SUMMARY
The present investigation was designed to study the effect of personality, intelligence and stress upon three types of problem solving tasks in both the sexes. A factorial design of \(2 \times 3 \times 2 \times 2\) was employed in the present study. There were two conditions of personality, i.e. introverts and extraverts; three conditions of intelligence i.e. high intelligence, above average intelligence and average intelligence, two conditions of stress i.e. high stress and no stress and lastly, both the sexes were included in equal number (120 males and 120 females). This would make 24 conditions. In each condition, 10 subjects were used, thereby yielding a total sample of 240 subjects. In the present investigation three groups of intelligence were formed by taking 45th to 95th percentiles of Raven's Standard Progressive Matrices (1960). Three types of problems were used for the present investigation.

A. Set Problems
B. Insightful Problems
C. Conceptual Problems

**SELECTION OF SAMPLE**

1. **Initial Sample**

A sample of 1000 students (500 males and 500 females) of college level was drawn randomly from Punjab Agriculture University, Ludhiana, for the session of 1985-1986.
The subjects were taken in a group of 10-15 students each. First of all they were administered the EPI (Eysenck Personality Inventory, 1964) to obtain their personality scores of Extraversion/Introversion. Instructions written on the top of the forms were read out loudly and clearly. They were told to start with the inventory after giving the instructions. There was no time limit for EPI. The N-dimension was controlled in the present investigation. Next, SPM (Standard Progressive Matrices, Raven, 1960) was administered on the selected subjects of introverts/extraverts to select the three groups on the variable of intelligence i.e. high intelligence, above average intelligence and average intelligence. For this instructions were read out loudly to the subjects and no time limit was given to them. Both EPI and SPM tests were scored following the instructions in the manual to formulate the desired groups.

Final Sample

The final sample of 240 subjects were selected on the basis of their scores on personality and intelligence tests. Introverts and extraverts were selected on the basis of their scores on EPI. The dimension of Neuroticism was controlled by taking only those subjects who scored between mean ± 1/2 SD on N. Subjects scoring mean + 1/2 SD on E were termed as extraverts and the subjects scoring mean - 1/2 SD were termed as introverts. For making the groups of intelligence the same criteria of mean ± 1/2 SD was applied on the
Standard Progressive Matrices. The subjects scoring mean $+\frac{1}{2}\text{SD}$ were assigned as high intelligence group, subjects scoring between the mean $+\frac{1}{2}\text{SD}$ were assigned as above average intelligence group and the subjects scoring mean $-\frac{1}{2}\text{SD}$ were assigned as average intelligence group. The details of means and SD's of the selected groups for personality and intelligence in both the sexes have been provided in Table I, page.

The variable of stress was instructionally manipulated in the present investigation. The stressful instructions were administered to half of introverts/extraverts, half high intelligence, above average and average intelligence groups and half males and females sample. And to their counterparts normal instructions were given. A-State Trait Anxiety Inventory (Spielberger, Sharma and Singh, 1973) was used in order to observe the State-Anxiety of the subjects before and after the instructions and once after the completion of all the problem solving tasks.

Thus the design come out to be having the 24 groups, the lay out of which is through $2 \times 3 \times 2 \times 2$ factorial design.

**Tools Used**

1. Eysenck Personality Inventory (EPI): (Eysenck and Eysenck, 1964)
4. Problem Solving Tasks
(A) **Set Problems**

a. Anagrams Problem (Adapted from Dominowski, 1966).

b. Candle Stick Problem (Adapted from Adamson, 1952).

(B) **Insightful Problems**

a. The Problem Solving Squares (Bhatia, 1955)


(C) **Conceptual Problems**

a. Sorting Cards Problem (Heidbreder's, 1948).


Means were calculated for the various conditions i.e. for two groups of personality, three groups of intelligence, two groups of stress and two sexes for each of the six problem solving tasks on the right responses, trials and time taken respectively (see Table IV).

To find out the significance of difference between the said means, ANOVA was employed by the order of 2 x 3 x 2 x 2 (Edwards, 1968) separately for each of the six problem solving tasks. In this way 10 analysis of variance for right responses, time taken and trials and time taken respectively were calculated (see ANOVA Tables V, VII, IX, X, XVI, XVII, XXIII, XXIV, XXVII and XXVIII).
Objectives of the Present Study

While initiating the present investigation certain objectives were kept in view and in line with that the hypothesis for the main effects and interactions were framed.

(I) In the present investigation the results on the variable of personality are very much in accordance with the hypothesis framed earlier (see ANOVA Tables V, VII, IX, X, XVI, XVII, XXIII, XXIV, XXVII and XXVIII and means Table IV). On this variable it was hypothesized that introverts would perform better than extraverts on all the six problem solving tasks because introverts excite quickly accumulate Ir slowly and dissipate it faster plus introverts have higher cortical arousal, which helps them to learn faster than extraverts. In line with these assumptions many investigators have reported that introverts perform better on learning and problem solving tasks than extraverts (Eysenck, 1959, 1967, 1970; Gray, 1972; Mohan and Kumar, 1976; Kumar and Kapila, 1987 and Kumar and Kumari, 1987).

(II) On the variable of intelligence again the results are very much in line with the hypothesis framed earlier (see ANOVA Tables V, VII, IX, X, XVI, XVII, XXIII, XXIV, XXVII and XXVIII and means Table IV). On this variable it was assumed that high intelligence subjects would perform better than above average and average intelligence groups and above average intelligence subjects would perform better
than average intelligence group. Again the Duncan's analysis show that the high intelligence group is significantly better than the other groups and above average intelligence group is significantly better than average intelligence group (see Tables VI, VIII, XI, XVIII, XXV and XXIX). The obtained results on the variable of intelligence may be explained due to the fact that high scorers on intelligence have higher cognitive ability which helps them to bring different strategies for the solution of different kinds of problems than low scorers. The present results where high scorers are performing better than low scorers do find support from several studies (Maltzman, Eisman and Brooks, 1956; French, 1958; Klausmaier and Longlilin, 1961; Mendelsohan, Griswold and Anderson, 1966; Laughlin, 1967; Laughlin, Doerrty and Dunn, 1968; Vasilyeva and Zemtsova, 1982; and Ajwani and Upadhyay, 1983).

(III) The results on the variable of induced stress are also very much in line with the hypothesis framed earlier (see ANOVA Tables V, VII, IX, X, XVI, XVII, XXIII, XXIV, XXVII and XXVIII and means Table IV). On this variable it was hypothesized that induced stress would be detrimental to performance. In the present results where stress is showing its adverse effects on the performance of the subjects do find support from the several studies (Bardack, 1960; Marlett and Watson, 1968; Silverman and Waite, 1969; Dusek and Hill, 1970; Deffenbacher, 1978, 1985; Harrison and Whissell, 1980; Ruisel, 1982; Vander Ploeg and Hulshof, 1984; Paulman and Kennelly, 1984;
(IV) On the variable of sex, the results are very much in accordance with the hypothesis framed earlier (see ANOVA Tables V, VII, IX, X, XVI, XVII, XXII, XXIV, XXVII and XXVIII) and means table IV. On this variable it was hypothesized that males may take less trials and less time in order to solve different kinds of problem solving tasks. In the present results where males are performing better than females on all the six problem solving tasks do get support from the several studies (Bedell, 1934; Billings, 1934; Sweeney, 1953; Terman and Tyler, 1954; McNemar, 1955; Stass, 1957; Maier and Burke, 1967; Priested and Hunsaker, 1969; Maier and Casselman, 1970; Roll, 1970; Constantinople, 1974; Raahein and Kaufman, 1974; Felen, 1975; Maxwell, 1975; McWay, 1975; Singer, 1975; Hayes, 1978; Benbow and Stanley, 1980; Jacob and Dominowski, 1981; Johnson, 1984; Luchins and Luchins, 1984; Pesch, 1985; Kumar and Kumari, 1987). The reasons behind the better performance of males over females are (i) attitude towards facing the problem (Carey, 1958; Hoffman and Maier, 1961; and Kumar, 1983) (ii) Sex role differentiation (Parson and Bales, 1955; and Milton, 1957; 1959; and Kumar and Kapila, 1987) (iii) Fear of success (Horner, 1968, 1972, 1974).
(V) The interactions between personality x intelligence on the problem solving squares for both trials and time taken are very much in accordance with hypothesis framed earlier (see ANOVA Tables IX and X). For this interaction it was hypothesized that introverts and extraverts may significantly differ amongst high scorers because of high arousal of introverts and higher cognitions and intellectual capacity of high scorers on intelligence but not among low scorers of intelligence because in the absence of high cognitions and low intellectual capacity the arousal differences in extraversion may be nullified. For details (see Figure I and Table of contingency means along with t-values, XII).

(VI) The interactions between personality x sex on the prisoners problem and Hanfmann-Kasanin test for both trials and time taken are again very much in line with the hypothesis framed earlier (see ANOVA Tables XVI, XVII, XXVII and XXVIII) wherein it was assumed that there would be significant differences between males and females in problem solving efficiency in extraverted group. The hypothesis was framed on basis of some studies (Kumar, 1975 and Kumar, Malhotra and Jerath, 1986) wherein they had suggested that females perform poorly since they are more extraverted. In the present results it is clearly observed that introversion boosts the performance of both the sexes especially males whereas extraversion hinders the performance of both the sexes - more pronounced in females. For details (see Figures V and X and means contingency
Tables XIX and XXX). The present interaction clearly demonstrates that on extraversion, there are significant differences between males and females (For t-values see Tables XIII and XX) because in the present sample of introverts and extraverts females are more extraverted (see Table I).

(VII) The interactions between intelligence x stress on the problem solving squares for both trials and time taken and on the prisoners problem for trials taken only are very much in line with the hypothesis framed earlier (see ANOVA Tables IX, X and XVI) wherein it was hypothesized that stress would affect more adversely high intelligence and above average intelligence group than the average intelligence group. It was framed keeping in view the latest trend of studies (Ploeg, Schwarzer and Spielberger, 1983, 1984 and Gupta and Sharma, 1987) that the effects of induced stress are nested at the higher levels of intelligence. The same trend has been observed in the present investigation. For details (see Figures II and VI and contingency tables along with t-values, XIII and XX).

(VIII) The interactions between intelligence x sex on the prisoners problem for trials taken and on the sorting cards problems for time taken are again in line with the hypothesis framed earlier (see ANOVA Tables XVI and XXVI) wherein it was assumed that on all the levels of intelligence females may perform poorly than males because of lack of motivation and positive attitude towards facing the
problem, sex role differentiation and fear of success i.e. females are more feminine and score higher on fear of success. In line with these assumptions many investigators have reported the same trend (Parson and Bales, 1955; Milton, 1957, 1958; Carey, 1958; Hoffman and Maier, 1961; Horner, 1968, 1972, 1974; Kumar, 1983 and Kumar and Kapila, 1987). In the present study also males are performing better than females on all the three levels of intelligence. For details (see Figures XII and IX and contingency tables along with t-values, XXI and XXVI).

(IX) The interactions between stress x sex on the problem solving squares and Hanfmann-Kasanin test for both trials and time taken are also in accordance with the hypothesis framed earlier (see ANOVA Tables IX, X, XXVII and XXVIII) wherein it was presumed that stress may show its deliterious effects more among females than males. The results are in the expected direction. The means contingency tables along with t-values (see Tables XIV and XXXI) reveal one interesting observation that differences between stress/no stress conditions are more pronounced in males than among females though females as a group perform poorer than males (see Figures III and XI). The reasons for smaller differences between females under stress/no stress conditions may be due to the fact that females under testing conditions become anxious even under no stress conditions.
(X) In the present investigation some triple interactions on
the prisoners problem on time taken and on the Hanfmann-Kasanin
problem for both trials and time taken have also been observed
between personality x intelligence x sex (see ANOVA Tables XVII,
XXVII and XXVIII). The obtained results show that in males as well
as in females introversion facilitates the performance of all the
three groups of intelligence because of higher arousal and lower
inhibition and on the other hand extraversion seems to be hindering
the performance of males and females on all the three levels of
intelligence. For details (see Figures VIII and X and means
contingency Table along with t-values, XXII and XXXII).

(XI) The interaction between intelligence x sex x stress on the
problem solving squares on time taken only has also been observed
in the present study (see ANOVA Table X). It is clearly observed
that females are inferior to males and at the same time the effect
of stress is more pronounced in females and is nested at higher
levels of intelligence. The obtained results do get support by some
latest studies (Ploeg, Schwarger and Spielberger, 1983,1984 and
Gupta and Sharma, 1987) For details (see Figure IV and Means
contingency Tables along with t-values, XV).

In the present investigation an attempt was made to measure
the effect of stress through S-Anxiety since the two are highly
correlated (see ANOVA Table XXXIII and Figure XIII). For this
purpose the S-Anxiety was measured before the instructions, after the stressful/normal instructions and after the completion of the task. A repeated measure factorial design of the order of 2 x(3) was employed. The Table XXXIII clearly shows that the main effect of stress and anxiety are significant thus signifying that stressed group had more State-Anxiety and again in after instructions condition, there is a significant increment of S-Anxiety compared with other groups as expected and hypothesized earlier.

An interesting feature of the present study is that as expected, an interaction between stress x anxiety has been obtained. The t-values for the interaction show that there is no significant difference between stressed and non-stressed group before the instructions and in after the completion of task. On the other hand significant differences exists between stressed and non-stressed group in State Anxiety in after the instructions condition. The obtained results clearly indicate that stress is detrimental to performance through State-Anxiety meaning thereby that stress leads to State-anxiety which has negative consequences and is deliterious to performance.