SOME EFFECTS OF STRESS ON ABSTRACT AND CONCRETE BEHAVIOR

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Jacques M. Levy

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SOME EFFECTS OF STRESS ON ABSTRACT AND CONCRETE BEHAVIOR

by

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AN ABSTRACT

Submitted to the School of Graduate Studies of Michigan State University of Agriculture and Applied Science in partial fulfillment of the requirements for the degree of

MASTER OF ARTS

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ABSTRACT

From a theoretical viewpoint which proposes that individuals tend to cope with inadequate conditions by becoming more concrete, two hypotheses were formulated with regard to the effects of stress. It was expected that if individuals were given concrete and abstract tasks, i.e. tasks which activate these differential performances, then the subjects under stress would find channels for the expression of their coping behavior in the concrete task. So then, it was predicted that:

1. Stress would facilitate performance on a concrete tasks;

2. Stress would impair performance on an abstract task.

Thirty male students served as subjects for this study, fifteen in the experimental group and fifteen in the control group. Each S was given three pairs of block-design tasks to solve (one pair being a sample, and therefore not bearing upon the results). Each pair consisted of an abstract task (Task A) and a concrete task (Task C). All subjects took the sample pair and another pair (pre-Tasks A and C), under normal conditions. Then, half the subjects were placed under stressor conditions (introduction of false norms) and the other half waited for a comparable time period. Subsequently, all of the subjects took the third pair of tasks (post-Tasks A and C). Effectiveness of the stressor conditions was ascertained by introspective data.

Using analysis of covariance technique, the subjects were all equated on pre-Tasks A and C. The comparisons made were between groups

on both post-Task A and post-Task C. No significant differences were found between groups on either task. Since the introspective data seemed to indicate that the stressor conditions were effective, the results did not substantiate either of the hypotheses.

Some possible reasons for this were advanced. The most tenable of these seemed to be that the tasks themselves were not valid. Theoretically, performance on concrete tasks should show no relationship to performance on abstract tasks. Correlations between pre-Task A and pre-Task C and between post-Task A and post-Task C for the experimental and control groups indicated that one can predict, with a fair amount of accuracy, the performance on one kind of task from the performance on the other. Since this violated an essential assumption of the study, i.e. that abstract and concrete behaviors were being discretely tapped, possibilities for future research on this same topic, which would eliminate this error, were offered.

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to Kurt Goldstein

Always the beautiful answer
who asks the more beautiful question *

* from: e.e. cummings, Poems 1923-1954

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I. INTRODUCTION

A. The Abstract and Concrete Attitudes.

Gelb and Goldstein (17), from their experiences with brain-injured patients, first made the distinction between two modes of behavior which they called "abstract" and "concrete". Years later, Goldstein and Scheerer (21) more explicitly studied and described these. They wrote:

> The normal person is capable of assuming both, whereas the abnormal individual is confined to but one type of behavior - the concrete. The abstract and concrete behaviors are dependent upon two corresponding attitudes which are psychologically so basic that one may speak of them as almost levels.
>
> The abstract and concrete attitudes are not acquired mental sets or habits of an individual, or special isolable aptitudes, such as memory, attention, etc. They are rather capacity levels of the total personality. Each one furnishes the basis for all performances pertaining to a specific plane of activity. In other words, each attitude constitutes one definite behavioral range which involves a number of performances and responses. These latter, when taken individually at their surface value, may appear to be discrete entities of quite a diversified nature (e.g. attention, recall, retention, recognition, synthesizing, symbolization, etc.). Closer analysis reveals that these seemingly diverse performances and responses have as a common basis one functional level of integration, one cross-sectional attitude of the personality: either the concrete or the abstract attitude...
>
> ...Our concept of attitude implies a capacity level of the total personality in a specific plane of activity.
>
> This plane can be related to the outerworld situation or to an inner experience. One can assume either an abstract or a concrete attitude towards the outerworld as well as towards an inner experience. In assuming the one or the other, the individual as a whole gears himself to a specific direction of activity which we call abstract or concrete behavior. (p. 1f).

Goldstein (20) offers further explication of these concepts:

> The concrete attitude is realistic. In this attitude, we are given over and bound to the immediate experience of the given thing or situation in its particular uniqueness. Our thinking and acting are directed by the immediate claims made by one particular aspect of the object or situation in the environment.
>
> In the abstract attitude, we transgress the immediately given specific aspect or sense impression; we abstract from particular properties. We are oriented in our action by a more conceptual viewpoint...We detach ourselves from the given impression...The abstract attitude is basic for the abilities:
>
> 1. To assume a mental set voluntarily.
> 2. To shift voluntarily from one aspect of the situation to another.
> 3. To keep in mind simultaneously various aspects.
> 4. To grasp the essentials of a given whole; to break up a given whole into parts and to isolate them voluntarily; to synthesize.
> 5. To generalize; to abstract common properties; to plan ahead ideationally; to assume an attitude toward the 'mere possible,' and to think or perform symbolically.
> 6. To detach our ego from the outer world. (p. 18f)

Because, in his writings, Goldstein sometimes speaks of a "lack of abstract attitude" and sometimes of "impairment" of it (19,pp.66-67) there has been a great deal of confusion as to whether this is posited as an all-or-none phenomenon. The difficulty arises from the fact that Goldstein is sometimes not rigorous in his terminology. A general survey, however, leads to the conclusion that although he does speak of patients in which there is a <u>complete</u> loss of this capacity, he also conceives of this loss in terms of greater or less extent, i.e. impairment. At the same time, abstract and concrete are not invariable in themselves. There are gradations of each: "We have to differentiate between various degrees of both the concrete and the abstract behavior." (21, p. 7).

B. Coping with the World.

The normal organism under adequate conditions shows behavior which is "characterized by an alternation between an attitude involving abstract and one involving concrete behavior, and this alternation is appropriate to the situation and the individual, to the task for which the organism is set." (19, p. 66). One can only understand the behavior of an individual when one takes into account the meaning of the performance for the organism, for "those performances are always fulfilled which are most important for the organism." (18, p. 202). This, however, "presupposes a normal, adequate environment. Because these conditions are not always fulfilled, even in normal life, the organism might often appear to be governed transitorily by a special tendency." (ibid., p. 202). In such situations, when the conditions are inadequate for the person, "...normal reactions...no longer take place. Under these conditions, stimulus utilizations may occur which have the characteristics of isolation." (ibid. p. 322). Looked at broadly, "...the organism also tends primarily to avoid catastrophes, and to maintain a certain state which makes that possible...the only form of self-actualization which remains is the maintainence of the existent state." (ibid., p. 197).

The important ideas here is that the organism's actualization takes the form of self-maintainence. In order to utilize his capacities to their fullest extent, the person must be presented with

channels in the environment for this to take place. If these channels are not present (or are not perceived), then the person is "driven to utilize his preserved capacities in the best possible way," (ibid., p. 197) or he is faced with catastrophe, the disintegration of the organism.

In an attempt to define what is meant by adequacy and inadequacy of conditions, a general formulation would be that a situation is inadequate for a person when he experiences a threat to his existence, due to his subjective experience of being unable to cope with a task to which he has addressed himself. The result of such a condition would be anxiety usually, but not necessarily. That is, the brain injured patient will come into anxiety because his capacities are so much impaired in general that an incapacity to perform does mean some threat to his existence. However,

> "in a normal person, this will not always be the case. He will cope with a difficult situation in some fashion without becoming actually endangered in his existence. ...Yet, however true it may be that difficult situations do not involve severe anxiety, the concomitant mental state is nevertheless structurally of the same type. The only reason they do not impress us as anxiety, is because they are less relevant to the total personality and its existence...(However) a failure, which by itself is irrelevant, may bring anxiety into distinct prominence, if it occurs in a situation in which it becomes significant for the very existence of the person concerned; for example, anxiety during any examination." (ibid., p. 302).

In coping with the difficult situation, the person's reactions will, as was stated above, have the characteristics of isolation. These are: dedifferentiation, abnormal stimulus bondage, abnormal dependency upon the quality of the stimulus, forced responsiveness,

etc. - in short, concrete behavior. So then, when the individual feels threatened, he moves to a concrete mode in order to cope with the inadequate conditions.

This is quite similar to Rogers' view of the process of defense, wherein he states that defense against threat keeps "the total perception of the experience consistent with the individual's self-structure,... The general consequences of the process of defense, aside from its preservation of the above consistencies, are: rigidity of perception..." (38, p. 62). Arieti (4) has, in the same way, characterized schizophrenia as "... a reaction to a severe state of anxiety...(which) consists in the teleologic or motivational use of a more or less advanced impairment of the abstract attitude.... (This impairment) has the purposes of avoiding anxiety at the same time that it permits the uniqueness of the individual to emerge." (pp. 316-317).

Experimentally, Beier (5) found just this relationship between avoidance of anxiety and impairment of abstract attitude. Using Goldstein's theory and formulations, he placed a group under stress (by reading a faked Rorschach report to each subject) and found a definite impairment of abstract behavior resulted. But, the question remains as to what the nature of these subjects' behavior was. The only channel open to the subject for expression of his responses was the abstract task. Since their performance on this was impaired, i.e., they became more concrete, it would seem fairly safe to assume that

they did feel threatened. But, at the same time, none of the subjects was reported to have entered into a catastrophic reaction. They did cope with the situation, i.e. they were maintaining a state of existence in order to avoid catastrophe. But the coping behavior was not afforded a channel for expression, and therefore a seemingly important variable was overlooked.

In most of the studies reported in the literature, a similar procedure is followed, and so this coping behavior is not experimentally isolated. In the present study, the individual is confronted with both an abstract and a concrete task. This is done in order to facilitate the channeling, of the coping behavior in a measurable way. In this manner, it was hoped that when the situation was made inadequate (i.e. threat introduced), the subject would become more concrete; and this would be reflected in his performance on the concrete task. The characterization of a task as concrete will be taken up in more detail in the section on Materials.

C. The Definition of Stress.

Before summarizing the relevant literature which bears specifically upon the effects of psychological stress on performance, the writer would like to present some of the attempts at defining stress as a variable.

Grinker and Spiegel (22) consider psychological stress to be strictly analogous to the physical concept of stress. They speak of

physical stress as the restorative forces exerted by an elastic body when an external force deforms that body. This homeostatic function of physiological mechanisms was more elaborated by Selye (42), who defined physiological stress as any condition that produces the "adaptation-syndrome" - which is the reaction of the organism in returning to the homeostatic state. Chiles (9) summarizes the definition of Darrow and Henry and of Haggard, who define stress as a condition under which the subject or individual reacts with responses or actions which are out of proportion or inappropriate to the circumstances in which he is placed. Chiles further presents the following authors' treatments of stress:

> 1. Katchmar defines it thusly: 'To summarize...we can say that stress is an internal process of the organism, manifested as an equilibrium seeking response, occurring in the psychological context when the objective situation is cognitively evaluated as one involving a goal, the attainment of which is thwarted, or interpreted as being thwarted.'
>
> 2. Katchmar states that Lazarus and Deese (in an unpublished study) consider the basis of stress to be (a) the thwarting of a motive (in the clinical or psychoanalytical sense); (b) the thwarting, or more specifically the threat of thwarting, must be recognized by the organism; thus previous experience (cognitions, habits) plans an important role in the stress situations; (c) a third class of variables is that of the affective aspects of stress.
>
> 3. Bass, Hurder and Ellis state: 'In order to define stress adequately it is necessary to consider the interaction of stimulating conditions, organismic ability and organismic motivation. One way of doing this is to conceive stress in terms of the cost of performance to the organism...' (measured by) energy expenditure.
>
> 4. Miller...takes the position that stress is the disruption of homeostasis, but it is not clear...whether he is referring to psychological or physiological...or both. Miller states: 'As a working definition, we may say that stress is any marked increase or decrease in some

> characteristic of the environment which affects the individual. This may be a very strong stimulation or threat...' (ibid, p. 4)

Lazarus, Deese and Osler (27) conceive of stress as an intervening variable. Stress occurs when a particular situation threatens the attainment of some goal. Schaffer (41) proposes that stress should be considered as the "functional decortication" of the organism. A stressful situation is regarded as essentially one in which a major disruption of the relationship between an organism and its environment has taken place.

Amidst the many treatments of this concept, wherein much overlap is present, a statement by Lazarus, Deese and Osler (op. cit.) seems to summarize quite appropriately the extant situation: "The psychologist has no adequate way of defining the psychological condition that corresponds to the homeostatic steady state. Consequently, the use of the term stress must necessarily be a little looser than we would like it to be." (p. 295).

Without wishing to become side-tracked on the issue of whether the normal organism is, in fact, governed by a tendency toward homeostasis and tension-reduction, this writer will summarize what, in this study, the characteristics of psychological stress were taken to be. They are: that the person feels (not necessarily in symbolized awareness) a threat to his existence; that he has a subjective experience of being unable to cope with a task to which he has addressed himself; that he perceives himself as being negatively evaluated; and that the

foregoing may find expression in symbolized feelings of tenseness, sadness, and nervousness.

D. Stressor Conditions.

We now turn to the means of inducing stress. Following Vogel, Baker, and Lazarus (47) we shall call these the stressor conditions. "By stressor conditions we mean those experimental conditions which are intended by the investigator to be stressful, but which are not necessarily responded to as such by the S. The term 'stress' we use to refer to a state of the organism, not a class of conditions." (p. 105). The various techniques which have been used fall into two main classes (27). These are: (a) stress induced by failure, and (b) stress induced by working conditions and the task itself. In the former category, the more frequently used, three methods have been employed: presenting the subject with an unsolvable task, interrupting the subject before he has finished, and the introduction of false norms which indicate failure even if the performance has been adequate. In the latter category, the methods most often used, although the varieties are infinite, have been: distraction, physical discomfort, verbal disparagement of the performance by the experimenter, requiring the subject to attend to too many things or to perform too many operations at once, rapid pacing, etc.

E. History.

Let us proceed, then, to have a look at some of the studies that

have appeared in the literature. In their review of the theoretical issues and experimental results concerned with the effects of psychological stress upon performance, Lazarus, Deese, and Osler (op. cit.) present studies which "have yielded varying results: some show only a decrement in performance, others show improvement, and still others produce both of these effects for different individuals (an increase in variability)." (p. 310). Three years later the situation apparently had not changed, for Farber (15) reviewed the current literature on the role of motivation in verbal learning and performance and stated:

> Experimental studies have usually tended to show that when failure instructions are not applied to specific responses, but are used, instead, to characterize general performance, subsequent performance in verbal learning situations is impaired. As a result of such observations, it is generally believed that statements expressing approval of a learner's performance are more beneficial to his subsequent performance than statements indicating disapproval. At the same time, however, it is also rather generally believed that excessive praise may decrease motivation and thus impair performance, whereas some kinds or degrees of censure may increase motivation and thus improve performance. This indecision with respect to the effects of failure characterizes treatments of the effects of frustrating events in general. (p. 316).

On this same issue, Child and Waterhouse (8), from a more theoretical vantage point, wrote:

> Indeed, the conflict appears strikingly in some general textbooks in psychology. In a chapter on thinking and reasoning, frustration is viewed as the condition for more organized behavior, and in a chapter on emotion, it is viewed as the condition for less organized behavior. (p. 127).
>
> Frustration may operate to increase the motivation supporting the goal-oriented activity and thereby to improve the quality of performance (p. 136),...(but) severe emotion does often have a disorganizing effect and thus reduces the quality of performance in the face of frustration. In part this may be

> because the emotional responses themselves are to some extent incompatible with the ongoing instrumental activity. (p. 137)

We shall first present some of the studies wherein an increment in performance was observed following stress. Lazarus and Eriksen (28) found that stress produced an increase in the number of errors on the digit symbol test, but this was compensated for by a concomitant increase in speed. Since, however, in this task speed scores accounted for 92% of the variance in total scores, lowered accuracy mattered very little for it was so poorly correlated with total scores. The authors concluded, in part, that "frequently subjects do well under stress by increasing their speed at the expense of accuracy." (p. 104). Deese and Bowen (13) obtained initial decrement but later improvement in code-learning as the result of stress due to pacing. However, Hurlock (23), using failure, found just the opposite relationship. Clark and McClelland (10) reported that subjects with mild fear of failure performed better, particularly towards the end of a test. Using motor coordination and color naming tasks, Gates and Rissland (16) found improved performance under failure-stress.

Increments in performance after stress have often been interpreted in light of the energizing aspects of motivation. Lazarus, Deese and Osler (27) quote two studies wherein an increase in motivation, brought about through stress, was accompanied by an increased output in performance. "Miller and Wickert both suggest that fear, produced in a stressful situation, may actually be beneficial to performance. They cite as

evidence the fact that AAF personnel reported that under the stress of combat they performed more efficiently." (p. 310). Animal studies have been conducted by Miller (34), Brown and Jacobs (7), and Amsel (2), among others, to show that anxiety does exhibit both the reinforcing and energizing properties of a drive. Experiments by Brown (6), and by Rosenbaum (40) indicated that increases in the hunger drive result in the general elevation of performance measures of stimulus generalization. Rosenbaum (39) found this same elevation as a result of experimentally induced anxiety. Using motor responses to visual stimuli, he concluded that "experimentally induced anxiety shows the energizing function of a drive..." (p. 42). The role of electric shock as a reinforcer is well known, and its generalizing effect has been demonstrated in numerous studies (e.g., 3, 36, 43, 44).

On the other hand, the literature is replete with studies which indicate decrements in performance due to stress. Earlier (p. 8), the study by Beier was mentioned. Cowen (11) found that stress elicited increasing amounts of problem-solving rigidity on the Luchins water-jar problem. Using a similar technique, the same author (12) successfully replicated his results and further showed that praise produces an "extinction" of rigidity. Osler (37) applied failure-stress and found depressed performances on various intellectual tasks (arithmetic, nonsense syllables). Montague (35) found that increase in anxiety caused anxious Ss to perform less well on a difficult list of nonsense syllables

to be learned. A similar study by Lucas (31) arrived at the same conclusion. Deese, Lazarus, and Keenan (14) found that low anxious Ss suffered a decrement in nonsense syllable learning due to stress, and in a repeat of the study, varying the difficulty of the list of syllables, both high and low anxious Ss showed the decrement (26). Using nine-year old boys, Lantz (24) obtained impairment of Stanford-Binet scores following failure. Further examination by Lantz of the various subtests indicated that tasks requiring visual or rote memory were not affected, while those involving reasoning or thinking were. Decrements following stress have been found in production in a sentence-formation test (1), learning in arithmetic problems (45), digit span on fifth-and sixth-grade children (49), recall and relearning of nonsense syllables (50), digit symbol (48), visual discrimination (32), card sorting (33), reaction times for completing pictures (46), and many others.

Many of the authors do not provide a clear differentiation among concepts such as frustration, emotion, motivation, drive, stress, and the like. Apparently, however, such differentiations are implicit in their usage of the terms. It would not seem productive to attempt, in this paper, to provide an adequate theoretical model concerning this issue. Let it suffice to say that these terms are usually used in two groupings: on the one hand, frustration, stress, and emotion are thought of as short-term, induced states of the organism, while on the other hand,

motivation and drive are considered as longer-term organismic qualities. The induced states affect these long-term qualities by either raising or lowering their levels. That is, an organism is not always frustrated, stressed, or emotional, but is always motivated or driven to a greater or lesser extent. The concept of "learned drives" (34) would not easily fit into the two groupings offered here, but this writer tends to feel that drive, in this case, is a misnomer, and might better be referred to as frustration or stress.

More recently, Lazarus and various co-authors have begun to advance more sophisticated hypotheses. Interaction effects are being sought after in their fairly complex experimental designs. Vogel, Baker, and Lazarus (47) report a study that appears to be first in what promises to be a long line of experiments attempting to tease out the relationship between stress and motivation. Using a perceptual-motor task and accompanying physiological reactivity as dependent variables from which behavior under stress is obtained, the authors proceeded to manipulate motive states in two ways: through induction by use of ego-involving instructions; and through inferences from TAT material, academic accomplishment, and study habits. Although the results of the study are, for the most part, not significant, they did obtain some interesting interactions between induced motivation and physiological reactivity. Their conclusion:

"The findings of this experiment indicate the complexity of the role of motivation in determining response to stressor conditions and highlight the methodological difficulties involved in the ... investigation." (p. 111).

This experimentation involving the systematic use of motive states as the independent variable is a product of two earlier papers by Lazarus and Baker (24, 25) which presented a theoretical and methodological framework for the studies to come. Their conception is that the motivational state of the individual in relation to the stressor conditions imposed upon him determines whether or not a state of stress occurs.

F. The Nature of the Task.

It is truly surprising that, with all of the work that has been done in this area, there is none reported wherein a controlled study of the relationship between stress and the nature of the task has been made. In the early review (27), under a section which outlined what appeared to be the six most obvious questions for future research, the nature of the task was listed first.

Farber (15) too concluded, in part, that "just as the associative mechanisms attending failure may either benefit or harm performance, so might an increase in drive, in and of itself, affect behavior either favorably or adversely, depending on the specific nature of the task and the experimental conditions involved." (p. 317, underlining ours).

Child and Waterhouse (8) had said practically the same thing when they concluded that: "The extent to shich heightened drive can lead to improved performance, and the extent to which other responses are incompatible and produce interference, may vary with the exact nature of the task or activity in which quality of performance is being judged." (p. 137). And, for Lazarus, Deese, and Hamilton (26) along with Osler (37), the exact nature of the task appeared to be an extremely important variable which they had not taken into consideration.

It is just this variable which the present study does take account of, although not in and for itself, but in order to be able to make inferences about the kinds of performances which are needed to cope with the task presented. It is extremely difficult to extract from the many studies quoted above just what differences, if any, in performance are related to the nature of the task. Broadly conceived, however, there does seem to be a consistency that emerges at times - when performance of a task requires the subject to function at a high level of abstraction (e.g. water-jar problem, complicated memory tasks, difficult arithmetic), then stress impairs performance; on the other hand, when the task requires only the lowest level of concrete functioning (e.g. simple motor tasks, conditioning of part processes, color naming, animal behavior,)then stress facilitates performance.

Strictly speaking, the present study is focused upon the functioning of the individual in terms of the requirements of the task, rather than on the nature of the task, per se. It is not quite accurate to

define a task as concrete or abstract. It is the individual's approach and behavior which can be so defined. But, it is possible to "devise special tests in which we can ascertain unequivocally the corresponding approach required for each task; i.e., the solution must presuppose a definite attitude and the experimental arrangement preclude success by means of any other approach...Tasks which presuppose the activation of the abstract performance-level cannot be genuinely solved as long as the subject operates within the confines of the concrete level." (21, p. 22). It is of utmost importance that this not be misunderstood. The differences between abstract and concrete attitudes is NOT merely a difference in difficulty or complexity. "The greater difficulty connected with the abstract approach is not simply one of greater complexity, measured by the number of separate, subservient functions involved. It demands rather the behavior of the new, emergent quality, generically different from the concrete." (ibid, p. 22).

G. Hypotheses

So then, what we shall do is present each subject with two tasks - one which presupposes the activation of the abstract approach, and one which presupposes the activation of the concrete approach. Since, as we have indicated, individuals tend to cope with inadequate conditions (stress) by maintaining their existent state through becoming more concrete, our expectations are that this will be reflected in their differ-

ential performance on the two kinds of tasks.

That is, we hypothesize that, under stressful conditions:

1. Performance on a task which requires an abstract approach will become impaired, i.e. a decrement will be seen;

2. Performance on a task which requires a concrete approach will be facilitated, i.e. an increment will be seen.

II. MATERIALS

The task of the subject was to reproduce colored designs with blocks. Both the designs and the blocks are those used in the Goldstein-Scheerer Cube Test (21). Two kinds of reproductions were required of the subject.

1. A colored design was placed before him, and along with it was placed a modification of this design. This modification is the exact size of a four-block model (approximately four inches x four inches), whereas the original colored design is the size of one block; on the face of the modification two intersecting lines are drawn, which divide the design into four equal sections. Both the original and the modified designs face in the same direction (one higher than the other), and aside from the afore-mentioned changes, they are identical in color, shape, and proportion. The subject's task was to build a model using four blocks which will reproduce the design shown to him.

2. Only the original colored design was placed before the subject. His task was to build a model again - but, this time there are three important changes: (a) the model was to be built using sixteen blocks; (b) the model was to be built rotated 90 degrees, one full turn, either to the left or to the right - it could not be built first and then rotated; (c) the model was to be built with the original colors interchanged, i.e. where there was red on the original, white was to be put, and vice versa.

The first reproduction (four-block) will be referred to as Task C, standing for concrete. The presentation of the modified design follows the procedure of the Goldstein-Scheerer Cube Test. In their test, they have set up six levels on an abstract-concrete scale. The presentation used in our study is at step four (one being most abstract, six being most concrete). These authors state that "the experimental findings on this test suggest that there are degrees of lesser and stronger concreteness in a subject, which correspondingly require more or less concrete aids. A subject who needs only facilitation with regard to the difference in size (step two) is in all probability less concrete than a subject who fails with this help and requires the line division (step four)." (ibid, p. 57). These modifications of the presented designs consist of stages of diminishing discrepancy between the design to be copied and the block model to be composed. In summary,

> The modifications introduced represent aids of a concrete, palpable nature; they supplant in the phenomenal realm of perception the lack of abstract approach which the subject does not or cannot assume at that moment. It would be absolutely erroneous to suppose that these aids help to initiate a process of abstraction in an individual who lacks the prerequisites for that act. These aids simply render that act unnecessary. (ibid., p. 55, underlining ours).

So then, if what has been said up to now is actually the case, there is every reason to believe that Task C fulfills the requirements as a task which presupposes the activation of the concrete approach mainly. Putting it another way, this task is a simple, copying task

and as such does not require conceptualization for attainment of solution.

The second reproduction (sixteen-block, rotated, colors interchanged) will be referred to as Task A, standing for abstract. Due to the demands which this task makes upon the subject, it would appear to have face validity as a high-level performance. The subject is continually faced with the necessity of manipulating three sets (size, position, color) at one time, and he has no model from which to copy except his own conceptual one. A series of these tasks has been used successfully to tap the functions of analysis and synthesis (29), both of which are intrinsically related to the abstract attitude.

Task A and Task C comprise a pair of block designs which attempt to make available to the subject channels through which he can express both abstract and concrete approaches to problems. In the present study, three such pairs were used, one of them being a sample.

III. SUBJECTS AND PROCEDURE

Thirty male, undergraduate students at Michigan State University were the subjects in this study. All volunteered, and each subject was seen individually, the experimental sessions lasting from twenty minutes to one hour. The subjects had no previous knowledge about the experiment, except that it had "something to do with problem-solving." The same experimenter examined all of the subjects.

It is well known that wide variation exists among individuals in ability to perform on block design tasks. In order to isolate the treatment effects an analysis of covariance design was used. (30). This would allow for the extraction of variance due to "block design ability" by equating all subjects on a pre-test. In this way, whatever intellectual and personality factors go into making up this ability would be controlled for. No other controls were placed upon the subjects. Selection of subjects for both Control and Experimental groups was done in a fortuitous manner; nevertheless, before any subject was seen, he had been assigned to one or the other group.

All subjects received three pairs of tasks. First, a fairly simple sample pair was presented to each subject. If he encountered difficulty in either Task C or Task A, sparing help was offered; however no statements regarding methods of approach or underlying principles was made. The importance of the sample tasks was to insure that the subject understood what was to be required in the tasks which followed. Then, pre-Task C and pre-Task A were administered.[1] Following this, depending on

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[1] pre-Task refers to the tasks administered before stressor conditions or interpolated time interval. Post-Task refers to those administered after - see schematic design.

whether the subject was a Control or an Experimental one, either stressor conditions were induced or a comparable time period was allowed to elapse. In the latter case, conversation was limited and no questions regarding the experiment were answered- the experimenter busied himself in one way or another. This time period was never more than 30 seconds. Then, post-Task C and post-Task A were administered. Finally, introspective data was collected with regard to the effectiveness of the stressor conditions.

In all trials, Task C was presented before Task A. Therefore, if an order effect had any importance it was probably held constant (barring interactions).

Schematically, the design is:

	Sample	Pre-Tasks		Post-Tasks
Experimental	C-A	C-A	Stress	C-A
Control	C-A	C-A		C-A

The directions for the tasks were as follows:

> I am going to show you some colored designs and I will ask you to reproduce them with these blocks. (indicate the blocks) As you can see, these blocks are all identical - they have a red side, white side, and so forth. Now here is the first design you are to reproduce. (place both original and modified design in front of subject and indicate that they are both representations of the same design). I'd like you to make it out of four blocks (separate them from the rest), just the way you see it here in front of you. Please tell me when you are finished. Go ahead. (after S has completed his model, brush up the blocks, remove the modified design - the original remains in front of the subject) Now I'd like you to make this design out of all sixteen blocks - but, I'd like you to build it so that it is

> rotated 90 degrees to the left or right - that is, one full turn to the left or the right. You must build it rotated - you cannot build it and then turn it. And, at the same time, I'd like you to interchange the colors as you build it - where there's red, put white; and where there's white, put red. Do you understand what you are to do? (if S is at all confused, explain more fully). All right, go ahead, and please tell me when you are finished. (after S has finished, remove the design and brush up the blocks) This is the way we will proceed on the following designs. Do you have any questions? (in the following tasks, repeat the relevant sections of the above each time.)

The stressor conditions were the introduction of false norms, i.e. failure-stress. An important, although extremely difficult to control, variable here is the degree of realism achieved by the experimenter, however the general impression was that these evaluations were seriously taken. After the subject finished the pre-Tasks, he was told:

> Well, I guess I don't have to tell you - you did pretty lousy on those. What we're doing here is trying to make up an intelligence test, and we're trying to get some averages for it. I'm giving these same tests to a lot of different students now, but I've already given them to a bunch of high school seniors - and you did worse than they did. I mean that, on the average, the high school kids did better on this than you did. (pause) Well, do you want to try another one?

After the subject finished the last block design, the introspective data was collected. All subjects were asked to try and think back upon how they felt <u>just before</u> the beginning of the last pair of designs. Three forced-choice questions were asked and the subject was instructed to choose one or the other alternative:

1. Did you feel tense or relaxed?

2. Did you feel happy or sad?

3. Did you feel nervous or at ease?

Each subject was given a brief description of the true nature of the study at the end of the session and was asked not to communicate this information to anyone for obvious reasons.

IV. RESULTS

The measures obtained for the groups were solution times for the various block designs presented to them. As so often is the case, the distribution which resulted was skewed; and so, in order to proceed with the analysis of results, a reciprocal transformation was done.

Two analyses of coveriance were run to test our hypotheses. According to hypothesis one (see p. 18), under stressor conditions we should expect a decrement in performance on the abstract task. More specifically, this predicts that the experimental group will take longer on post-Task A than will the control group. Table 1 presents the results of the covariance analysis. The F-ratio of .27 is not significant, and, in fact, the mean solution times (before adjustment) for the groups indicate that the Control subjects took longer to solve post-Task A than did the Experimental subjects. These means are presented in Table 1 A.

Table 2 presents the results of the test of significance on hypothesis two (see p. 18). This hypothesis gives rise to the expectation that the experimental group will take less time on post-Task C than will the control group, i.e. performance on a concrete task will be facilitated by stress. The F-ratio of .73 is again not significant. A look at the mean solution times (Table 2A) reveals that the control group solved post-Task C a little bit faster than did the experimental subjects.

The introspective data (see p. 24) were used to allow some assessment of the effectiveness of the stressor conditions. In answering the three questions asked, those subjects who did experience stress would be expected to respond that they felt tense, sad, and nervous. Control subjects should respond that they felt relaxed, happy, and at ease. A chi-square test of significance was used for each of the questions. Table 3 contains the results of these tests. All are in the expected direction, two of them (tense-relaxed and nervous-at-ease) are significant at below the .05 level, and the other (happy-sad) places at below the .15 level of significance. One-tailed tests were used because specific predictions were made in accordance with our definition of stress (see p. 8).

Since a major variable in the study was the validity of the tests used in testing our hypotheses, an attempt was made to gain some insight into their character. One important aspect of this is whether they are, in fact, tapping the <u>independent</u> functions of abstract and concrete behavior. If this were the case, then one should expect there to be a negative correlation, or no correlation at all, between the abstract and concrete tasks. That is, from Goldstein's statement that "even in its simplest form...abstraction is separate in principle from concrete behavior. There is no gradual transition from the one to the other. The assumption of the abstract attitude...is a totally different activity of the organism" (19, p. 60), if our tasks are

measuring what we designed them to measure, one should not, in principle, be able to predict performance on one type of task from performance on the other. Table 4 presents results which show that such does not seem to be the case. Four product-moment correlations were run between the performance on Task A and Task C for the two groups during the pre- and post-trials. The correlations ranged from .318 (experimental group before stress) to .619 (control group during the same period).

Summarizing the various results presented, neither of our hypotheses was borne out although it appeared that the stressor conditions were effective. Further, it seems that the tasks used to represent abstract and concrete behaviors were not measuring the independent functions for which they were designed.

TABLE 1

COMPARISON BETWEEN GROUPS ON ABSTRACT TASK

Analysis of Covariance for Task A

	Total	Within	Between
sum of products	6393.40	6005.40	388.00
sum of squares: X	9066.30	8752.67	313.63
sum of squares: Y	14037.87	13557.87	480.00
df	29	28	1
correlation coefficient	.567	.551	...
df for r	28	27	...
b_{xy} value	.4554	.4429	...
adjusted sum of squares	6154 .49	6092.60	61.89
df	28	27	1

Note: X is post-Task A N = 30 F = .27, N.S.
Y is pre-Task A

TABLE 1A

Mean Solution Times for Task A

	Control	Experimental
pre-Task A	5.92	5.38
post-Task A	7.04	5.67

Note: times presented in minutes and decimals

N = 30

TABLE 2

COMPARISON BETWEEN GROUPS ON CONCRETE TASK

Analysis of Covariance for Task C

	Total	Within	Between
sum of products	7257.00	7356.67	-99.67
sum of squares: X	18648.97	18631.33	17.64
sum of squares: Y	11668.00	11122.67	445.33
df	29	28	1
correlation coefficient	.492	.511	...
df for r	28	27	...
b_{xy} value	.6220	.6614	...
adjusted sum of squares	14135.42	13765.54	369.88
df	28	27	1

Note: X is post-Task C N = 30 F = .73, N.S.
Y is pre-Task C

TABLE 2A

Mean Solution Times for Task C

	Control	Experimental
pre-Task C	:29.9	:16.7
post-Task C	:21.1	:17.9

Note: Times in seconds and decimals.

N = 30

TABLE 3

COMPARISONS BETWEEN GROUPS ON INTROSPECTIVE DATA

	tense- relaxed		happy - sad		nervous - at ease	
Control	6	9	9	6	6	9
Experimtl.	12	3	5	10	12	3
Chi-sq.	3.475		1.206		3.475	
p	less than .05		less than .15		less than .05	

Note: df = 1 in all cases, p values for one-tailed tests. N = 30

TABLE 4

CORRELATIONS BETWEEN TASK A AND TASK C FOR EACH GROUP IN EACH CONDITION

		r
Control.....	pre-	.619
	post-	.513
Experimental.....	pre-	.318
	post-	.577

Note: N = 15 for each of the four groups. Product-moment r used in each case.

V. DISCUSSION

In contrast to the large body of previous research in the area, in the present study psychological stress had no significant effects on performance. Two parallel hypotheses were advanced with regard to the expected effects of stress, and both had to be rejected.

Following a line of reasoning within Goldstein's theoretical framework, it became evident that one of the most important variables in relation to stress effects is the nature of the task. This was not a new theoretical discovery, for it had often been emphasized by writers in this area. At the same time, however, very little work had been done attempting to isolate this variable in order to assess its meaning. It seemed consistently to be mentioned in the conclusions of studies done, but not in the experimental design proper. The present study set out to isolate the variable in terms of its function as a channel allowing the expression of certain performances. That is, this writer felt that varying the task along known dimensions would enable the behaviors intrinsically related to such dimensions to emerge. The results did not bear this out.

Furthermore, not only were the predictions not substantiated, but a curious turnabout took place. It was predicted that the experimental group would be impaired in performance on the abstract

task and facilitated on the concrete task. The assumption went along with this that these differences would be relative to a generally unchanging control group. A look at Tables 1A and 2A reveals that, to all intents and purposes, the control group behaved the way the experimental group should have (according to the hypotheses), and vice versa. The differences are not significant ones, and they become even smaller when the groups are equated on their pre-Task performances. On the surface, however, it might appear that, if the hypotheses were in fact valid, the control group was the one which experienced threat. Introspective evidence points to the contrary though, for the experimental subjects reported feelings associated with stress significantly more often than did the controls. Taking this into consideration, the reversal of roles appears to be a chance phenomenon.

Does this lead us to the conclusion that the theory which generated the hypotheses is invalid? This is, of course, a possibility, but not necessarily so. The counter-question which must be asked is whether this study adequately went about testing the hypotheses.

Since a great deal of control was obtained over individual differences through the covariance analysis (the correlations ranged from .49 to .57 as shown in Tables 1 and 2), it seems unlikely that individual variation was an important source of error. This is further substantiated by the fact that, although the within variance differences

from pre- to post-Task are in opposite directions on Task A and Task C performances (variance becomes greater on task A, smaller on Task C - see Tables 1 and 2), both experimental and control groups react in the same direction. That is, both the control and experimental groups vary less on post-Task C than they did on pre-Task C, and both groups vary more on post-Task A than they did on pre-Task A.

Such a finding places suspicion on the tasks themselves. It is here that the source of extrinsic error seems likely to be. Because of the posited independence between abstract and concrete behavior (see above, pp. 1, 17, and 27), it follows that any attempt at devising a task which should activate one or the other of these, must not activate both. To the extent that this is violated it will be impossible to estimate which of the two performances, abstract or concrete, is actually taking place. The question which is here being raised concerns the validity of the task.

Herein lies the special importance of the correlations presented in Table 4. There is no doubt that Tasks A and C are correlated with each other. Contrary to theoretical expectations, one can predict, with a fair amount of accuracy, the performance on one task from a knowledge of the performance on the other. This indicates that the tasks chosen in this study to present pure measures of abstract or concrete behavior fail to do so.

So then, aside from the possibility that the theoretical model is erroneous, two other possibilities now arise. One is that abstract and concrete behavior are impossible to definitely discriminate. In this case, further research on the general questions asked by this study would profit from a reformulation of the problem. Perhaps task components should be studied, rather than characterizing the task as an entity. Very little work has been done in this area, and it would probably prove fruitful. The main implimentation of such an approach micht be carried out through factor analytic techniques. The other possibility is that it is possible to discriminate between the two behaviors, in which case one must design a task that will tap either behavior, but not both. Were this study to be repeated, this writer would favor the latter possibility as the first step. Various tasks would have to be administered to samples in order to ascertain a lack of correlation between two tasks which would still seem to have face validity in terms of the performance in question. It is not difficult to find two uncorrelated tasks, but the important issue along with that is the tasks should "look like" they are measuring abstract and concrete behaviors.

VI. SUMMARY AND CONCLUSIONS

From a theoretical viewpoint which proposes that individuals tend to cope with inadequate conditions by becoming more concrete, two hypotheses were formulated with regard to the effects of stress. It was expected that if individuals were given concrete and abstract tasks, i.e. tasks which activate these differential performances, then the subjects under stress would find channels for the expression of their coping behavior in the concrete task. So, it was predicted that:

1. Stress would facilitate performance on a concrete task.
2. Stress would impair performance on an abstract task.

The results did not substantiate either of these hypotheses. Some possible reasons for this were advanced. The most tenable of these seemed to be that the tasks themselves were not measuring what they were purported to measure. Some evidence within the experimental data lend further support to this notion. Possibilities for further research avenues on this same topic, which would attempt to eliminate this error, were discussed briefly.

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