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Behavior styles of children under varying conditions of stress

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Behavior styles of children under varying conditions of stress

by

Anjani C. Patel

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Introduction

Significance of the Problem

What is stress? The term seems to have incorporated a wide range of phenomena and also seems to have held the interest of a number of different professions. A physician examining a patient suffering from coronary heart attack or the like will attempt to collect a social as well as a medical history. The physician is interested in any evidence that the patient has experienced unusual psychological trauma, but he is rarely quite sure what to do with such information. It has been believed that some sort of social or psychological threat or insult, a corollary of stress, contributes to the risk of developing heart disease and other similar conditions. Even the conventional wisdom includes the notion that to worry or to be tense or to take things hard is to increase one's vulnerability to disease.

In spite of this popular and very commonly prevalent view of the importance of stress in the day to day life and of stress as a possible contributing factor to many psychosocial and physiological disorders, one is struck by the slightness of the evidence that links stress to disorder and that which describes the nature of the relationship, its processes, and mechanisms. The evidence points to one obvious explanation, that very little descriptive research has been conducted in the area.

Freud (1936), discussing the concept of anxiety, proposed that excess stimulus intensity, or overstimulation as he referred to it, may well be the prototypic origin of distress. Explaining the psychoanalytic theory, Baldwin (1967) observes that the development of a higher threshold to stimuli is one of the changes that leads toward maturity. It can be inferred
from this that the affective quality of stress may well be dependent on the developmental level of the individual, also that overstimulation is one of the first experiences to which reactions labeled as signs of stress can become conditioned.

Studies of anxiety and variables similar to it, like stress, have been conducted within a wide variety of theoretical frameworks, e.g., Levy (1959), Festinger (1957), and Rao and Russell (1960). A majority of recent theory-based studies seem to have used concepts or have attempted to test hypotheses derived from some version of psychoanalysis or S-R learning theory. This is very evident in the excellent review of stress studies provided by Reubush (1963).

Theoretical literature and clinical work from both psychoanalytic and behavioristic schools are rich in hypotheses concerning the effects of anxiety and stress. These hypotheses comprehensively encompass the full range of intellectual and personality development. Most of the research, however, seems to have been in the nature of theory interpretation (Reubush, 1963). The investigators have tried to derive their own predictions regarding the specific variables being studied. Both the behaviorist and the psychoanalytic oriented researchers seem to consider anxiety leading to stress as playing a central theoretic role in explaining the personality development of the child.

The Phenomena of Stress

For purpose of understanding the nature of studies of stress, it becomes necessary to see how the term stress has been defined. Lazarus
(1966) suggests that the word is clouded by multiple usages and referents. He traces the origin of the word to the field of engineering:

...in literary and colloquial usage it [stress] also means a special force or emphasis exerted on some word or idea while speaking or writing. To the engineer it means any external force directed at some physical object. The result of this force is strain, the temporary or permanent alteration in the structure of the object. Many writers in psychology and physiology have adopted this engineering convention, stress being the external agent or stimulus and strain being the resultant effect (p. 12).

He considers using stress as a generic term for the whole area of problems including the stimuli producing stress reactions, the reactions themselves, and the various intervening processes.

The term stress, then, may encompass the physiological, sociological, and psychological phenomena and their respective concepts. The study of conditions of stress could include research and theory on group or individual disaster, physiological assault on tissues and the effects of this assault, disturbances or facilitation of adaptive functioning produced by conditions of deprivation, thwarting or the prospects of thwarting, and the field of negatively toned emotions such as fear, anger, depression, despair, hopelessness, and guilt. Lazarus concludes: "Stress is not any one of these things; nor is it stimulus, response, or intervening variable, but rather a collective term for an area of study" (p. 27).

The term stress appears to have been used to define a large and complex interdisciplinary area of interest and study. Sociologically defined mechanisms of disasters and the impact on the social structure would be included under sociological stress. The effects of physical assault on the tissues and the physiological mechanisms involved would fall under the general heading of physiological stress.
Appley and Trumbull (1967) trace the initiation of the term into the life sciences to work by Hans Selye (1956). When Selye (1951) began his series of annual reports of stress research, the use of the term was accelerated (Appley and Trumbull, 1967). Since that time, the term has gained some attention and apparently some status as a research topic. Stress has been used as a substitute for what might otherwise be called anxiety, conflict, emotional distress, extreme environmental conditions, ego-threat, frustration, threat to security, tension, arousal, or by some other previously respectable terms.

It seems investigators have usually sought both a condition which produces stress and a measure which indicates its presence as the most frequent combination of circumstances in which to study the phenomenon. Cofer and Appley (1964) defined stress as "the state of an organism where he perceives that his well-being (or integrity) is endangered and that he must divert all his energies to his protection" (p. 453).

According to McGrath's (1970) historical analysis of stress research, a variety of specific definitions of stress have been offered. These definitions most often have involved the specification of a class or classes of response taken as evidence that the organism is, or recently has been, under stress. For example, Selye's definition holds the notion that a general adaptation syndrome is a particular pattern of physiological response of the organism. A special kind of response-based definition which has received considerable attention is that of stress as performance degradation.

Another type of definition of stress according to McGrath (1970) relates to stress as a situation-based concept. Frequently stress involves
the presence of certain classes of situations or situations involving cer-
tain classes of stimulus properties. Haythorn (1970), Lazarus (1966), and
Arnold (Appley & Trumbull, 1967) consider stress as an organism-environment
transaction, implying that a useful stress definition must include some
reference to intra-individual processes.

Looking at the variety and complexity of the definition of the term
stress, it is not surprising that research in the area tends to be multi-
dimensional. The most common research design of stress studies involves
the experimenter who manipulates the environment in a manner intended to
produce a response and then measures the extent and/or direction of the
produced behavior change. The manipulations are expected to produce not
just a change in the direction of ongoing behavior but a disruption of
behavior or its disorganization.

Researchers conducting stress studies generally use speed, accuracy,
errors (or some such measure) as indicators of the behavioral concomitants
of the stress situations. Related to these performance measures are what
might be thought of as their extremes -- immobilization or inappropriate
responses (Weitz, 1970).

Levine and Scotch (1970) produce an exhaustive review of literature to
emphasize that "...five major kinds of evidence can be identified to sup-
port that stress is related to and even contributes to physiological dys-
function, disease, mental disorder and socially pathological behavior"
(p. 2). The five types of supporting evidences are: 1) clinical impres-
sions, 2) laboratory studies, 3) variations in the prevalence of the "dis-
order," 4) empirical epidemiological studies, and 5) logic and common
sense. They conclude that "...psychosocial stress is a contributing factor in specific disorders" (p. 7).

The area of stress research has definitional problems. Weick (McGrath, 1970) is of the opinion that because of the pervasive nature of stress in human affairs, investigators have been tempted to use expensive definitions that incorporate stimuli, responses, and mediating processes. Lazarus (1966) contends that multiple meanings of the term "stress" exist and also that a variety of other terms are used to refer to similar phenomena. He believes in using stress as a generic term for the whole area of problems that include the stimuli producing stress reactions, the reactions themselves, and the various intervening processes. In this way, Lazarus (1966) suggests that the term would incorporate the physiological, sociological, and psychological phenomena and their respective concepts. "Stress" to Lazarus (1966) is "...a universal human and animal phenomenon, results in intense and distressing experience and appears to be of tremendous influence in behavior" (p. 2).

In spite of the voluminous research on stress in recent years, the study of stress, especially of the social and psychological aspects of human stress, is still in a fairly primitive state. The techniques for measuring stress and its effects are as yet crude, far less advanced, for example, than the ability to measure intelligence or perceptual skills or abilities. A standardized behavioral profile of children under stress could be a useful instrument for the teacher and for the clinician as well as for the child-developmentalist in any position to understand and plan for children.
Stress research in its present state is not applicable to the solution of operational problems. Examples of these problems deal with questions relating to the predecessory of stress or defining the behavioral modifications made under stressful conditions. What seems to be lacking is a proper knowledge of the "affective" state of stress.

McGrath (1970) reporting on a three-day conference on stress, concludes that there is a "...need for stress research that uses multiple stress conditions and multiple measures of stress effects" (p. 349). Research needs to be designed to study a variety of stress provoking conditions involving the cognitive, social, and motor areas of development. Such studies also open the door for investigation of several key issues regarding stress. A multitrait, multimethod research design of different measures of stress effects would give insight for personal correlates of sensitivity to particular kinds of stress conditions. Such a design also would make it possible to examine divergent patterns of stress response and to search for personal correlates of coping patterns. In this way, knowledge of the human coping patterns and behavior styles may be clarified.

It is assumed in psychotherapy, especially through the emphasis of Freud and his followers, that frustrating experiences generate and provoke expression of hostility (Lerner, 1941). It can be assumed further that this psychotherapeutic principle can be turned into a more positive form. Frustrating experiences and the subsequent behavior may serve as a basis for differential diagnosis and prognosis in the study of normal children's personality organizations.

Idiosyncratic observations of children under frustrating or stress provoking experiences may prove to be very useful for the clinician inter-
ested in the study of "why" and "how" of children's behavior. Lazarus (1966) believes, "There is a developmental progression in motives and in the kinds of techniques available for coping with stress" (p. 22). He implies that the stress reaction would vary during different developmental periods. It would seem appropriate, therefore, to study the affective behavior expressed by a child during a cognitively oriented test situation which is likely to be stress provoking.

There is a growing realization that the personality is an active, dynamic process of organizing life experience and that the individual reacts affectively to the meanings of situations and people as the individual idiomatically sees and feels them. This realization has led to an increasing interest in explorations for methods and procedures designed to reveal the patterns of personality development (Murphy & Lerner, 1941; Murphy, 1962, 1964). The customary method of constructing a standardized test is to statistically validate and check for reliability for each chronological age group and the socially sanctioned norms of performance. Such a procedure appears to offer little help in devising methods for revealing the individual's idiosyncratic pattern of action and feeling. Therefore, the present investigation will involve the development of an instrument to measure the affective behavior of preschool children under stress.

In even a brief review of current research on stress, certain factors become explicit. Even though there is an abundance of work done on stress per se, there is very little that would serve a functional or operational purpose. The present need seems to be for work which is multitrait, multi-method in nature. The present study is planned with the hope that this need can, at least in part, be realized. Though this study emphasizes a
particular aspect (i.e., cognitive experience under conduction of stress), it is hoped that other stress studies involving observation of motor and social tasks will follow. Such a series of studies will increase the possibility of acquiring a more accurate picture of the behavior styles of children under stress in a variety of life situations.

**Statement of Problem**

The purpose of the present study is two-fold:

1. To develop a behavioral rating inventory related to the performance of five-year-old children under varying conditions of stress.

2. To study the relationship between five-year-old children's behavior under varying conditions of stress across mental age and sex of the child.

**Operational Definitions**

1. Behavioral Rating Inventory: Grouping or classifying behavior in a series of steps or degrees according to a standard of relative actions, specifically non-verbal, observed under standardized stress producing conditions. Specifically an instrument with a certainty scale component delineating adjectival word groups describing behavior.

2. Stressful Situation: Standardized situations involving strain and pressure which produces resistance, a situation preventing a person from attaining his goal or finding a solution to a problem. Specifically a situation involving performance on the form-board frustration puzzles following the completion of the Stanford Binet Intelligence Test.
3. Mental Age: Mental age as measured by the Stanford Binet Test of Intelligence, 1960 revision.

Hypotheses

The theoretical null hypothesis states that behavior is unrelated to the type of activity independently of mental age and sex. Subhypotheses are: (a) that behavior is unrelated to sex independently of mental age and (b) that behavior is unrelated to mental age independently of sex.
Considerable research has been stimulated by many investigators of stress and related areas. The present chapter reviews some of these studies in the area of stress with specific attention directed to factors like intelligence, sex, and the effect of stress on performance in general. In the past two decades, behavioral and social scientists have moved toward the development and use of standardized instruments to measure various aspects of human behavior. However, in the pressure to quantify certain aspects of human behavior for such scientific investigations, the essentially human qualities of the person seem to be deemphasized and at times forgotten. A review of the literature seems not only to reflect this pressure but also to reveal an ambiguity in research findings in the field.

Three different areas will be reviewed: the general effect of stress on performance, the effect of intelligence or abilities on the mode of individual's reactions to stress, and the effect of sex differences in the adjustment to stress. It has been essential to go into allied topics like aggression, frustration, and anxiety studies to get a comprehensive picture of the field.

**Effect of Stress on Performance**

There does not seem to be much direct attempt made in studying the effect of stress on performance. Lazarus and Eriksen (1952) studied the effect of stress on the performance of a task. They examined the nature of the effect of failure-stress upon a digit symbol test performed by university sophomores. The subjects in the sample, comprised of 115 subjects in the experimental group and 73 subjects in the control group, were given an
intelligence test. The subjects were told that the test was an excellent predictor of college success. Following the intelligence test, the extended version of Form 1 of the Wechsler-Bellevue digit symbol sub-test was given. Subjects in the experimental group were told that they had performed poorly and needed to take a second test. Subjects in the control group were told that they had performed well, but to verify this, they would be given another test. Form 2 of the digit symbol test was eventually administered to both groups. The attitude of the examiner was strict and unapproachable with the experimental group but friendly with the control group.

The experimental group variance on Test 2 was significantly higher than on Test 1 (F = 2.6, p<.01 for experimental; F = 2.0, p<.02 for control). The study indicated that the effect of stress upon performance varies with the individual. The performance of some subjects under stress is little affected whereas the performance of other subjects shows large improvement or decrement. Subjects with high academic standing did better under stress (N = 26, Mean Stress Score = +6.5) than did those with low academic standing (N = 26, Mean Stress Score = -2.4, t = 2.97, p<.01).

In another performance study with adult subjects, 96 female undergraduate students were given a task consisting of 15 anagrams. The purpose of this study by Feather (1966) was to investigate the effect of prior success and subsequent performance. The study was designed so that half of the subjects failed (initial failure) and half succeeded (initial success) at the first five anagrams. The initial failure group were told that the anagrams they received were easier than those received by most others. The members of this group, then, were the "high expectation" subjects. The
members of the initial success group were told that they had anagrams which were more difficult than those received by most others. These were the "low expectation" subjects. All subjects rated their chances of success before attempting each anagram.

Measures of achievement were secured by an experienced scorer, and the subjects also completed a Test Anxiety Questionnaire (TAQ, Mandler & Sarason, 1952). Results showed that mean performance on the last 10 anagrams was significantly ($p<.01$) lower after initial failure than after initial success. Success oriented subjects made more "typical" changes in probability estimates in the success condition. Failure oriented subjects made more of these typical changes in the failure condition. The main effect of initial experience was highly significant ($F = 40.52, df = 1/64, p<.001$). The overall mean probability estimate for subjects who experienced initial failure ($m = .34$) was significantly lower than the overall mean probability estimates for subjects who experienced initial success at the task ($m = .65$). Performance scores correlated positively with initial probability estimates in the high expectation initial success group.

Smock (1955), hypothesizing that individuals under psychologically stressful conditions tend to become intolerant of ambiguity, worked with a total sample of 145 male and female university students. As a screening device, students were administered the Differential Aptitude Test (DAT) and the Gottschaldt Figures Test. All subjects who fell beyond 1 SD of the group mean on the DAT and beyond 1.5 SD on the Gottschaldt Tests were eliminated from further consideration. The final sample was comprised of 90 subjects of whom 80 were assigned at random to one of the two experimental groups.
The experimental task designed to measure intolerance for ambiguity consisted of stimulus configurations which were totally ambiguous (e.g., half-man half-woman figures). Five such stimulus tasks were constructed. These were administered in such a way that all subjects would not experience the same degree of stress.

The analysis of variance for the scores for the trial of first response suggested a strong tendency for the faster response to be associated with the stress group; the probability level was between .10 and .05 level (1 df F = 3.88). An F ratio (23.41, significant at .001 level) for the group effects was found to support the hypothesis that psychologically stressful conditions influence the number of trails required for correct recognition of the completed stimulus figure. In short, the study showed that anxious individuals tend to resolve ambiguous or unstable situations through premature structuring and closure.

The inverted-U hypothesis has been proposed by different scientists, Courts (1942), Duffy (1957, 1962), and Malmo (1959). This is based on two rather loose empirical generalizations: a) tasks involving relatively stronger and more numerous competing responses are more subject to the impairing effect of stress and b) increasing stress results in improved performance up to a point and impairment thereafter. Sometimes performance is impaired, sometimes facilitated, sometimes there is increased inter-individual variance.

This inverted-U hypothesis has lately been tested by Martens and Landers (1970). They attempted to determine if the inverted-U hypothesis is supported by studying the relationships between a novel motor task under three levels of arousal created by psychological stresses, three levels of
trait anxiety determined by the children's form of the Manifest Anxiety Scale and the interaction between these levels of arousal and trait anxiety.

Over 1,000 junior high school boys were given the children's form of the Manifest Anxiety Scale. Thirty subjects scoring in the upper 10 percent, 30 subjects scoring in the lower 10 percent, and 30 subjects scoring at the mean constituted the high-, low-, and moderate-anxiety groups. A 3x3x2x5 factorial design (three levels of anxiety, three levels of stress, two experimenters, and five trials) was used. The 30 subjects within each anxiety group were randomly assigned to the stress conditions, making 10 subjects per cell. The task used involved the tracking of a ring along a tube which it encircled without making contact. As measures of stress, arousal heart rate and palmar sweat were used.

An anxiety by stress by experiment by trials (3x3x2x5) analysis of variance revealed significant stress main effect ($f = 26.30$, df = 2/72, $p<.01$). The results showed that subjects in low-stress treatment groups were significantly poorer in performance than subjects in the moderate-stress treatment group ($f = 4.95$, df = 2/72, $p<.01$). The moderate-stress treatment group also was significantly better than the high-stress treatment group ($f = 50.27$, df = 2/72, $p<.01$). A significant anxiety mean effect was obtained ($F = 3.51$, df = 2/72, $p<.05$). The inverted-U hypothesis was supported separately for three increasing levels of trait anxiety. Similar observations with motor tasks have been made earlier by Matarazzo et al. (1955), Boren and Storms (1961).

In order to get evidence for hypothesizing a relationship between frustration-aggression and performance, Elbert and Ulrich (Ulrich, 1966) observed four 10-year-old subjects. Three of these were male, one female.
Each subject was given the task of stacking 10 bottle stoppers into two stacks of five each. When the subjects completed this task successfully, a dime was delivered as reinforcement.

At the beginning of the experiment, the task was explained to each subject. In addition, the subjects were told that another hypothetical subject in another room was engaged in the same task. The hypothetical subject supposedly had in his room a button which he could push, causing the top of the subject's table to vibrate, upsetting his stack and depriving him of reinforcement. The actual subject also had a button which he could press, supposedly to shake the hypothetical subject's table. Presses on this button were registered on a cumulative recorder and counters in an adjoining room. After the subject's stacking behavior was well established, the experimenters who observed the subject from behind a one-way mirror would occasionally introduce vibrations of the table.

In all cases, aggressive responses increased after the vibrations were introduced. A wide variation from subject to subject in button pressing rate both before and after the vibrations was noted. Casual observation indicated that one subject, who showed very low rates of button-pressing, was most aggressive toward inanimate objects in the environment. Also, some of the children indicated in interviews conducted after the session that they had not pushed the button as much as they would have liked, since they had been taught that such behavior was wrong.

Working with younger children, Mallick and McCandless (1966) gave eight- and nine-year-old boys (N = 30) and girls (N = 18) a simple construction task in order to earn money. Two kinds of stresses were used here. Besides the peer's "inadvertently clumsy" behavior which prevented
some of the subjects from completing their assignment, the frustration coupled his interference with sarcastic remarks. Various aggression measures were obtained in three investigations carried out: number of electric shocks administered to the peer, number of presses on a button that supposedly could interfere with the peer's work, and questionnaire ratings of like or dislike of him. For each of these measures, the frustrated subjects exhibited stronger aggression than did the unfrustrated controls. The analysis of the transformed aggression scores showed the frustrated subjects significant at .01 level (MS 1.15, df 1/8, f = 15.10). Frustrated subjects manifested greater hostility than non-frustrated subjects, but neither the sex of the subject nor the type of interpolated activity resulted in differences in amount of hostility.

Miller and Swanson (1960) studied the expressive styles of children while attempting to resolve conflict. These styles are typically depicted by adjectives like "rigid," "neat," and "diffident." On the assumption that expressive styles are relatively enduring aspects of people's personalities, it was anticipated that individual stylistic differences among subjects would affect methods of resolving conflicts. As one part of their extensive study, Miller and Swanson chose to analyze behavior of 96 male pupils from seventh through ninth grades. They made reality powerful by insuring that each subject would fail a series of problems which he was strongly motivated to solve successfully. The tests involved were two sets of story beginnings. Both sets were more or less parallel with respect to content. All story beginnings culminated in failure. First story was in the area of achievement, second in the area of social acceptance, and the
third about job failure. One of the eight different orders of stories was randomly selected for the six stories.

Among the many findings was that bright boys (as measured by Chicago Test of Primary Mental Abilities) react differently from boys of average intelligence to the threat of failure. The higher the intelligence of the subjects, the less frequent was denial, and the endings to the stories they wrote were more realistic. Those with less verbal intelligence defended themselves by increasing denial in fantasy ($N = 96, X^2 = 4.52, p<.03$).

Using Lerner's "blocking technique," Otis and McCandless (1955) found that even very young individuals have certain characteristic modes of dealing with problems with which they are confronted. Working on a prediction that other than aggressive responses would decrease in strength and/or number during prolonged or repeated frustration whereas dominant aggressive responses, being frustration reducing, would increase in number and/or strength. Two classes of behaviors were established, dominant-aggressive (Ag) and complaisant-submissive (Su).

The "blocking technique" used here was such that it provided standardized, mild, repeated frustration but did not appear to involve the children beyond a minimal level. A pretested manual of scoring for frequency and intensity of Ag and Su scoring was used by a total of five different observers (Os) for three experimental groups A, B, and C. Subjects were children enrolled at the Laboratory Preschools of the Iowa Child Welfare Research Station Group A, (average age 62 months) comprised of older children, Group B, (average age 52 months) the younger children. A subsection of the study included Group C, (average age 54 months) made up of children
all new to the Preschools. A total of 63 subjects (31 boys, 32 girls) was approximately evenly distributed by sex and number in Groups A, B, and C.

While there were no significant differences in Ag or Su between Groups A and B, Group C children new to preschool showed significantly less Ag and significantly more Su than either Groups A or B.

One of the assumptions of a study conducted by Reubush, Byrum, and Farnham (1963) was that test anxious and defensive children differ most fundamentally in the ways in which they defend against anxiety or the predisposition to anxiety. The study employed the Defensiveness Scale for Children (DSC) as the measure of defensiveness. The DSC is composed of 11 Lie scale items which were previously embedded within the general anxiety score for children plus three items designed to measure the tendency to deny the experience of negative feelings such as anxiety, guilt, and inadequacy. Also, the Test Anxiety Scale for Children (TASC) as the measure of anxiety was employed. The sample of 32 fifth grade boys was selected from a population of 299 boys from nine elementary schools of suburban Minneapolis-St. Paul. Those boys who had an IQ score between 100 and 120 on the Lorge-Thorndike Intelligence Test were selected as the sample for the study.

Two tests were employed; one was both the regular and the extension forms of the Porteus Maze Test and the other was a Jigsaw Puzzle Test - a 75-piece jigsaw puzzle map of the United States. Cross comparisons between the Low Defensive (LD) and the High Defensive (HD) subjects were made. The analysis of variance was employed for the statistical analysis. The analysis yielded a statistically significant mean effect of defensiveness (p<.05). The difference of 1.07 errors between the mean difference scores of LD and HD boys is statistically significant (t = 2.77, p<.01). This
indicated that the qualitative performance of LD boys would be superior to that of HD boys on the Porteus Test.

The mean puzzle time scores for the Jigsaw Test was 20.19 minutes for HD boys and 16.31 minutes for LD boys. Though this difference of 3.88 minutes is in the predicted direction, it only approached statistical significance (t = 1.33, p<.10). The findings support that discrepancy between ability and performance in defensive boys seems to be a function of the type of problem solving behavior required by the task.

Failure was found to be a negative reinforcer in children with a high anxiety level in a study by Marlett and Watson (1968). These researchers studied a group of 220 ninth grade males between the ages of 11.5 and 16.5 years with Otis and Dominion IQ Scores between 99 and 124. The anxiety scales for the subjects on Alpert-Harber Test Anxiety Scale ranged from 1 to 17; the possible range being 1 to 18. From the groups scoring more than 11 points and less than 5 points, 56 subjects were randomly selected, 28 in the high anxiety (HA) and 28 in the low anxiety (LA) conditions. Within the HA and LA groups, subjects were randomly and equally divided into two experimental conditions, delay and no delay. There were 14 subjects in each of the four cells.

Each subject was given a problem to solve and told that it was a test to evaluate his IQ. The problem was to find two buttons, one after the other, which will stop a particular buzzer from sounding. In the immediate feedback condition, the subject heard the buzzer immediately. In the other conditions, a feedback delay was manipulated. Prior to test, two palmar sweat index prints were taken. After 12 failure trials, again palmar sweat prints were taken.
There was a large initial difference between HA and LA subjects. The analysis of variance of the data for trial 1 indicated a significant difference between the anxiety groups ($F_{1,52} = 8.09, p<.01$). Also the delay in reinforcement was found to bring about slower responding with children. The delay-no delay condition had a significant effect ($F_{1,52} = 7.91, p<.01$). In short, in the LA subjects, the experience of failure increased the tendency to respond, to cope with the failure, while for the HA subjects the experience of failure increased the tendency to avoid the situation.

Prior to this study, somewhat parallel observations were made by Barnard, Zimbardo, and Sarason (1961) and Zimbardo, Barnard, and Berkowitz (1963). In their observations, studies relating anxiety to task instructions suggest that high anxious children tend to perform on tasks as if they were evaluative situations, regardless of how the task is introduced. Also low anxious children have been found to show less achievement behavior and task evaluation under permissive instructions, although when the task itself involves clear standards for successful or unsuccessful performance, non-evaluative instructions quickly seem to lose their effectiveness.

**Intelligence**

One of the prevalent areas of research deals with the effect of stress on the individual's intelligence scores. Hutt (1947) conducted a clinical study of "consecutive" and "adaptive" testing with the Revised Stanford Binet in order to investigate the relative effects upon IQ. The "consecutive" procedure involved the administration of the Stanford Binet Test in the usual serial testing method terminating with six consecutive failures. The "adaptive" procedure involved beginning with an exceptionally easy item.
and then onwards alternate "easy" and "hard" items. The "serial" testing starts after the subject has "warmed up."

These methods were applied to a total population of 630 subjects (mean age 132.2 months). From a comprehensive clinical data available on 493 of these 630 children, a total of 57 subjects (24 maladjusted children and 33 well-adjusted) were chosen for further analysis.

The adaptive method which produced greater psychological support resulted in higher average IQ's for the maladjusted group. No difference between the two testing methods was found for the well-adjusted group. The analysis of variance for the overall difference between the two methods was significant at .05 level.

Messer (1970) manipulated anxiety over the quality of one's intellectual performance and tried to explore its effect on the tendency to be reflective or impulsive. In this study, the subjects were 60 third-grade boys. Sets of three subjects were matched on the Kuhlman-Anderson IQ Test (Form CD). Average IQ was 111. Twenty subjects each were randomly assigned to one of the three condition groups in which the task was a memory task with 25 anagrams. Condition one was that of anagram failure; the subjects were given a difficult task and were made to feel inadequate when they failed. Condition two was a success experience. The subjects were introduced to the task in a straightforward way and were able to recall appropriately. Condition three involved no manipulation of the task, and subjects were introduced to task immediately.

The subjects were scored on a special scoring system devised for free recall aspect of the memory test. An analysis of variance was employed on the free recall and elicited recall mean scores for each of the treatments.
A one-way analysis of variance revealed significant difference among conditions ($F = 7.13, p<.01$). Individual means further revealed that subjects in Anagrams Failure condition had significantly lower mean score than subjects in either of the control conditions ($1$ vs. $3$, $p<.01$; $1$ vs. $2$, $p<.0005$).

Between each of the treatment conditions, $t$ test comparisons revealed that subjects in the Anagrams Failure treatment condition did significantly more poorly than subjects in both the Anagrams Success condition ($t = 2.39; p<.005$) and the No Manipulation condition ($t = 1.81; p<.05$). In short, failure tended to result in a lowered elicited recall.

Support for the findings in this study also are reported by the author (Messer, 1970) in two similar experiments which he conducted and by Ward (1968) where he found that decision time on a task to be greater after failure than following success.

Using two different procedures, Zigler and Butterfield (1968) administered the Stanford Binet Intelligence Test four times to 69 children. Of these 69 children: 35 children from the lower-income group were randomly divided into a Standard Optimizing (S-O) test procedure group ($N = 19$) and a Standard-Standard (S-S) group ($N = 16$); 15 upper-lower-class children comprised a group of 10 children in S-O procedure and a group of 5 children in S-S procedure; and 19 children from lower-lower class were divided into two S-O group ($N = 12$) and two S-S group ($N = 7$). The S-S procedure mentioned here involved a standard neutral though friendly attitude of the examiner toward the children. The S-O condition subjects were exposed to a special procedure employed to heighten the children's motivation to
respond correctly to the intelligence test items while not giving them test relevant information.

The Stanford Binet Test Form L-M was administered in the spring. S-O procedures were employed for all four examinations of the S-S condition subjects and for the first fall and first spring examination of the S-0 condition subjects.

In addition to other findings, this study indicated a significant mean effect for condition (F 1/46 = 7.07, p<.025). A direct different t test showed a significant increase in IQ from the first to the second fall standard testings for all S-S condition subjects combined (t_{18} = 3.28, p<.01). The study showed that for all subjects the increase in IQ in the fall was greater from a standard to an optimizing condition than from a standard to a standard condition.

**Sex Differences**

Major factors distinguishing between behavior and the extent of participation between sexes are aggressive activities. Studies of sex differences in children's aggression have shown boys to be more aggressive than girls when direct physical aggressive responses are assessed. It is clear that role demands placed by the culture upon boys and upon girls are a major source of sex differences in behavior (N. Feshbach, 1969; Feshbach & Sones, 1971; Sears, 1961; Mallick & McCandless, 1966). Oetzel (1966) is of the opinion that sex differences in aggression appear to be present at the age of two and to persist into adulthood.

Haan (1963) observed significant differences between the two sexes. She proposed a model of ego functioning in relationship to IQ change. Her
study was with adult subjects and was part of the Oakland Growth Study. The subjects were 49 males and 50 females who participated in the earlier study when they were between 12 and 18 years of age (Jones, Mcfarlane, & Eichorn, 1959). The measure of IQ was developed from two administrations of Terman Group Test of Mental Ability. Beside IQ, the subjects' socio-economic stature, childhood family size, and some selected adolescent personality variables also were considered. The IQ change measure was obtained for each subject by subtracting the 1933 rank from the 1955 rank and adding a constant of 100. The subjects were interviewed in accordance with a schedule and were rated by the interviewer on ego mechanisms. The Ego Mechanisms were made up of Defense Mechanisms and Coping Mechanisms. The Defense Mechanisms were defined by a list of characteristics ranging from rigid, automated, and stimulus-bound behavior to behavior allowing impulse gratification by subterfuge. Six such categories were listed. Coping Mechanisms were defined by another set of six categories ranging from flexible, purposive behavior to the type that allows forms of impulse satisfaction in an open, ordered, and tempered way.

The highlight of the findings was that male subjects rated significantly higher than female subjects on a number of Coping Mechanisms and general Ego Mechanisms. This was primarily true when the area of cognitive functioning was considered. Impulse transformation was the only mechanism from the impulse economics section of the ego that differed for the sexes. In short, intelligence was found to be positively related to Coping Mechanisms and negatively related to Defense Mechanisms for both men and women. However, coping was generally related to IQ acceleration and defense to deceleration. Men were generally more accelerative in the various kinds of
intelligence than women. Male accelerators were generally coping in an expressive manner, whereas female accelerators were coping in a controlled manner but had neurotic types of defenses as well.

There is some evidence that girls appear to be more afraid of failure and become more disorganized by it than do boys. Moriarity (1962) observed structured test behavior of 32 children of preschool age. The purpose was to study the individual coping styles of children placed in a test situation requiring cognitive achievement with the difficulties and failures intrinsic in the test sessions and experiencing mild but continuous pressure from an unfamiliar adult. These children, matched for age and sex, made up the preschool sample of the Coping Project, a study under the direction of Murphy (1962).

Coping styles were examined with reference to objective standards of the effectiveness in handling the environment, i.e., the child's response to and use of environmental demands. The other aspect observed was with reference to assumptions or observations of his own inner equilibrium, i.e., his own resources for maintaining and defending internal integration when under stress. Standardized testing procedures were adapted. Initially subjects were asked to draw with crayons whatever they pleased. Following this, each child was given Form L of the revised Stanford Binet and the Merrill-Palmar Performance Test. Notes were made on each session with the intention of recording accurately and as fully as possible exactly how the child behaved.

The behavior was rated on a 10-point scale with regard to 11 variables in four different aspects or parts of the test: a) initial orientation,
b) verbal items, c) performance items, and d) in response to the challenge or frustration aroused by difficulty or failure.

Among their many observations, interesting sex differences were observed in the speed of orientation. The ratings showed that girls were more likely than boys to orient themselves quickly or to become more rapidly aware of meanings and implications of the testing situation at the onset when both the situation and the examiner were new. Boys were found to be more likely than girls to respond to the challenge of cognitive difficulty by an increase in their integrative efforts.

Also when it came to sex difference in expression of autonomy, girls seemed to be able to meet newness and unfamiliarity in ways consistent with their own personality patterns without much overt sign of stress, whereas boys appeared to move into a new structured situation more slowly, but once involved in it, increasing difficulty served as a challenge to alertness and to achieve maneuvers to stay in command of the situation. In short, the point made here was that boys tended to be challenged by difficulty and increased alertness, whereas girls made less direct effort to handle difficulty.

This finding is consistent with the results of McClelland et al. (1953) that among women the level of achievement motivation (as reflected in TAT stories) is not affected by "arousal" treatment involving academic competition, while among men it is increased. Also, Harmatz (Maccoby, 1966) in his study with college students found that when women were working on a fairly difficult task and were told that they were not doing well on it, both their level of aspiration and their performance declined, as compared with a control group of women who did not receive this negative feedback.
Murphy (1962) makes a comparable observation in her work with nursery-school-age children. She found that during an intelligence test experience when confronted with difficulty, a larger number of boys became more active in expressing autonomy, while girls tended to become more passive.

Crandall and Rabson (1962) investigated the age, sex, and personality differences associated with young children's (N = 59, ages 3 years to 9 years) repetition choices following success and failure in an intellectual achievement situation. These subjects came from the families who were members of the Fel's Research Institute's Longitudinal Study.

The subjects were divided into two groups: the Nursery School Group comprised of 30 three-, four-, and five-year-olds and the Older Group comprised of 29 six-, seven-, and eight-year-olds. The repetition choice experiment was administered to the children in individual sessions. Two seven-piece wooden puzzles were presented in random order to the child (both puzzles were approximately equal in difficulty).

Success and failure was manipulated by allowing each child to complete one of the two puzzles (success experience) and by calling time and removing the other puzzle before the child could complete it (failure experience). As soon as one success and one failure experience was over, the child was asked to choose the puzzle he preferred to work on a second time. His response (repetition choice) was recorded for analysis.

The repetition choices of the Nursery School Group children were compared with those of the Older Group children. A chi square of 2.66, p<.10, indicated a trend for the older children to prefer repeating the previously failed puzzle rather than the successfully completed one. However, an interesting sex difference was noted. The repetition choices of the total
sample of boys vs. girls showed the boys preferred returning to the previously failed puzzle more frequently than the girls (chi square of 6.69, p<.01). The study showed more pronounced sex differences than age differences. The girls more often chose to avoid potential failure and sought satisfaction where they had previously experienced success; the boys were more willing to risk failure in order to ultimately master a task on which they had previously failed.

Contradictory results have been observed in a study which differs only slightly from the Crandall and Rabson (1962) investigation.

In the process of studying the effects of frustration on perceptual-motor tasks, Solkoff, Gibson, and Chandler (1964) observed considerable sex differences in their subjects. Three experimental situations were provided: high frustration, low frustration, and no frustration (HF, LF, NF, respectively). Each subject was given the coding sub-test from the Wechsler Intelligence Test for children and then subjected to one of three experimental situations. Children assigned to the high frustration (HF) situation were given a marble game with a prize to be gained at the end. However, they were interrupted before completion of the task so that the prize was not obtained. In the low frustration (LF) group, subjects played a game for a short time and were interrupted. These subjects (LF), however, had no knowledge of a prize lost or a goal unachieved. No frustration (NF) group subjects were taken out of the room for a short time and played no game. All subjects then repeated the coding sub-test. The subjects were 42 boys and 42 girls aged five to nine years.

Results showed a decline in coding performance in boys under high frustration and slight improvement under no frustration. Against that, the
girls improved under high frustration conditions. The sex-by-condition interaction was significant. Prior to the initiation of the experimental conditions, there was no significant difference in the coding performance between males and females. In addition, there was no initial performance difference among any of the experimental groups for either sex.

An analysis of the means of treatment by level of design showed that the main effect of frustration was not significant, whereas the interaction between degree of frustration and sex was significant (p<.01). The degree of frustration significantly affected the performance of only the boys (p<.05). Comparisons among the three male groups (HF, LF, NF) showed a significantly (p<.01) greater decrement in performance for the HF than LF and lower performance level for the LF than the NF group.

The treatments did not significantly differentiate among the performance levels of the girls. However, in cross comparisons between the two sexes, males showed a significantly (p<.01) greater decrement in performance under high frustration. Under no frustration, females showed a performance decrement, while the boys improved (p<.05).

**Conclusion**

The present review of research in the area of stress and associated topics seems to indicate the extensive scope of recent work in this area. Apparently the area has been subject to study for the last three decades, and most of the stress studies _per se_ were conducted primarily in the 40's and 50's. What seems to be of current interest to the behavioral scientists are the allied areas of stress such as frustration-aggression and anxiety. However, there seems to be a good deal of ambiguity of the defi-
nitions of terms and the methods of study. Regardless of the definitions researchers have evolved and the tools or procedures adopted, the findings do seem to indicate that the behavior of subjects under stress or stress-like conditions varies from situation to situation. Apparently the idiosyncratic traits of the individuals, their sex, and other abilities and intelligence potentials influence the behavior in varying degrees.

What seems to emerge here is a need for an instrument to observe behavior of children under stress with a view to investigating variations in behavior under different conditions of stress.
Method and Procedure

Research Design

The aims of the present study are to investigate behavior styles of five-year-old children under varying conditions of stress and to develop a behavior rating inventory related to the behavior styles. The specific variables under investigation are behavior styles, intelligence, and sex of subjects. Part of the standardization of the stress situation involves the administration of the Stanford Binet Intelligence Test, 1960 revision. In addition to providing a measure of mental age, one of the variables under investigation, the Stanford Binet Intelligence Test, is thought to produce a somewhat fatiguing experience for the subjects.

Upon the completion of Stanford Binet (point at which subject experiences six consecutive item failures), two frustration form boards are presented one at a time to the child. The first form board is termed the Easy Puzzle and, although it is easy in nature, it is likely to provide a mild degree of stress since it follows an experience of failure (Stanford Binet). The second form board, Difficult Puzzle, is difficult in nature though simple in appearance. It is presumed that the subjects may experience greater stress on the Difficult Puzzle than on the Easy Puzzle.

The children's behavior under the varying conditions of stress are recorded in a series of motion picture episodes for later cinemanalysis. Thus opportunity for prolonged and intensive observations of the behavior is provided from which is developed a behavior rating inventory consisting of adjectival descriptive phrases. Judges trained in the use of the rating
inventory rate the film episodes for behavior differences between children's performance on the Easy and the Difficult Puzzles.

Subjects

The subjects of this investigation are children from the four groups of the Laboratory Nursery Schools and Kindergarten under the jurisdiction of the Department of Child Development at the Iowa State University. Those children who ranged in age between four years seven months and five years six months were selected as potential subjects for study. Of the 32 children who fell into this age group, 23 children comprised the final sample.

For the purpose of having a socio-culturally homogenous sample, only white Caucasian children of American origin were selected. This eliminated four children of whom one was Greek, another Spanish, one Oriental, and one Black American. Two children known to have clinical histories of personality adjustment and physical problems were eliminated from the sample as well as a third child who refused to accompany the examiner to the testing room.

The parents of one child refused permission to include him in the study while another child was eliminated due to having taken the Stanford Binet within the past six months. Of the remaining 23 children in the sample, 9 were girls and 14 were boys. The age and sex distribution of subjects can be seen in Table 1.

Instruments

Stanford Binet

The 1960 revision of the Form L-M of Stanford Binet Intelligence Test was used as a standardized pretest experience. This 1960 revision of
Table 1
Age and Sex Distribution of Subjects

<table>
<thead>
<tr>
<th>Age (months)</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>56-58</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>59-61</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>62-64</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>65-67</td>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>

Range: 56-67
Mean: 62.1
Total: 14 9

Stanford Binet is believed to perform even more dependably the functions that have come to be expected of this test (Smith et al., 1966). The revision also is believed to have a better coverage at the lower end of the scale and a more reliable assessment of the extreme ranges of intelligence (Freides, (Buros, 1960). The test has a correlation of .61 at the preschool level 2-6 through 5 (Terman & Merrill, 1962, p. 33). The reliability is further increased by reason of the high level of biserial correlations between individual sub-tests and the total.

The Frustration Form Board Puzzles (Figure 1) were developed by Susan Doak (1968) as a part of her master's research in the Department of Child Development. The form boards are designated as Easy Puzzle and Difficult Puzzle. To induce stress, it is essential that frustration be experienced, and the more difficult of the two puzzles had been found to be effective in this respect by Doak. Applying the criterion of failure after success, Doak (p. 77) found that only 5 out of a total of 40 children could success-
Figure 1. Puzzles used in stress-inducing situation

Top Row: Easy Puzzle: puzzle in completed form on left with puzzle base in middle and form on right

Bottom Row: Difficult Puzzle: puzzle in completed form on left, puzzle base in middle and form on right arranged according to peg alignment
fully complete the Difficult Puzzle. In fact, most of Doak's subjects verbally expressed their inability to do so.

The Easy Puzzle has six forms of approximately the same dimensions but in two different shapes--circles and triangles. There are three holes in each form which is placed on an arrangement of three pegs. All the triangles fit onto any of the sets of pegs for triangles in any position, and all the circles fit onto any of the sets of pegs for circles in any position. In order to make this puzzle as easy as possible, narrow lines on the base of the puzzle outline the forms around each set of pegs.

The Difficult Puzzle, which is more difficult to complete, appears almost identical to the Easy Puzzle when all the forms are in place. The circle forms are the same shape and size as those of the Easy Puzzle, however, the triangle forms are almost, but not exactly, unilateral. For each form of the Difficult Puzzle, the pegs and holes are arranged in a slightly different format. The three pegs and matching holes no longer form an equilateral triangle but are slightly askew. Each form fits only onto its respective set of pegs and must be turned in a certain direction in order to fit onto the base. No outline of the forms are present on the base of the Difficult Puzzle.

The administration of the frustration form boards are the same for both puzzles. Seated at a table at right angles to the subject, the examiner says:

"I have two puzzles I want you to try." (Present the Easy Puzzle first positioning with triangles as the bottom row toward the child.) "Watch what I do." ( Examiner places between puzzle base and subject, removing top row first and placing the forms in order; the bottom row is then removed from the puzzle base and placed below the top row of forms.) "Now put them back onto the pegs."
After the subject completes putting the forms back on the puzzle base, the forms are removed from the pegs in the manner originally described, and the base is rotated 180 degrees. The subject is asked again to put the forms back onto the pegs.

At the end of the completion of the Easy Puzzle, the Difficult Puzzle is presented. The subject is shown the puzzle in completed form, and the forms are removed from the pegs in full view of the child. This time the form board is rotated immediately, and the subject is asked to place the forms onto the pegs.

Test may be terminated when the child makes a verbal decision to stop, verbally requests to stop, or indicates that the puzzle is difficult and answers "yes" to the question, "Would you like to stop now?". A simple statement, "This is hard," is not construed as a request to terminate. The child is allowed to continue working on the Difficult Puzzle as long as he is interested.

The examiner does not verbally encourage the child but may share his pleasure of accomplishment by smiling in response to the child's smile when he successfully places a form. Questions unrelated to the puzzle are answered as simply as possible, but the examiner avoids making the child feel that no communication is possible.

**Procedure**

**Test Administration**

The 23 subjects were tested individually in random order. In the few cases when a child was not available when he was scheduled to be tested, the next child in order was taken, and the unavailable child was tested.
later that day or next day. The first part of the test situation was comprised of the administration of the Stanford Binet. The test was administered individually according to manual instructions (Terman & Merrill, 1962) by a trained psychometrician qualified in the administration of this test. At the termination of the Stanford Binet Test (six consecutive failures), the frustration form board Easy Puzzle was presented followed by the Difficult Puzzle. Both form board puzzles were administered following the established procedure.

**Recording Behavior Episodes**

As soon as the examiner instructed the child to place the forms on the pegs on the Easy Puzzle, filming began. Performance on both the Easy and the Difficult Puzzles were recorded by the use of Bolex H 16 Reflex 5 camera placed in an observation booth adjacent to the examining room. A one-way vision mirror allowed for the filming without the subject's awareness of the camera and operator.

From consulting Doak's work, it was expected that the subjects would not require more than two or three minutes to complete the Easy Puzzle. Doak also reports in her study (N = 40) that the five children who were able to complete the Difficult Puzzle took about 20 minutes to do so. Therefore, it was decided to film the entire performance on the Easy Puzzle and to take to time-sample 20 minutes of the performance of the subjects on the Difficult Puzzle.

After the filming of the entire performance of the child on the Easy Puzzle (approximate time two minutes), a time sampling technique was employed for filming performance on the Difficult Puzzle. Filming began as
soon as the child was presented the Difficult Puzzle and continued for four minutes. At the end of the first four minutes of work on the puzzle, a filming pattern of two minutes of no filming and one minute of filming was followed. This pattern was followed until a total of 10-11 minutes of filming from the beginning of the Easy Puzzle was completed (Appendix A). All film episodes were timed independently by two observers equipped with stop watches. The filming time for the Difficult Puzzle averaged 3.4 minutes (Table 2).

These films of subjects' performance on both the Easy and the Difficult puzzles were divided into two units for each subject: one unit depicted behavior on the Easy Puzzle and the second unit consisted of behavior on the Difficult Puzzle. In this way, a total of 23 subjects yielded 46 film episodes. Each film episode was given a different case number. Eight reels of films were prepared, each having an average of 15 minutes of viewing time. Since the 46 film episodes were randomly arranged on the reels, each of these reels had both Easy and Difficult Puzzle episodes on it.

Development of Behavior Rating Inventory

Twenty-four child development specialists were chosen from the staff and graduate students of the Child Development Department. All specialists were the holders of a Master's Degree in Child Development or the equivalent and had some experience in working with children at a professional level. Since there were eight reels of films varying from six to eight episodes, each film was viewed by three different judges. The judges were asked to concentrate on the behavior of the child and react by listing
<table>
<thead>
<tr>
<th>Case no.</th>
<th>Easy puzzle</th>
<th>Difficult puzzle</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.8</td>
<td>3.1</td>
</tr>
<tr>
<td>2</td>
<td>2.7</td>
<td>4.1</td>
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<td>3.0</td>
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<tr>
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<td>2.0</td>
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</tr>
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<td>4.5</td>
</tr>
<tr>
<td>23</td>
<td>1.1</td>
<td>4.6</td>
</tr>
</tbody>
</table>

Range  
Easy puzzle: 1.0 to 2.7  
Difficult puzzle: 1.6 to 8.6

Average  
Easy puzzle: 1.9  
Difficult puzzle: 3.4
adjectives or adjectival phrases describing the child's behavior in relation to the puzzle task. An adjective was defined as a word used (with noun) to denote a quality of the behavior named or something attributed to it (Appendix B).

Attempts were made to ensure that each judge saw the film in the same manner. The position of the screen, projector, and the judge's sitting position were marked so that they remained the same as all judges came individually for the viewing.

After removing duplicate words, the remaining words on these lists given by the 24 experts were each printed on individual cards. Four such sets of cards were prepared. Four judges, oriented in child development, independently sorted the cards into groups which they felt had similar meanings (Appendix C). When all four judges had grouped the words according to directions, two of the four judges made a final regrouping of the word groups. There were some disagreements at this stage of final regrouping, but arbitrary decisions were arrived at after discussing the reasons and implications for including a word in a particular group. In this way, a list of 49 word groups evolved. These items were prepared with a certainty scale\(^1\) and entitled Behavior Rating Inventory (Appendix D).

In using the certainty scale technique (Tilford, 1966), each item on the scale is scored as either present or absent in the observed behavior. The rater is expected to score the degree of certainty he feels regarding the decision he has made. For instance, an observer might mark an item

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\(^1\) This scale was designed by Dr. Leroy Wolins of the Iowa State University Department of Statistics.
present and circle 80 percent. This indicates that the rater has observed this behavior, and he is at least 80 percent certain that it is present. An 80 percent certainty score means the rater is certain of his decision but not as certain as if he had scored 90 percent, the highest degree of confidence on the scale. The degrees of certainty, 50, 60, 70, 80, and 90, were weighted 1, 2, 3, 6, and 8, respectively. The weighting of this scale is based on research (Goodrich, 1962; Cranny, 1965) which indicates the scale is most accurate on each end. The absence of a component is given a negative value (Tilford, 1966).

Judging of Filmed Behavior Episodes

Training of Judges

Four undergraduate students with some child development background and who were completely ignorant about the nature of the study were selected for judging the filmed behavior. They were given training in the viewing of films, rating on the inventory, and general understanding of the word groups on the inventory. Each judge was given the inventory to study prior to a discussion of the meaning and the reason for the grouping of different words. At the first training session, the judges were asked to voice their feelings about the inventory in general and to express their concerns or opinions relative to the word groupings. The reasons and purposes behind these groupings were explained. Every effort was made to clarify as many ambiguities as possible. Practice films previously prepared with children not subjects in the study were divided into segments of easy and difficult units and shown to the judges. Each judge viewed the film and rated the behavior on the
groupings. The reasons and purposes behind these groupings were explained. Every effort was made to clarify as many ambiguities as possible.

Practice films previously prepared with children not subjects in the study were divided into segments of easy and difficult units and shown to the judges. Each judge viewed the film and rated the behavior on the inventory certainty scale. At the end of every practice film, the amount of agreement among the judges was calculated.

Wherever there was disagreement, a discussion of "who rated which way" was held until a consensus was obtained. At the completion of six hours of practice training, the judges had accomplished some uniformity in the manner of rating. It was found that with two 10-minute breaks, the judges were able to view one hour of film each day without undue fatigue.

Judging of Behavior

The judges were asked to pick the most suitable time when they could come for the viewing of the films. It was jointly decided that all the judges come at the same time every day in the week. It was considered desirable to judge some films every day so that the training effect would not be lost. The positions of the screen, projector, and the judges' chairs were marked to ensure that all films were seen in the same manner.

Each day before starting to show the films for judging, the judges reviewed one practice film to refresh their training and also help them in adjusting to see the short films. The films were shown in the same random order as was arranged for the first viewing for the initial set of judges. This time, though, each episode of the film was viewed independently.
All four judges were shown the films of the subjects working the puzzles at the same time in the same room, though they were asked not to talk among themselves or to discuss the film till they had rated the subject they had just seen. Each film episode was to be rated on the inventory immediately after the film was viewed. There was no pressure of time for rating. In fact, the judges were asked to take as much time as they wanted. One reviewing of the film was permitted, if requested. In this manner, ratings on the Behavior Rating Inventory were obtained for 46 films.

**Statistical Treatment**

The judges' ratings on each item (49) on the certainty scales were coded, as to the type of stress experience (Easy or Difficult Puzzle), chronological age, mental age, and judge. Thus there were a total of 184 behavior inventories rated by judges (4) for 23 subjects on 46 behavioral episodes.

A three-way analysis of variance\(^1\) was performed controlling for sex of subject, type of puzzle (easy, difficult), and judge effect. An analysis of covariance was calculated controlling for sex and mental and chronological age. Since the range in chronological age was not great (56 to 67 months), mental and chronological age were not separately analyzed. Thus, these two variables were considered together as one source of variance.

\(^1\)Under the direction of Dr. Leroy Wolins, Professor of Statistics and Psychology at the Iowa State University.
Results

The main concern of the present study was to investigate relationships between the type of activity (behavior of children under varying conditions of stress) and sex, mental, and chronological ages. The following null hypothesis was formulated:

Behavior is not related to the type of activity (the two varying conditions of stress) independent of mental and chronological age and of sex.

Sex, chronological age, mental age, and performance on the type of puzzle are considered the independent variables. They are compared to each of the 49 Behavior Rating Inventory items which are considered the dependent variables.

The data were analyzed with a three-way analysis of variance. Sex, performance on the two types of puzzles, and judges were considered the main effects. The other variables studied were the interactions between sex and type of puzzle; sex and judges; type of puzzle and judges; and sex, type of puzzle, and judges.

Puzzle Effect

Of the 49 items on the inventory, two items showed a significant relationship where the puzzle effects were concerned. The subjects had a lower mean score of 7.01 on the Easy Puzzle for Item 28 (hesitant, cautious, watchful) as compared to a mean score of 9.17 for the same item on the Difficult Puzzle (df 1/21, F = 7.30, p < .01). Contrary to this, children scored higher on Item 38 (rushed, quick, fast, rapid, active, swift) on the Easy Puzzle (mean score = 8.43) than on the Difficult Puzzle (mean score = 6.45, df 1/21, F = 4.75, p < .05). This can be seen in Table 3.
47

Table 3
Analysis of Variance for Behavior Rating Inventory
Items Significantly Related to Type of Puzzle

<table>
<thead>
<tr>
<th>Item description</th>
<th>df</th>
<th>Easy</th>
<th>Difficult</th>
<th>F value</th>
</tr>
</thead>
<tbody>
<tr>
<td>28. Hesitant, cautious, watchful</td>
<td>1/21</td>
<td>7.02</td>
<td>9.17</td>
<td>7.30**</td>
</tr>
<tr>
<td>38. Rushed, quick, fast, rapid, active, swift</td>
<td>1/21</td>
<td>8.43</td>
<td>6.45</td>
<td>4.75*</td>
</tr>
</tbody>
</table>

*p<.05.

**p<.01.

None of the remaining 47 items on the Behavior Rating Inventory showed significant interactions for puzzle alone. Since a significant relationship for two items from an inventory of 49 is not outside the range of chance, these findings can be considered only as a weak confirmation of the null hypothesis stating that behavior is not related to the type of activity (the two varying conditions of stress) independent of mental age, chronological age, and sex. The null hypothesis, therefore, fails to be rejected. However, these two items seem to make sense in terms of the direction of the differences within the context of the two stress conditions.

**Sex Differences**

The analysis of variance on various items on the inventory did yield some significant results on the main effect of sex and sex-by-puzzle inter-
actions. As can be seen in Table 4, girls (N = 9) rather than boys (N = 14) were found to score higher on: Item 15 (dependent, seeks praise, reassurance) (mean score = 7.89, df 1/21, F = 15.00, p<.01); Item 20 (elated, excited) (mean score = 3.68, df 1/21, F = 5.94, p<.05); Item 33 (jovial, joking, playful) (mean score = 2.01, df 1/21, F = 4.30, p<.05); Item 36 (proud, complimentary of self) (mean score = 7.22, df 1/21, F = 5.78, p<.05); and Item 41 (sensitive, happy, pleased, pleasant, cheerful, enjoyment, delighted) (mean score = 9.15, df 1/21, F = 5.83, p<.05).

Contrary to this, not only did males place lower in their scores on these items (Items 15, 20, 33, 36, 41), but they were found to score higher on Item 40 (serious and sober) (mean score = 13.71) than girls (mean score = 11.71), (df 1/21, F = 4.18, p<.05). Table 4 gives a clearer picture of these sex differences.

**Sex-by-Puzzle Interaction**

Inspection of Table 5 reveals that a completely different set of items showed a level of significance relative to sex-by-puzzle interaction. Relatively speaking, higher scores were earned by girls on the Easy Puzzle. These items were: Item 9 (careful, orderly, exact, organized, methodical, logical, systematic) (mean score for girls = 11.39; for boys = 9.14, df 1/21, F = 12.40, p<.01). Similar observations were made on Item 10 (certain, sure, decisive, assured, confident) (mean score for girls = 10.61; for boys = 7.23, df = 1/21, F = 10.94, p<.01), and Item 27 (goal oriented, achievement oriented, task oriented) (mean score for girls = 13.47; for boys = 11.14, df 1/21, F = 10.41, p<.01).
Table 4
Analysis of Variance for the Behavior Rating Inventory Items Significantly Related to Sex

<table>
<thead>
<tr>
<th>Item description</th>
<th>Mean scores</th>
<th>df</th>
<th>F value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Males (N=14)</td>
<td>Females (N=9)</td>
<td></td>
</tr>
<tr>
<td>15. Dependent, seeks praise, attention, approval, support, assistance, reassurance</td>
<td>5.88</td>
<td>7.89</td>
<td>1/21</td>
</tr>
<tr>
<td>20. Elated, excited</td>
<td>1.50</td>
<td>3.68</td>
<td>1/21</td>
</tr>
<tr>
<td>33. Jovial, joking, playful</td>
<td>0.80</td>
<td>2.01</td>
<td>1/21</td>
</tr>
<tr>
<td>36. Proud, complimentary of self</td>
<td>3.27</td>
<td>7.22</td>
<td>1/21</td>
</tr>
<tr>
<td>40. Serious, sober</td>
<td>13.71</td>
<td>11.71</td>
<td>1/21</td>
</tr>
<tr>
<td>41. Sensitive, happy, pleased, pleasant, cheerful, enjoyment, delighted</td>
<td>5.31</td>
<td>9.15</td>
<td>1/21</td>
</tr>
</tbody>
</table>

*p<.05.

**p<.01.
Table 5

Analysis of Variance for the Behavior Rating Inventory Items Significantly Related to Sex by Puzzle Interactions

<table>
<thead>
<tr>
<th>Item description</th>
<th>Mean scores</th>
<th></th>
<th></th>
<th>df</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Males</td>
<td>Females</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Easy</td>
<td>Diff.</td>
<td>Easy</td>
<td>Diff.</td>
<td>df</td>
</tr>
<tr>
<td>10. Certain, sure, decisive, assured, confident</td>
<td>7.23</td>
<td>10.75</td>
<td>10.61</td>
<td>8.36</td>
<td>1/21</td>
</tr>
<tr>
<td>15. Dependent, seeks praise, attention, approval, support, assistance, reassurance</td>
<td>7.75</td>
<td>4.00</td>
<td>6.55</td>
<td>9.28</td>
<td>1/21</td>
</tr>
<tr>
<td>26. Giving up, leaves job, lacks persistence</td>
<td>8.13</td>
<td>4.71</td>
<td>4.22</td>
<td>6.83</td>
<td>1/21</td>
</tr>
<tr>
<td>27. Goal oriented, achievement oriented, task oriented</td>
<td>11.14</td>
<td>12.34</td>
<td>13.47</td>
<td>10.52</td>
<td>1/21</td>
</tr>
</tbody>
</table>

**p<.01.

*p<.05.
On the interactions for the Easy Puzzle, boys were observed to rate higher on Item 15 (seeking praise, attention, approval, support, assistance, reassurance) (mean score for boys = 7.75; for girls = 6.55, df 1/21, F = 4.41, p<.05) and on Item 26 (giving up, leaving job, lacking in persistence) (mean score for boys = 8.13; for girls = 4.22, df 1/21, F = 10.94, p<.01). This was in comparison to their scores on Difficult Puzzle as shown in Table 5. This observation further clarifies that there exists an inverse relationship between the sexes where their performance on the two puzzles is concerned.

**Analysis of Covariance**

An analysis of covariance controlling sex for mental and chronological ages was computed to adjust for a possible bias due to these sources. This analysis, when adjusted for mental age and chronological age, showed no significant F values at 1/19 df. This is indicative of the possibility that the significant values attained on sex and sex-by-puzzle interaction from the analysis of variance is partly a result of the mental age and chronological age. However, when adjusted for mental age and chronological age, the analysis of covariance showed some significant F values at .05 level.

These significant results showed up on behavior categories Item 18 (disinterested, distracted, doodling, dawdling); Item 27 (goal oriented, achievement oriented, task oriented); and Item 48 (unsure, uncertain, puzzled, doubtful, confused, self-conscious). However, the items for which the covariates mental and chronological age were significantly rated to the
response are of interest. Table 6 shows the average mental age, F values, and levels of significance on these items.

These values clearly indicate that on certain items both mental and chronological age exercise some influence. However, there was very little variation in the chronological age of the subjects. The average chronological age in months was 62.1, and the range was 56 to 67 months. Whereas the average mental age of the subjects was 75.8 months, and the range was 64 to 90 months. It is possible that this combined effect of mental age and chronological age may be mainly due to mental age. However, as none of the F values here were above the .05 level, it was felt that a further split of mental age and chronological age may not in any way give a different picture of the issue at hand.

Of some interest is the effect of judges and its interactions with puzzle and sex. However, the main effect judges is not of interest. The interaction between judges and sex showed some significance only on one item. This was Item 11 (consistent, persistent, rigid, preserving, enduring). Due to this observation of a possible judge interaction (df 3/63, F = 6.34, p<.01), even though this item showed a high significance with respect to the puzzle (df 1/21, F = 6.07, p<.01), this observation was rejected and not included in previous tables.

The interactions between puzzle and judges were observed to be significant on two items: Item 17 (direct, forceful, determined) (df 3/63, F = 2.77, p<.05) and Item 23 (exploratory, probing, manipulative, questioning, searching, challenging) (df 3/63, F = 3.73, p<.01). These items have not been observed to have any significance on other variables, hence the effect of judge observed here does not affect the other observations.
Table 6
Analysis of Covariance for Combined Effect of Mental Age and Chronological Age When Controlled for Sex

<table>
<thead>
<tr>
<th>Item description</th>
<th>Average mental age</th>
<th>df</th>
<th>F value</th>
</tr>
</thead>
<tbody>
<tr>
<td>18. Disinterested, distracted, doodling, dawdling</td>
<td>75.1</td>
<td>2/19</td>
<td>3.57*</td>
</tr>
<tr>
<td>27. Goal oriented, achievement oriented, task oriented</td>
<td>76.6</td>
<td>2/19</td>
<td>3.95*</td>
</tr>
<tr>
<td>48. Unsure, uncertain, puzzled, doubtful, confused, self-conscious</td>
<td>75.6</td>
<td>2/19</td>
<td>4.92*</td>
</tr>
</tbody>
</table>

*p < .05.

A consistently high interjudge reliability was observed. Also all the four judges persistently reported differences in their observations of individual child's interaction with the puzzle. This indicated that puzzle differences in terms of the judges' ratings were observed, but these differences were overshadowed by the idiosyncratic reaction patterns of the subjects.

Summary

In conclusion, these observations show that the responses of the children under the two stress conditions as observed by the Behavior Rating Inventory are very ambiguous. While they fail to completely reject the inventory as a possible rating scale, a couple of items (Item 28 and Item 38) seem to have proved their usefulness. Evidence for behavioral discrimination in relation to sex and sex-by-puzzle interactions are fairly
strong. Mental age and chronological age seem to have some partial effect on the overall behavior of the subjects.

The overall findings can be summarized as follows:

1. The evidence against the null hypothesis that the behaviors of children under the two conditions of stress are different is meager but interpretable or meaningful.

2. Sex of the subjects does seem to affect their overall behavior as observed by the judges response to the inventory.

3. Sex-by-puzzle interaction also results in statistical significance relatively often. Failure to obtain convincing evidence for the main hypothesis may be explained by the fact that males and females respond oppositely to the stress conditions.

4. There is slight evidence that mental age and chronological age affect the behavior of the subjects on certain items on the inventory.
Discussion

The present study was designed to investigate relationships of two stress experiences and the sex and the mental age of a sample of five-year-old children. Two cognitive-type tasks were given to the subjects at the end of an administration of the Stanford Binet Test of Intelligence. A Behavior Rating Inventory was formulated from the responses of the subjects on these cognitive-type tasks (puzzles) and subsequently was used to evaluate and quantify the puzzle performance of the subjects. The inventory was comprised of 49 items. Data were analyzed with a three-way analysis of variance. Sex, performance on the two types of puzzles, and judges were considered the main effects. The other variables studied were the interactions between sex and type of puzzle, sex and judges, type of puzzle and judges, and sex, type of puzzle, and judges. Highlights of the findings and implications for further research will be discussed here.

**Puzzle Effect**

The evidence against the null hypothesis that the behavior of children under the two stress conditions are different was found to be meager but meaningful. The responses of the children under the two conditions of stress as observed by the Behavior Rating Inventory are very ambiguous. While the inventory fails to be completely rejected as a possible rating scale, two items (Items 28 and 38) seem to have proved their usefulness. The effect of stress on performance varies considerably among individuals. Performance of some individuals under stress is little affected whereas performance of others shows significant improvement or deterioration (Lazarus & Eriksen, 1952; Mallick & McCandless, 1966; Otis & McCandless,
1955). The present study, at least in part, seems to be supportive of these observations.

Item 28 (hesitant, cautious, watchful) was significant for puzzle effect. Children displayed more behavior in this category while they were working on the Difficult Puzzle than when they were working on the Easy Puzzle. This observation supports previous research. Smock (1955) in his study on the effect of stress on the intolerance of ambiguity observed a similar tendency in response when the task faced became ambiguous or challenging. He also observed a premature closure or withdrawal when the subjects were confronted with ambiguity. Both these behavior characteristics observed by Smock imply a kind of strained behavior. Miller and Swanson (1960) in their study of the expressive style of children attempting to resolve conflict report to have observed enduring characteristics described by adjectives such as "rigid," "neat," and "diffident" in their school-age subjects. However, Reubush et al. (1963) report that their subjects tended to be more "defensive" when faced with a difficult task. Their study, however, was a cross comparison between low-defensive and high-defensive children and may be a typical attitude for that group only.

Support for the finding that children were more hesitant, cautious, and watchful on the Difficult Puzzle can be drawn from studies on anxiety, particularly those dealing with anxiety in the evaluative context. The findings here indicate that high anxious children tend to perform on tasks as if the tasks were evaluative situations (Reubush, Byrum, & Farnham 1963; Marlett & Watson, 1968). Cautious, hesitant, and watchful behavior may be considered comparable to components of an evaluative situation. Perhaps the tasks in the present investigation did provoke a considerable
amount of anxiety and a feeling of being evaluated which became all the more apparent when the job was more challenging and difficult.

The other item on the scale showing a significant puzzle effect was Item 38 (rushed, quick, fast, rapid, active, swift). Behavior categorized by this item was more observable when the Easy Puzzle was being solved than when the Difficult Puzzle was being attempted. Item 28 (hesitant, cautious, watchful) and Item 38 (rushed, quick, fast, rapid, active, swift) are mutually supportive in that they appear to be in opposition to each other in their diversity. Apparently when children are faced with a comparatively easy task, they tend to be rushed, quick, fast, rapid, active (Item 38). They exhibit a kind of exuberance. This could be the joy of encountering a task they can accomplish after the failure experienced on the Stanford Binet. However, when faced with a difficult task, the children tend to behave in a somewhat different (opposite) manner. Studies by Lazarus and Eriksen (1952), Mallick and McCandless (1966), Otis and McCandless (1955) tend to support this position.

**Sex Differences**

Sex of subjects did seem to affect the overall behavior on the puzzle tasks. The main effect of sex and sex-by-puzzle interaction did show significance. The girls in the study were found to score higher on certain items (Item 15: dependent, seeks praise, attention, approval, support, assistance, reassurance; Item 20: elated, excited; Item 33: jovial, joking, playful; Item 36: proud, complimentary of self; and Item 41: sensitive, happy, pleased, pleasant, cheerful, enjoyment, delighted).
One of the major domains in which sex differences has been studied relatively extensively deals with the dependency-independency relationship (Mischel, 1970). There appears to be greater dependency, social passivity, and conformity in females than in males (Kagan & Moss, 1962). Affiliative and nurturant behaviors also tend to occur more often in females than in males (Goodenough, 1957; Honzik, 1951).

Researchers in the field of sex-role development appear to have reached a consensus that sex typing begins very early and crystallizes sometime during the first few years of the child's life (Brown, 1957; Kagan & Moss, 1962). Behavior manifesting characteristics like dependency, passivity, and conformity are some of the sex-typed characteristics investigators agree are more prominent in girls. Girls are allowed greater license to express these behaviors, whereas boys and men are pressured to inhibit them (Kagan & Moss, 1962; Lindzey & Goldberg, 1953; Crutchfield, 1955). Greater preoccupation with people and harmonious interpersonal relations among girls than among boys have been reported, too (Lansky et al., 1961; Honzik, 1951; Goodenough, 1957).

The girls in the present investigation were judged to behave in many ways similar to subjects in previous research studies. On the whole, girls displayed a greater degree of exuberance than boys. Child rearing practices and cultural expectations in sex typing may account for this difference between boys and girls. Men in most cultures are generally assigned the physically strenuous, dangerous tasks; women, on the other hand, generally carry out established routines, ministering to needs, cooking. The husband-father role is supposed to be "instrumental," i.e., task oriented and emotion inhibited whereas the wife-mother role is customarily more
"expressive," i.e., emotional, nurturent, and responsible (Parsons, 1955). These almost universal sex differences have been observed in children, too. Ethnographic observations indicate that boys in most cultures are much more likely to engage in conflict and overt aggression, while girls are more likely to be affectionate, cooperative, responsive, sociable, and succorant (d'Andrade, 1966).

In contrast to the significant relationships established for girls in this study, the boys scored higher on just one item (Item 40: serious, sober). In various studies where behavioral manifestations of sex-typed characteristics have been the area of interest, the correlations for males are generally low. Most studies fail to demonstrate strong relationships for males (Mussen, 1961). Sears, Rau, and Alpert (1965) observed that the products of sex typing are not well integrated at the nursery-school age but hypothesizes a higher integration of femininity than of masculinity. Perhaps the fact that more relationships were identified for girls than for boys in the present study results from the variations in the development of the socialization process between the sexes.

The nature of behavior characteristics on which boys scored higher (Item 40: serious, sober) than girls may well be a reflection of the socialization process. This seems to have been very true with the earlier discussion in support of the reverse observations on girls. While there was a general marked exuberance and overtly expressive behavior by girls, the boys tended to be more controlled, i.e., serious and sober. Studies on the problem solving behavior of the two sexes can be used to lend support here. Moriarity (1962) observed increased integrative efforts in boys in comparison to girls in her sample when both were exposed to a task in a new
situation. Boys in her study also were found to move in a new situation more slowly. Once they became involved in the new situation, they were more alert and tried to stay in command of the situation. Studies by McClelland et al. (1953), Harmatz (1962), and that by Murphy (1962) support Moriarity's observations.

**Sex-by-Puzzle Interaction**

The sex-by-puzzle interaction produced a number of significant relationships suggesting that males and females responded at times in opposite directions under the two stress conditions. The failure to obtain convincing evidences on stress effect may be partly explained by the occurrence of differential behavior of the two sexes. The trend for the behavior to be inverted observed for the main effect of sex was also observed for the sex by puzzle interactions. This observation, surprisingly enough, was made on a completely different set of items. Girls were more overt in their reaction to the two puzzles, and they placed higher on the Easy Puzzle than the boys on Item 9 (careful, orderly, exact, organized, methodical, logical, systematic), Item 10 (certain, sure, decisive, assured, confident), and Item 27 (goal oriented, achievement oriented, task oriented). Boys on the other hand were found to score higher on the Difficult Puzzle on these three items.

Studies dealing with differences in problem solving behavior between sexes have comparable observations to report. Crandall and Rabson (1962) observed that girls more often chose to avoid potential failure inherent in a difficult task, whereas the boys showed a tendency to master a difficult task. Perhaps this inclination for an ultimate mastery of task was instru-
mental for the boys in the present study who showed comparable behavior characteristics (Items 9, 10, and 27). It needs to be remembered here that the girls scored low on these characteristics when faced with a difficult task (Difficult Puzzle).

The observations that boys and girls react differently to different tasks once again reflect the cultural distinctions in our expectations and treatments between the two sexes. When it came to seeking emotional support (Item 15) and lack of perseverance (Item 26), the girls scored higher on these characteristics when confronted with the Difficult Puzzle; whereas the boys scored low on these characteristics on the Difficult Puzzle.

**Mental Age**

To determine if behavior is unrelated to mental age independently of sex, the combined effect of mental age and chronological age was analyzed controlling for sex. Chronological age and mental age were combined for analysis because the range of the chronological age (56-67 months) was narrow relative to the range for mental age (64-90 months). The high average mental age is indicative of the fact that the population under study comes from a relatively higher socio-economic group. The laboratory nursery school, a part of the university program from where the subjects were taken, has a highly select clientele. The average chronological age of the subjects was 62.1 months while the average mental age of the subjects was 75.8 months. It was, therefore, presumed that the differences observed due to the combined effect of these variates may be due indeed to the effect of mental age rather than of chronological age. The combined effect of the two variates was found to be significant for three items: Item 18 (disin-
terested, distracted, doodling, dawdling), Item 27 (goal oriented, task oriented), and Item 48 (unsure, uncertain, puzzled, doubtful, confused, self-conscious).

It was observed that the average mental age of the subjects who scored higher on Item 18 (disinterested, distracted, doodling, dawdling) and Item 48 (unsure, uncertain, puzzled, doubtful, confused, self-conscious) was slightly lower than the total average. Miller and Swanson (1960) observed similar differences in the expressive styles of their subjects. They found that the intelligence or brightness of the subjects affected their mode of reaction to threat of failure. Those subjects with less verbal intelligence defend themselves by increasing denial in fantasy. The subjects in this present study, too, used denial mechanisms (Item 18) beside being unsure and confused (Item 48).

Haan (1963) found a positive correlation between intelligence and the coping mechanisms used. Coping was generally related to acceleration of IQ, and defense mechanisms were generally related to IQ deceleration. Distracted, doodling, dawdling (Item 18) may be a manifestation of defense mechanisms and found to be related to slightly lower mental age for the sample in the present study.

More goal-oriented, achievement-oriented behavior (Item 27) was found for children of this sample with higher than the average mental age. Lazarus and Eiiksen (1952) found adult subjects with high academic standing to be more perseverant in their stress study. In addition, Haan (1963) reports a high incidence of coping mechanisms in IQ acceleration. Similar support can be drawn from the works of Miller and Swanson (1960).
Limitations of the Study

No strong evidence has been found to support the effectiveness of the Behavior Rating Inventory as a tool to measure behavior under varying conditions of stress. However, there can be two factors contributing to the apparent ineffectiveness of the inventory: either the inventory does not hold all the essential components as an appropriate measuring tool or the experience provided to the subjects is not stressful enough.

Conceptualizing a framework for stress research may be too much involved in what is the obvious. Great diversity in the definition of the term stress exists. Most commonly used modes of defining the term tend to be a situation-based pattern. An attempt has been made in the present study to observe children's behavior while employed in a task that is presumed to be difficult. McGrath (1970) points out the inherent weakness of such a "situation and consequent response" based definition. Such methods for the manipulation of variables, i.e., an indication of stress, are vulnerable to the methods for measurements that are employed (McGrath, 1970).

The inherent shortcoming in the theory underlying stress research has been the greatest drawback in evolving measuring instruments. The theoretical biases prevalent in the field seem to have left their mark here, too; similar characteristics have been given a variety of names and what emerges is a complex picture. This complex nature of the theory itself has not helped in providing a delineated definition for the development of adequate methods for its measurements. Good methodological tools are hard to come by. This has been all the more obvious in current research. Concurrently, there has been limited investment of efforts and resources to develop methods for research on stress. Factors such as the pervasiveness of indi-
vidual differences, the factor of cognitive appraisal, and personal antici-
pation of stress all go to influence the affective and effective concept of
stress. These views have been endorsed by Weick (1970), Appley and
Trumbull (1967), and McGrath (1970).

Methodological limitations seem to have hampered the effectiveness of
the Behavior Rating Inventory. A variety of factors were involved in the
evolution of this inventory, and anyone or all of them are likely to be the
cause of failure in developing an effective scale.

The situations (puzzle tasks) which were expected to be stress provok-
ing may not have been so. Keeping in mind Opton and Lazarus' (1967) ipsa-
tive strategy as an useful approach to measurement of stress behavior, the
present study was so designed that instead of having a stress, non-stress
condition, two different degrees of stress experiences were given. Thus,
the design became a multi-trait (situation as trait) issue with divergence
between traits. An attempt was made to investigate the sensitivity of the
individual in two varying levels of stress. But if neither of the condi-
tions (Easy or Difficult Puzzle) were stress provoking, then obtaining a
distinct pattern of behavior may not be possible. Different personality
patterns seem to be associated with sensitivity to different types of
stress (Murphy, 1962; Moriarity, 1961; Opton & Lazarus, 1967; Miller &
Swanson, 1960). McGrath's (1970) observation seems to be very pertinent,
"One man's stress is another man's challenge" (p. 49). It may be that this
factor of individual reaction pattern itself has made the inventory an
ineffective tool. What was observable in the behavior of some children did
not hold true for most. Also, the two situations of stress may not have
posed as threatening in the same sense to all or most of the subjects.
In addition to the condition of stress, another issue involved in the evolution of the scale was the description of the behavior of children under stress. The words that formed the Behavior Rating Inventory were solicited from a professionally trained and experienced group of individuals. Thus it can be safely presumed that what they reported was what they professionally thought was there. However, there is an inherent shortcoming here. The professionals involved at this stage of the study were all to some degree aware of the nature of the study. It is possible that the adjectives used in describing the filmed behavior were what they "thought" or "expected" to be there rather than what they saw on the screen.

The next stage of the development of the inventory involved the placing of the words into meaningful groups. It is possible that some word groups failed to delineate behavior to the extent that the judge could make individual item distinctions.

The final stage was putting the inventory into practice. The judges used to rate the children's behavior were four undergraduate students. Care was taken to ensure that they had some child development background and that they understood what was implicit in the inventory. It is felt, however, that the lack of any advanced professional training and limited insights into the field of human behavior of these judges may have proved to be a drawback in the use of the scale. While in conversation with the investigator, the judges gave the impression of observing differences in the children's behavior between the easy and the difficult episodes. The judges were unable, however, to differentiate this on the inventory.

Perhaps the greatest shortcoming of the present study might be the peculiar characteristic of the sample. The sample was comprised of a very
narrow age range (56 to 67 months) with an average of 62.1 months. This tendency toward homogeneity made age an ineffective variable. In addition to age, another shortcoming involves the number of subjects and the sex ratio. While there were 14 boys in the sample, there were only 9 girls. It is possible that whatever sex differences observed in the study may well be individual variations.

Suggestions for Further Research

During the course of the present study, certain major procedural weaknesses were revealed. While the effectiveness of the stress puzzles may not be outrightly questioned, there is still room for doubt. Could the task situation have been more stress provoking if the examiner had evoked a time limit or pressured the child in some way to complete the task? Such additional stress-producing procedures might have been helpful in eliciting a greater degree of the overt behavior.

The size of the sample studied while acceptable for exploratory research seems to be far from satisfactory in terms of scale development. Statistically there seems to be a need for at least 100 subjects to establish item significance. Also the present study was limited to one age level (five-year-olds). A further study across a wider age range with a sizable sample might prove valuable. Also the expansion of the sample size might be instrumental in overshadowing the continuous reoccurrence of the idiosyncratic traits.

As mentioned in the introduction in the present study, there seems to be a need for multidimensional studies in the area of stress behavior. The
present study has been an attempt to view the effects of stress on cognitive experience. Other research studies considering the aspects of social behavior and motor performance under the effect of stress would help in completing the picture of the field.

Out of a list of 49 items on the inventory, two items showed a considerable degree of significance; further research on these two behavior characteristics may be interesting and highly revealing work. The two diverse characteristics that showed significance under differing stress conditions can be further elaborated in an intensive study.

It has been pointed out in reporting the results of the present investigation males and females responded oppositely to the stress conditions and that this might have played against the effectiveness of the Behavior Rating Inventory as a possible rating scale. A further study investigating the behavior of just one sex might control for such a bias should it exist and yield more conclusive results of behavior under stress.

**Implications**

The findings of the present study indicate that there is a relationship between the nature of experience and sex and chronological and mental age. The certainty with which the relationship of chronological age can be considered is not clear. Some responses to the items on the inventory in terms of the nature of the puzzle were found to be significant.

Information pertaining to the nature of cognitive type responses under stress can be of great use to both the educationist and child developmental-
ist. With tools that can be useful in measuring both the effective and affective value of an experience, professionals in the field may find themselves in a better position to assess the child, his capacities, and his mode of reaction. The information on the differential reactions in relation to the nature of the task also can be considered useful to those responsible for planning school programs and curriculum. If we are sure of the effects of an experience on the preceding performance of the pupils, we may plan so that the pupil is able to perform to his optimum level and not allow his experience on one task to overshadow his performance on the next.

This study further emphasizes certain highly pertinent issues in the field of developmental psychology. It reinforces the hypothesis that a lot of individual variations exist in behavior and in reactions to various situations. In addition to variables of sex and mental and chronological ages, the idiosyncratic traits of the children also need to be considered as possible source of variance. What may be of interest is the characteristic ways in which different children learn to defend against or to cope with complex situations and the relationship between teacher behavior and pupil's participation.

An important implication of this study can be found in programs for mental hygiene. An instrument like the Behavior Rating Inventory developed in this study could be of great use to the mental hygienists to assess the strengths and weakness of their clientele. This instrument could serve the purpose of a gauge to good mental health.
Summary

The aims of the present study were to investigate behavior styles of five-year-old children under varying conditions of stress and to develop a behavior rating scale related to the behavior styles. The specific variables under investigation were the behavior styles, intelligence, and sex of subjects. The specific null hypothesis was: behavior is unrelated to the type of activity independent of mental age and sex.

Part of the standardization of the stress situation involved the administration of Stanford Binet Intelligence Test, 1960 revision. Two frustration form boards were presented one at a time to the subject. The first form board, Easy Puzzle, followed the failure on Stanford Binet and was thought to provide a mild degree of stress. The second form board, Difficult Puzzle, followed the administration of the Easy Puzzle and was more difficult in nature.

The children's behavior under these varying conditions of stress was recorded in a series of motion picture episodes for cinemanalysis. A behavior rating inventory consisting of adjectival descriptive phrases of the filmed behavior was developed. Judges trained in the use of the rating inventory rated the film episodes for possible behavior differences between the children's performance on the Easy and Difficult Puzzles.

The subjects were 23 five-year-old children (9 boys, 14 girls) enrolled at the Laboratory Nursery Schools of the Iowa State University. The subjects were tested individually in random order. The first part of the test situation comprised the administration of the Stanford Binet. At the termination of this test, the frustration form board Easy Puzzle was
presented followed by the Difficult Puzzle thus there were a total of 46
units of filmed behavior: one film each on Easy and Difficult Puzzles per
subject.

The data were analyzed with a three-way analysis of variance. Sex,
performance on the two types of puzzles, and judges were considered the
main effects. The other variables studied were the interactions between
sex and type of puzzle, sex and judges, type of puzzle and judges, and sex,
type of puzzle, and judges. The evidence against the null hypothesis that
the behavior of children under the two conditions of stress are different
was meager but meaningful. Two items, however, showed significant rela-
tionship where the puzzle effects were concerned. On the Easy Puzzle, the
subjects scored lower on Item 28 (hesitant, cautious, watchful) as compared
to their score on the same item on Difficult Puzzle (df 1/21, F = 7.30,
<.01). Contrary to this, subjects scored higher on Item 38 (rushed, quick,
fast, rapid, active, swift) on the Easy Puzzle than on the Difficult Puzzle
(df 1/21, F = 4.75, <.05).

The sex of the subjects was found to affect their overall behavior.
Girls were found to score higher on Item 15 (dependent, seeks praise, reas-
surance), (mean score = 7.89, df 1/21, F = 15.00, <.01); Item 20 (elated,
excited), (mean score = 3.68, df 1/21, F = 5.94, <.05); Item 33 (jovial,
joking, playful), (mean score = 2.01, df 1/21, F = 4.30, <.05); and Item
36 (proud, complimentary of self), (mean score = 7.22, df 1/21, F = 5.78,
<.05). The males not only place lower in their scores on these items but
were found to score higher on Item 40 (serious, sober) than girls (df 1/21,
F = 4.18, <.05).
Significant sex differences were observed on sex-by-puzzle interaction. Relatively higher scores were earned by girls on the Easy Puzzle on: Item 9 (careful, orderly, exact, organized, methodical, logical, systematic), (mean score for girls = 11.39; for boys = 9.14, df 1/21, F = 12.40, p<.01); Item 10 (certain, sure, decisive, assured, confident), (mean score for girls = 10.61; for boys = 7.23, df 1/21, F = 10.94, p<.01); and Item 27 (goal oriented, achievement oriented, task oriented), (mean score for girls = 13.47; for boys = 11.14, df 1/21, F = 10.41, p<.01). Boys, however, were observed to rate higher on Item 15 (seeking praise, attention, approval, support, assistance, reassurance), (mean score for boys = 7.75; for girls = 6.55, df 1/21, F = 4.41, p<.05) and on Item 26 (giving up, leaving job, lacking in persistence), (mean score for boys = 8.13; for girls = 4.22, df 1/21, F = 10.94, p<.01).

Slight evidence was found to indicate that mental age and chronological age of the subjects affect the behavior of the subjects on certain items on the inventory. Since the study was exploratory in nature, it was felt that perhaps more conclusive evidence in support of the null hypothesis would have been found if the stress conditions were more distinct and if the final set of judges were more sophisticated. A further analysis of the two items (Items 28 and 38) which showed significance on the Inventory may prove to be worthy of further study. Also a further study to assess the behavioral variations in relation to chronological age and mental age with a legitimate sample was suggested.
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Acknowledgment must also be expressed to the contributions of the staff and graduate students of the department for their assistance in the collection of the data for the study, to the children of the laboratory nursery school, and the teachers of the nursery school.
Appendix A: Filming Log
FILMING LOG

DATE

TIME

AM

PM

SUBJECT: _____________________________________________________________

PUZZLE PERFORMANCE

EASY PUZZLE

EASY PUZZLE REVERSED

DIFFICULT PUZZLE

______ 7 minutes

______ 2 minutes off

______ 2 minutes off

______ 1 minute on

______ 1 minute on

______ 2 minutes off

______ 1 minute on

______ 1 minute on

______ off

TOTAL PUZZLE TIME

STANFORD-BINET

Total time of administration

COMMENTS:

__________________________

Camera Operator:

__________________________

Examiner:

__________________________

Assistant:
Appendix B: Film Word Lists
DIRECTIONS: You will view four short films involving preschool age children working on the problem of solving a puzzle task. For each film segment of behavior, list as many adjectives or adjectival phrases describing the child's behavior in relation to the puzzle task as you can. In the film, do not be concerned with the examiner's behavior. Concentrate on the behavior of the child.

(Adjective: A word used, often with a noun, to denote a quality of the thing named or something attributed to it.)
Appendix C: Constructing Word Similarity Groups
CONSTRUCTING WORD SIMILARITY GROUPS

You will be given a number of cards on which appear a word or phrase describing behavior of preschool age children. Your task is to sort the words into groups which appear in your judgment to have similar meanings. Not all words will necessarily fall into groups; do not be disturbed if you cannot place all words into similarity groups.

Once you are satisfied with your decisions, place a rubber band around cards with similar words. Put the words that you are unable to place in similarity groups into a separate stack, place a rubber band around them, and label "miscellaneous." Return the word groups to Anjani Patel.
Appendix D: Behavior Rating Inventory
DIRECTIONS

Following these directions are adjectives or adjectival phrases describing preschool behavior. We are interested in your judgment concerning the presence or absence of the described behavior in the films viewed. You are to indicate your judgment by circling either "P" (present) or "A" (absent).

After you have made this decision, please indicate the degree of certainty you have about the decision. If you made a decision, you must have been at least 50% certain of whether the described behavior was present or absent. If you are not very confident about your judgment, circle 50%. If you are very confident about your judgment, circle 90%. In general:

- circle 50% if at least 50% certain but not as certain as 60%
- circle 60% if at least 60% certain but not as certain as 70%
- circle 70% if at least 70% certain but not as certain as 80%
- circle 80% if at least 80% certain but not as certain as 90%
- circle 90% if at least 90% certain.

Please be sure to respond twice to every statement unless you are completely uncertain about your answer. In that case, circle both "P" and "A" but do not circle a degree of certainty. This response indicates you have read the adjective or adjectival phrase but could not decide if it is present or absent in the child's behavior.
Preschool Behavior Rating Inventory
BRI-3-72

<table>
<thead>
<tr>
<th>ADJECTIVE</th>
<th>PRESENT</th>
<th>PERCENT OF CERTAINTY</th>
<th>SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. accurate, comparing</td>
<td>P 50</td>
<td>60 70 80 90</td>
<td></td>
</tr>
<tr>
<td>2. aloof, withdrawn, withdrawal, rejects</td>
<td>P 50</td>
<td>60 70 80 90</td>
<td></td>
</tr>
<tr>
<td>3. anticipating</td>
<td>P 50</td>
<td>60 70 80 90</td>
<td></td>
</tr>
<tr>
<td>4. aware of adult</td>
<td>P 50</td>
<td>60 70 80 90</td>
<td></td>
</tr>
<tr>
<td>5. bored, passive, disinterested, unconcerned</td>
<td>P 50</td>
<td>60 70 80 90</td>
<td></td>
</tr>
<tr>
<td>6. busy, energetic</td>
<td>P 50</td>
<td>60 70 80 90</td>
<td></td>
</tr>
<tr>
<td>7. capable, competent</td>
<td>P 50</td>
<td>60 70 80 90</td>
<td></td>
</tr>
<tr>
<td>8. carefree, silly, fooling around</td>
<td>P 50</td>
<td>60 70 80 90</td>
<td></td>
</tr>
<tr>
<td>9. careful, orderly, exact, organized, methodical, logical, systematic</td>
<td>P 50</td>
<td>60 70 80 90</td>
<td></td>
</tr>
<tr>
<td>10. certain, sure, decisive, assured, confident</td>
<td>P 50</td>
<td>60 70 80 90</td>
<td></td>
</tr>
<tr>
<td>11. consistent, persistent, rigid, persevering, enduring</td>
<td>P 50</td>
<td>60 70 80 90</td>
<td></td>
</tr>
<tr>
<td>12. cooperative, friendly, accepting</td>
<td>P 50</td>
<td>60 70 80 90</td>
<td></td>
</tr>
<tr>
<td>13. creative, inventive, experimental, curious</td>
<td>P 50</td>
<td>60 70 80 90</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>---</td>
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<td>---</td>
<td>---</td>
</tr>
<tr>
<td>14.</td>
<td>deliberate, slow</td>
<td>P</td>
<td>50</td>
</tr>
<tr>
<td>15.</td>
<td>dependent, seeks praise, attention, approval, support, assistance, reassurance</td>
<td>P</td>
<td>50</td>
</tr>
<tr>
<td>16.</td>
<td>desperate</td>
<td>P</td>
<td>50</td>
</tr>
<tr>
<td>17.</td>
<td>direct, forceful, determined</td>
<td>P</td>
<td>50</td>
</tr>
<tr>
<td>18.</td>
<td>disinterested, distracted, doodling, dawdling</td>
<td>P</td>
<td>50</td>
</tr>
<tr>
<td>19.</td>
<td>eager, enthusiastic, motivated</td>
<td>P</td>
<td>50</td>
</tr>
<tr>
<td>20.</td>
<td>elated, excited</td>
<td>P</td>
<td>50</td>
</tr>
<tr>
<td>21.</td>
<td>erratic, haphazard, irregular, random activity, trial &amp; error</td>
<td>P</td>
<td>50</td>
</tr>
<tr>
<td>22.</td>
<td>even-tempered, contented, patient, gentle, calm, mild, easy-going, composed, relaxed, well-adjusted</td>
<td>P</td>
<td>50</td>
</tr>
<tr>
<td>23.</td>
<td>exploratory, probing, manipulative, questioning, searching, challenging</td>
<td>P</td>
<td>50</td>
</tr>
<tr>
<td>24.</td>
<td>flexible</td>
<td>P</td>
<td>50</td>
</tr>
<tr>
<td>25.</td>
<td>frowning, scowling, shaking head</td>
<td>P</td>
<td>50</td>
</tr>
<tr>
<td>26.</td>
<td>giving up, leaves job, lacks persistence</td>
<td>P</td>
<td>50</td>
</tr>
<tr>
<td>27.</td>
<td>goal-oriented, achievement oriented, task-oriented</td>
<td>P</td>
<td>50</td>
</tr>
<tr>
<td>28.</td>
<td>hesitant, cautious, watchful</td>
<td>P</td>
<td>50</td>
</tr>
<tr>
<td>29.</td>
<td>impulsive, impatient, restless</td>
<td>P</td>
<td>50</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>---</td>
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<td>---</td>
<td>---</td>
</tr>
<tr>
<td>30. industrious, earnest, diligent, hard-working</td>
<td>P</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>31. involved, engrossed, concentrating, interested, attentive</td>
<td>P</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>32. irritated, disgusted, angry, perturbed, upset, agitated</td>
<td>P</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>33. jovial, joking, playful</td>
<td>P</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>34. negative, inhibited, defeated, resigned, frustrated</td>
<td>P</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>35. observant, perceptive</td>
<td>P</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>36. proud, complimentary of self</td>
<td>P</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>37. reasoning, problem-solving, thoughtful, pondering, contemplating</td>
<td>P</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>38. rushed, quick, fast, rapid, active, swift</td>
<td>P</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>39. satisfied, successful, pleased with success</td>
<td>P</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>40. serious, sober</td>
<td>P</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>41. smiling, happy, pleased, pleasant, cheerful, enjoyment, delighted</td>
<td>P</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>42. talkative, talking, commenting</td>
<td>P</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>43. tense, nervous, anxious, apprehensive, uneasy, stressful</td>
<td>P</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>44. tired, fatigued</td>
<td>P</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>45. twitching, wriggling, itching, squirming, fidgeting, fiddling, sucking</td>
<td>P</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>unhappyness, sad, pensive, apathetic, disappointed, discontented</td>
<td>P</td>
<td>50</td>
</tr>
<tr>
<td>---</td>
<td>-----------------------------------------------------------------</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td></td>
<td>unskilled, unorganized, careless, clumsy</td>
<td>P</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>unsure, uncertain, puzzled, doubtful, confused, self-conscious</td>
<td>P</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Deferent</td>
<td>P</td>
<td>50</td>
</tr>
</tbody>
</table>