a jump than on a day two weeks from a jump. This difference, tested by analysis of variance, is significant at the .05 level. The difference between the day before and the day of a jump is negligible. It may be concluded that the level of reactivity of parachutists increases up to a point as the time for the anticipated jump approaches. Parachutists are also shown to react less strongly to neutral words on a control day than their non-parachuting counterparts. This difference is significant at the .01 level. Apparently, when not jumping, parachutists tend to react less strongly than non-parachutists to stimuli that are not associated with parachuting. This finding appears to reveal a personality difference as it may be interpreted to indicate that parachutists are more apt to release tension in motor activity, rather than to inhibit their emotions, or bend their tensions.

Turning to GSR to anxiety words, in Figure 11 it can be seen that parachutists and control <u>S</u>s produce increasing gradients from neutral to anxiety words. While the steepness of the gradients is the same for control <u>S</u>s, parachutists on a control day and parachutists on the day before a jump, on the day of a jump parachutists produce a markedly steeper gradient. Analysis of variance (see Tables 8, 9 and 10 in Appendix A) reveals that all positive effects are significant. It is of interest that, where general anxiety is concerned, control Ss also produce gradients, indicating the phenomenon is not restricted to an approaching critical event. That differences in steepness of the gradients between the two groups emerge only when proximity to the goal for parachutists is considered, indicates that the effect of the specific event, in this case, is superimposed upon a more general effect.

Absolute Level of Skin Conductance

Turning to Figure 12, it can be seen that the hypothesis on change in conductance level as a function of approaching time to a jump is not supported. The results, in fact, are in the opposite direction of the hypothesis. Conductance is highest on the control day and decreases as time to the jump approaches. Analysis of variance reveals that the decrease is significant at the .05 level. The relationship holds for level of conductance following the three minute waiting period as well as for initial conductance level. These results are obviously opposite to results for GSR to neutral words, although the two were presumed to be simultaneously associated with activation. The possibility was raised that this discrepancy may be due to the difference in time sampled by basal conductance at the beginning of the word-association test, and GSR to neutral words interspersed throughout the test. Thus, only the responses

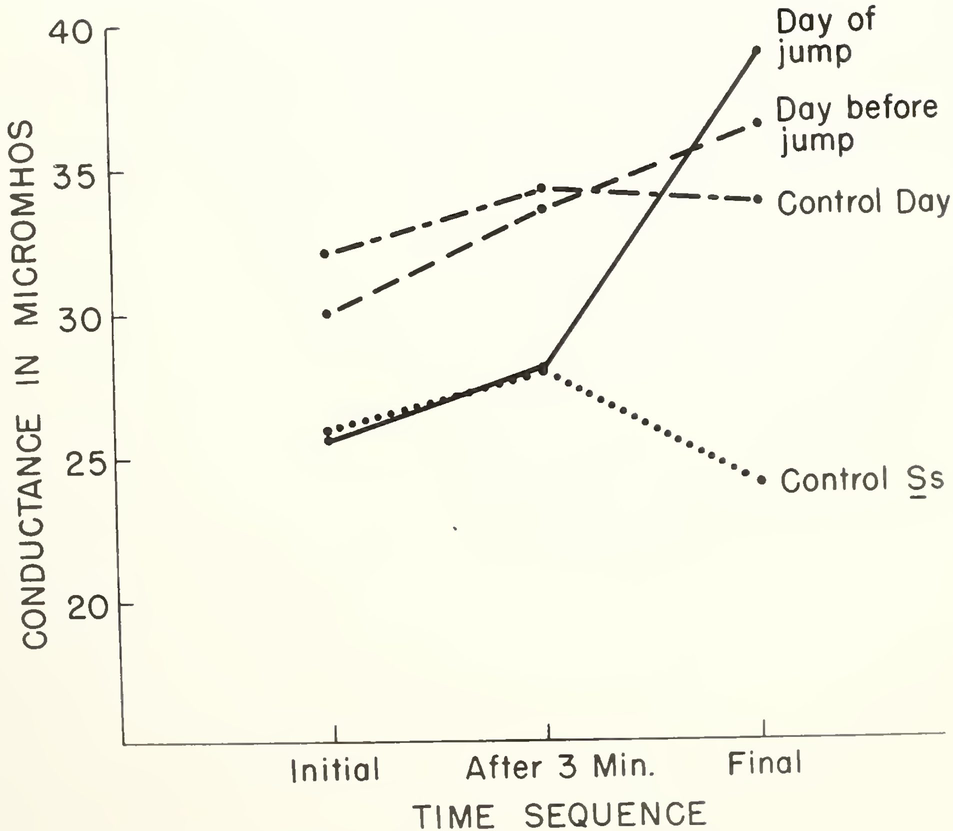


Figure 12. Absolute level of skin conductance of parachutists and controls as a function of testing sessions.

to the first 5 neutral words of each record were considered in a new comparison. These words had been presented to the Ss no longer than 3 minutes after the beginning of the word-association test, and may therefore be considered as more comparable to initial basal conductance. The means for the 5 words at the beginning of the test were found to be somewhat higher than the means for the neutral words interspersed throughout the test, but do not differ in relative position, i.e., parachutists on the day two weeks from a jump obtain smaller GSRs than on the day before a jump or the day of a jump. Thus the discrepancy between the findings on GSR and basal conductance can not be attributed to differences in the periods sampled, and it must be concluded that they are not functionally equivalent measures of activation. How is one to account for this unexpected finding? One possibility is that a blanket type of inhibition of anxiety occurs as the time to a jump approaches, which succeeds in lowering the general resting level of conductance in the absence of strong stimulation. Presumably this general state of inhibition is disrupted by specific stimulation which demands a reaction. Such an interpretation is supported by the finding that on the day of a jump absolute conductance before testing is lower than at any other session, while at the end of the test it is higher than at any other session.

In Figure 12 it can further be seen that the other hypotheses on absolute conductance are generally verified. During the 3 minute period before testing absolute level of conductance rises for all Ss. Following this, control Ss demonstrate an adaptation effect by a drop in conductance level, while parachutists exhibit a sharp increase in conductance on the day of a jump, less of a rise on the day before a jump, and a slight decline two weeks from a jump.

In order to establish the reliability of the above observations, the usual analyses of variance were performed (Tables 11, 12 and 13 in Appendix A). When parachutists are treated as their own controls, the main effect of time (i.e., the 3 periods in which the testing session is divided), and the interaction of time period and experimental condition, are highly significant. The significant main effect is due to the overall rise in level of conductance of parachutists throughout the testing sessions, when all three sessions are averaged, and the significant interaction is due to the sharper rise in level of conductance on the day of a jump than at either of the other times. The analysis for control Ss fails to reveal any source of significance other than individual differences, indicating that the adaptation effect that appears in Figure 12 is not reliable. When parachutists and controls are compared in a single analysis, the groups differ significantly in their pattern of conductance change as a function of the time period within the testing session, confirming the results obtained when the groups are analyzed independently.

Figure 13 presents the average prestimulus levels of basal conductance at four equal intervals during the word-

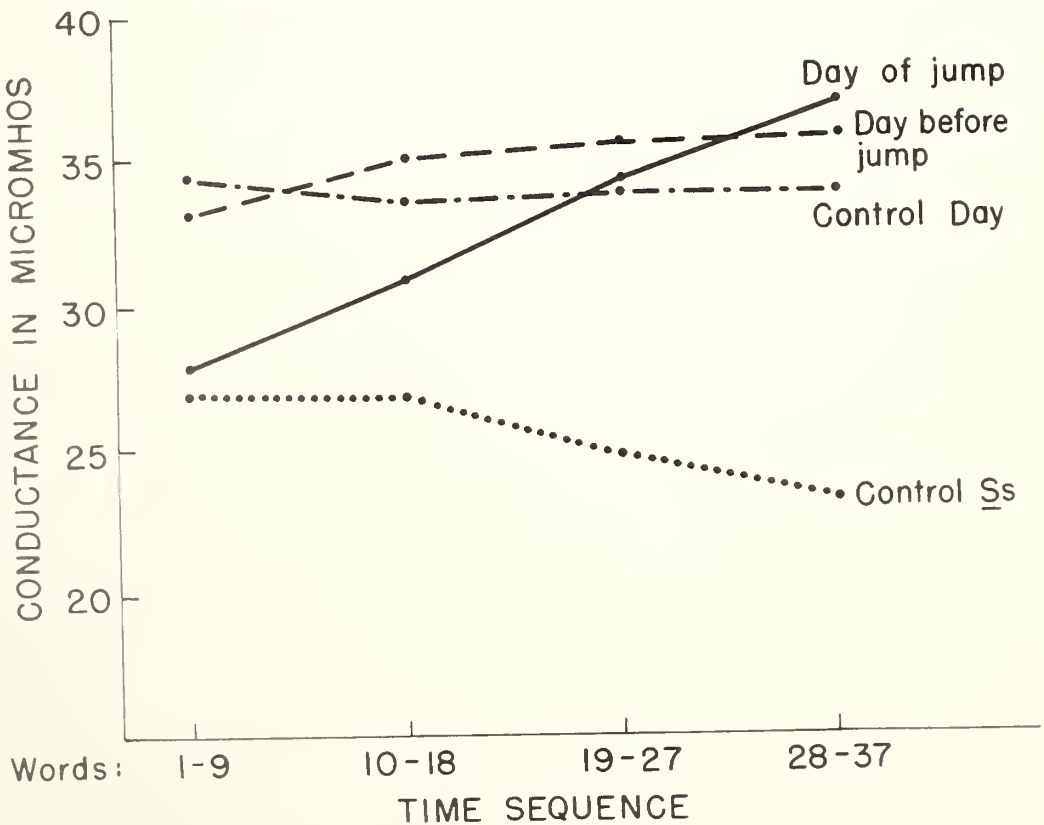


Figure 13. Absolute conductance of parachutists and controls throughout the word list.

association test. No analysis was performed on these data, which are presented only to illustrate in a more detailed manner the effects that appear in Figure 11 for the last 2 intervals. It is evident that for the parachutists on the day of a jump, the increase in conductance is continuous throughout the testing session.

Auditory Threshold

Figure 14 reveals an increase in steepness of gradient with increasing proximity to a jump, as had been hypothesized. On the day of a jump, auditory thresholds obtained after presentation of high relevant words are 2.8 decibels higher than thresholds obtained after neutral words. The corresponding figure for the day before a jump is 1.3 decibels, and for a day two weeks from a jump, 0.90 decibels. Control Ss manifest a slight decreasing gradient as a function of the stimulus dimension, suggesting adaptation to the cues of parachuting. Tables 14, 15 and 16, presented in Appendix A, indicate that all the above effects are highly significant.

Trend analysis of the interaction between experimental condition (proximity to a jump) and stimulus dimension yields a significant difference (.001 level) in the linearity of the gradients as a function of time from a jump. Individual analyses carried out for each experimental condition reveal significant linear and cubic functions. The F ratios are more pronounced on the day of the jump than on the other two days of testing (see Tables 17 through

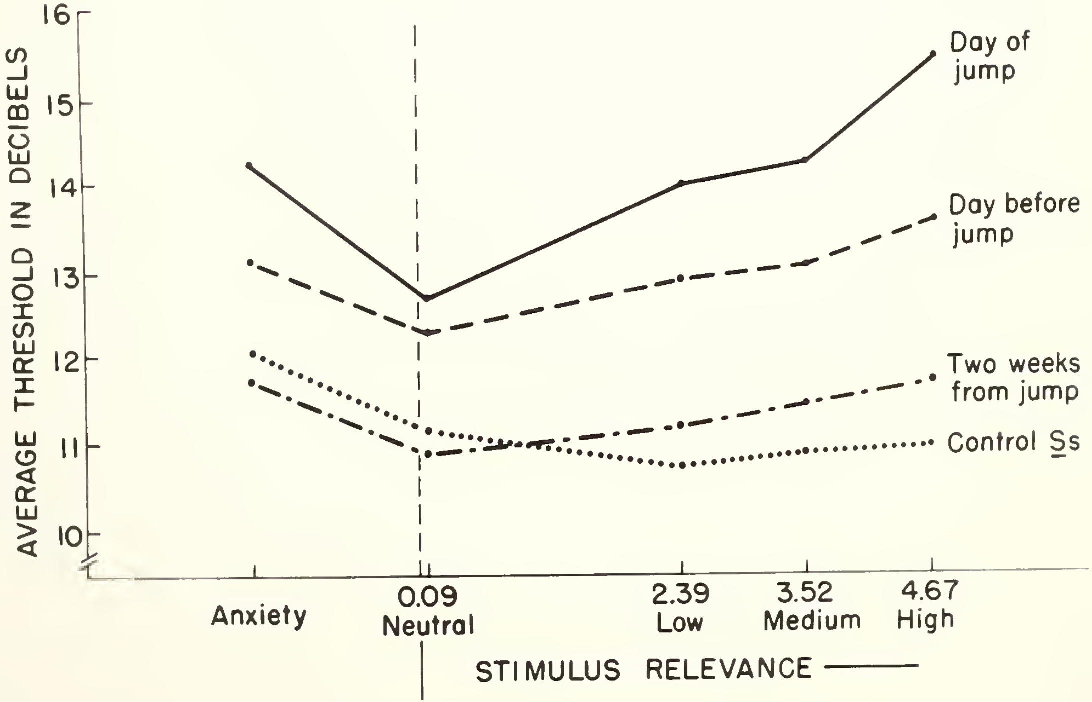


Figure 14. Auditory threshold of parachutists and controls following cues associated with parachuting and anxiety.

20 in Appendix A for the analyses of variance). In Figure 14 it can be seen that gradients become increasingly positively accelerated as the time of the jump approaches.

Again referring to Figure 14, it can be seen that there is a sharp increase in the threshold of parachutists for tones following neutral words from the control day to the day of a jump (1.82 decibels). When tested by analysis of variance, the difference is significant at the .01 level. It may be concluded that parachutists on the day of a jump demonstrate sensory deficit independent of the effect of activation-arousing cues. On the day two weeks from a jump parachutists do not differ from control Ss.

Turning to the effect of anxiety words on threshold for tones, it can be seen from Figure 14 that parachutists on each of the three days of testing have a considerably higher auditory threshold for tones following anxiety words than for tones following neutral words. Analysis of variance reveals that this effect is significant at the .001 level (see main effect for stimulus dimension). While the greatest differential effect occurs on the day of a jump, a failure of the interaction of experimental condition (proximity to a jump) and stimulus dimension to reach significance, indicates that the greater steepness of gradient on the day of a jump than on the other days is not reliable. The trend nevertheless is in the direction of the hypothesis. Control Ss show the same effect as parachutists (significant at the .001 level) indicating, as for GSR, that anxiety cues, which are not specific to parachuting, produce similar effects in both groups. (Tables 21, 22 and 23 in Appendix A summarize the analyses of variance for these data.)

Response Latency

Hypotheses for response latency were generally confirmed. In Figure 15 it can be seen that at all three times of testing parachutists produce positive gradients as a function of the stimulus dimension, and that the gradient is higher and steeper on the day of the jump than on the day before a jump, and least steep two weeks from a jump. The mean difference in reaction time for neutral and high words is 1.67 seconds on the day of a jump, 0.96 seconds on the day before a jump, and 0.63 seconds two weeks from a jump. No reliable difference in reaction time as a function of the stimulus dimension occurs for control Ss. Analyses of variance, shown in Tables 24, 25 and 26 of Appendix A, indicate that all the above effects are significant.

The trend analysis for the interaction between experimental condition and stimulus dimension indicates that the difference between gradients is associated with linear, quadratic, and cubic components. Separate analyses for each experimental condition reveal a significant linear, quadratic and cubic function on the day of a jump, a significant linear and cubic function on the day before a jump, and a significant linear, quadratic and cubic function on the day two weeks remote from a jump. All effects are clearly more pronounced

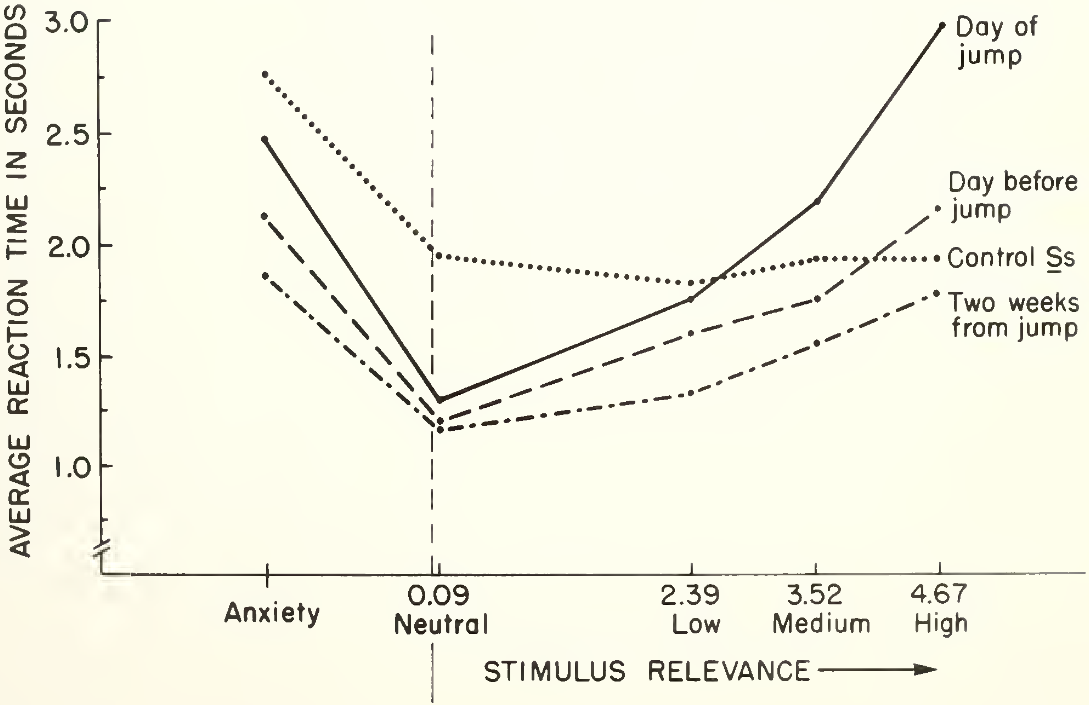


Figure 15. Reaction time of parachutists and controls to a stimulus dimension and to anxiety words.

on the day of a jump than on the day two weeks from a jump. While the pattern is less orderly than for GSR, Figure 15 reveals the same increasing positive acceleration of the curves as a function of decreasing time to a jump. (Tables 27 through 30, representing these analyses, are found in Appendix A.)

Turning to the results on reaction time to neutral words, Figure 15 clearly reveals that parachutists are more rapid responders than control Ss. Mean reaction time of parachutists to neutral words on a control day (1.16 seconds) is significantly lower (.01 level) than mean reaction time of control Ss (1.95 seconds). Increasing reaction time to neutral words as a function of decreasing time to a jump is in the predicted direction, but falls short of significance.

Figure 15 further shows that an increase in reaction time from neutral to anxiety words is demonstrated by all groups. However, there is a tendency for this effect to be greatest for parachutists on the day of a jump. Analyses of variance of these data (see Tables 31, 32 and 33 in Appendix A) indicate significance for the effect of the dimension, but fail to indicate a differential effect of the dimension associated with groups or time of testing in relation to a jump.

Perception

Perception differs from sensation in that it involves the ascription of meaning to a stimulus. Using as a point of reference the objective meaning of the stimulus, as defined by consensus, perceptual responses can be scored as accurate or inaccurate. In the present study, a gross measure related to perceptual threshold was obtained by simply noting whether words were correctly or incorrectly perceived. Misperceptions could be unambiguously scored when a S reported that he had not heard a word or when later questioning of obviously inappropriate responses indicated that the stimulus word was mistaken for another, frequently with one that rhymed with it. Misperception in the word-association test could be scored in reference to approach and avoidance of cues associated with parachuting. In addition, a score of more general perceptual deficit could be obtained by attending only to neutral words.

Figure 16 presents number of misperceptions of words in a category, presented as a percentage of all words in a category. It is immediately apparent that parachutists on the day of a jump misperceive a high proportion of anxiety words and relatively few parachute relevant words. Inspection of the frequency distribution indicates that there are a high number of cases with zero misperceptions accounting for markedly skewed distributions. Accordingly chi square analysis of frequency data was resorted to.

Of 20 parachutists who, on the day of a jump, misperceive a different number of neutral words and words highly relevant to parachuting, 18 make fewer errors on the parachute words, which is significant at the .01 level. That this is not due to any intrinsic difference in the difficulty of the words

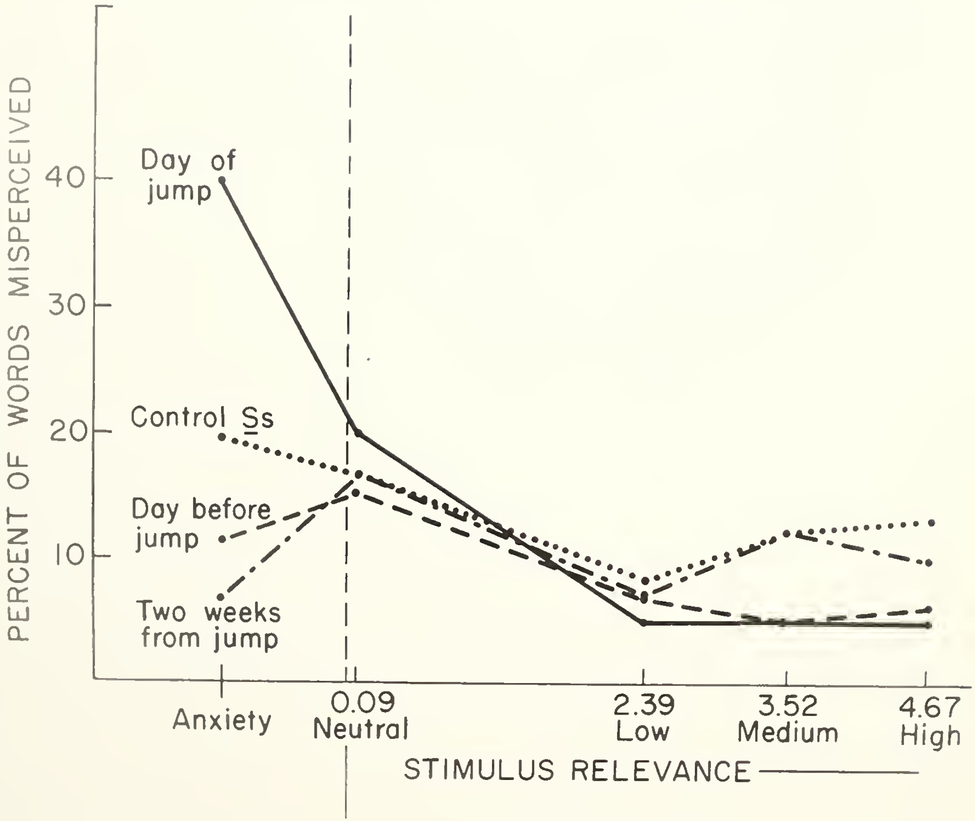


Figure 16. Percentage of misperceptions by parachutists and controls of words on a stimulus dimension and anxiety words.

is indicated by the finding that control Ss do not differ in misperception of neutral and parachute-relevant stimuli. Thus, of the 23 control Ss who produce an unequal number of misperceptions to the two categories, 12 produce more misperceptions to the neutral words and 11 to the words related to parachuting.

Consistent with findings on the day of the jump are findings on the other two days of testing: the ratio is 19 to 3 in favor of fewer misperceptions of parachute-relevant words than neutral words on the day before a jump (significant at the .01 level), and 19 to 4 on the day two weeks from a jump (significant at the .01 level). The hypothesis of differences between experimental condition of proximity to a jump is not upheld, although the tendency in Figure 16 is in the expected direction. It thus may be concluded (1) that parachutists perceive parachute-relevant words more readily than neutral words, (2) that perception of parachute-relevant words by parachutists does not vary significantly as a function of experimental condition, although the tendency is in the predicted direction, and (3) that control Ss do not demonstrate differential perception of neutral words and words related to parachuting.

Turning to anxiety words, the indication in Figure 16 that parachutists misperceive more anxiety words on the day of a jump than any other day of testing, and than control Ss, is in support of the hypothesis. The hypothesis that the same effect occurs on other days, but to a lesser extent, is not supported. Of parachutists who produce an unequal number of misperceptions of neutral and anxiety words two weeks from a jump, 1 makes more errors on anxiety words, while 20 miss more neutral words (about 5 per cent). On the day before a jump, corresponding figures are 1 and 8 (about 11 per cent), and on the day of a jump, 13 and 12 (about 52 per cent). It is apparent that there is generally a much greater likelihood for Ss to miss neutral words than anxiety words in the present test, although the findings show a clear tendency of increased anxiety words missed with greater proximity to a jump. A comparison of number of parachutists who misperceived more anxiety words than neutral words on the day of a jump relative to the day before a jump yielded a difference significant at the .001 level (chi square = 12.04), at the .01 level for day of jump versus day before a jump (chi square = 8.84) and at the .05 level for day before a jump versus day two weeks from a jump (chi square = 6.50). No significance was found for control Ss, or between parachutists and control Ss in any single comparison. It may be concluded that parachutists on the day of a jump show a deficit for anxiety words, while on days more remote from a jump are relatively sensitized to anxiety words.

With regard to misperception of neutral words, it was hypothesized that the number of misperceptions increases with closeness to a jump, as the result of a very general perceptual deficit. The results, when tested by chi square, fall short of significance. There is no significant difference between parachutists and control Ss on neutral words under any of the experimental conditions. In Figure 16 it can be seen that there is nevertheless a tendency for parachutists to misperceive more neutral words on the day of a jump than on the other occasions.

Figure 17 presents percentage of misperceptions for neutral words categorized according to the word they follow. It is evident that parachutists on the day of a jump produce a positive gradient of misperceptions as a function of the degree of relevance to parachuting of the preceding word. Of 22 parachutists who misperceive a different number of neutral words following words of high parachute relevance on the day of a jump and two weeks from a jump, all 22 produce more misperceptions on the day of a jump, which is significant at the .001 level. A similar analysis comparing the day of a jump and the day before a jump reveals that 18 out of 21 Ss misperceive more neutral words following relevant words on the day of a jump, which is significant at the .01 level. Of 13 Ss who misperceive an unequal number of neutral words following high relevant words on the day before a jump and two weeks from a jump, 12 make more such misperceptions on the day before a jump, which is significant at the .01 level. Thus, when parachutists are used as their own controls, they demonstrate an increase in deficit associated with perception of neutral following high relevant words as time to an anticipated jump approaches. The same conclusion is supported when parachutists are

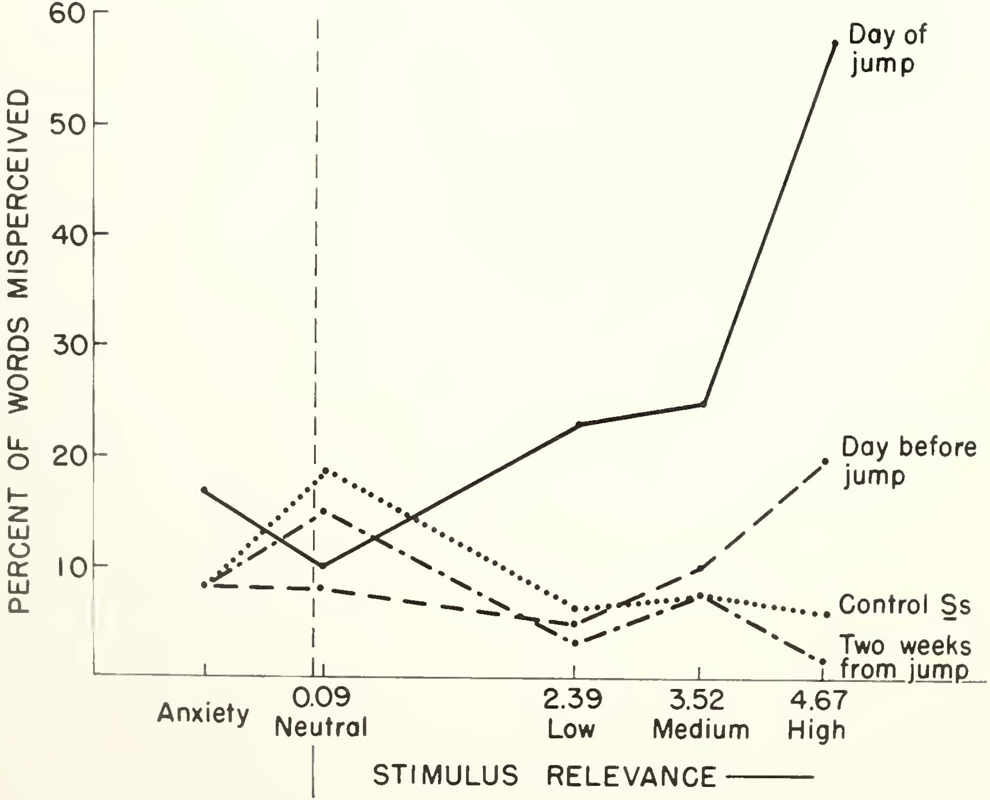


Figure 17. Percentage of misperceptions of parachutists and controls of neutral words following words on a stimulus dimension and anxiety words.

evaluated relative to control Ss. There are 22 parachutists on the day of a jump who misperceive more neutral words following high relevant words, as compared to 3 control Ss. The difference is significant at the .001 level. When comparison is between parachutists on the day before a jump and control Ss, 12 parachutists and 1 control S show greater deficit to neutral words following high relevant words. This difference is significant at the .01 level. Parachutists do not differ from control Ss two weeks from a jump. It may be concluded that a parachute relevant word influences the perception of the immediately following non parachute relevant word to the extent of its own activation producing effect on parachutists due to distance in time to a jump and to its relevance to parachuting. No effect is noted for control Ss.

A comparison between neutral words following high relevant words with neutral words following neutral words reveals that the two differ. Of 19 parachutists who produced an unequal difference on the day of a jump and a day two weeks from a jump, all make relatively more misperceptions of neutral words following parachute relevant words on the day of a jump, which is significant at the .001 level. When the comparison is between parachutists on the day before a jump and parachutists two weeks from a jump, there are 12 Ss who produce an unequal difference on the two days. All 12 make more misperceptions of neutral words following parachute relevant words on the day before a jump, which is significant at the .01 level. When the comparison is between parachutists on the day of a jump and control Ss, 19 out of 27 parachutists, and 2 out of 27 control Ss misperceive more neutral words following words of high relevance than neutral words following neutral words, which is significant at the .01 level. In the comparison between parachutists on the day before a jump and control Ss, 12 out of 27 parachutists, and 1 out of 27 control Ss misperceive relatively more neutral words following high relevant words than neutral words following neutral words, which is significant at the .01 level. It may be concluded that there is a selective increase in misperception of neutral words following words of high relevance for parachutists as time to an anticipated jump approaches.

Memory

Each list of 37 words contains 3 words in 5 categories that are scored on all measures, 5 practice words, and 17 neutral buffers. In the memory task, Ss are asked to recall all word-stimuli together with their respective responses. At times Ss were able to remember only the stimulus word, and at other times only the response word. On occasion, a wrong response was produced to the right stimulus, and vice versa. Inspection of these different kinds of errors failed to reveal functional differences. Accordingly, the data were pooled into 3 indices of recall: correct recall of neutral stimuli and responses, correct recall of parachute relevant stimuli and responses, and correct recall of anxiety stimuli and responses. A division of responses according to the degree of parachute relevance of the stimulus word was found to add nothing and was discarded.

Figure 18 indicates that while there is a general tendency to recall more parachute-relevant than neutral words, this tendency is more pronounced for parachutists than for control Ss. Analyses of variance (see Tables 34, 35 and 36 in Appendix A) indicate the difference between parachutists and control Ss in recall of parachute-relevant words relative to neutral words is significant at the .05 level. Figure 18 also shows a tendency for parachutists to recall more parachute relevant words on the day of a jump than on the day before a jump, or on a day two weeks from a jump, in that order, as had been hypothesized, but this difference is not found to be significant. It may further be seen in Figure 18, that the trend of differential recall of neutral and anxiety words is opposite from what had been hypothesized. There is nevertheless no significant effect due to experimental condition or groups, all groups demonstrating a constant bias in favor of recall of anxiety words. It may be concluded that parachutists and non parachutists recall more parachute-relevant and anxiety words than neutral words, and the effect of closeness to a jump increases the tendency for recall of parachute-relevant words for parachutists. While this finding supports the hypothesis for sensitization

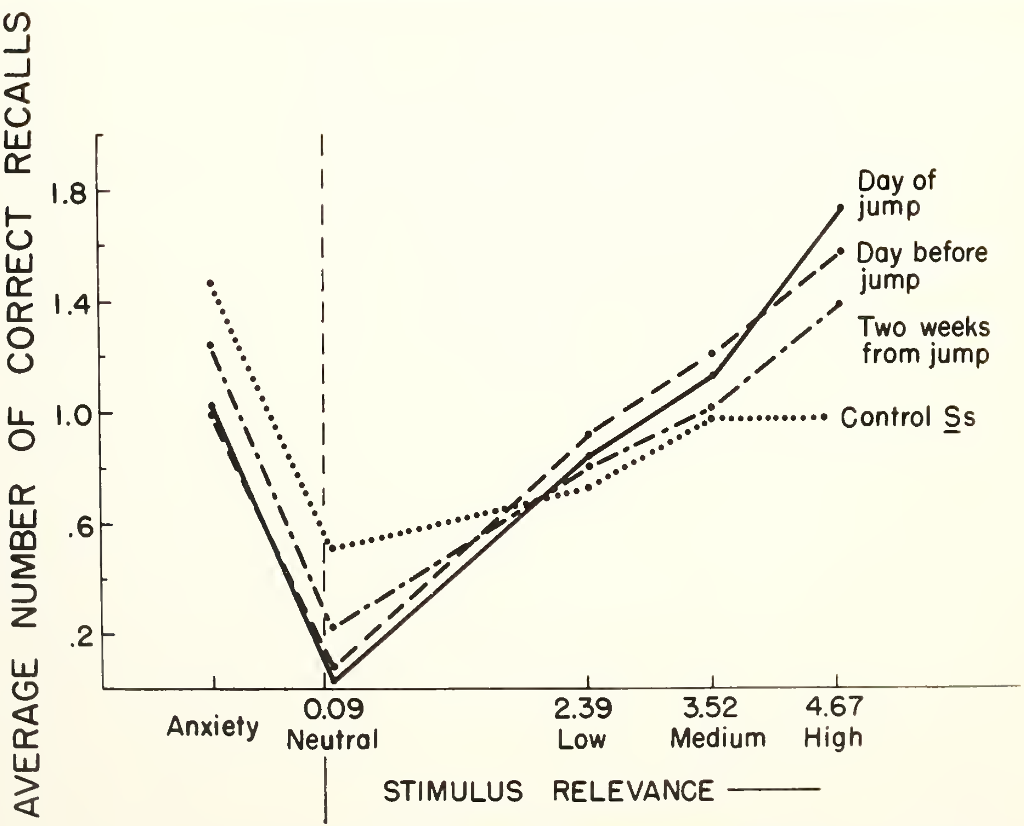


Figure 18. Average number of stimuli and responses correctly recalled in each stimulus category by parachutists and controls.

toward parachute-relevant material, the hypothesis for defense against anxiety-relevant material was not confirmed.

To evaluate generalized memory deficit as a measure of performance, it was decided to use a score representing the recall of the 22 "neutral" buffer words rather than only the three neutral words. The hypothesis that parachutists would perform more poorly the closer in time to a jump was substantiated. The average number of neutral stimuli and responses correctly reproduced was 3.88 on the day of a jump, 5.66 on the day before a jump, and 8.18 two weeks from a jump. Analysis of variance reveals the difference to be significant at the .01 level. Control Ss recall on an average 7.24 neutral stimuli and responses per session, and do not differ significantly over sessions. Comparing parachutists to control Ss, the difference between groups and experimental condition is significant at the .01 level. It may be concluded that, so far as neutral words are concerned, parachutists in the control condition do not differ from control Ss, but show increasing memory deficit as the time of a jump approaches.

Association

Although there was some indication of response deficit to correctly perceived stimuli, such as the failure to produce a response, the repetition of a stimulus word, the repetition of a response word, or the production of a neologism, such responses were relatively rare. Of these, the most common was the repetition of a response word, as illustrated in the following example of a record of a parachutist on the day of a jump: "skydiver-jump; hungry-jump; radiator-hot; happy-parachute; bicycle-jump, damn it, I can't get away from it!" Unfortunately there were not enough such low level responses to allow for statistical analysis, although the trend was clearly in the direction of parachutists producing more such responses on the day of a jump than at any other time.

The number of parachute-relevant responses produced was investigated as a measure of approach. Since there was no evidence that stimulus words at different points along the stimulus dimension were functionally dissimilar, responses to all stimuli were combined into an overall score. Parachutists on the day of a jump produce an average of 12.8 parachute-relevant associations, parachutists on the day before a jump 7.9 such responses, and parachutists two weeks from a jump 6.1 such responses. Control Ss produce the least number of parachute-relevant responses, with a mean of 4.8. Differences between parachutists at the three testing sessions, and between parachutists and controls were tested by analysis of variance, and were found to be all highly significant. It may be concluded that parachutists, irrespective of testing session, produce more parachute-relevant associations than control Ss, and that the number of parachute-relevant associations is directly influenced by proximity to a jump.

Self-Ratings of Approach and Avoidance

Shortly after landing from a parachute jump, parachutists were asked to rate their feelings of approach and avoidance at each of the following points along a sequence of events associated with parachuting: (1) last week, (2) last night, (3) this morning, (4) upon reaching the airfield, (5) during training period before jump, (6) getting strapped, (7) boarding aircraft, (8) during ascent, (9) at the ready signal, (10) stepping outside, (11) waiting to be tapped, (12) freefalling, (13) after chute opened, (14) immediately after landing. Approach was defined as "looking forward to the jump, wanting to go ahead, being thrilled by the prospect of jumping"; avoidance as "wanting to turn back and call the jump off, questioning why you ever got yourself into jumping, fear." Ss were told to place a rating of 10 at the point of strongest approach, of 1 at the point of weakest approach, and to rate other points comparatively. After completing ratings on approach, the same procedure was followed for avoidance (see rating sheet in Appendix C).

Figure 19 presents the mean self-ratings of approach and avoidance as a function of the sequence of events associated with a jump. It is immediately apparent that approach is much greater than avoidance to begin with, but as time to a jump diminishes, there is a rapid falling off in approach and an increase in avoidance, so that by the time the aircraft is boarded, avoidance is greater than

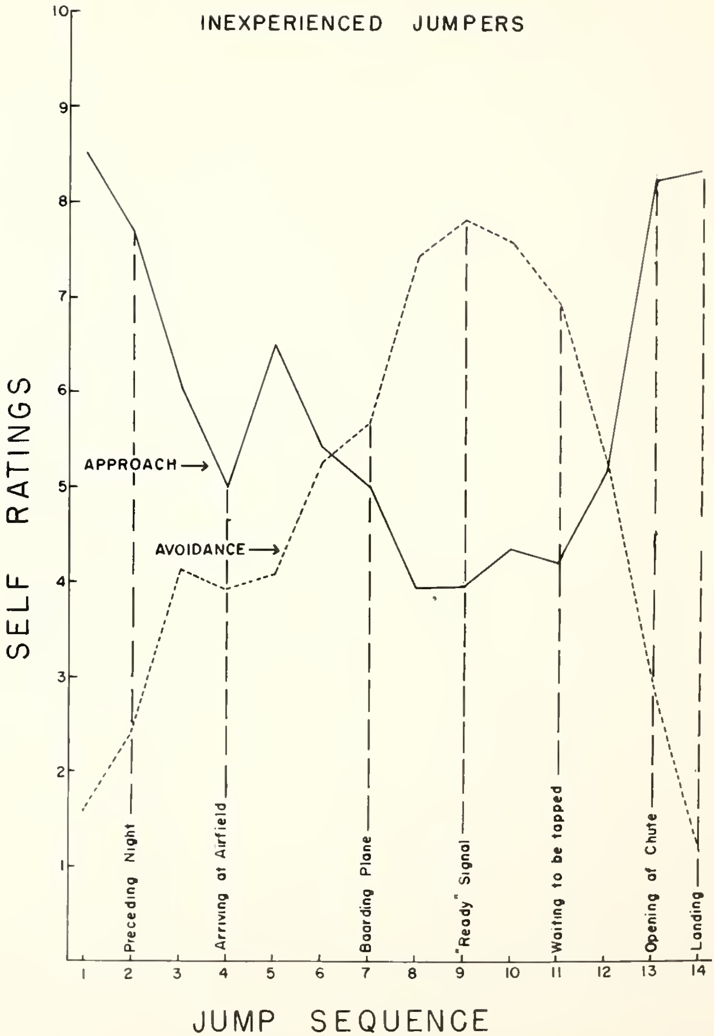


Figure 19. Self-ratings of approach and avoidance as a function of the sequence of events leading to and following a jump.

approach. This was an unexpected finding, as the parachutists, after all, do jump. It would appear that they are jumping on "psychological momentum" rather than because of their momentary feelings about jumping, per se. The momentum consists of commitment and the fear of loss of face if the decision to jump were to be reversed. Avoidance continues to become increasingly greater than approach, reaching a peak when the signal is given to get ready to jump. It is noteworthy that the greatest avoidance reaction is not associated with the moment of jumping, but with a point that involves a final commitment to jump. When the parachutist is standing out on the step above the wheel, waiting to be tapped, where jumping is a foregone conclusion, there is a decrease in avoidance. At point 12 in the sequence, where the S is freefalling and objective danger is maximal, approach again exceeds avoidance.

Content of Thematic Responses

It will be recalled that the thematic apperception test was administered only on the day of a jump, and permitted therefore no comparison on the time effect. Criteria for scoring were the same as the ones used by Fenz and Epstein (1962) and are described in detail in that study. Each story was typed on a separate card and cards were coded, shuffled and stories scored blindly. All stories to the same picture were sorted then into separate columns representing different weights, allowing for ready comparison within and between stories in each column.

Approach content. A score of net approach attempted to assess the overall approach or avoidance to parachuting manifested in a story. Judges were told to make a global estimate of the degree to which the storyteller's thoughts centered on parachute relevant activities and were favorable or unfavorable to jumping, and to then assign a weight of zero to stories suggesting no approach to parachuting, a weight of 4 to stories most strongly indicating approach to parachuting, and to give relative intermediate weights. They were told to assign a positive reference to parachute relevant activities, such as flying ("I wish I could be up there with the pilot"), a higher score than a simple reference to a boy admiring the flight of birds ("this boy is gazing in wonderment at the birds, how they go so freely with the wind"), while a positive reference to parachuting itself ("he is looking forward to the excitement and adventure of the freefall") should receive a yet higher score. Examples for each score are given in Appendix D.

With the above considerations in mind, the stories were independently scored by two examiners. For the low relevant picture an interscorer reliability coefficient of .83, and for the high relevant picture a coefficient of .83 was obtained. Where disagreement between scores was within two points, ratings were averaged; where greater than two points, differences were resolved by discussion.

As had been hypothesized, parachutists showed greater approach to parachuting in their stories to pictures of both high and low relevance than control _S_s. Mean net approach score on the low relevant picture was 2.0 for parachutists, and 1.2 for controls. Mean net approach score on the high relevant picture was 2.3 for parachutists, and 1.1 for controls. Analysis of variance indicates that the difference between groups is significant at the .05 level. The difference between high and low relevant pictures is not significant, although the tendency is in the direction hypothesized.

Fear of parachuting. It was noted that picture 5, which is highly relevant to parachuting, elicited many fear responses, such as: "He says to himself, what the hell am I doing up here anyway?" "He looks worried . . . What will happen? . . . and thinks, 'Am I gonna die?'" "The guy is scared stiff. He is biting his lips, wondering if he will have the courage . . ." It was decided to score these responses on a continuum of fear of parachuting, and it was found that responses could be discriminated along 5 points. The method of scoring followed the same procedure as for approach content. Judges were told to rate responses on a 5 point scale, with zero indicating an absence of fear ("he is not scared at all") and 4 ("I am not going out there") a high degree of fear. Examples for each score are given in Appendix D. An interscorer reliability coefficient of .92 was obtained. Final scores consisted of the average ratings of both examiners.

Expression of fear of parachuting yielded a mean score of 1.35 for parachutists, and 1.92 for controls. The difference tested by analysis of variance is significant at the .05 level. It may be concluded that parachutists express less fear than control Ss to a picture of high relevance to parachuting.

Defense mechanisms. If it could be shown that parachutists express less fear to parachute relevant stimuli, and more fear to stimuli unrelated to parachuting than control Ss, a strong point for the use of a defense mechanism of displacement by parachutists could be made, and for their need to control and exhibit fear.

Pictures 2 and 6 elicited a considerable number of references to fear unrelated to parachuting. To picture 2, which shows two boys running, some examples of fear responses were: "He is scared stiff of being beaten up . . .", and "He is running away from danger which he cannot escape . . .". Picture 6 shows a young man in front of a stately home. Fear to this picture was expressed by such comments as: "The closed door is an omen of disaster . . .", and "The boy is scared; he is picking up his girl, and wonders . . .".

Fear responses to picture 2 were rated by two examiners on a 5-point scale and yielded an interscorer reliability coefficient of .79. An average fear score for parachutists of 1.6 was obtained, and for control Ss, 1.0. Combining Ss who expressed fear, and who obtained a score of 1 or higher, and comparing them to those who did not express fear, and obtained a score of zero, it was found that 14 parachutists and 8 control Ss fell in the first category. The comparison yields a chi square of 4.50, which is significant at the .05 level. Not enough Ss expressed fear to picture 6 for scores to be analyzed, although the tendency again was for parachutists to express more fear than controls. In accordance with the hypothesis, it may be concluded that parachutists express more fear than non parachutists to stimuli unrelated to parachuting.

Examining the unidentified pool of stories it was noted that there were 9 explicit denials of fear of parachuting to the high relevant picture. Examples are: "He does not worry. It will be a real experience in his life, but his sweetheart and mother are afraid for him . . .", and "He looks so relaxed, he is not scared at all . . .". All such stories were found to be produced by parachutists, which is significant beyond the .01 level.

In summary, parachutists on the day of a jump produce strong approach responses to parachuting in their TAT stories, explicitly deny fear of parachuting, and produce an inordinate number of fear responses unrelated to parachuting.

Discussion

The mental state of a parachutist making his first or second jump is very similar to that of a psychiatric patient who is seriously troubled by some very real problem. While an experienced jumper is, in most cases, capable of exerting control over his actions and emotions, a beginning jumper, at the time of the jump, is overwhelmed by his fears. Yet, at this point, to back out and give up is unacceptable. The result is an acute conflict resulting in a deterioration of performance. Much of the training in sport parachuting is directed toward making the subject react by reflex, since experience has shown that the beginning jumper is apt not to follow the simplest instructions, such as waiting for the jumpmaster's signal to jump, keeping a count of time elapsed until the chute opens, and assuming a proper position during the period of freefall. The same parachutists had no difficulty in performing the operations on the ground during training exercises. Thus it is apparent that the deficit exhibited in the air can be attributed to stress. To keep the deficit from producing disaster, the first few jumps are "static lines" jumps, in which the ripcord is automatically pulled for the jumper by the jumpmaster who remains in the aircraft. A report of the Parachute Club of America (1963) indicates that chances of malfunctions are 10:1 in favor of the first freefall (when the jumper for the first time pulls his own ripcord) which usually comes between the 5th and the 8th jump, and that failures are essentially due to a lack of cognitive control on the part of the jumper. The condition induced by a forthcoming jump for a beginning parachutist may be viewed as a miniature abnormal state. It is in this light that the findings become meaningful in their implications for the understanding of maladaptive behavior in the behavior disorders. The high reliability that was found for some of the measures indicates that they are completely adequate for measuring individual differences, and that they thus have important implications for the development of diagnostic methods for determining areas of conflict and stress. The fact that the findings on the various measures could be meaningfully integrated about a few key concepts also points to the fruitfulness of the theoretical approach. Central to the theoretical model presented in this study is the assumption that conflict can be measured by its correlates of physiological activation, performance deficit, and directionality of verbal content. The remainder of this paper is devoted to a discussion of the relationship of each of these response systems to stress and conflict.

Activation

Physiological activation has been reported in the literature to be indicative of changes in mental states. In a study by Landis and Hunt (1935), subjects were asked to describe their subjective feelings during a period of stimulation. When the galvanic skin responses were sorted according to the mental states reported, it was found that tension, fear and confusion, in that order, produced the strongest GSRs. These three feelings are highly descriptive of the mental state of a novice parachutist immediately prior to jumping. The hypotheses on activation in the present study assumed that such feelings as tension, subsumed under the concept of activation, would increase as a function of a decrease in time to the approaching event, and of an increase in cues associated with the event. The hypotheses were clearly supported using GSR as the measure of activation.

The reliability and validity of GSR as a measure of activation, assuming the covariance of the latter with time to a jump and relevance of cues to parachuting, were clearly demonstrated. It will be remembered that so far as the cue dimension is concerned, Luria (1932) used a somewhat similar technique. He characterized stimuli in a word-association test as indifferent, doubtful and critical as to their relationship to a specific situational conflict, and observed that behavioral disorganization varied in a direct manner, according to the degree of relationship of the stimulus to the area of conflict. The use of projective tests containing dimensions associated with an area of conflict was also reported by Epstein and Fenz (1962). Whereas Luria, however, had used motor activity as the measure which most clearly corresponds to the concept of activation, as used in this paper, Epstein and Fenz used GSR. Luria's measure of motor behavior is actually a combined index both of activation and performance deficit, each of which is measured separately in the study by Epstein and Fenz and in the current study. The present findings on GSR clearly corroborate the earlier findings. As in the previous work, parachutists produced gradients of GSR to cues of increasing relevance to parachuting under all testing conditions, and for each individual, the gradient was steeper on the day of a jump than on a day two weeks from a jump. In like manner the average gradient of parachutists on the day of a jump was steeper than on the day before a jump, but in this case the results were not consistent for all subjects. Obviously there are factors other than proximity to a jump which influence steepness of gradients. This is well illustrated by one subject who produced a steeper gradient on the day preceding a jump than on the day of a jump. (His order of testing was such that the first test was two weeks before a jump, the second test on the day of a jump, and the third the day before a jump.) Questioning revealed that after the second testing and just prior to the jump itself, he witnessed several minor malfunctions by other parachutists, and expressed apprehension and doubt about his ability to cope with similar situations. Nevertheless, he made the jump. On the third testing session, he produced a very steep gradient. While he said he would make the next jump, which was scheduled for the following day, he never did, nor was he seen at the airfield thereafter. Similar incidents provide convincing evidence that the GSR is a sensitive measure in differentiating intensity of reaction to stress both between and within individuals.

A measure of activation which has received less attention in the literature than GSR is the absolute level of conductance. There is reason to believe that absolute conductance varies with general state of alertness or activation (Woodworth and Schlossberg, 1954). Several studies have reported that activation is high when the subject is alert, and low when he is relaxed (Farmer and Chambers, 1925; Freeman and Darrow, 1925; Richter, 1926). Darrow and Heath (1932) investigated the changes in absolute level of conductance that occurred during the course of an experiment. They found that conductance was high when the subject was being harnessed in the recording apparatus, and rose yet higher as he awaited the onset of the experiment. Davis (1934) reported a rise in absolute conductance throughout the course of an experiment which involved rapid adding under conditions of distraction by a loud noise. Duffy and Lacey (1946) reported a fall in absolute conductance in an experiment involving the determination of the subject's lower threshold for sound. The findings of Davis and Duffy and Lacey might seem to be contradictory, if one were not to take into consideration that whether absolute conductance rises or falls depends on how the subject perceives and reacts to the task at hand. This was clearly demonstrated in the present experiment where, after an initial rise in conductance while waiting for the task to start, control subjects manifested a drop in conductance, while parachutists on the day of a jump demonstrated a sharp rise. The rise was less marked on the day before a jump, and on the day two weeks from a jump there was even a slight drop in conductance from the beginning to the end of the experiment. It follows that the rise in absolute conductance during the testing session provides an index of degree of disturbance of the jumper in reacting to cues associated with parachuting. The implication for locating areas of psychopathology are that in a parallel clinical situation, an area of conflict, if tapped by appropriate stimuli, will overrule the effects of adaptation, and reveal itself by a rise in conductance during testing. It should be noted that out of the 27 parachutists tested on the day of a jump, 23 manifested a rise in conductance throughout the session, indicating that the reliability should be sufficient for measuring individual differences in a clinical situation. It will be remembered that initial level of conductance was lowest on the day of a jump, and highest on the day remote from a jump. As a result of stimulation, parachutists showed a rise in conductance, the sharpest rise occurring on the day of a jump. The findings on initial level of conductance can be interpreted as revealing a general state of inhibition produced by mounting stress. Since they were contrary to the original hypothesis, they will need to be replicated. If verified, they point to the importance of considering different types of inhibition, at least a distinction between a general inhibition which produces an overall blanketing effect, and inhibition specific to particular stimuli.

Performance Deficit

It was assumed that high levels of activation would produce performance deficit, and the findings were consistent with this assumption. Whether the autonomic nervous system causes changes in the central nervous system, as Luria (1932) has suggested, or whether the two systems are independently influenced by a third source, or both, a significant correlation between performance deficit and autonomic reactivity under conflict is of considerable significance in its own right.

There is reason to believe that the relationship of level of performance to activation can best be described by an inverted U-shaped curve (Malmo, 1959). That is, up to a point, which differs according to the nature of the performance measure, level of performance increases with increasing activation, but beyond that point performance level declines. Thus the qualification was made in the present study that an increase in activation, whether produced by cues or time, would produce deficit, provided that total activation was of sufficient magnitude, and it was assumed that such was the case for a novice parachutist.

A number of studies have related autonomic reactivity to performance. Thorne (1934) and Hartmann (1934) found an inverse relationship between autonomic reactivity and sensory acuity. Trehub (1954) reported a relationship between sensory deterioration and states of tension. He obtained continuous recordings of GSR and visual thresholds during a session in which conflict-arousing verbal stimuli were presented. A direct relationship was found between magnitude of GSR and sensory threshold. Silverman et al. (1959) investigated the relationship between GSR and performance in subjects exposed to different degrees of stress in a human centrifuge. They found that when an increase in nonspecific GSRs suggested moderate alerting, psychomotor performance improved, but when hyperalerting was indicated by a further increase in nonspecific GSRs, performance declined. In other experiments reported in the same paper, the authors demonstrated variations in perceptual threshold as a function of "level of arousal" as indicated by nonspecific GSRs. Eysenck (1960) compared a neurotic and a normal group on a test of auditory flicker fusion. He found that the neurotics had lower flicker fusion rates than normals. In other work he demonstrated that neurotics produce greater GSRs than normals. Taken together, the findings suggest a correlation between rate of flicker fusion and GSR productivity.

In the present study the correlation coefficients between magnitude of GSR and auditory threshold in individual records ranged from .37 to .58, with a mean of .46 for 10 randomly selected records of parachutists tested on the day of a jump. On the day of a jump, 14 subjects produced a gradient for sensory acuity, and 27 subjects produced a gradient for GSR. Thus, both measures covary with activation, whether the latter is manipulated by cues or time. However, while a positive relationship between the two measures is indicated, auditory threshold would appear to be a less reliable measure of conflict than GSR. It is likely that the specific effect of stimulus cues on auditory threshold was to a great extent overshadowed by the effect of temporal proximity, since the parachutists exhibited a marked overall rise in threshold on the day of a jump.

A relationship between autonomic reactivity and reaction time has been widely discussed in the literature. Lanier (1941) reported that affect-laden words influenced length of reaction time in the same direction and to about the same extent as GSR. Hathaway (1929) reported a correlation of .60 between GSR and reaction time, while Hunt and Landis (1935) found no relationship. Peterson and Jung (1907) reported that only in certain cases is there a clear relationship. Findings by Epstein and Fenz (1962) indicated a marked relationship between the two measures. It is thus apparent that the relationship between GSR and reaction time is not a direct and simple one. Assuming that the curve for performance is inverted U-shaped (Malmo, 1959), the relationship between reaction time and activation would depend in part on the nature of the task, and in part upon the degree and range of activation sampled. In the present study, the correlation coefficients between GSR and reaction time in individual records ranged from .56 to .83, with a mean of .71 for 10 randomly selected records of parachutists tested on the day of a jump. It is especially noteworthy that 27 out of 27 subjects produced gradients both for GSR and reaction time on the day of a jump. The high reliability of the findings with reaction time as a measure of performance deficit under states of high emotionality and conflict, indicates its adequacy when used in conjunction with a scaled stimulus dimension for measuring both individual differences and changes within the same person.

Reaction time might well be considered to be of special significance to a parachutist: exiting the aircraft at the right moment, assuming the proper freefall position, detecting malfunctions, and determining whether or not to pull the rip-cord of the reserve chute, are all tasks in which time is a key element. From the altitude at which a beginning jumper leaves the aircraft, in the case of a total malfunction he has only 16 seconds before hitting the ground. During these 16 seconds only the first 10 seconds are considered safe for activating the reserve chute, to permit its full deployment and to slow down the jumper's rate of descent enough to prevent serious injury. It might thus be suspected that reaction time, being of specific significance to a parachutist, should produce less deficit than other measures of performance. The evidence nevertheless is in the contrary, and suggests that the novice jumper is not able to cope adequately even with performance which may be directly related to his own safety.

Similar findings to those for reaction time were obtained for measures of perception, memory and association. These findings showed that there is a clear relationship between GSR and perceptual deficit. It will be remembered that the present study measured perceptual deficit with respect to the three scaled neutral words on the stimulus dimension, as well as neutral words following words relevant to parachuting, and that results substantiated hypotheses. In Jung's (1919) experiments on word association a similar phenomenon was noted. Erroneous reproductions, especially when given after a prolonged reaction time and a general failure of reproduction were used as indicators of "complexes". Jung notes that such failures often occurred not at the complex connected stimulus word (critical word), but at the word following it (post-critical stimulus). Similar results were reported by Luria (1932). He found that post-critical reactions (which are all to neutral stimuli) exhibited delayed reaction time and other signs of disturbance. What is probably the case is that the rise in activation produced by the stimuli related to an area of conflict extends beyond the inter-stimulus interval. Moreover, the response to the critical stimulus may start the subject ruminating and wondering about its adequacy and what it may reveal. Thus, he is caught quite unprepared at the presentation of the next stimulus. A further possibility is that the new stimulus serves as a disinhibitor of the excess tension which was activated but not released in the response to the critical word.

Findings on memory for neutral stimuli and responses and on deficit in associative responses augment and corroborate the general findings on deficit in performance under states of tension. Some parachutists, when asked on the day of a jump to recall words on the association test immediately after having taken it, were unable to recall a single word. An average recall of less than 4 out of 22 neutral and buffer words on the day of a jump versus more than 8 words on the day two weeks from a jump is a clear indication of deficit under conditions of stress.

The findings on the influence of stress and conflict on performance find wide corroboration in the clinic. Serious personal conflicts are known to produce generalized inadequate and inefficient behavior, since much of the patient's time and effort are consumed in coping with the area of anxiety. The present study suggests that generalized performance deficit is a promising measure for detecting conflict.

Directionality of Response

It can be assumed that self-ratings of approach and avoidance, to a large extent, are simply different ways of rating the same thing, namely, net approach or net avoidance.

Thus, the gradients of self-ratings can not be taken as independent representations of the underlying approach and avoidance response tendencies, both of which are assumed to have positive slopes. It will be recalled that while self-ratings of avoidance had a positive slope, self-ratings of approach had a negative slope, varying in reciprocal relationship to the self-ratings of avoidance. It is nevertheless revealing that at a time remote from a jump self-ratings of approach were greater than of avoidance, while close to the jump the position of the two ratings reversed. From this it follows that the inferred independent avoidance gradient rises more steeply than the inferred independent approach gradient with approaching time to a jump. These ratings clearly conform to the observation of beginning jumpers who generally appear much more reluctant to jump when out on the airfield than when discussing their forthcoming jump with friends back home. The findings also indicate that the subjects tested in the present study were aware of this fact, and were able to give a candid evaluation of their feelings. The consistency found in these reports from one subject to the other, points to the reliability of the phenomenon. Of additional interest, the point of maximum avoidance was found to occur at the signal to get ready to jump rather than during the freefall, the point of maximum danger, attesting to the role of commitment in influencing anxiety.

How do parachutists deal with their feelings of approach and avoidance in projective tests? In the present study it was found that novice parachutists expressed on the thematic apperception test very much the opposite of what they said they felt on self-ratings, particularly in regard to fear. When asked to evaluate their feelings, they admitted fear about parachuting on the day of the jump, while on the other hand they strongly denied fear about parachuting in the thematic apperception test. In an analogous manner they reported a diminished desire to jump as the time to a jump approached, and demonstrated an increase in approach responses on the thematic apperception test. The same reaction tendencies as exhibited on the thematic apperception test, i.e., approach to parachute relevant cues and avoidance of anxiety cues were exhibited in a variety of response measures on the word-association test. Approach to parachute-relevant cues was revealed in a decrease in perceptual threshold for parachute-relevant words, in an increase in selective recall of parachute-relevant stimuli, and in an increase in associations with parachute-relevant content, with greater proximity to a jump. It is as if the parachutist, despite a general state of high tension and an additional increase in tension brought about by thoughts of parachuting, nevertheless forces himself to concentrate on cues related to parachuting. Avoidance of fear was exhibited in the large number of anxiety words misperceived on the day of a jump, in addition to the denial of fear of parachuting in the thematic apperception test. It is as if the parachutist closed his ears to what he did not want to hear, and denied the fear that he wished were not there. The projective tests gave him the license to order the world in terms of his wishes, while the self-ratings demanded a realistic appraisal. The novice jumper avoids thinking, i.e., attempts to inhibit his fear about parachuting, and forces himself to think about the thrills and excitement and the prestige of making a jump, because of the adaptive significance of such reactions, once the decision to jump has been made.

What are the implications of these findings on theory? When Miller's model on conflict (Miller, 1944) and displacement (Miller, 1951) were first applied to projective techniques, it was generally hypothesized (Epstein and Smith, 1956; Miller, 1951) that conflict is indicated by an increase in conflict relevant responses to cues of low relevance, and a decrease of conflict relevant responses to cues of high relevance. Recent studies by Epstein and Fenz (1962) and Fenz and Epstein (1962) yielded results which were opposite to this hypothesis, namely, approach responses to stimuli of high relevance increased more than to stimuli of low relevance as time to the jump approached. Trying to find an explanation for these findings, it was reasoned that projective tests measure verbal responses that reflect expressive and inhibitory tendencies, rather than approach and avoidance per se, and that the gradient of inhibition is steeper than the gradient of expression. In the present experiment these hypotheses derived from previous work on approach and avoidance as applied to projective tests were tested. As shown above, the hypotheses were generally substantiated. Thus, in the projective tests, the conflict that was measured was not one of approach and avoidance, but of expression and inhibition of fear, with the inhibition exhibited in responses to cues of high relevance, and the expression in responses to cues of low relevance. Findings on inhibition and denial of fear to cues of high relevance, which gains expression in reaction to cues of low relevance, obviously do not reflect the parachutist's conflict about whether to jump or not to jump, but indicate instead how he copes with the fear.

While the above comments point to the adaptiveness of sensitization and defense in a particular stressful situation, it is a well known clinical fact that expressive sensitization and defense are hallmarks of maladaptive behavior. Thus, deficit is not only produced by excessive general activation, but also by excessive focus on one source of cues to the exclusion of other sources of information. Clinical data on fixation, compulsions and paranoid delusions illustrate how a thought may become so central and persisting in a person's thinking, that it obfuscates and pervades all others. A pertinent case, which illustrates excessive sensitization to the point of producing marked performance deficit was included in the present sample. On the day remote from a jump this parachutist's responses on the word-association test were totally inadequate. On the day of the actual jump, however, parachuting had become so central to his thinking, that he could not keep from giving parachute-relevant responses even when totally irrelevant to the eliciting stimulus, such as "skydiver" to "chair," and "jumpmaster" to "stove." This may be taken to represent a good example of performance deficit due to excessive focus of interest, as independent from the non-directive deficit already discussed. During ascent in the plane, this same subject fell asleep, and had to be forcefully aroused to get ready for the jump. Since the jumper was sitting at the open door of the plane, the blast of the wind, and the noise of the engine were hardly conducive to sleep. The behavior of this jumper under stressful conditions may be interpreted as maladaptive of defensiveness. It suggests that a failure of inhibition and control at high levels of stress or activation, as illustrated in the inappropriate parachuting intrusions on the word-association test, is apt to be followed by excessive and overly generalized inhibition at yet higher levels of stress. Perhaps such a person is not able to adequately modulate his inhibition of fear, and thus exhibits an all or none reaction.

Broverman (1958) speaks of an opposite form of loss of cognitive control, which is associated with an inability to concentrate on the important aspects of a task rather than becoming overly focused. He developed a method for measuring cognitive control by assuming that it reflects an individual's ability to resist the influence of interfering or irrelevant stimuli. Findings in the present study indicate that under moderate states of tension parachutists generally showed adaptive focussing responses as indicated by sensitization to cues associated with parachuting, and defensiveness to cues associated with fear of jumping. Under yet higher states of tension, as when getting strapped into the harness, during take-off, and while gaining altitude, jumpers often asked strangely irrelevant questions. An experienced jumper has learned to interpret these as requests for reassurance, and to answer them most effectively with a reassuring pat on the back. In accordance with Broverman's (1958) findings, it appears that under this high state of tension a subject is no longer able to resist the influence of irrelevant stimuli, thereby showing indices of lack of control.

It may thus be condluded that stress influences performance via several different mechanisms. Being sensitized to a task may facilitate performance in that task to the detriment of performance in other tasks. If the focus is to be restricted to a particular aspect of a task, other aspects of the task will suffer, and performance decline. Thus, the increase in focused activity at high levels of stress can reach a point of deficit. An opposite phenomenon, that of inadequate focus and an attendant inability to respond differentially to relevant and irrelevant cues is apt to occur at the highest levels of stress.

Summary

The present study investigated the relationship between stress experienced in a real life approach-avoidance conflict situation, and physiological activation and performance. A three dimensional model permitted evaluation of conflict in relation to both temporal and cue dimensions.

Twenty-seven sport parachutists were tested three different times in relation to a jump, and the test consisted of stimuli scaled along a dimension of increasing relevance to parachuting. GSR and absolute level of conductance measured physiological activation, while performance was sampled over a wide range of responses, varying from simple sensory functions at one extreme, to complex cognitive processes at the other.

A direct relationship between physiological activation and performance deficit was noted. As had been hypothesized, parachutists produced increasingly steep gradients of GSR to parachute relevant and anxiety words with increasing proximity to a jump. Parachutists also produced gradients for auditory threshold of pure tones following words on the dimension, and for reaction time to these words. Parachutists further became generally more reactive on the day of a jump as compared to days more remote from a jump, and showed a corresponding deficit in general performance.

Absolute level of conductance was measured prior to, and during testing. Prior to testing it was lowest on the day of a jump, and highest on a day remote from a jump, but during testing itself the relative position reversed itself. This finding was explained as reflecting a general state of inhibition under states of tension which nevertheless is not capable of warding off the effect of intense stimulation.

Self-ratings of approach and avoidance indicated that novice parachutists are afraid of jumping, and that their fear becomes greater as the time of the jump approaches. On the thematic apperception test, parachutists nevertheless strongly denied their fear of jumping. This was viewed as an adaptive way of handling a fear provoking situation which parachutists feel obliged to face. In addition, parachutists showed sensitization to parachute relevant cues, as reflected in measures of perception, memory and association, and defense against anxiety provoking cues.

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Mrs. Dorothy G. Thayer typed the manuscript and transcribed the tables.

Appendix A

Tables

Table of Contents

Table 1

Analysis of Variance of GSR to a Stimulus Dimension for Parachutists on the Day of a Jump, the Day before a Jump, and on a Control Day

Source of Variance	Degrees of Freedom	Mean Squares	F
Between Ss	26		
Sequence (Q)	2	24.75	2.58
Ss / Q	24	9.58[e]	28.18***
Within Ss	297		
Experimental Condition (E)	2	83.15	29.42***
Q x E	4	7.53	2.66*
Ss x E / Q	48	2.83[e]	
Dimension (D)	3	83.17	86.61***
Q x D	6	.82	.85
Ss x D / Q	72	.96[e]	
E x D	6	12.77	37.54***
Q x E x D	12	.19	.56
Ss x E x D / Q	144	.34[e]	

[e]Error term for mean squares above it up to the next error term. The Ss x E x D / Q interaction was used to evaluate all other error terms.

*Significant at .05 level.

***Significant at .001 level.

Table 2

Analysis of Variance of GSR to a Stimulus Dimension for Control Subjects at three Testing Sessions

Source of Variance	Degrees of Freedom	Mean Squares	F
Between Ss	26		
Sequence (Q)	2	2.57	.32
Ss / Q	24	8.03[e]	25.90***
Within Ss	297		
Testing Session (T)	2	4.54	.88
T x Q	4	9.71	1.88
Ss x T / Q	48	5.15[e]	
Dimension (D)	3	.35	1.59
D x Q	6	.12	.55
Ss x D / Q	72	.22[e]	
T x D	6	.35	1.16
T x D x Q	12	.53	1.72*
Ss x T x D / Q	144	.31[e]	

[e]Error term for mean squares above it up to the next error term. The Ss x T x D / Q interaction was used to evaluate all other error terms.

*Significant at .05 level.

***Significant at .001 level.

Table 3

Analysis of Variance of GSR

to a Stimulus Dimension for

Parachutists and Control Subjects

Source of Variance	Degrees of Freedom	Mean Squares	F
Between Ss	53		
Groups (G)	1	162.10	17.66***
Ss / G	52	9.18[e]	27.82***
Within Ss			
Experimental Condition (E)	2	24.43	5.62**
G x E	2	63.26	14.56***
Ss x E / G	104	4.34[e]	
Dimension (D)	3	42.82	73.53***
D x G	3	40.71	69.91***
Ss x D / G	156	.58[e]	
D x E	6	6.75	20.67***
G x D x E	6	6.37	19.53***
Ss x E x D / G	312	.33[e]	

[e]Error term for mean squares above it up to the next error term. The Ss x E x D / G interaction was used to evaluate all other error terms.

**Significant at .005 level.

***Significant at .001 level.

Table 4

Trend Analysis for GSR across Stimulus Dimension over all Experimental Conditions

Source of Variance	Degrees of Freedom	Mean Squares	F
Experimental Condition (E) x Dimension (D)	6	12.77	37.54***
Linear	2	29.00	54.72***
Quadratic	2	7.86	24.56***
Cubic	2	1.44	8.47***
Ss x E x D / Sequence	144	.34	
Linear	48	.53	
Quadratic	48	.32	
Cubic	48	.17	

***Significant at .001 level.

Table 5

Trend Analysis for GSR across

Stimulus Dimension on the Day of a Jump

Source of Variance	Degrees of Freedom	Mean Squares	F
Dimension (D)	3	85.15	83.27***
Linear	1	207.05	118.53***
Quadratic	1	41.23	46.52***
Cubic	1	7.16	16.27***
_S_s x D / Sequence	72	1.02	
Linear	24	1.75	
Quadratic	24	.89	
Cubic	24	.44	

***Significant at .001 level.

Table 6

Trend Analysis for GSR across

Stimulus Dimension on the Day before a Jump

Source of Variance	Degrees of Freedom	Mean Squares	F
Dimension (D)	3	17.74	43.57***
Linear	1	43.91	64.04***
Quadratic	1	8.37	20.19***
Cubic	1	.93	7.75**
_Ss_ x D / Sequence	72	.41	
Linear	24	.69	
Quadratic	24	.41	
Cubic	24	.12	

**Significant at .025 level.
***Significant at .001 level.

Table 7

Trend Analysis for GSR across Stimulus Dimension on the Day two Weeks from a Jump

Source of Variance	Degrees of Freedom	Mean Squares	F
Dimension (D)	3	5.82	27.60***
Linear	1	16.48	10.72***
Quadratic	1	.77	4.81*
Cubic	1	.22	3.14
S x D / Sequence	72	.21	
Linear	24	.40	
Quadratic	24	.16	
Cubic	24	.07	

*Significant at .05 level.
***Significant at .001 level.

Table 8

Analysis of Variance of GSR to Neutral and to Anxiety Words for Parachutists on the Day of a Jump, the Day before a Jump, and a Control Day

Source of Variance	Degrees of Freedom	Mean Squares	F
Between Ss	26		
Sequence (Q)	2	14.46	2.59
Ss / Q	24	5.57[e]	11.87***
Within Ss	135		
Experimental Condition (E)	2	17.14	10.72***
Q x E	4	4.41	2.76*
Ss x E / Q	48	1.59[e]	
Dimension (D)	1	107.32	64.96***
Q x D	2	3.46	2.09
Ss x D / Q	24	1.65[e]	
E x D	2	3.11	6.33**
Q x E x D	4	.19	.39
Ss x E x D / Q	48	.49[e]	

[e]Error term for mean squares above it up to the next error term. The Ss x E x D / Q interaction was used to evaluate all other error terms.
*Significant at .05 level.
**Significant at .01 level.
***Significant at .001 level.

Table 9

Analysis of Variance of GSR to Neutral and to Anxiety Words for Control Subjects at three Testing Sessions

Source of Variance	Degrees of Freedom	Mean Squares	F
Between Ss	26		
Sequence (Q)	2	4.41	.39
Ss / Q	24	11.15[e]	11.38***
Within Ss	135		
Testing Sessions (T)	2	4.59	1.16
T x Q	4	5.73	1.45
Ss x T / Q	48	3.95[e]	
Dimension (D)	1	69.73	22.16***
D x Q	2	3.95	1.26
Ss x D / Q	24	3.14[e]	
T x D	2	1.01	1.04
T x D x Q	4	.55	.57
Ss x T x D / Q	48	.98[e]	

[e]Error term for mean squares above it up to the next error term. The Ss x T x D / Q interaction was used to evaluate all other error terms.

***Significant at .001 level.

Table 10

Analysis of Variance of GSR

to Neutral and to Anxiety Words for

Parachutists and Control Subjects

Source of Variance	Degrees of Freedom	Mean Squares	F
Between Ss	53		
Groups (G)	1	1.46	.17
Ss / G	52	8.44[e]	12.06***
Within Ss	270		
Experimental Condition (E)	2	2.04	.69
G x E	2	19.69	6.67**
Ss x E / G	104	2.95[e]	
Words (W)	1	175.03	70.02***
W x G	1	2.02	.81
Ss x D / G	52	2.49[e]	
W x E	2	.96	1.36
G x W x E	2	3.16	4.48*
Ss x E x W / G	104	.70[e]	

[e]Error term for mean squares above it up to the next error term. The Ss x E x W / G interaction was used to evaluate all other error terms.

*Significant at .05 level.

**Significant at .01 level.

***Significant at .001 level.

Table 11

Analysis of Variance of Basal Conductance taken at three Time Intervals (T) during the Experiment for Parachutists on the Day of a Jump, the Day before a Jump and on a Control Day (E)

Source of Variance	Degrees of Freedom	Mean Squares	F
Between Ss	26		
Sequence (Q)	2	11.10	1.53
Ss / Q	24	7.22[e]	24.98***
Within Ss	216		
Experimental Condition (E)	2	2.09	.69
Q x E	4	.93	.30
Ss x E / Q	48	3.02[e]	
Time (T)	2	11.00	21.40***
Q x T	4	.22	.41
Ss x T / Q	48	.52[e]	
E x T	4	3.29	11.36***
Q x E x T	8	.21	.72
Ss x E x T / Q	96	.29[e]	

[e]Error term for mean squares above it up to the next error term. The Ss x E x T / Q interaction was used to evaluate all other error terms.

***Significant at .001 level.

Table 12

Analysis of Variance of Basal Conductance taken at three Time Intervals during the Experiment for Control Subjects at three Testing Sessions

Source of Variance	Degrees of Freedom	Mean Squares	F
Between Ss	26		
Sequence (Q)	2	3.82	.45
Ss / Q	24	8.42[e]	4.73***
Within Ss	216		
Experimental Condition (E)	2	3.26	.83
Q x E	4	1.70	.43
Ss x E / Q	48	3.92[e]	
Time (T)	2	1.02	.28
Q x T	4	4.44	1.24
Ss x T / Q	48	3.57[e]	
E x T	4	.79	.44
Q x E x T	8	3.68	2.06
Ss x E x T / Q	96	1.78[e]	

[e]Error term for mean squares above it up to the next error term. The Ss x E x T / Q interaction was used to evaluate all other error terms.

***Significant at .001 level.

Table 13

Analysis of Variance of Basal Conductance taken at three Intervals during the Experiment for Parachutists and Control Subjects

Source of Variance	Degrees of Freedom	Mean Squares	F
Between Ss	53		
Groups (G)	1	39.40	5.06**
Ss / G	52	7.79[e]	7.02***
Within Ss	432		
Experimental Condition (D)	2	3.64	1.10
G x E	2	1.72	.52
Ss x E / G	104	3.31[e]	
Time (T)	2	6.51	3.15*
T x G	2	5.54	2.68
Ss x D / G	104	2.06[e]	
T x E	4	.89	
T x E x G	4	3.18	2.87*
Ss x E x T / G	208	1.11[e]	

[e]Error term for mean squares above it up to the next error term. The Ss x E x T / G interaction was used to evaluate all other error terms.
*Significant at .05 level.
**Significant at .01 level.
***Significant at .001 level.

Table 14

Analysis of Variance of Auditory Threshold to a Stimulus Dimension for Parachutists on the Day of a Jump, the Day before a Jump, and on a Control Day

Source of Variance	Degrees of Freedom	Mean Squares	F
Between Ss	26		
Sequence (Q)	2	247.22	2.34
Ss / Q	24	105.23[e]	159.44***
Within Ss	297		
Experimental Condition (E)	2	213.79	15.74***
Q x E	4	8.99	.66
Ss x E / Q	48	13.58[e]	
Dimension (D)	3	38.93	31.86***
Q x D	6	1.59	1.30
Ss x D / Q	72	1.22[e]	
E x D	6	4.56	6.95***
Q x E x D	12	.55	.84
Ss x E x D / Q	144	.66[e]	

[e]Error term for mean squares above it up to the next error term. The Ss x E x D / Q interaction was used to evaluate all other error terms.

***Significant at .001 level.

Table 15

Analysis of Variance of Auditory Threshold to a Stimulus Dimension for Control Subjects at three Testing Sessions

Source of Variance	Degrees of Freedom	Mean Squares	F
Between _S_s	26		
Sequence (Q)	2	222.90	1.82
_S_s / Q	24	122.54[e]	121.22***
Within _S_s	297		
Testing Session (T)	2	50.75	2.50
T x Q	4	18.47	.91
_S_s x T / Q	48	20.22[e]	
Dimension (D)	3	2.51	3.24*
D x Q	6	.99	1.27
_S_s x D / Q	72	.77[e]	
T x D	6	1.93	1.91
T x D x Q	12	.97	.97
_S_s x T x D / Q	144	1.01[e]	

[e]Error term for mean squares above it up to the next error term. The _S_s x T x D / Q interaction was used to evaluate all other error terms.

*Significant at .05 level.

***Significant at .001 level.

Table 16

Analysis of Variance of Auditory

Threshold to a Stimulus Dimension

for Parachutists and Control Subjects

Source of Variance	Degrees of Freedom	Mean Squares	F
Between Ss	53		
Groups (G)	1	561.58	4.55*
Ss / G	52	123.20[e]	148.43***
Experimental Condition (E)	2	28.80	1.72
G x E	2	235.73	14.15***
Ss x E / G	104	16.66[e]	
Dimension (D)	3	15.53	15.22***
D x G	3	25.89	25.38***
Ss x D / G	156	1.02[e]	
D x E	6	1.35	1.63
G x D x E	6	5.14	6.22***
Ss x E x D / G	312	.83[e]	

[e]Error term for mean squares above it up to the next error term. The Ss x E x D / G interaction was used to evaluate all other error terms.

*Significant at .05 level.

***Significant at .001 level.

Table 17

Trend Analysis for Auditory Threshold across Stimulus Dimension over all Experimental Conditions

Source of Variance	Degrees of Freedom	Mean Squares	F
Experimental Condition (E)	6	4.56	6.95***
Linear	2	12.85	10.04***
Quadratic	2	.10	1
Cubic	2	.72	2.57
Ss x E x D / Sequence	144	.66	
Linear	48	1.28	
Quadratic	48	.41	
Cubic	48	13.58	

***Significant at .001 level.

Table 18

Trend Analysis for Auditory Threshold across Stimulus Dimension on the Day of a Jump

Source of Variance	Degrees of Freedom	Mean Squares	F
Dimension (D)	3	36.05	20.74***
Linear	1	100.80	25.15***
Quadratic	1	1.28	1.54
Cubic	1	6.03	15.87***
Ss x D / Sequence	72	1.74	
Linear	24	4.00	
Quadratic	24	.83	
Cubic	24	.38	

***Significant at .001 level.

Table 19

Trend Analysis for Auditory Threshold across Stimulus Dimension on the Day before a Jump

Source of Variance	Degrees of Freedom	Mean Squares	F
Dimension (D)	3	7.86	14.74***
Linear	1	20.63	27.85***
Quadratic	1	.30	1
Cubic	1	2.65	5.76**
Ss x D / Sequence	72	.53	
Linear	24	.74	
Quadratic	24	.40	
Cubic	24	.46	

**Significant at .025 level.
***Significant at .001 level.

Table 20

Trend Analysis for Auditory Threshold across Stimulus Dimension on the Day Two Weeks from a Jump

Source of Variance	Degrees of Freedom	Mean Squares	F
Dimension (D)	3	4.15	15.83***
Linear	1	10.90	18.72***
Quadratic	1	.33	2.99
Cubic	1	1.23	13.67**
Ss x D / Sequence	72	.26	
Linear	24	.58	
Quadratic	24	.11	
Cubic	24	.09	

**Significant at .005 level.
***Significant at .001 level.

Table 21

Analysis of Variance of Auditory Threshold to Neutral and to Anxiety Words for Parachutists on the Day of a Jump, the Day before a Jump, and on a Control Day

Source of Variance	Degrees of Freedom	Mean Squares	F
Between Ss	26		
Sequence (Q)	2	152.12	2.77
Ss / Q	24	54.84[e]	50.78***
Within Ss	135		
Experimental Condition (E)	2	65.28	9.84***
Q x E	4	3.85	.58
Ss x E / Q	48	6.63[e]	
Dimension (D)	1	49.71	26.19***
Q x D	2	1.35	.71
Ss x D / Q	24	1.99[e]	
E x D	2	2.04	1.88
Q x E x D	4	.79	.73
Ss x E x D / Q	48	1.08[e]	

[e]Error term for mean squares above it up to the next error term. The Ss x E x D / Q interaction was used to evaluate all other error terms.

***Significant at .001 level.

Table 22

Analysis of Variance of Auditory Threshold to Neutral and to Anxiety Words for Control Subjects at three Testing Sessions

Source of Variance	Degrees of Freedom	Mean Squares	F
Between Ss	26		
Sequence (Q)	2	92.61	1.72
Ss / Q	24	53.70[e]	85.23***
Within Ss	135		
Testing Session (T)	2	10.56	.80
T x Q	4	9.39	.71
Ss x T / Q	48	13.16[e]	
Dimension (D)	1	31.29	35.53***
D x Q	2	.85	.96
Ss x D / Q	24	.88[e]	
T x D	2	4.50 - 3	7.14 - 03
T x D x Q	4	1.89	3.00
Ss x T x D / Q	48	.63[e]	

[e]Error term for mean squares above it up to the next error term. The Ss x T x D / Q interaction was used to evaluate all other error terms.

***Significant at .001 level.

Table 23

Analysis of Variance of Auditory Threshold to Neutral and to Anxiety Words for Parachutists and Control Subjects

Source of Variance	Degrees of Freedom	Mean Squares	F
Between Ss	53		
Group (G)5	1	62.75	1.05
Ss / G	52	59.51[e]	66.86***
Within Ss	270		
Experimental Condition (E)	2	12.62	1.31
G x E	2	63.21	6.55
Ss x E / G	104	9.65[e]	
Dimension (D)	1	79.94	58.51***
D x G	1	1.06	.77
Ss x D / G	52	1.37[e]	
D x E	2	1.08	1.21
G x D x E	2	.97	1.08
Ss x E x D / G	104	.89[e]	

[e]Error term for mean squares above it up to the next error term. The Ss x E x D / G interaction was used to evaluate all other error terms.

***Significant at .001 level.

Table 24

Analysis of Variance of Reaction Time to a Stimulus Dimension for Parachutists on the Day of a Jump, the Day before a Jump, and on a Control Day

Source of Variance	Degrees of Freedom	Mean Squares	F
Between Ss	26		
Sequence (Q)	2	1.45	.92
Ss / Q	24	1.56[e]	.24
Within Ss	297		
Experimental Condition (E)	2	9.31	43.32***
Q x E	4	.33	1.52
Ss x E / Q	48	.22[e]	
Dimension (D)	3	16.70	98.71***
Q x D	6	8.52	.50
Ss x D / Q	72	.17[e]	
E x D	6	1.44	22.59***
Q x E x D	12	7.74	1.21
Ss x E x D / Q	144	6.38[e]	

[e]Error term for mean squares above it up to the next error term. The Ss x E x D / Q interaction was used to evaluate all other error terms.

***Significant at .001 level.

Table 25

Analysis of Variance of Reaction Time to a Stimulus Dimension for Control Subjects at Three Testing Sessions

Source of Variance	Degrees of Freedom	Mean Squares	F
Between Ss	26		
Sequence (Q)	2	10.84	4.71*
Ss / Q	24	2.30[e]	13.53***
Within Ss	297		
Testing Session (T)	2	.54	.85
T x Q	4	.67	1.05
Ss x T / Q	48	.63[e]	
Dimension (D)	3	.26	1.95
D x Q	6	.13	.96
Ss x D / Q	72	.13[e]	
T x D	6	.14	.84
T x D x Q	12	.23	1.42
Ss x T x D / Q	144	.17[e]	

[e]Error term for mean squares above it up to the next error term. The Ss x T x D / Q interaction was used to evaluate all other error terms.
*Significant at .05 level.
***Significant at .001 level.

Table 26

Analysis of Variance of Reaction Time to a Stimulus Dimension for Parachutists and Control Subjects

Source of Variance	Degrees of Freedom	Mean Squares	F
Between Ss	53		
Groups (G)	1	5.12	2.26
Ss / G	52	2.25[e]	18.75***
Within Ss	594		
Experimental Condition (E)	2	7.04	16.36***
G x E	2	2.82	6.57**
Ss x E / G	104	.43[e]	
Dimension (D)	3	8.58	57.61***
D x G	3	8.38	56.21***
Ss x D / G	156	.15[e]	
G x D x E	6	.62	5.23***
Ss x E x D / G	312	.12[e]	

[e]Error term for mean squares above it up to the next error term. The Ss x E x D / G interaction was used to evaluate all other error terms.

**Significant at .005 level.

***Significant at .001 level.

Table 27

Trend Analysis for Reaction Time across Stimulus Dimension over all Experimental Conditions

Source of Variance	Degrees of Freedom	Mean Squares	F
Experimental Condition (E) x Dimension (D)	6	1.44	22.59**
Linear	2	3.28	41.60**
Quadratic	2	.83	16.43**
Cubic	2	.21	3.39*
S x E x D / Sequence	144	.064	
Linear	48	.078	
Quadratic	48	.051	
Cubic	48	.062	

*Significant at .05 level.
**Significant at .001 level.

Table 28

Trend Analysis for Reaction Time across Stimulus Dimension on the Day of a Jump

Source of Variance	Degrees of Freedom	Mean Squares	F
Dimension (D)	3	13.39	69.47***
Linear	1	34.91	123.31***
Quadratic	1	4.41	26,83***
Cubic	1	.86	6.61**
S x D / Sequence	72	.19	
Linear	24	.28	
Quadratic	24	.16	
Cubic	24	.13	

**Significant at .025 level.
***Significant at .001 level.

Table 29

Trend Analysis for Reaction Time across Stimulus Dimension on the Day before a Jump

Source of Variance	Degrees of Freedom	Mean Squares	F
Dimension (D)	3	4.19	58.50***
Linear	1	11.93	110.33***
Quadratic	1	.27	3.70
Cubic	1	.37	12.33**
S x D / Sequence	72	.07	
Linear	24	.11	
Quadratic	24	.07	
Cubic	24	.03	

**Significant at .005 level.
***Significant at .001 level.

Table 30

Trend Analysis for Reaction Time across Stimulus Dimension on the Day Two Weeks from a Jump

Source of Variance	Degrees of Freedom	Mean Squares	F
Dimension (D)	3	2.00	61.78***
Linear	1	5.60	132.57***
Quadratic	1	.26	12.66**
Cubic	1	.15	5.00*
S x D / Sequence	72	.03	
Linear	24	.04	
Quadratic	24	.02	
Cubic	24	.03	

*Significant at .05 level.
**Significant at .005 level.
***Significant at .001 level.

Table 31

Analysis of Variance of Reaction Time to Neutral and to Anxiety Words for Parachutists on the Day of a Jump, the Day before a Jump, and on a Control Day

Source of Variance	Degrees of Freedom	Mean Squares	F
Between Ss	26		
Sequence (Q)	2	.75	.82
Ss / Q	24	.91[e]	4.33***
Within Ss	135		
Experimental Condition (E)	2	2.23	9.88***
Q x E	4	.25	1.13
Ss x E / Q	48	.22[e]	
Dimension (D)	1	33.65	147.01***
Q x D	2	.51	2.22
Ss x D / Q	24	.23[e]	
E x D	2	.63	2.91
Q x E x D	4	.21	.96
Ss x E x D / Q	48	.21[e]	

[e]Error term for mean squares above it up to the next error term. The Ss x E x D / Q interaction was used to evaluate all other error terms.
***Significant at .001 level.

Table 32

Analysis of Variance of Reaction Time

to Neutral and to Anxiety Words for

Control Subjects at Three Testing Sessions

Source of Variance	Degrees of Freedom	Mean Squares	F
Between Ss	26		
Sequence (Q)	2	2.55	1.29
Ss / Q	24	2.06[e]	5.42***
Within Ss	135		
Testing Session (T)	2	.27	.35
T x Q	4	.91	1.19
Ss x T / Q	48	.77[e]	
Dimension (D)	1	27.36	79.24***
D x Q	2	.19	.54
Ss x D / Q	24	.34[e]	
T x D	2	5.22 -.02	.13
T x D x Q	4	.26	.69
Ss x T x D / Q	48	.38	

[e]Error term for mean squares above it to the next error term. The Ss x T x D / Q interaction was used to evaluate all other error terms.
***Significant at .001 level.

Table 33

Analysis of Variance of Reaction Time to Neutral and to Anxiety Words for Parachutists and Control Subjects

Source of Variance	Degrees of Freedom	Mean Squares	F
Between Ss	53		
Group (G)	1	36.51	24.37***
Ss / G	52	1.49[e]	5.14***
Within Ss	270		
Experimental Condition (E)	2	1.72	3.42*
G x E	2	.77	1.54
Ss x E / G	104	.50[e]	
Dimension (D)	1	60.85	208.57***
D x G	1	.16	.55
Ss x D / G	52	.29[e]	
D x E	2	.41	1.40
G x D x E	2	.27	.93
Ss x E x D / G	104	.29[e]	

[e]Error term for mean squares above it up to the next error term. The Ss x E x D / G interaction was used to evaluate all other error terms.
*Significant at .05 level.
***Significant at .001 level.

Table 34

Analysis of Variance of Parachute-Relevant and Neutral Words Correctly Recalled by Parachutists on the Day of a Jump, the Day before a Jump, and on a Control Day

Source of Variance	Degrees of Freedom	Mean Squares	F
Between Ss	26		
Sequence (Q)	2	7.04	.58
Ss / Q	24	12.11[e]	1.86**
Within Ss	135		
Experimental Condition (E)	2	6.12	.84
Q x E	4	1.41	.19
Ss x E / Q	48	7.26[e]	1.11
Dimension (D)	1	28.22	5.05*
Q x D	2	3.16	.56
Ss x D / Q	24	5.59[e]	.86
E x D	2	1.03	.16
Q x E x D	4	3.70	.57
Ss x E x D / Q	48	6.52[e]	

[e]Error term for mean squares above it up to the next error term. The Ss x E x D / Q interaction was used to evaluate all other error terms.
*Significant at .05 level.
**Significant at .01 level.

Table 35

Analysis of Variance of Parachute-Relevant and Neutral Words Correctly Recalled by Control Ss at Three Testing Sessions

Source of Variance	Degrees of Freedom	Mean Squares	F
Between Ss	26		
Sequence (Q)	2	1.53	.25
Ss / Q	24	6.11[e]	4.30*
Within Ss	135		
Testing Session (T)	2	3.61	.71
T x Q	4	4.21	.83
Ss x T / Q	48	5.05[e]	3.56*
Dimension (D)	1	.64	1.10
D x Q	2	.12	.21
Ss x D / Q	24	.58[e]	.41
T x D	2	.27	.29
T x D x Q	4	.92	.65
Ss x T x D / Q	48	1.42[e]	

[e]Error term for mean squares above it up to the next error term. The Ss x T x D / Q interaction was used to evaluate all other error terms.

*Significant at .001 level.

Table 36

Analysis of Variance of Parachute-Relevant and Neutral Words Correctly Recalled by Parachutists and Control Subjects

Source of Variance	Degrees of Freedom	Mean Squares	F
Between Ss	53		
Groups (G)	1	8.29	3.00
Ss / G	52	2.76[e]	.75
Within Ss	270		
Experimental Condition (E)	2	8.76	1.53
G x E	2	9.74	1.70
Ss x E / G	104	5.71[e]	1.56**
Dimension (D)	1	16.07	5.64*
D x G	1	12.31	4.32*
Ss x D / G	52	2.85[e]	.78
D x E	6	1.55	.42
G x D x E	2	4.13	1.13
Ss x E x D / G	104	3.66[e]	

[e]Error term for mean squares above it up to the next error term. The Ss x E x D / G interaction was used to evaluate all other error terms.
*Significant at .05 level.
**Significant at .01 level.

Appendix B

Selecting and Scaling Words on a Dimension of Increasing Relevance to Parachuting

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Problem

A common experimental design in psychological research requires comparison between two or more groups of Ss, who are assumed to differ on a given variable. Once it has been established by statistical analysis that the responses of the groups differ, the question still remains unanswered as to whether the groups differ because they differentially perceive the stimuli, or whether the differences occur in spite of the fact that the groups perceive the stimuli uniformly. Although it may be at times of interest to investigate the question of phenomenological differences per se, one may also want to hold the perceptual element constant, and obtain a response measure which is independent from it.

In the present study a good example of such a problem presented itself in the selection of groups of word stimuli with approximately equal relevance to parachuting for both parachutists and control Ss. The experimental design required four categories of words: neutral, low, medium and high in relevance to parachuting. The design further required each category to be subdivided into three approximately equal sub-categories. As a final result there were to be 3 parallel lists of words, each containing 4 levels of increasing relevance to parachuting.

After having selected on an empirical basis the required stimulus words for each stimulus category, the next problem consisted of transforming the empirical means into theoretical scale values which would take into account the dispersion of scores around the empirical mean values for each stimulus category. The advantage of theoretical scale values over empirical means, or over the reliance on the judgment of the experimenter for the selection of words to be placed in each category, lies in the greater precision which scaled values afford, in categorical boundaries which may be obtained, and in the consequent greater freedom in the use of statistics which more quantified values afford.

Selection of Four Categories of Stimulus Words with Equal Relevance to Parachuting for Experimental Ss and Controls

Twenty-two inexperienced parachutists and 24 non-parachutists were asked to scale a list of 73 words in terms of their relevance to parachuting following Thurstone's psychophysical method of successive intervals (Saffir, 1937). All Ss were given the following instructions:

> "This test endeavors to scale words in terms of their relationship to parachuting. The question put before you is this: How much is a given word related to parachuting? A neutral (N) word is, for all practical purposes, not related to parachuting; a low (L) word is only slightly related to parachuting; a medium (M) relevant word, more so, and a high (H) relevant word is directly relevant to parachuting. Your task is to indicate the degree of relevance of each word in the following list through a sign ( ) in the appropriate column. Read the following list over once first, and then read it over carefully a second time, marking the relevance of each word to parachuting. Do not spend more than a few seconds on each word."

Words were presented randomly and in counterbalanced order to counteract sequence effects, or effects due to fatigue. Three words were presented twice, as a check of the Ss' consistency. Only those records were used in which the S had given each word appearing twice the same score each time. Six Ss (4 non-parachutists and 2 parachutists) were eliminated because of inconsistencies, reducing the total number of Ss in each group to 20.

Assigning a score of 1 to neutral, 2 to low, 3 to medium and 4 to high relevant words, mean scores for parachutists and non-parachutists could be compared. Prior to final categorization feeling tone words, such as "thrill" and "excitement," which had received a great variety of ratings, were excluded. Also left out were technical parachute words, such as "dummy" and "spread-eagle," which non-parachutists had difficulty in evaluating.

The four final categories were set to include neutral words to which had been assigned mean values from 1 to 1.45; low relevant words, with mean values from 1.50 to 2.45; medium words with mean values from 2.50 to 3.45, and high relevant words with mean values from 3.50 to 4.00. The final selection consisted of words falling for both parachutists and non-parachutists in the same category.

The experimental design required 9 stimulus words for each stimulus category. This was done by finding the mean of all words falling into one category, and selecting the word closest to the mean, as well as the 4 words with scores falling immediately above it and below it. Means and standard deviations for parachutists and controls for each category are shown in Table 1.

Table 1

Means and Standard Deviations of Neutral, Low, Medium and High Relevant Words for Parachutists and Controls

	Neutral		Low		Medium		High	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Parachutists	1.02	.05	2.05	.22	2.83	.19	3.64	.29
Controls	1.06	.03	2.05	.23	2.78	.18	3.75	.20
Mean	1.04		2.05		2.80		3.69	

Final selection of three comparable lists of words, each including 3 neutral, 3 low, 3 medium and 3 high relevant words with respect to parachuting, followed the same procedure. In no case was the discrepancy for any category greater than .05. The actual empirical values are shown in Table 2.

Scaling of Stimulus Words in the Method of Successive Intervals

The technique here followed is essentially the one described by Edwards (1957) and Torgerson (1958). The basic data represent a total of 36 words sorted, or rated into 4 successive intervals by a group of 40 judges. For each group of 9 words a frequency distribution was plotted, showing the number of times each word had been placed in each of the successive intervals. The frequencies were then cumulated, from left to right, and the cumulative frequencies expressed as cumulative proportions by multiplying each one by the reciprocal of the number of judges. The basic data are shown in Table 3. For each group of 9 words there are three rows: the first row gives the frequency with which each one of the 9 words was placed in a given interval, the second gives the cumulative frequency, and the third gives the cumulative proportion.

Entering the table of the normal curve with the cumulative proportions the normal deviates corresponding to the boundaries of the successive intervals for each group of words were obtained. These normal deviates are shown in Table 4. In obtaining the z values of Table 4 proportions less than .02 and greater than .98 were ignored.

Table 2

Three Word Lists with Approximately Equal Mean Values for Each Stimulus Category

Word List A			Word List B	
High:	parachute	4.00	sky-diver	3.65
	fall	3.18	bail out	3.85
	ripcord	3.95	jumpmaster	3.60
		M 3.71		M 3.70
Medium:	opened	2.82	height	2.87
	aircraft	2.92	altitude	2.95
	flying	2.75	pilot	2.72
		M 2.83		M 2.84
Low:	sky	2.35	coveralls	2.20
	swift	1.75	taxi	1.85
	airport	2.10	take-off	2.15
		M 2.06		M 2.06
Neutral:	music	1.07	salt	1.02
	stove	1.02	bicycle	1.07
	paper	1.05	black	1.02
		M 1.04		M 1.03

Word List C

High:	paratrooper	3.75	Low:	fast	2.00
	free-fall	3.70		reserve	1.95
	jump	3.62		wings	2.15
		M 3.69			M 2.03
Medium:	airplane	2.75	Neutral:	chair	1.05
	streamer	2.77		lamp	1.05
	altimeter	2.90		pencil	1.02
		M 2.80			M 1.04

Table 3

Successive Intervals Data Showing the Frequencies, Cumulative Frequencies and Cumulative Proportions for Each Stimulus Group of Words

Categories		SUCCESSIVE INTERVALS Neutral	Low	Medium	High
1	f	1	12	80	267
	cf	1	13	93	360
	cp	.002	.036	.258	1.000
2	f	8	109	178	65
	cf	8	117	295	360
	cp	.022	.325	.819	1.000
3	f	89	183	72	16
	cf	89	272	344	360
	cp	.247	.755	.955	1.000
4	f	344	16	0	0
	cf	344	360	360	360
	cp	.955	1.000	1.000	1.000

Table 4

Normal Deviates (Z Scores) corresponding to the Cumulative Proportions Shown in Table 3 (Only Workable Scores Included)

	SUCCESSIVE INTERVALS			
Categories	Neutral	Low	Medium	High
1	-------	-1.800	-.649	-----
2	-1.918	- .454	+.911	-----
3	-0.685	+0.690	+1.695	-----
4	+1.695	------	------	-----

By considering the entries in a single row, the width of a given interval on the psychological continuum was estimated in terms of a difference matrix shown in Table 5, with the resulting estimate of the low and medium categories.

Using formula (Edwards, 1957)

$$S_i = 1 + \frac{.50 - p_b}{p_w} w_j$$

where S_i = scale value of the ith stimulus; 1 = lower limit of the interval on the psychological continuum in which the median falls; p_b = Sum of proportions below the interval in which the median falls; p_w = proportions within the interval in which the median falls; and w_j = width of the interval of the psychological continuum; using the above formula, scale values for stimuli of low and medium relevance are respectively .7066 and 1.834.

When more than 50 percent of the judgments from the group of neutral and the group of high relevant words fall into the first and the last interval, as is the case in this study, Edwards (1957) suggests the procedure shown in Table 6 to determine scale values for these two categories.

Substituting for the above formula

$$S_{neutral} = \frac{.50 - .477}{.477} \quad 1.682$$

$$S_{neutral} = .087$$

Table 5

Estimate of Interval Width

for the 2nd and 3rd Categories

	SUCCESSIVE INTERVALS	
Categories	Low - Neutral	Medium - Low
1	------	1.151
2	1.464	1.365
3	1.375	1.005
4	------	------
Sum	2.839	3.523
Number of Entries	2	3
Average Width	1.419	1.173

Table 6

Proportions Falling below the Midpoint and Upper Limit of the First Interval and Normal Deviates Corresponding to the Proportions for 4 Categories

Categories	Proportion Falling Below Midpoint (1)	Proportion Falling Below Upper Limit (2)	Normal Deviates Midpoint (3)	Normal Deviates Upper Limit (4)	Difference (4) - (3)
1	---	---	---	---	---
2	.011	.022	-2.295	-2.006	.289
3	.123	.247	-1.162	-.684	.478
4	.477	.955	-.062	+1.695	1.757
				Sum	2.524
				n	3
				1/2 $\overline{w}$	.841
				$\overline{w}$	1.682

Table 7 illustrates the procedure to determine scale value of the last category.

Substituting for the above formula

$$S_{high} = 2.592 + \frac{.50 - .258}{.742} 1.218$$

$$S_{high} = 2.989$$

Figure 3 in the main text shows the category boundaries, scale values and empirical means. It can be seen that the general pattern for empirical means is the same as that for scale values, although some differences are indicated: (1) the interval between first and second stimulus category is greater for scale values (2.30) than for empirical means (1.85); (2) the interval between third and fourth stimulus category is smaller for scale values (1.15) than for empirical means (1.61). Both empirical means and scale values show least difference between second and third categories, suggesting least reliability in differences between these two stimulus categories.

Edwards (1957) suggests an internal consistency check making use of the discrepancy between the empirical cumulative proportions and the theoretical cumulative distributions. The latter are obtained by successively subtracting cumulative interval widths from scale values, which then are transformed into theoretical cumulative proportions. Subtracting the empirical proportion matrix from the theoretical proportion matrix, and summing the

Table 7

Proportions Falling below the Lower Limit and Midpoint of the Last Interval and Normal Deviates Corresponding to the Proportions for 4 Categories

Categories	Proportions: Lower Limit (1) Below	Proportions: Interval (2) Within	Proportions: Midpoint (3) Below	Normal Deviates: Lower Limit (4)	Normal Deviates: Midpoint (5)	Difference (5) - (4)
1	.258	.742	.629	-.649	+.330	.979
2	.819	.181	.909	+.911	+1.335	.424
3	.955	.045	.978	+1.695	+2.120	.425
4	--	--	--	--	--	--
					Sum	1.828
					n	3
					$\frac{1}{w}/2\ \bar{w}$	.609
						1.218

absolute values of discrepancies over all entries, an average deviation of .015 was obtained. This is typical (Edwards and Thurstone, 1952; Edwards, 1957) of values reported of average error, when the method of successive intervals is used to scale stimuli.

Appendix C

Subjective Self-Ratings

Subjective Self-Ratings

Instructions:

Sport parachuting is a good example of an approach avoidance type conflict: approach, in that the parachutist looks forward to the thrill and adventure of a jump; avoidance, because of possible danger.

We would like to know how you felt about today's jump, and when you had your maximum "approach" and "avoidance" feelings. Consider approach as looking forward to the jump, wanting to go ahead; avoidance as wanting to turn back and call the jump off, questioning why you ever got yourself into jumping, or fear.

As you turn the page, you will find listed on the baseline a sequence of 14 events which led up to, and immediately followed today's jump. You are to give a score from one to ten to each of these 14 moments in time in terms of the strength of your approach and avoidance.

First select the time of your strongest approach, and give it a weight of 10 by placing a check in the appropriate square. Then select the time of your weakest approach, and give it a weight of one. With this 10 point scale in mind, now check all the other points, considering how far they fall between one and ten. Then do the same for avoidance.

Approach:

How much did you look forward to the jump, or how thrilled did you feel about today's jump? Please indicate by checking proper square.

	1	2	3	4	5	6	7	8	9	10
1. Last week										
2. Last night										
3. This morning										
4. Reaching airfield										
5. Preparing for jump										
6. Getting strapped										
7. Boarding aircraft										
8. During ascent										
9. At 'ready' signal										
10. Stepping to door										
11. Just prior to jump										
12. Free-falling										
13. After chute opened										
14. Immediately after landing										
	1	2	3	4	5	6	7	8	9	10

Comments

<u>Avoidance</u>:

How anxious did you feel about today's jump, or how strong was your feeling of wanting to turn back in connection with today's jump? Please indicate by checking proper squares.

	1	2	3	4	5	6	7	8	9	10
1. Last week										
2. Last night										
3. This morning										
4. Reaching airfield										
5. Preparing for jump										
6. Getting strapped										
7. Boarding aircraft										
8. During ascent										
9. At 'ready'signal										
10. Stepping to door										
11. Just prior to jump										
12. Free-falling										
13. After chute opened										
14. Immediately after landing										
	1	2	3	4	5	6	7	8	9	10

Comments:

Appendix D

Samples for Each of the Scores on the Thematic Apperception Test

(Stories Condensed)

Table of Contents

Approach Content

Picture 3

Score of 4: "He wishes he was up there in the air, flying like the bird and the plane, to go free with the wind . . . can't wait to grow up and be a skydiver . . . loves to experience himself the freedom of flight, wishes he were old enough to be a skydiver."

Score of 3: "How wonderful to fly with the birds--he would like to fly, and become a pilot . . . he loves things that fly, wants to be a pilot . . . he imagines himself flying, up there with the kite . . . wishes he were up there with the pilot."

Score of 2: "He is gazing in wonderment at the kite, wondering how an inanimate object can fly . . . he wanted a kite very much, wishes he had a kite . . . he is thrilled watching the tail of the kite."

Score of 1: "Kite is fun, but work is more important than play . . . the cousin is flying the kite in a beautiful country setting . . . he is wondering how the kite can fly . . . he wishes he too could have a kite."

Score of 0: No mention of kite or flight, as in "he is confused about life."

Picture 5

Score of 4: "He is anticipating the thrill of the freefall . . . he is experiencing an intense desire to jump . . . he jumps for the fun of it, he feels excited and safe . . . he is an avid aviation fan, now he feels the anticipation of freefall . . . he finds in it a deep satisfaction."

Score of 3: "He is looking forward to the jump and does not worry, will have a safe landing . . . he looked forward to this, even dreamed about it, had dreams of grandeur of being a top skydiver . . . he is fascinated by the experience of jumping."

Score of 2: "He feels relaxed, experiences no fear, will make a good jump . . . he is admiring the beauty of the flight . . . he will make a good jump, but the next will be easier . . . he is enjoying the scenery, is not scared at all, looks rather relaxed . . . he anxious to jump, ready to go, and will hit the silk just like that."

<u>Score of 1</u>: "He will like it, once it's over . . . he is out on a special mission, quite dangerous . . . he will come out OK, but not go up again . . . a lot of fun--he will jump by his own determination (much hedging and unconvincing)."

<u>Score of 0</u>: "This is a military operation requiring him to jump, and he is in for the pay . . . he jumps because he fears the ridicule of his buddies . . . this is the moment of truth, he won't fail . . . the guy is learning how to fly, and he is not sure if he is going to like it."

Fear of Parachuting

Picture 5

Score of 4: "He is tense, feels anxious, does not know if he will have the courage to jump . . . fear of injury . . . he is wondering if he is going to make it . . . I am not going out there! . . . he wonders whether his parachute will open . . . shows no sign of fear, but will break his neck."

Score of 3: "He makes a high altitude jump and is thinking about his chances. His fears are justified . . . he is rather nervous, and wishes he had chosen another way to have fun . . . he feels anxious, and not quite sure he wants to jump . . . he is afraid his chute may not open--he is very anxious."

Score of 2: "He is quite nervous, but able to control his fears, at least he thinks he can . . . wondering why he ever came up here (proceeds to deny fear) . . . a little bit nervous."

Score of 1: "He is clenching his chute--as soon as it will open, he will fall gently . . . this is a military operation requiring him to jump (disapproves of it) . . . he is wondering if he will need the reserve chute, but he will not need it . . . he is hoping he will make out all right."

Score of 0: "There is not a trace of fear in him . . . looking forward to the jump . . . how wonderful to be up there . . . wishes he could jump every day."

Fear Unrelated to Parachuting

Picture 2

Score of 4: "This boy is scared stiff of the other kid, who wants to beat him up . . . frightened by someone, who is trying to catch him . . . poor kid, he looks so scared."

Score of 3: "Both boys are trying to get away from a common object menacing them . . . running away from danger he cannot escape . . . afraid of the dark, trying to get home."

Score of 2: "Apprehensive about getting caught after breaking a window . . . afraid of getting punished when he gets home late."

Score of 1: "Trying to hide from the other kid, he does not trust . . . running away after having stolen an apple from a store."

Score of 0: "Playing tap . . . hide and seek . . . having fun."

Appendix E

Data

Table of Contents

CONDUCTANCE CHANGE

EXPERIMENTAL SUBJECTS

STIMULUS DIMENSION

1 = CONTROL DAY

2 = DAY BEFORE JUMP

3 = DAY OF JUMP

.27	.54	.62	.79	11
.51	.62	.89	1.62	12
.68	1.45	2.30	2.70	13
.67	.96	1.97	2.04	21
1.61	2.27	2.32	3.44	22
1.62	2.00	2.27	4.57	23
.37	.48	.48	.76	31
.97	1.12	1.37	1.68	32
1.34	1.44	2.31	2.78	33
.41	.79	1.44	1.91	41
3.42	4.15	5.18	5.74	42
2.84	3.81	4.10	6.85	43
.79	.89	1.12	1.33	51
1.07	1.22	1.24	1.42	52
2.05	2.15	2.23	4.65	53
1.47	1.62	1.83	1.99	61
2.19	2.36	2.47	3.03	62
2.90	4.61	4.72	9.49	63
.82	1.72	1.69	2.52	71
.59	.71	1.27	2.36	72
1.12	2.77	3.92	6.82	73
.67	.92	.98	1.42	81
.81	.88	1.26	2.73	82
1.11	1.53	1.75	4.05	83

.43	.62	.98	1.34	91
1.23	1.65	2.72	4.11	92
.25	2.36	3.04	4.95	93
.74	.92	1.24	1.57	1 1
.97	1.24	1.37	1.67	1 2
1.10	2.01	2.49	2.96	1 3
.92	1.62	1.84	2.00	111
1.88	2.20	4.44	4.97	112
2.42	3.64	6.21	8.44	113
.99	1.08	1.30	1.57	121
1.95	3.15	2.96	3.42	122
1.28	1.81	1.86	3.17	123
.97	1.37	2.42	4.10	131
2.55	3.33	4.10	8.16	132
1.16	2.89	3.41	12.0	133
1.35	2.72	3.02	3.02	141
5.42	5.34	6.63	9.69	142
1.37	2.27	2.32	4.81	143
.37	.62	.68	.97	151
.64	.72	.79	1.42	152
.53	.94	1.75	4.62	153
.41	.79	1.44	1.91	161
3.42	4.15	5.18	5.74	162
2.84	3.81	4.10	6.85	163
2.00	2.24	2.37	2.57	171
2.01	2.42	2.68	3.21	172
2.96	4.72	5.85	7.13	173
.78	.94	1.42	1.76	181
2.45	2.73	3.34	4.02	182
1.51	2.98	3.81	9.16	183
.97	1.25	1.36	1.81	191

.68	1.17	1.42	2.41	192
.97	1.33	1.44	3.20	193
.76	.84	.96	1.03	2 1
.67	.92	.99	1.42	2 2
.87	1.91	2.52	6.27	2 3
.57	1.79	2.85	2.80	211
1.07	1.15	1.75	2.83	212
1.29	1.89	3.12	4.15	213
1.13	1.53	1.84	2.35	221
.53	1.50	1.47	2.88	222
.83	2.15	4.39	4.44	223
.23	.47	.61	.82	231
.37	.64	.74	1.12	232
.57	1.03	1.32	3.52	233
.37	.42	.49	.67	241
1.45	2.16	2.26	2.51	242
2.36	2.90	3.89	8.14	243
1.55	1.53	1.48	2.18	251
.76	.88	1.45	2.53	252
1.85	2.11	2.54	5.43	253
2.59	3.45	3.48	6.86	261
2.11	2.41	2.71	6.48	262
2.35	2.98	4.18	7.27	263
1.16	1.80	1.47	1.43	271
.36	.65	.58	1.67	272
.48	1.48	2.34	3.88	273

CONDUCTANCE CHANGE

CONTROL SUBJECTS

STIMULUS DIMENSION

1 = FIRST SESSION

2 = SECOND SESSION

3 = THIRD SESSION

.29	.47	.30	.38	11
.24	.25	.38	.37	12
.78	.62	.92	1.75	13
.32	.28	.18	.21	21
.22	.19	.21	.17	22
.18	.29	.15	.15	23
.10	.16	.34	.19	31
6.51	4.44	4.58	6.02	32
2.53	2.53	3.79	2.95	33
.49	.38	.39	.63	41
.40	.35	.36	.31	42
.37	.19	.18	.18	43
.13	.36	.30	.44	51
.21	.19	.41	.53	52
.23	.42	.24	.48	53
3.17	1.01	.81	1.60	61
1.52	.35	1.15	1.05	62
.57	2.74	.83	1.54	63
2.24	2.04	1.64	1.98	71
2.00	1.89	1.39	1.07	72
.87	.98	.92	1.01	73
2.08	2.01	2.45	2.53	81
3.50	4.57	2.83	4.30	82
.59	.30	.46	.68	83

1.64	1.94	1.68	1.61	91
2.29	2.01	1.94	1.68	92
1.68	2.04	2.42	1.99	93
1.03	.57	1.52	.85	1 1
.37	.61	.29	.24	1 2
.48	.42	.54	.68	1 3
2.61	1.89	1.41	2.24	111
.18	.36	.10	.30	112
.44	.21	.25	.29	113
.40	.40	.43	.33	121
.88	1.33	1.18	.87	122
.98	.67	.75	.52	123
.78	.42	.37	.53	131
.82	.18	.50	.46	132
.21	.24	.18	.19	133
1.63	1.57	1.36	.71	141
1.31	1.78	.63	.57	142
.85	1.04	.26	1.58	143
.16	.79	.19	.43	151
1.26	1.53	1.09	.60	152
4.49	3.96	.43	6.56	153
.92	.92	1.04	1.21	161
.98	1.92	1.88	1.87	162
1.01	.84	.79	.28	163
2.48	2.19	3.54	2.70	171
2.78	2.92	3.00	3.24	172
3.41	2.74	2.47	3.49	173
.49	.84	1.47	1.60	181
.95	.60	.82	1.14	182
1.63	.27	.34	1.13	183
2.24	1.75	1.57	2.12	191

1.98 1.98 .97 2.07	192
2.04 1.88 2.34 1.94	193
1.42 1.49 1.86 .97	2 1
1.53 1.67 1.43 .82	2 2
1.45 1.18 1.42 1.11	2 3
7.58 6.86 8.70 8.05	211
.10 .12 .26 .14	212
.59 .25 .60 .61	213
1.57 1.11 1.42 2.74	221
.48 .34 .73 .83	222
.37 .48 .39 .61	223
3.50 2.01 4.88 4.94	231
.78 4.26 .90 .97	232
1.77 1.39 1.20 .68	233
1.41 1.31 .61 1.21	241
1.62 1.24 1.35 1.02	242
1.11 1.12 1.21 1.14	243
.28 1.63 .74 .53	251
.21 .64 .57 .28	252
.74 .86 .16 .29	253
1.13 1.69 1.05 1.66	261
1.78 .36 .75 .49	262
.28 .37 .28 .14	263
.54 .56 .66 1.11	271
2.27 2.36 2.17 1.87	272
.92 1.02 1.43 .87	273

CONDUCTANCE CHANGE

EXPERIMENTAL SUBJECTS

NEUTRAL + ANXIETY WORDS

1 = CONTROL DAY

2 = DAY BEFORE JUMP

3 = DAY OF JUMP

.27	.80	11
.51	1.44	12
.68	2.33	13
.67	1.67	21
1.61	2.73	22
1.62	4.18	23
.31	.62	31
.97	1.44	32
1.34	2.16	33
.41	.60	41
3.42	3.86	42
2.84	4.63	43
.79	1.42	51
1.07	2.18	52
2.05	2.63	53
1.47	1.71	61
2.19	2.62	62
2.90	5.40	63
.82	1.82	71
.59	2.60	72
1.12	3.64	73
.67	1.43	81
.81	1.96	82
1.11	2.36	83

.43	.97	91
1.23	2.83	92
.25	1.45	93
.74	.97	101
.97	2.21	102
1.10	2.58	103
.92	4.12	111
1.88	4.66	112
2.42	5.94	113
.99	2.42	121
1.95	3.06	122
1.28	1.73	123
.97	4.27	131
2.55	5.75	132
1.16	6.20	133
1.35	2.09	141
5.42	9.57	142
1.37	4.11	143
.37	.94	151
.64	1.94	152
.53	2.97	153
.41	.60	161
3.42	3.86	162
2.84	4.63	163
2.00	4.23	171
2.01	3.41	172
2.96	7.01	173
.78	2.72	181
2.45	4.87	182
1.51	4.53	183
.97	1.14	191

.68	1.17	192
.97	2.68	193
.76	1.24	201
.67	1.27	202
.87	4.35	203
.57	2.05	211
1.07	1.61	212
1.29	2.26	213
1.13	3.86	221
.53	2.17	222
.83	4.61	223
.28	.68	231
.37	1.33	232
.57	1.41	233
.37	.97	241
1.45	2.47	242
2.36	4.41	243
1.55	2.32	251
.76	1.43	252
1.85	2.62	253
2.59	10.61	261
2.11	7.14	262
2.35	4.51	263
1.16	.79	271
.36	2.28	272
.48	3.70	273

CONDUCTANCE CHANGE

CONTROL SUBJECTS

NEUTRAL + ANXIETY WORDS

1 = FIRST SESSION

2 = SECOND SESSION

3 = THIRD SESSION

.29 .41	11
.24 .98	12
.78 .89	13
.32 .87	21
.22 .96	22
.18 .83	23
.10 .64	31
6.51 6.58	32
2.53 7.58	33
.49 .85	41
.40 .38	42
.37 .28	43
.13 1.02	51
.21 .34	52
.23 .35	53
3.17 4.73	61
1.52 1.30	62
.57 2.75	63
2.24 4.21	71
2.00 3.68	72
.87 2.11	73
2.08 3.10	81
3.50 2.99	82
.59 .58	83

1.64	2.14	91
2.29	2.24	92
1.68	1.74	93
1.03	1.41	101
.37	.97	102
.48	.60	103
2.61	3.84	111
.18	.45	112
.44	.51	113
.40	.78	121
.88	1.73	122
.98	.81	123
..78	.42	131
.82	.40	132
.21	.94	133
1.63	6.64	141
1.31	2.97	142
.85	10.49	143
.16	.61	151
1.26	4.95	152
4.49	2.08	153
.92	3.21	161
.98	3.68	162
1.01	1.94	163
2.48	9.47	171
2.78	7.33	172
3.41	8.24	173
.49	2.43	181
.95	2.30	182
1.63	1.90	183
2.24	6.42	191

1.98	7.11	192
2.04	4.28	193
1.42	2.97	201
1.53	2.54	202
1.45	2.21	203
7.58	10.0	211
.10	1.26	212
.59	.75	213
1.57	1.77	221
.48	.97	222
.37	.89	223
3.50	8.00	231
.78	1.98	232
1.77	1.85	233
1.41	3.87	241
1.62	3.42	242
1.11	3.61	243
.28	.82	251
.21	.71	252
.74	1.32	253
1.13	2.94	261
1.78	1.99	262
.28	.26	263
.54	.57	271
2.27	3.23	272
.92	2.88	273

BASAL CONDUCTANCE

EXPERIMENTAL SUBJECTS

INITIAL/AFTER 3 MIN/FINAL

1 = CONTROL DAY

2 = DAY BEFORE JUMP

3 = DAY OF JUMP

8130.00	12195.00	16000.00	11
21400.00	25000.00	23240.00	12
34482.00	30303.00	27027.00	13
23809.00	17544.00	16496.00	21
47619.00	47619.00	37453.00	22
33333.00	40000.00	41322.00	23
31446.00	33769.00	31250.00	31
41600.00	40112.00	36200.00	32
35714.00	34482.00	34482.00	33
10614.00	11008.00	10756.00	41
8764.00	8764.00	10112.00	42
4385.00	4385.00	10752.00	43
39764.00	42553.00	41152.00	51
32214.00	36416.00	37155.00	52
38461.00	38461.00	43478.00	53
51020.00	55619.00	47983.00	61
29412.00	39200.00	44221.00	62
7027.00	28004.00	49019.00	63
32258.00	33847.00	31847.00	71
29411.00	31250.00	32258.00	72
9346.00	9346.00	22522.00	73
29850.00	30120.00	30303.00	81
30303.00	37037.00	30303.00	82
4386.00	6667.00	20000.00	83

34482.00	38314.00	37453.00	91
20405.00	25000.00	37878.00	92
14705.00	14705.00	51282.00	93
40000.00	51020.00	38543.00	101
31124.00	35532.00	36112.00	102
37500.00	42187.00	48076.00	103
38112.00	39809.00	42197.00	111
32004.00	40221.00	45214.00	112
41666.00	47619.00	62114.00	113
26315.00	29411.00	40816.00	121
32258.00	28574.00	35335.00	122
32258.00	33333.00	33112.00	123
52129.00	55182.00	50629.00	131
32258.00	41666.00	45454.00	132
19230.00	25000.00	40000.00	133
43478.00	47619.00	36363.00	141
11494.00	19230.00	62500.00	142
5952.00	9523.00	40000.00	143
29498.00	30303.00	28985.00	151
36214.00	39112.00	38333.00	152
8762.00	9942.00	19124.00	153
10752.00	12195.00	12658.00	161
55555.00	55555.00	46082.00	162
47619.00	47619.00	51282.00	163
26595.00	29673.00	28169.00	171
27640.00	29100.00	33333.00	172
18181.00	31250.00	35714.00	173
50761.00	51322.00	44052.00	181
40000.00	41666.00	50761.00	182
37037.00	40000.00	53763.00	183
50000.00	47000.00	50761.00	191

42480.00	56200.00	55241.00	192
33333.00	38461.00	36496.00	193
52114.00	57624.00	55112.00	201
32688.00	34982.00	40000.00	202
47619.00	47619.00	74626.00	203
7692.00	1 .00	17985.00	211
15873.00	22222.00	35714.00	212
10752.00	10752.00	30303.00	213
40000.00	45454.00	46511.00	221
38461.00	40000.00	36900.00	222
28571.00	33333.00	40000.00	223
35114.00	37629.00	36812.00	231
28762.00	28762.00	30412.00	232
27777.00	27777.00	27397.00	233
31347.00	33333.00	35142.00	241
33333.00	33333.00	33333.00	242
6622.00	9346.00	30432.00	243
17241.00	16393.00	16501.00	251
14285.00	15384.00	22471.00	252
40000.00	45454.00	66666.00	253
21276.00	25000.00	35971.00	261
21276.00	25000.00	35971.00	262
23809.00	23809.00	34722.00	263
33333.00	31250.00	30769.00	271
25000.00	27027.00	11598.00	272
22222.00	27027.00	24875.00	273

BASAL CONDUCTANCE

CONTROL SUBJECTS

INITIAL/AFTER 3 MIN/FINAL

1 = FIRST SESSION

2 = SECOND SESSION

3 = THIRD SESSION

15625.00	12987.00	10111.00	11
20000.00	18182.00	9372.00	12
17857.00	17857.00	19193.00	13
38442.00	42119.00	19128.00	21
19884.00	24682.00	16009.00	22
26857.00	29132.00	19664.00	23
11494.00	9345.00	8084.00	31
18518.00	25641.00	48076.00	32
32258.00	35714.00	27027.00	33
40000.00	33333.00	29411.00	41
25641.00	25641.00	27027.00	42
28571.00	28571.00	31055.00	43
12987.00	10752.00	12987.00	51
28409.00	31250.00	25906.00	52
40000.00	27027.00	22123.00	53
29411.00	37037.00	33333.00	61
36316.00	29411.00	30120.00	62
33333.00	36363.00	29411.00	63
52072.00	59253.00	38193.00	71
42623.00	48380.00	32150.00	72
39112.00	46461.00	37198.00	73
20408.00	22222.00	27173.00	81
20000.00	28571.00	31746.00	82
5649.00	5649.00	10582.00	83

40322.00	47878.00	36496.00	91
44264.00	49114.00	31165.00	92
49211.00	52002.00	32732.00	93
30303.00	39642.00	23809.00	101
24509.00	24875.00	16631.00	102
31212.00	34809.00	22624.00	103
12987.00	18181.00	41152.00	111
8695.00	12048.00	10752.00	112
7142.00	8197.00	11173.00	113
20408.00	35715.00	20833.00	121
40000.00	40000.00	34364.00	122
30303.00	33333.00	28490.00	123
19230.00	19230.00	23809.00	131
8197.00	8197.00	17241.00	132
21629.00	24448.00	19161.00	133
6666.00	7692.00	222123.00	141
19231.00	29412.00	28985.00	142
4347.00	4347.00	36764.00	143
9345.00	9345.00	7519.00	151
6666.00	6666.00	16207.00	152
21276.00	28571.00	22988.00	153
21978.00	25316.00	9008.00	161
42500.00	45076.00	33500.00	162
16207.00	19942.00	6024.00	163
20000.00	15625.00	17094.00	171
39614.00	42007.00	17002.00	172
34624.00	44444.00	24048.00	173
7692.00	21004.00	31152.00	181
6666.00	6666.00	11598.00	182
37037.00	25925.00	40000.00	183
47624.00	49192.00	33333.00	191

46898.00	49686.00	31746.00	192
22624.00	28141.00	16724.00	193
16575.00	24241.00	10774.00	201
8962.00	1 114.00	6641.00	202
24149.00	28310.00	26421.00	203
27777.00	31250.00	25974.00	211
4348.00	4348.00	8333.00	212
10204.00	12987.00	13793.00	213
35555.00	39741.00	28259.00	221
39840.00	42021.00	29242.00	222
47850.00	49211.00	33333.00	223
33333.00	35714.00	34482.00	231
4347.00	4347.00	17730.00	232
7143.00	7143.00	24038.00	233
57143.00	57143.00	34038.00	241
55724.00	59214.00	39124.00	242
29673.00	30303.00	26112.00	243
18518.00	18518.00	13020.00	251
5263.00	5263.00	6849.00	252
23809.00	26315.00	24570.00	253
42618.00	45112.00	19241.00	261
18873.00	15873.00	15151.00	262
39241.00	42718.00	18662.00	263
27027.00	33333.00	23148.00	271
45454.00	38461.00	46729.00	272
12195.00	12195.00	40983.00	273

AUDITORY THRESHOLD

EXPERIMENTAL SUBJECTS

STIMULUS DIMENSION

1 = CONTROL DAY

2 = DAY BEFORE JUMP

3 = DAY OF JUMP

12.94	12.90	13.00	13.21	11
17.37	19.62	18.37	19.50	12
14.87	16.50	17.83	18.16	13
11.58	11.41	12.50	12.62	21
7.41	7.58	8.93	9.81	22
4.87	7.16	7.62	9.16	23
6.53	7.00	7.12	7.37	31
7.87	9.24	9.58	9.24	32
9.62	9.66	9.08	11.08	33
15.75	15.37	15.68	16.31	41
13.33	14.50	12.16	12.58	42
12.62	13.17	11.54	14.74	43
7.62	7.68	8.00	8.00	51
8.50	8.66	8.87	9.12	52
10.94	12.12	12.42	13.50	53
15.00	14. 4	15.20	15.28	61
17.50	17.16	16.37	19.06	62
19.20	19.84	20.50	22.12	63
9.12	9.50	9.87	9.29	71
8.91	10.5	10.66	10.08	72
10.45	11.43	11.99	12.91	73
11.25	12.50	13.75	14.87	81
13.00	13.87	15.37	15.50	82
8.25	18.87	20.25	21.12	83

6.66	6.84	6.52	6.97	91
5.75	8.00	6.87	8.87	92
13.75	14. 8	14.41	15.00	93
8.92	8.00	9.06	9.34	101
13.00	13.12	12.59	13.04	102
14.04	14.58	15.00	16.22	103
6.00	6.06	6.24	6.50	111
9.25	10.04	11.62	11.31	112
7.62	8.00	8.62	9.75	113
15.37	15.20	14.95	15.66	121
15.58	15.25	15.87	16.62	122
16.56	17.	17.16	17.33	123
13.79	13.91	13.87	14.49	131
14.08	13.91	14.24	14.99	132
16.94	17.52	18.08	19.00	133
12.40	12.62	12.48	13.00	141
15.81	17.	17.62	18.04	142
16.48	16.80	18.00	18.22	143
15.75	15.37	15.68	16.31	151
15.33	16.50	14.16	14.58	152
13.62	14.17	12.54	15.74	153
9.81	11.38	11.25	11.58	161
15.20	15.37	15.50	15.54	162
17.18	17.33	17.20	18.33	163
13.36	14.15	13.30	14.36	171
19.70	20.70	20.12	21.66	172
18.93	20.16	21.49	21.81	173
14.83	14.54	14.83	14.50	181
14.66	14.80	15.00	15.04	182
14.93	15.42	15.65	15.16	183
8.35	9.25	9.46	9.62	191

11.87	12.45	12.93	13.78	192
9.75	10.28	11.75	12.41	193
6.00	6.48	6.52	7.00	201
8.00	8.37	8.48	9.00	202
6.75	12.37	12.87	16.32	203
6.28	8.22	9.48	9.56	211
10.47	10.34	11.30	10.85	212
11.02	11. 4	11.00	12.17	213
14.93	15. 4	15.12	15.62	221
14.08	13.37	13.79	15.62	222
14.00	15.	16.87	18.87	223
14.70	14.78	14.95	15.20	231
12.95	13.29	13.85	14.24	232
11.60	12.27	13.06	12.79	233
13.50	14.66	14.53	14.62	241
15.46	15.91	14.68	17.04	242
14.70	14.87	15.45	16.24	243
10.00	10. 4	10.12	10.40	251
12.12	11.86	13.09	13.24	252
14.12	14.25	14.68	15.62	253
8.90	8.61	9.18	8.64	261
9.47	9.34	10.30	9.85	262
13.02	13. 4	13.00	14.17	263
4.28	6.22	7.48	7.56	271
5.18	7.91	9.33	9.20	272
6.75	10.08	9.83	10.58	273

AUDITORY THRESHOLD

CONTROL SUBJECTS

STIMULUS DIMENSION

1 = FIRST SESSION

2 = SECOND SESSION

3 = THIRD SESSION

15.08	16.16	17.33	15.87	11
16.45	16.24	17.24	16.87	12
18.87	19.87	17.62	18.25	13
13.87	13.81	14.66	14.16	21
14.79	13.41	14.70	16.20	22
13.18	13.33	11.16	11.29	23
19.04	17.45	17.08	17.93	31
18.50	16.	17.37	16.37	32
13.70	13.79	13.54	13.62	33
13.69	12.83	13.62	13.12	41
11.95	11.74	11.50	12.43	42
9.37	9.45	9.62	9.58	43
13.25	13.68	13.79	13.62	51
8.37	9.75	8.68	11.75	52
12.71	12. 8	12.50	9.70	53
14.68	15.33	14.31	14.06	61
9.93	8.03	7.12	11.49	62
9.37	8.20	9.03	6.07	63
14.12	12.87	14.37	13.25	71
16.37	16.37	16.62	17.25	72
15.81	14.87	15.87	16.08	73
11.50	11.68	11.91	11.37	81
14.79	14.45	14.62	14.18	82
9.12	9.12	8.54	8.62	83

5.75	4.82	4.90	5.00	91
7.25	6.00	4.85	6.25	92
3.82	4.00	3.58	4.54	93
15.95	13.16	14.66	15.12	101
4.68	6.62	6.37	4.54	102
14.50	14.37	13.43	14.62	103
12.24	11.87	11.62	11.50	111
11.20	14.	12.75	13.62	112
10.00	9.91	10.79	10.50	113
11.78	11.26	12.39	10.87	121
9.12	9.50	9.75	9.62	122
11.96	12. 4	12.06	12.62	123
14.37	14.25	13.20	14.12	131
14.25	13.32	13.66	15.91	132
13.13	11.95	12.25	12.79	133
12.74	13.36	13.50	13.12	141
10.62	8.5	12.36	11.42	142
14.12	11.25	13.20	14.12	143
12.16	12.96	13.62	12.98	151
11.62	12.33	12.25	13.00	152
10.16	8.0	8.43	8.12	153
7.91	9.12	8.91	9.45	161
8.16	6.91	4.31	8.12	162
5.25	5.78	7.25	3.91	163
7.45	7.62	7.50	6.37	171
5.12	4.25	3.62	3.87	172
4.45	4.37	4.37	4.62	173
9.75	11.74	12.44	11.56	181
9.12	7.89	10.56	9.56	182
10.81	10.28	10.33	10.70	183
6.25	7.22	4.64	5.24	191

7.89	6.84	4.92	7.29	192
4.88	5.14	3.78	8.14	193
6.12	6.00	6.25	6.12	201
6.75	7.12	6.37	6.62	202
8.50	7.00	7.37	8.12	203
12.12	12.24	12.36	12.00	211
14.68	14.39	13.84	13.96	212
13.11	13.19	14.16	12.00	213
14.62	15.11	15.68	14.50	221
13.89	14.61	14.66	13.08	222
14.00	13.24	14.24	14.00	223
14.37	14.45	16.12	16.50	231
6.54	5.87	5.68	5.58	232
13.87	10.31	13.50	7.74	233
13.50	11.75	12.43	13.68	241
14.54	15.37	15.37	14.87	242
7.50	6.12	7.25	7.00	243
4.07	3.69	3.84	4.12	251
3.62	3.41	3.64	4.12	252
14.00	7.12	6.94	8.00	253
11.24	10.84	10.92	11.22	261
12.62	13.12	10.11	11.24	262
12.09	12.62	12.14	12.94	263
8.31	8.20	7.33	7.43	271
12.95	9.74	9.58	10.43	272
5.75	5.62	5.50	5.12	273

AUDITORY THRESHOLD

EXPERIMENTAL SUBJECTS

NEUTRAL + ANXIETY WORDS

1 = CONTROL DAY

2 = DAY BEFORE JUMP

3 = DAY OF JUMP

15.08	17. 8	11
16.45	17.24	12
18.87	19.75	13
13.87	14.16	21
14.79	14.45	22
13.18	11.87	23
19.04	18.28	31
18.50	18.66	32
13.70	13.54	33
13.69	13.25	41
11.95	12.50	42
9.37	9.70	43
13.25	13.45	51
8.37	10.37	52
12.71	12.37	53
14.68	15.79	61
9.93	10.37	62
9.37	13.83	63
14.12	15.50	71
16.37	19.	72
15.81	15.54	73
11.50	11.43	81
14.79	15. 8	82
9.12	9.25	83

5.75	7.22	91
7.25	8.00	92
3.82	6.20	93
15.95	14.33	101
4.68	5.95	102
14.50	14.75	103
12.24	11.18	111
11.20	13.78	112
10.00	11.29	113
11.78	12.83	121
9.12	10.16	122
11.96	12.87	123
14.37	14.20	131
14.25	13.66	132
13.13	13.50	133
12.74	14.36	141
10.62	11.75	142
14.12	12.62	143
12.16	12.95	151
11.62	16. 8	152
10.16	10.54	153
7.91	8.50	161
8.16	9.87	162
5.25	4.95	163
7.45	7.37	171
5.12	5.62	172
4.45	6.50	173
9.75	12.04	181
9.12	10.29	182
10.81	11.95	183
6.25	7.96	191

7.89	8.14	192
4.88	8.22	193
6.12	6.87	201
6.75	7.87	202
8.50	9.12	203
12.12	13.62	211
14.68	15.12	212
13.11	13.89	213
14.62	17.	221
13.89	14.69	222
14.00	15.12	223
14.37	16.31	231
6.54	7.20	232
13.87	16.16	233
13.50	16.56	241
14.54	15.93	242
7.50	8.37	243
4.07	5.29	251
3.62	5.11	252
14.00	15.94	253
11.24	13. 4	261
12.62	13.	262
12.09	13.66	263
8.31	8.56	271
12.95	9.79	272
5.75	6.62	273

AUDITORY THRESHOLD

CONTROL SUBJECTS

NEUTRAL + ANXIETY WORDS

1 = FIRST SESSION

2 = SECOND SESSION

3 = THIRD SESSION

12.94	13.	11
17.37	19. 4	12
14.87	16.24	13
11.58	10.97	21
7.41	8.97	22
4.87	8.29	23
6.53	8.00	31
7.87	9.23	32
9.62	10.25	33
15.75	15.75	41
13.33	13.28	42
12.62	11.68	43
7.62	8.00	51
8.50	9.00	52
10.94	12.	53
15.00	15.	61
17.50	16.58	62
19.20	20.63	63
9.12	11.03	71
8.91	10.62	72
10.45	11.62	73
11.25	14.12	81
13.00	15.25	82
8.25	20.0	83

6.66	6.50	91
5.75	7.50	92
13.75	14.29	93
8.92	9.12	101
13.00	14.37	102
14.04	14.60	103
6.00	7.00	111
9.25	9.25	112
7.62	9.50	113
15.37	15.29	121
15.58	15.58	122
16.56	17. 8	123
13.79	14.62	131
14.08	14.53	132
16.94	18.44	133
12.40	14. 2	141
15.81	17.29	142
16.48	17.	143
15.75	15.75	151
15.33	15.28	152
13.62	12.68	153
9.81	11.6	161
15.20	15.50	162
17.18	17.21	163
13.36	15.	171
19.70	20.56	172
18.93	21.49	173
14.83	15.66	181
14.66	14.90	182
14.93	16.	183
8.05	9.57	191

11.87	13.18	192
9.75	11.12	193
6.00	6.42	201
8.00	8.62	202
6.75	12.56	203
6.28	9.11	211
10.47	13.60	212
11.02	11.77	213
14.93	15.19	221
14.08	13.21	222
14.00	16.87	223
14.70	15.	231
12.95	13.74	232
11.60	12.53	233
13.50	14.91	241
15.46	15.54	242
14.70	15. 8	243
10.00	10.	251
12.12	12.90	252
14.12	14.13	253
8.90	9.39	261
9.47	12.6	262
13.02	13.77	263
4.28	7.11	271
5.18	5.62	272
6.75	7.79	273

REACTION TIME

EXPERIMENTAL SUBJECTS

STIMULUS DIMENSION

1 = CONTROL DAY

2 = DAY BEFORE JUMP

3 = DAY OF JUMP

.73	.80	1.30	1.44	11
1.02	.93	1.22	1.52	12
1.00	1.06	1.16	1.60	13
1.20	1.27	1.90	2.00	21
1.35	1.87	1.93	2.13	22
1.67	2.83	2.70	3.36	23
.93	1.25	1.48	1.67	31
1.03	1.56	1.53	1.50	32
1.20	2.04	2.17	2.80	33
1.50	1.26	2.40	2.60	41
1.90	1.80	2.21	3.07	42
1.83	1.96	2.35	3.16	43
.53	.64	1.14	1.52	51
.62	.98	1.54	2.60	52
.80	1.37	3.20	4.47	53
.52	.82	1.15	1.25	61
1.07	1.97	1.67	1.93	62
.65	1.90	1.70	2.30	63
1.05	1.47	1.60	2.00	71
1.27	1.80	2.00	2.00	72
1.83	1.87	2.47	3.47	73
1.20	1.20	1.40	1.67	81
.93	1.38	1.33	1.67	82
.90	1.20	1.80	2.20	83

1.30	1.30	1.30	1.53	91
1.50	1.73	1.53	1.85	92
1.50	2.00	2.50	2.95	93
.87	.92	.90	1.10	1 1
1.10	1.57	1.87	2.33	1 2
1.24	1.42	1.93	2.52	1 3
1.30	1.50	1.65	1.92	111
1.40	2.10	2.20	2.50	112
1.50	1.53	1.80	3.70	113
1.17	1.25	1.30	1.97	121
1.20	1.80	1.86	2.13	122
1.33	1.83	1.85	2.54	123
1.30	1.13	1.61	1.80	131
1.40	1.70	1.70	2.44	132
1.15	1.16	1.80	2.97	133
.90	1.10	1.83	1.72	141
.90	1.12	1.70	1.52	142
1.15	1.73	1.63	3.10	143
1.67	1.80	1.63	1.60	151
1.70	1.96	1.67	2.00	152
1.46	1.80	2.60	2.80	153
1.35	1.66	1.46	1.83	161
.97	1.43	1.50	1.83	162
.80	1.10	1.50	1.83	163
1.35	1.53	1.70	1.87	171
1.03	2.15	2.24	2.62	172
2.15	2.20	2.50	2.97	173
.70	.85	1.10	1.25	181
1.00	1.30	1.70	1.75	182
.95	1.20	1.70	2.66	183
.95	1.60	1.57	1.53	191

1.00	1.50	1.65	1.72	192
1.10	1.60	1.92	2.20	193
1.10	1.62	1.81	1.95	2 1
1.30	1.40	1.73	2.10	2 2
1.67	2.83	2.70	3.36	2 3
1.10	1.27	1.40	1.53	211
1.00	1.45	1.47	2.80	212
.90	1.57	2.03	3.10	213
1.55	1.40	1.95	1.95	221
.96	1.40	1.54	1.86	222
1.50	2.46	2.10	3.66	223
1.23	1.27	1.60	1.83	231
1.23	1.50	1.77	1.93	232
1.62	1.80	2.24	2.95	233
1.47	1.93	1.57	2.06	241
1.30	1.57	1.73	1.86	242
1.30	1.37	1.96	2.30	243
1.10	1.36	1.45	1.66	251
1.06	1.50	1.53	1.80	252
1.06	1.04	1.76	1.93	253
1.94	2.55	2.56	3.20	261
2.02	2.68	2.74	4.42	262
2.12	3.17	2.80	6.56	263
1.40	1.73	1.83	1.90	271
1.30	1.30	1.87	2.43	272
1.56	1.80	2.05	3.37	273

REACTION TIME

CONTROL SUBJECTS

STIMULUS DIMENSION

1 = FIRST SESSION

2 = SECOND SESSION

3 = THIRD SESSION

.93	1.43	1.43	1.80	11
1.46	1.43	1.60	1.63	12
1.30	1.36	1.67	1.40	13
2.30	2.13	1.60	2.16	21
2.82	2.46	2.46	1.67	22
2.00	2.33	2.46	2.03	23
2.40	2.26	2.33	2.43	31
1.90	2.03	2.30	2.53	32
2.86	2.33	3.24	2.86	33
1.40	2.07	1.53	2.70	41
1.80	2.50	2.20	2.20	42
1.45	1.46	3.34	2.30	43
1.80	1.65	2.65	2.40	51
2.33	2.67	1.87	1.90	52
2.05	2.10	2.10	2.56	53
2.95	2.78	3.10	3.05	61
2.85	3.56	3.00	2.70	62
5.10	4.07	4.50	4.10	63
1.80	1.43	2.53	1.93	71
1.97	2.40	1.70	2.17	72
3.85	3.50	4.85	4.62	73
4.62	1.70	2.97	1.50	81
1.70	2.53	2.50	1.95	82
1.55	1.86	1.76	1.45	83

1.40	2.07	1.53	2.70	91
1.80	1.21	1.45	1.22	92
1.50	1.22	1.10	1.25	93
1.00	1.43	1.65	1.00	1 1
1.10	1.63	1.56	1.83	1 2
2.26	1.60	1.37	1.70	1 3
.97	1.70	1.35	1.10	111
1.57	1.27	1.10	1.30	112
1.60	1.27	1.30	1.75	113
1.83	1.44	1.32	1.57	121
1.12	1.41	1.27	1.61	122
1.41	1.21	1.52	1.21	123
1.33	.75	1.13	1.30	131
1.95	1.30	1.90	1.73	132
1.95	1.43	1.36	1.60	133
2.22	1.90	3.27	1.50	141
1.73	1.70	1.43	2.93	142
1.40	1.16	1.60	1.83	143
1.70	1.70	3.00	2.25	151
2.43	1.50	2.57	1.23	152
1.57	1.71	1.60	1.95	153
1.23	1.63	1.70	1.57	161
1.83	1.43	1.70	1.40	162
1.70	1.37	1.30	1.57	163
2.42	1.12	1.21	1.22	171
1.82	1.21	1.42	1.12	172
1.55	1.36	1.24	1.62	173
1.07	1.63	1.10	1.55	181
3.40	2.55	2.23	2.50	182
1.82	2.26	2.20	2.80	183
2.44	1.92	1.41	2.05	191

1.95	1.70	1.70	1.40	192
1.30	1.62	1.81	1.44	193
2.42	2.62	2.41	2.14	2 1
2.21	2.82	2.41	1.87	2 2
2.26	2.60	2.37	2.70	2 3
2.76	1.80	2.13	2.00	211
1.30	1.63	1.07	1.25	212
1.20	1.67	2.17	1.70	213
2.40	1.87	2.14	2.57	221
2.12	2.50	2.24	2.14	222
3.41	2.48	2.87	2.44	223
2.50	1.90	1.65	1.65	231
1.77	1.30	1.37	2.07	232
2.76	2.31	2.50	1.60	233
1.27	1.30	1.15	1.30	241
1.40	1.37	1.30	1.57	242
1.17	1.10	1.10	1.43	243
1.70	1.30	1.50	2.13	251
2.05	1.60	2.10	2.50	252
1.76	1.63	1.10	1.77	253
1.35	1.95	1.60	2.15	261
1.76	1.62	1.26	2.00	262
1.70	1.75	2.15	1.80	263
2.55	1.37	1.60	1.73	271
1.70	1.80	1.57	1.60	272
1.50	1.40	1.57	1.63	273

REACTION TIME

EXPERIMENTAL SUBJECTS

NEUTRAL + ANXIETY WORDS

1 = CONTROL DAY

2 = DAY BEFORE JUMP

3 = DAY OF JUMP

.73	1.30	11
1.02	1.15	12
1.00	1.20	13
1.20	1.93	21
1.35	2.00	22
1.67	3.63	23
.93	2.40	31
1.03	1.96	32
1.80	2.90	33
1.50	3.02	41
1.90	2.23	42
1.83	6.13	43
.59	1.40	51
.62	1.42	52
.80	1.30	53
.52	1.35	61
1.07	1.57	62
.65	3.10	63
1.05	1.87	71
1.27	2.40	72
1.83	2.43	73
1.20	1.83	81
.93	3.65	82
.90	2.40	83

1.30	2.00	91
1.50	1.73	92
1.50	2.47	93
.87	1.42	101
1.10	1.37	102
1.24	1.84	103
1.30	1.87	111
1.40	2.80	112
1.50	2.95	113
1.17	2.00	121
1.20	2.93	122
1.33	2.16	123
1.30	1.40	131
1.40	1.80	132
1.15	2.06	133
.90	1.30	141
.90	2.20	142
1.15	2.23	143
1.67	1.90	151
1.70	2.23	152
1.46	1.60	153
1.35	1.73	161
.97	1.40	162
.80	1.80	163
1.35	1.95	171
1.03	2.40	172
2.15	2.65	173
.70	1.15	181
1.00	1.00	182
.95	1.75	183
.95	1.97	191

1.00	2.05	192
1.10	1.70	193
1.10	1.68	201
1.30	2.25	202
1.67	3.63	203
1.10	2.13	211
1.00	1.90	212
.90	1.23	213
1.55	2.00	221
.96	3.30	222
1.50	2.40	223
1.23	2.30	231
1.23	2.10	232
1.62	2.40	233
1.47	2.30	241
1.30	3.10	242
1.30	2.76	243
1.10	2.63	251
1.06	1.61	252
1.06	1.70	253
1.94	1.66	261
2.02	3.07	262
2.12	2.70	263
1.40	1.60	271
1.30	1.90	272
1.56	3.67	273

REACTION TIME

CONTROL SUBJECTS

NEUTRAL + ANXIETY WORDS

1 = FIRST SESSION

2 = SECOND SESSION

3 = THIRD SESSION

.93	2.56	11
1.46	1.33	12
1.30	1.67	13
2.30	2.80	21
2.82	1.63	22
2.00	2.35	23
2.40	3.56	31
1.90	2.16	32
2.86	3.40	33
1.40	2.70	41
1.80	2.20	42
1.45	1.93	43
1.80	3.53	51
2.33	2.45	52
2.05	2.95	53
2.95	3.40	61
2.85	4.63	62
5.10	4.27	63
1.80	3.00	71
1.97	4.00	72
3.85	3.62	73
4.62	4.65	81
1.70	2.67	82
1.55	3.90	83

1.40	2.70	91
1.80	3.41	92
1.50	3.41	93
1.00	1.50	101
1.10	1.35	102
2.26	2.70	103
.97	2.85	111
1.57	2.17	112
1.60	1.60	113
1.83	2.44	121
1.12	2.71	122
1.41	2.41	123
1.33	2.26	131
1.95	1.80	132
1.95	3.41	133
2.22	1.92	141
1.73	2.01	142
1.40	2.01	143
1.70	2.43	151
2.43	6.10	152
1.57	1.97	153
1.23	1.70	161
1.83	1.60	162
1.70	2.93	163
2.42	3.42	171
1.82	2.12	172
1.55	3.54	173
1.07	2.03	181
3.40	4.67	182
1.82	6.13	183
2.44	3.41	191

1.95	2.41	192
1.30	2.42	193
2.42	3.69	201
2.21	3.62	202
2.26	2.84	203
2.76	2.93	211
1.30	1.67	212
1.20	2.07	213
2.40	3.68	221
2.12	3.67	222
3.41	4.11	223
2.50	2.80	231
1.77	2.60	232
2.76	4.17	233
1.27	2.33	241
1.40	1.70	242
1.17	1.36	243
1.70	1.97	251
2.05	2.20	252
1.76	2.57	253
1.35	2.15	261
1.76	2.80	262
1.70	1.46	263
2.55	2.70	271
1.70	2.60	272
1.50	2.57	273

Approved by:

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Claude [illegible]

Raymond Wyman

Date:

Nov. 13, 1963