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DISCUSSION

7.1 Anxiety Performance relationship: An Overview

The present investigation relates the personality and ability factors to performance. Anxiety (trait and state) is used as a personality factor while intelligence is used as an ability factor. The performance is measured on perceptual-motor task (two-hand co-ordination task) and cognitive task (letter-transformation task). The investigator is interested in studying the relationship of anxiety and intelligence with the performance on two-hand co-ordination and letter-transformation task. In the present work the trait and state anxiety and intelligence have been used as independent variables.

While relating anxiety to performance the researchers have used a number of tasks from simple to complex. They have started with the simplest task like eye-lid conditioned reflex (Spence 1964) to the complex task like letter-transformation (Hockey, Rejman 1977) and problem-solving. The nature of the task also has been varied by these researchers. Some tasks were motor and some were perceptual-motor, the others were verbal type. The example of simple motor task is tapping on pursuit-rotor, tracking is another example of this type. The examples of perceptual-motor task are mirror-tracing, two-hand co-ordination etc.

The perceptual-motor task differs from the simple motor task in two ways: (1) it is not a purely mechanical or manual task since
it involves selective perception in choosing the target to hit at. Two-hand co-ordination task is a perceptual-motor task in which the subject has to make a proper co-ordination of both the hands in tapping the appropriate numbers simultaneously. This involves the perceptual element like locating the numbers, judge its accuracy or appropriateness and then the motor element of tapping. When tapping is co-ordinated with accurate numbers, the subject gets a score, if done wrongly, the subject does not get the score. (2) the perceptual-motor task is difficult to perform than the simple motor task, because the co-ordination of perceptual, motor elements is involved.

The investigator has selected for study the perceptual-motor task because it is more complex. The results of anxiety and performance relationship show that trait anxiety is not an important predictor of performance on simple task. Therefore the investigator felt that studying anxiety with simple task would simply be redundant.

Many investigators have related anxiety to the verbal task. In verbal task like paired associate and serial learning, subject has to choose an appropriate response from a number of alternative responses. Hence, this task is of a complex nature. Perceptual-motor task like two-hand co-ordination cannot be compared with the verbal task. However, the present investigator was interested in keeping the nature of the task somewhat similar not affecting its difficulty. Therefore, she has selected a cognitive task (letter transformation) which is difficult and which involves selective perception. In cognitive task the subject has to process the information and then
decide in finding out an appropriate response. Such a task has been rarely used in previous research excepting that of Hockey and M.W. Eysenck (1982). By using these two tasks the investigator would be able to compare the findings across these two difficult tasks namely perceptual-motor and cognitive, while keeping the similar difficulty level of the tasks.

The present chapter of discussion is divided into three parts: (1) perceptual-motor performance as related to intelligence and trait anxiety (2) perceptual-motor performance as related to intelligence and state anxiety (3) performance on cognitive task as related to trait and state anxiety.

7.2. Perceptual-motor performance as related to intelligence and trait anxiety:

The two-hand co-ordination task was done by the right hand alone, left hand alone and both the hands together. We have therefore, three scores on two-hand co-ordination task with anxiety and intelligence as independent organismic variables.

The high intelligent subjects are better than the low intelligent subjects, is almost a foregone conclusion. But as a researcher one has to probe into strategies, these subjects employ in dealing with the task. The high intelligent subject makes use of his previous experience while processing the information at hand. He hardly uses a trial and error method but tries to gain insight into the problem.
Therefore sometimes it is seen that the high intelligent subjects go slow and their progress is hardly visible. But as they go ahead they speed up and compensate for the earlier slow progress. The high anxious because of their typical personality syndrome of insecurity are accuracy-prone. "Look before you leap", "Think hundred times before you take a decision", are some of the common features of high anxious subjects. The low anxious subjects, on the other hand, are of carefree disposition, sometimes impulsive and therefore speed-prone. The high anxious subjects have an advantage when the tasks are simple. But as the tasks become difficult, these subjects become undue overcautions and sometimes not able to process the information in a satisfactory way. Their typical high anxiety aggravated by the complexity of task and hence they cannot swim through easily, where they are in the midst of doing the complex task. On the other hand, the low anxious subjects have an advantage of their carefree disposition in helping them to tackle the complex situation in a satisfactory way.

Therefore, the high intelligent with low anxiety subjects should always be better on a complex task than other combinations based on anxiety and intelligence. The investigator likes to check whether these predictions are supported by the findings of the study.

It is observed from Table 3 that the main effect of intelligence is statistically significant (F=7.195; P < .01) but the main effect of trait anxiety is not statistically significant (F=1.70; P > .05). This means that intelligence has a definite and a positive effect on two-hand co-ordination performance. The interaction between anxiety and intelligence is not statistically significant.
A glance at Table 4 shows that, high intelligent group is better (Mean = 117.85 and 124.00) than low intelligent group (Mean = 112.25 and 107.80) irrespective of their anxiety level (high or low).

Table 4 also shows that, with intelligence level being the same (high or low) low anxious subjects performed better (means of HALB 124.00 and HAHB 117.85) than high anxious subjects on two-hand co-ordination task. But the difference between the means is so small as not to reach the level of statistical significance. Hence, trait anxiety is not found to be an important variable on two-hand co-ordination task done by the right hand.

Intelligence affecting the performance on two-hand co-ordination task by right hand does not need any explanation. Intelligence has been measured on Kuhlman-Anderson's Intelligence Test (Marathi Adaptation) which assesses the general mental ability of the subject. The intelligent subjects use the appropriate strategies which are different from the low intelligent subjects and these strategies like processing the information in a right way, ignoring the irrelevant information and concentrating on the relevant aspect and then analysing the information, help them to improve their performance on two-hand co-ordination task.

7.3 Left-hand performance on the two-hand co-ordination task:

It is observed from Table 6 that the main effect of intelligence is statistically significant (F=11.62; P < .055) but the main effect of trait anxiety is not statistically significant (F=1.95; P > .05).
The interaction effect of intelligence and anxiety is not statistically significant ($F = .079; \ P > .05$).

Table 4 shows the same trend of results as Table 1, i.e. high intelligent group is better than (Mean of HAHB = 113.40 and of HALB 117.35) the low intelligent group (Mean of LAHB = 110.30 and LALB 100.30 and LALB 106.25). Table 9 shows that, the main effects of intelligence ($F = 3.69; \ P > .05$) and trait anxiety ($F = .009; \ P > .05$) and also the interaction of intelligence and trait anxiety ($F = .054; \ P > .05$) are statistically insignificant. If we read the results from Table 7, it is seen that even on the task done simultaneously by both the hands, the high intelligent subjects are better (Mean=27.80 and 27.30) than the low intelligent subjects (Mean = 22.95 and 23.65).

If we carefully examine the results on two-hand co-ordination task by right hand we observe three points:

1. Intelligence has been consistently found to be statistically significant.

2. Trait anxiety and the interaction effect of trait anxiety and intelligence have been consistently found to be statistically insignificant.

3. The low anxiety group (with similar intelligence) is found to be better than the high anxiety group on single task performance. On the other hand, on performance by both the hands the high anxiety group was found to be slightly better.
The effect of trait anxiety as related to two-hand coordination task is not statistically significant. This can be explained by Spence's model. If the task is difficult or complex, the low anxiety group always gets the advantage over high anxiety group. The difficulty/complexity of the task arouses more tension in the high anxious subjects and hence they perform poorly on complex tasks. The two-hand co-ordination task is a simple motor task. Tapping is almost a manual or a repetitive activity which does not arouse in any way tension or stress in the subjects. Therefore, the high and the low anxious subjects perform almost similarly on the simple tasks and hence trait anxiety has not been found to be a significant factor on the performance on two-hand co-ordination task. The findings of the present investigation are in the line with the studies of Spielberger and Smith (1966) and Jain, Swantaur (1986).

When we compare the three tables of ANOVA (Table 3,6 and 9), we find that the effect of intelligence is more prominent for the left hand performance as compared to right hand performance and also performance by both the hands. Intelligence helps more on the single task performance by right hand than for both the hands. The prominent effect of intelligence on left hand performance can be explained. The subject trying to perform the task by non-preferred hand (left hand), has to use more skill and also in an effective way. Intelligence can definitely help him in manipulating the skill in this situation. Therefore, high intelligent subjects on the left hand performance are much superior to low intelligent subjects. The effects on intelligence on two-hand performance are meager. The situation here is more
confusing for the subjects when both the hands are used simultaneously. Intelligence, therefore, did not help much in this situation. Many psychologists time and again emphasize the point of division of attention whether the subject is of low intelligence or of high intelligence, does not make any difference for two-hand performance.

To sum up then, intelligence has facilitated more the left-hand performance than the right-hand performance and has slightly helped the performance by both the hands. Trait anxiety is found to be negligible factor so far as the performance on two-hand co-ordination is concerned. Since anxiety is not a very powerful factor, it did not interact with intelligence also.

The hypothesis Number 1 of the present study namely high anxious subjects will be better in performance than the low anxious subjects on single task, whereas low anxious subjects will be better on double task in perceptual-motor performance, is rejected.

The results support hypothesis 3 of the present study that the performance of high intelligent subjects will be better than the low intelligent subjects on perceptual-motor task.

7.4. Perceptual-motor performance as related to intelligence and state anxiety:

The second part of discussion focuses on the relation between state anxiety and perceptual-motor performance. The present researcher has selected the variable of anxiety for two reasons (1) it has been
stated by early researchers (Sagar Sharma, 1986, 1987) that state anxiety is a better predictor of performance than trait anxiety and (2) state anxiety has been used as a measure of stress.

Spielberger and Sarason have (1972, 75) edited a number of volumes on anxiety and stress. As anxiety is related to performance, stress also has been shown to be closely related to performance. The researchers have used the concept of stress as a stimulus, response or even a mediating process variable. The present investigator delimits the meaning of stress to stimulus. She wanted to see whether the stress condition facilitates or interferes the performance of the subject.

It is very difficult to measure stress since it is more or less a subjective condition (a mental state). However, the researcher operationally defines stress in this investigation. It is a score on state anxiety questionnaire, the subject who scores more on state anxiety questionnaire has more stress and he who scores less on the questionnaire has less stress.

Since this questionnaire is given immediately before the experiment to be carried out by these subjects, the stress condition would affect subject's performance and the effect of it could be accordingly measured.

It is observed from Table 12 that the main effect of intelligence 
\( (F = 5.19; \ P < .05) \) is significant. But the effects of state anxiety 
\( (F = 3.83; \ P > .054) \) and the interaction between intelligence and
state anxiety are not statistically significant (F = .37; P > .05). This means that the high intelligent group differs from the low intelligent group on two-hand co-ordination task, but high state anxious subjects do not differ from low state anxious subjects on this task. A look at Table 10 shows that low state anxiety facilitates the performance of high intelligent subjects (Mean of HALB = 123.13 and HAHB 117.63) more than low intelligent subjects (mean of LALB = 115.31 and LAHB 105.83).

The findings can be explained by the Spielberger's State-trait model of anxiety. State anxiety is generally used as a stressor. High level of the state anxiety means an aroused stress in the individual. Since state anxiety inventory was administered immediately before the experiment, state anxiety level (Stress) has directly affected the subject's performance. The low anxious subjects are not under stress and therefore their performance is better than that of the high state anxious (high stressed) subjects stress affecting the performance has been explained by a number of studies. Findings of the present study support that of Carlo, Manual, Almo and Leopaldo (1987), in which the evaluative condition is used as a stressor.

When we look at the left hand performance on two-hand co-ordination task, we get different findings. ANOVA, in Table 15 shows that only intelligence in a significant factor but state anxiety and interaction of intelligence and state anxiety are not statistically significant.
It is surprising to see that, the state anxiety is significant factor for right hand performance but not for the left-hand performance. State anxiety is a temporary phase which lasts till the condition or state is over. Here our subjects are in two different conditions (left and right hand co-ordination). It is likely that, these particular conditions may give rise to state anxiety. We find the right hand performance is better indicating indirectly lowering of anxiety level because right hand is preferred hand and no additional efforts are needed. The case is different in left-hand performance. Left hand is relatively less used, less practised and may give rise to higher level of anxiety. This may explain the discrepancy in right-hand performance and left-hand performance. One peculiar finding in Table 13 is that, low state anxious subjects are better than the high state subjects. (Mean of LALB-107.13 and LAHB = 100.71) when both belong to low anxiety group. There is no marked difference between high and low state anxious groups when they belong to high intelligent group (Mean of HAHB 115.50 and HALB 115.29). This clearly indicates that state anxiety (stress) has affected adversely the low intelligent subjects but not the high intelligent one.

The results of state anxiety on perceptual-motor performance can be discussed with the Spielberger's State-trait anxiety model. This model suggests that the subject should perceive the situation as threatening, then only the stress could arise. The low intelligent subjects may perceive the perceptual-motor task as threatening because of the very complexity of the task whereas the high intelligent subjects may not perceive it in a similar way. Thus the perception
of the task is an important factor in perceptual-motor task. Therefore, the stress would affect the low intelligent subjects but not the high intelligent one.

Probably, high intelligence level might have compensated for the performance of high state anxious subjects and therefore, their performance is not adversely affected.

An interest in individual differences has been central to experimental work on stress. There is enough evidence now, to suggest that some basis must exist for our findings. Valuable discussions of individual differences are included by a number of contributors notably Monk-Folkard (1981), Eysenck (1982). One of the measures of individual differences used in stress studies in that of temperament and the other variable of individual differences is ability or intelligence. M. W. Eysenck has studied these two variables quite extensively in studies of performance.

With reference to the complexity of the task the results of state anxiety should be viewed in a different way. The researcher should know first, how the subject perceives the task rather than imposing his perception upon the task. For the high intelligent subjects nature of the task as perceived by them is more important than the task per se. The high intelligent subjects may perceive the complex task simple and therefore even high state anxious subjects with high intelligence may not be disturbed by such a task. Hence the high state anxiety may not be a significant variable with the high intelligent group.
There could be another explanation given on the basis of Wine's research. Wine (1971) postulates two components of anxiety (1) Worry and (2) emotionality. The task may not be a cause of concern. The emotionality component will not be of any significance. Therefore, the high state anxious subjects may not be adversely affected by the complexity of the task.

In the case of the performance by both the levels, the results are still surprising. The ANOVA in Table 18 shows that the main effects of intelligence and state anxiety and also of interaction are not statistically significant. This means that the intelligence and state anxiety are in no way related to performance by both the hands. Observation of the Table 18 shows that the main effect of intelligence is narrowly missing .05 level of statistical significance.

A close scrutiny of Table 16 will throw light on the surprising non-significant results. The high state anxiety has adversely affected the performance of low intelligent subjects (mean = 22.00) whereas the low state anxiety has facilitated the performance of low intelligent subjects (mean = 25.25). In the case of high intelligent group, high anxiety facilitated the performance whereas the low anxiety adversely affected their performance. This shows an effect of interaction between state anxiety and intelligence. Table 18 shows that the interaction effect (F = 1.92) narrowly misses the statistical significance level. These results are typical for the performance by both the hands. It indicates that state anxiety is a prominent factor when the level of intelligence changes. The high intelligent subjects have a better processing capacity than the low intelligent
subject. In case of the task by both the hands the particular strategies used by these subjects can only explain their performance. Probably, the low anxious subjects with low intelligence are not disturbed and therefore they have a smooth sail. As against this high anxiety might have disturbed the low intelligent subjects in their performance and hence this interaction.

If we compare the F values for the trait and state anxiety, we find only in one case (Table 12) state anxiety value differs markedly from F value of trait anxiety but in other cases (ANOVA Table 3, 6, 9 and 21) the difference is very small. The results are not convincing to say that state anxiety is a better predictor of performance than trait anxiety in perceptual-motor task. The hypothesis number 5 is therefore rejected.

7.5 Cognitive task performance (Letter-Transformation Task)

While discussing the results of the cognitive task performance (letter-transformation task) one must bear in mind that, this task is a difficult one. The critical dimension of task difficulty is the extent of the demands placed on working memory capacity rather than some more specific processing resources.

When there are cognitive demands from the task, it will be assumed that the component of working memory mainly affected by anxiety is a major factor. Table 21 shows that the main effects of intelligence and trait anxiety are statistically significant. (F = 20.18; P < .001), (F = 4.73; P < .05) but the interaction effect is insignificant. The performance of high intelligent subjects is better than
low intelligent subjects, does not need any explanation. But, the value of F (20.18) and level of significance (.001) are remarkably significant. Since letter-transformation task is quite a difficult one as compared to perceptual-motor task, such remarkable findings are naturally expected. Such a task puts heavy demands on working memory system. The high intelligent subjects process the information quite effectively and this investment of processing resources makes a difference between the performance of high intelligent and low intelligent subjects. The hypothesis Number 3 that the performance of high intelligent subjects will be better than low intelligent subjects on cognitive task performance in supported.

If we compare the main effects of intelligence on perceptual-motor and cognitive task performance from ANOVA Table 3, 6, 9 and 21, we find that the F values are greater in cognitive task. This means that intelligence has a profound effect on cognitive task performance. It has already been explained from Baddley's (1974) working memory model that such tasks put more demand on the working memory and therefore, high intelligent subjects are better than low intelligent ones. The hypothesis Number 4 that, the difference between the performance of high intelligent and low intelligent subjects will be more pronounced in cognitive-task performance than in perceptual-motor performance is therefore supported.

The significant main effect of trait anxiety shows that the two groups namely the high anxious and the low anxious differ in their performance. Table 19 indicates that the low anxious subjects
are better than high anxious subjects irrespective of their intelligence level. The present study presents a strong support to say that anxiety impairs the performance in letter-transformation task.

Individuals, high in trait anxiety, attempt to compensate for adverse effect of anxiety by increased efforts or investment of processing resources. As a consequence, they have less spare processing capacity than the individuals low in trait anxiety. It is impossible to perform the transformation before the appropriate part of alphabet has been located in long-term memory, and product of transformation retrieved from store until the transformation has been compensated. The involvement of working memory system presumably increases progressively by letters. As the intervening letters increase, there is more demand on memory, making the task extremely difficult. Therefore, the performance of low anxious subjects is found to be better than high-anxious subjects. The explanation of Baddeley's working memory model and Spence's of anxiety are relevant to explain these findings.

The Yale theorists also try to explain the relationship between anxiety and task performance. When the task is difficult, task irrelevant responses are more likely to occur and thus they interfere with the performance. In the simple task the performance should remain unaffected. According to Yale theory the performance of low anxious subjects should be better than that of high anxious subjects in learning the task. Since the letter transformation task is a complex task, the superior performance of low anxious subjects is well explained by this theory. When in the complex task, the task irrelevant responses occur, high anxious subjects may not be able to cope up
with these and therefore their performance is adversely affected. The findings of this study are in the line with the Yale theory so far as complex task is concerned. These findings go with the studies of Lucas 1952, Montague 1953, Deshpande, 1972 and Aljapurkar 1982.

Tobias' model (1979) tries to explain the relationship between anxiety and learning. According to Tobias' model there are three stages where anxiety can have the largest effect on learning from instructions viz. (a) pre-processing (b) during processing and (c) post-processing. The first possible effect of anxiety on instructions in prior-to-processing is that anxiety may reduce in respect to effectiveness of input. In the present investigation the high anxious subjects might have faced the difficulty with following the information and therefore their performance might have been affected. However, the level of intelligence might have compensated this loss and therefore the difference between the two anxiety groups (high and low anxiety) with high intelligence though statistically significant, is not too much to reach the .01 level of significance. But in the low intelligent group the difference between two anxiety groups (high anxious and low anxious) is still lower since there is hardly any effect of cognitively mediated learning with such group. The results indicated in Table 21 therefore be explained by Tobias' model.

The second aspect of this model deals with low anxiety can affect instructional outcome by working of memory, transferring the input of information and generating a solution to problem. On the letter-transformation task when the transformation becomes difficult, the
high anxious subjects may get confused and they may take extraordinarily long time in arriving at solution to problem. In such a process they might make some errors. The difference between means of high anxious and low anxious is explained by Tobias' model. In short, the superior performance of low anxious group on cognitive task as against perceptual-motor task is in line with the Iowa model.

The investigator has used a non-parametric test (Mann-Whitney U test) in Table 22. Even the non-parametric test presents a similar trend of results. Hypothesis Number 2, of the present study, i.e. in cognitive task performance, the low anxious subjects will be better than the high anxious subjects is, therefore supported.

While relating the state anxiety to cognitive task performance the investigator found that the findings are different from trait anxiety. Table 25 shows that the main effect of state anxiety is not statistically significant. These findings may be explained by person situation model of Endler. Endler has reported about cognitive functions which are more person related. Ekhammer, Magmusson and Recklander (1974) emphasize the interaction of the person and the situation in understanding stress and anxiety. Letter-transformation task might not have aroused any stressful condition in subjects while finding out the solution and therefore state anxiety (which is also a measure of stress) has not been found statistical significant variable.
If we look at Table 23, we find that there is hardly a difference between high and low state anxious subjects, even if they are of high and low intelligence level.

From these findings, it is clear that the trait anxiety is a significant variable so far as cognitive task is concerned. But state anxiety is a better predictor of perceptual-motor performance. This gives the investigator a different line of thinking that the nature of task is a more important variable for anxiety and performance relationship study. This justifies her contention in including in the study, trait and state anxiety as organismic variables and perceptual-motor task and cognitive task as dependent variables. Further studies may even throw light on such a complex relationship between the personality variables interacting with the task variable.