CHAPTER-IV

DESIGN AND METHODOLOGY

The present study was conducted to study the effect of anxiety and work-load on CFF and performance. Two separate experiments were conducted to manipulate various levels of anxiety and work load.

Experiment-I.

In the first experiment the E wanted to study the effect of the various levels of anxiety on performance and CFF. Three groups of subjects were formed, by administering "Sinha Anxiety Scale", with low, moderate and high anxiety levels.

A schematic of the design employed is as follows:-

<table>
<thead>
<tr>
<th>Groups</th>
<th>Level of anxiety</th>
<th>Measurements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I</td>
<td>low</td>
<td>CFF, physical and mental performance.</td>
</tr>
<tr>
<td>n = 15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group II</td>
<td>Moderate</td>
<td>CFF, physical and mental performance.</td>
</tr>
<tr>
<td>n = 15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group III</td>
<td>High</td>
<td>CFF, physical and mental performance.</td>
</tr>
<tr>
<td>n = 15</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Experiment-II

In the 2nd experiment the E wanted to study the effect of various levels of stress given in the form of workload on CFF and performance.

A multigroup design was employed in the following manner:

<table>
<thead>
<tr>
<th>Groups</th>
<th>Before Measures</th>
<th>Treatment</th>
<th>After measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I</td>
<td>BP, CFF, mental and physical performance.</td>
<td>Pedaling on a bicycle for 3 min. continuously.</td>
<td>BP, CFF, mental and physical performance.</td>
</tr>
<tr>
<td>n=15 low work-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>load.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group II</td>
<td>BP, CFF, mental and physical performance.</td>
<td>Pedaling on bicycle for 6 min. continuously.</td>
<td>BP, CFF, mental and physical performance.</td>
</tr>
<tr>
<td>n=15 Moderate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>workload.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group III</td>
<td>BP, CFF, mental and physical performance.</td>
<td>Pedaling on bicycle for 9 min. continuously.</td>
<td>BP, CFF, mental and physical performance.</td>
</tr>
<tr>
<td>n=15 High</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>workload.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Experiment-III:

In the 3rd experiment the E wanted to study the interaction effect of anxiety and stress on CFF and performance. A 2x2 factorial design was used. Three groups of Ss were selected, by administering "Sinha Anxiety Scale", with low, moderate and high anxiety levels. Each group consisted of 10 Ss and
<table>
<thead>
<tr>
<th>Low Anxiety</th>
<th>High Anxiety</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Before measures</strong></td>
<td><strong>Treatment</strong></td>
</tr>
<tr>
<td>BP, CFF and mental and physical performances.</td>
<td>Pedaling on bicycle for 3 min.</td>
</tr>
<tr>
<td><strong>Low workload</strong></td>
<td></td>
</tr>
<tr>
<td>BP, CFF and performances.</td>
<td>Pedaling on bicycle for 9 min.</td>
</tr>
<tr>
<td><strong>High workload</strong></td>
<td></td>
</tr>
<tr>
<td>BP, CFF and performances.</td>
<td>Pedaling on bicycle for 3 min.</td>
</tr>
</tbody>
</table>
each group was given three levels of workload i.e. low, moderate and high randomly.

A schematic of the design employed is as follows: shown on page No. 30

Sample:

A sample consisting of 152 male Ss (including) 42 Ss for pilot work, ranging from 20-24 years in age, were selected at random from the group of students doing various post-graduate courses in M.D.U., Rohtak.

In the first experiment 75 subjects were given Sinha's anxiety scale to categories them into low, moderate and high anxiety groups. Of these Ss 45 subjects were randomly selected for required three groups - each containing 15 Ss.

2nd experiment was also a multigroup (3 groups) design and each group i.e. low, moderate and high workload included 15 Ss, thus a total of 45 Ss.

In the 3rd experiment 28 Ss were taken and divided into 4 groups i.e. low Anxiety - low workload, Low Anxiety - High workload, High Anxiety -
Total subjects (110)

Experiment 1st Anxiety (45)
- Low Anxiety (15)
- Moderate Anxiety (15)
- High Anxiety (15)

Experiment IIInd Work Load (45)
- Low workloads (15)
- Moderate workloads (15)
- High workloads (15)

Experiment 3rd Anxiety (20)
- Low Anxiety (10)
  - Stress
- High Anxiety (10)
  - Stress

Low Workload (5)
High Workload (5)
Low Workload (5)
High Workload (5)
Low Workload, High Anxiety - High workload. Each group consisted of 7 Ss each, though in final data only 5 Ss were included. In order to check any possible effect of physical workload due to sex, only male Ss were selected.

In final analysis 110 Ss were used. The sample break down is shown in the following fig. (on the opposite page).

Instrumentation:

Sinha Anxiety Scale:

In the present study to determine three levels of anxiety, self-analysis inventory called "Sinha Anxiety Scale" constructed and standardized by D. Sinha (Appendix No. DI) was used. This scale has 100 items with alternate responses of 'Yes' and 'No'. Ss have to answer all the 100 items in minimum possible time. Its reliability is .79 and validity is .8.

Sphygmomanometer:

DOCTOR mechanical sphygmomanometer and stethoscope were used for the recording of BP. It contains a cuff which is tied to the S's upper arm, a pump to fill air in this cuff and a dial to read systolic and diastolic BP of the S.
Hand Steadiness Apparatus:

Hand steadiness task was taken as an index of physical performance of S. To measure hand steadiness performance INCO Hand Steadiness Apparatus (Fig. 1) was used. It has a metal plate with 9 holes. The first hole has the largest diameter and continuously decreasing to the smallest diameter of the last whole in its front side. The apparatus was attached to an error counter through battery eliminator. The task of S was to put the stylus into the holes, one by one, without making contact with the plate error is counted.

Impulse Counter:

'Gujral' impulse counter of 6 volts AC (Fig. 1) was used to count the errors of the S. It has a 6 digit counter.

Battery Eliminator:

INCO Battery elimination (Fig. 1) was used to provide the required intensity of current i.e. 6 volts AC for impulse counter.

Flicker Fusion Apparatus:

To measure the CFF Threshold of S TECHNO Flicker Fusion Apparatus of model no. ff-3 and
serial No. 801014 (Fig. 2and §) was used. The apparatus has two sides - one for S, another for E. The S side has a viewing tube through which flickering light could be seen and an answer button is also there to be pressed by S whenever he perceives a change in the stimulus. The E side has power switch, answer back light, flickering light and controller of flicker per second. Flicker could be varied from 5 to 50 flickers per second.

Multiplication Chart:

To determine the mental performance of the S, the multiplication chart (Appendix D) was used. S has to multiply vertically in a definite manner for 3 minutes. Number of multiplication done acted as scores for mental performance.

Bicycle Ergogram:

TECHNO Bicycle Ergogram (Fig. 4) was used to induce physical stress. Spring balance is used to control the level of force required to pedal on the bicycle. The digital counter was attached with the wheel to give the reading of the work done.
Method

The present investigation was designed and conducted to study the effect of anxiety and stress/workload on CFF and performances.

The first experiment was conducted to determine the effect of anxiety on CFF and performance. Sinha Anxiety Scale was given to 75 Ss to classify them according to their anxiety scores. Ss were divided into three categories i.e. low, moderate and high anxiety. Each category consisted of 15 Ss.

After setting the apparatus the actual experiment was started. Ss were called in the lab., one by one, and made to sit comfortably. Rapport was established and S was given the general instructions of the experiment in the following manner:

"The purpose of this experiment to see the efficiency on various performances and a perceptual phenomenon called CFF. You have to co-operate to your maximum as this investigation is useful in the day to day life".

First of all physical performance was measured with the help of Hand Steadiness task. S was instructed in the following manner -
"You have to perform a simple task - you see, this apparatus (Hand steadiness) has some holes and you have to insert this stylus in the holes and take it out one by one. You have to avoid any contact of the stylus with sides of the holes or the metal plate as it will be counted as an error. No support should be given to your hand".

After giving the instructions the S was asked to perform this task and errors were recorded with the help of impulse counter.

After the physical performance CFF measures were taken. For it instructions were given as follows:-

"This is a viewing tube through which you can see a flickering light which will appear to be fused after sometime. As soon as you feel that the light has fused do press this button on your right hand side (RHS). In some trials you will see the fused light has started flickering. When you feel that light has started flickering again press the button immediately".

In this manner four measures were be taken.

After giving these instructions, S was adapted to darkness for 3 min. In the darkroom
the lights were put off for 3 mins. and S was asked to see through the viewing tube for one min. so as to adapt him to the light. Then the flickering was increased gradually and where the S responded i.e. he perceived the light as fused, that point was noted down. Then again S was adapted to darkness for one min. followed by one min. adaptation to fused light at 50 Hz frequency. The speed was then gradually reduced and the point where S felt that light has started flickering was noted down. In this manner 4 trails i.e. 2 in ascending and 2 in descending order, were taken. The average of 4 trails was taken as the find CFF value.

Finally, the S was asked to perform the mental task and the following instructions were given:

"Here is a multiplication chart. What you have to do is to multiply the numbers vertically. Where two digits come take the Right Hand Side value and if the last number is zero consider it as one and continue multiplications until I ask you to stop".

After instructions, the S was given the chart and asked to perform. After 3 min. he was
asked to stop. The number of multiplications done, were taken as score for mental performance.

In the 2nd experiment E wanted to study the effect of stress/workload on CFF and physical and mental performances. Three groups of 15 Ss each were taken. The groups were assigned to different levels of workload i.e. low, moderate and high, in terms of length of time. Pilot work was done on 42 Ss to determine low, moderate and high levels of workload in terms of physical task i.e. pedaling on bicycle ergometer. 6 levels of physical workload varying in length of time i.e. $1\frac{1}{2}$, $3$, $4\frac{1}{2}$, $6$, $7\frac{1}{2}$ and $9$ mins. were taken. The speed of pedaling was fixed at 150 units in a min. before-after measures were recorded and increase in BP was taken as confirmatory measure of stress. On the bases of BP measures and also of subjects i.e. how much time they took to be cover, it has found that $3$ min. physical work was sufficient to induce low stress/workload, $6$ min. as moderate workload and $9$ min. as high workload. Before and after measures of CFF and physical and mental performances were taken, since increased in BP was taken as confirmatory measure.
for workload, BP was also measure before and after the workload.

After setting the apparatus, S was called and given a comfortable seat. Then general instructions were given in the following manner:

"The purpose of this experiment is to know the effect of work done on different measures as BP, (CFF) perception and performance. You are required to pedal on a bicycle for some time. Various measures will be taken before and after the pedalling work".

First of all BP measures were taken. The cuff was tied on the upper arm of the S. Pulse beats in the upper arm were located by stethoscope. Then air was pumped into the cuff and released slowly, in this manner the diastolic and systolic BPs were recorded.

After this hand steadiness task, CFF and multiplication measures were recorded in the same way as in the 1st experiment. After recording all the measures the S was asked to perform on the bicycle ergogram. The S was given low, moderate or high workload, i.e. he was asked to pedal on
on the bicycle for groups to which he was assigned. Then again BP, CFF and performances measures were taken.

In the 3rd experiment E wanted to know the interaction effect of anxiety and stress/workload. First of all Sinha Anxiety scale was administered on the Ss and they were divided in 3 groups i.e. low and high anxiety groups. Each group consisted of 10 Ss. Further Ss in each group were randomly divided into 2 groups of 5 Ss each. These subjects were given 2 levels of workload i.e. low and high as in 2nd experiment. The before-after measurements of BP, CFF and performances were taken similarly as in 2nd experiment.

In this manner the data for 3 experiments was collected and results were tabulated for analysis.