Chapter-I

Introduction

The present era of technological advancement, has lead to innumerable investigations into the nature and relative contribution of different personal and social factors to the effective and efficient performance of individuals. However, efficient performance cannot be maintained for a long period under unfavourable environmental conditions.

Advanced technology and complex production processes create new problems for the individual at work such as exposure to new chemicals, to radioactive substances, to dangerous dusts, excessive noise, extreme heat and cold, new machines and new speed of production. So, it is necessary to pay attention to environmental factors and their effects on performance.

Man can survive and function under a wide range of external stresses but it is only under a favourable environment that he can make sustained efforts and at the same time remain in good physical condition. So one must be cautious in creating a favourable work environment to get good results.

A socio-psychological survey conducted in Calcutta by Balgopal (1986) reports that noise pollution ranks next to waterdropping and air pollution as a health hazard.
Noise which is a ubiquitous form of stress is usually regarded as distracting and therefore as interfering with work efficiency since it draws attention away from the task at hand. But in certain instances it might increase the efficiency. The effect of noise depends on a number of factors such as nature of noise, kind of work and the emotional response of the individual.

Intensity of the noise is one of the most important factor which affects performance. Efficiency increases only when there is a reduction in noise (Weston and Adams, 1932). If intensity of noise is high, a reduction in detections associated with high false-alarm rates is observed (Broadbent and Gregory, 1965). But the general laboratory findings show performance under noisy condition to exceed that during quiet. Some investigators have found that subjects had their greatest attention capacity level in the noise condition (Ponsoda, 1982) while others observed that average performance was not affected by intense noise (Park and Payne, 1963). They observed that performance is affected only in the case of a boring easy task. With a task of high difficulty they observed no effect of noise. Similar results that noise even at very loud levels has little effect on performance of a single-source monitoring tasks have been reported by Blackwell and Belt, (1971). Other investigators have found that in tasks which demand complete attention noise proves to be a distractor. (Pollock and Bartlett, 1932; Woodhead, 1966). Infact noise above
SOUND PRESSURE LEVEL (dB)

- SOMANIC AROUSAL AND SLEEP INTERFERENCE
- SPEECH MASKING AND ANNOYANCE STARTS
- HEARING LOSS STARTS
- PHYSIOLOGICAL DAMAGE STARTS
- PAIN

1. SCOOTER VEHICLE TYPE
2. MOTOR CYCLE
3. CAR
4. MOTORCYCLE
5. VAN/ JEEP
6. MINI BUSES
7. BUS AND TRUCK
8. DOUBLE DECKER BUS
9. TEMPO VANS

THE PSYCHOLOGICAL AND PHYSIOLOGICAL EFFECTS (LOCOMOTOR VEHICLES) ON HUMANS.
25 decible (db) causes somatic arousal and interferes with sleep. If the level increases above 65 db speech is masked and annoyance develops, while at 80 db hearing loss might occur. If loudness of noise increases even further i.e. above 100, it might cause physiological damage (Figure 1).

Loudness being the same, noises that have a higher pitch are more annoying than those of a lower pitch. Sounds of either very high or low tone qualities are also more irritating than those in the middle zones. Thus a person may tolerate a sound of a certain intensity provided it falls into his middle zones of hearing, whereas he may be annoyed by a sound of equal intensity that has a high pitch or a very low or very high tone quality.

Intermittent noise has a detrimental effect on performance in comparison to continuous noise. On a complex psycho-motor task intermittent noise definitely decreases the performance (Eschenbranner, 1971). Similarly unexpected and unpredictable, noise also disrupts performance (Sander's 1961; Finkelman and Glass, 1970; Glass and Singer, 1972). However, Plutchik (1962) failed to observe any effect of intermittent noise on a compensatory tracking and mirror tracing task but there was an increase in errors committed during the mirror tracing task. Similarly Smith and Broadbent (1980) did not observe any effect of noise on performance of an embedded figures tasks involving salient and irrelevant cue.
Duration of noise also influences its effect on efficiency. Sounds of longer duration have more adverse effect on efficiency than short-term exposures. As the level of noise increases beyond 90 db and as the length of the working period increases the performance on a vigilance task is affected. (Broadbent, 1960). Similarly (Kryter, 1950 and Broadbent, 1957) a task requiring continuous long-term attention is more likely to be degraded by noise than tasks requiring short-term attention.

From the above discussion it is clear that the effect of noise depends on the kind of noise and the kind of work. Noise fails to show much distracting effect with tasks that are readily automatized. (Pollock and Bartlett, 1932). This is particularly true with simple motor tasks. Similarly, with tasks that are both highly interesting and complicated, noise does not appear to disturb output. On the other hand with tasks that do not demand complete attention, noise tends to be distracting. Noise is especially disturbing in those tasks, when the individual comes to a difficult point in the performance. The more the work involves mental activity the greater is the disturbance from noise (Vernon and Warner, 1932).

Another factor which also affects its distracting power is the intelligibility of noise. (McBain, 1961). Noise that has little meaning for the individual is less likely to attract attention away from the task at hand.
That is why students whispering across a library table may prove more distracting than the drilling, pounding and crashing noises from the construction job across the street. A related factor which influences the disruptive effects of noise is the individual's emotional response to it. This is particularly true when the distraction is caused by some inconsiderate action on the part of another person, such as, a co-worker, fellow student or neighbour. Glass and Singer, (1972) have presented experimental evidence that the effects of noise are less disruptive when the individuals have some control over the noise.

Differences are also found in the individual's attitude toward noise and the annoyance which thereby arises. Empirical work, usually connected with investigating the effect of intensity on both annoyance and performance, confirms a large variation between individuals. This variability might be apportioned to one or a combination of sources, such as some non systematic variation in the response of the individual or to some enduring characteristic of the individual. (Delaurzun, 1977; Jonah et al.1981). Even at very low levels there will be some individuals who are intensely annoyed by noise, and although this proportion increases with the level of noise, at the highest level of exposure a few individuals remain unperturbed.

Individual and group differences in the effect of noise upon performance have been less thoroughly investigated than have individuals and group differences in noise annoyance.
The greatest majority of investigators, of the effects of noise upon performance have reported individual differences only incidentally if at all, and although individual differences in the effects of noise are generally believed to be considerable, some doubt exists as to their reliability (Wilkinson, 1974).

It has also been reported that when loud noises are introduced, the first effect is the startle reaction. Soon the subject adjusts, and eventually he performs better during the noisy period than during the quiet periods which precede or follow it. It has been noticed that after a period of several weeks individuals even adapt to a noise as intense as jet aircraft, (Culbert and Posner, 1960). This absence of change in performance is due to adaptation to the noise. Evidence has been found by Cassel and Dallenbach, (1918) that when a noise is accepted as a part of the background it is no longer distracting. Under continued noisy conditions the increased effort and energy expenditure which occurs at the beginning of exposure to noise gradually decreases and finally approaches the level, characteristic of quiet conditions (Freeman, 1939). Ford, (1929) reported that noise actually is not disturbing rather it is the change which is disturbing. Once subjects have been accustomed to the experiment, going from noise to quiet is about as distracting as the reverse.

In an article published in Psychological Reports
in 1979 Poulton reviewed the effects of continuous loud noise on performance. He reported that in a number of settings efficiency could be improved by the presence of continuous noise. He proposed that this was probably due to increased arousal. Since, intense, complex stimulations are postulated to arouse the individual and noise is an external stimuli which can be controlled in terms of intensity, variation and meaningfulness, it qualifies as a potential arouser. According to Duffy, (1962) human performance tends to vary in accordance with the general activation level of the individual. However, the relationship is not a direct linear one. Rather, it is described better by an inverted U-shaped function. At low activation levels, performance is handicapped by lack of alertness, a decrease in sensory activity, and lack of muscular coordination. At intermediate levels of activation, performance is optimal, and at high levels performance is again handicapped by hypertensiveness, loss of muscular control, impulse to action, and in the extreme, total disorganisation of responses (Scott, 1966).

Direct tests of the arousal hypothesis have not been frequent. Scott, (1966) has reviewed the research and found it supportive of the hypothesis but still quiet meagre. Recent examples of studies which have tried to correlate the effect of noise on performance to the arousal hypothesis are those by McBain, (1961) and Smith & Curranow (1966).
In a recent study by Caracciolo, (1985) the fundamental role of general arousal in determining good performance was investigated. Tactile perception and visual discrimination under high arousal were better than those in a relaxed condition. Also, the discriminating task interfered more with performance under a relaxed condition than with that under high arousal. A similar relationship i.e. inverted U-shaped has been found between performance and another variable i.e. anxiety. As anxiety increases up to a certain level it results in an increase in the activation level and thereby has a facilitative effect. But as anxiety increases beyond an optimal level it has a detrimental effect. Thus best performance occurs not at the lowest but at the optimum level of arousal, above which there is a decrement effect.

Anxiety which is a unique combination of unpleasant thoughts and feelings is accompanied by internal physiological changes. According to Speilberger, (1972) the symptoms of anxiety are feelings of tension, apprehension, nervousness and worry as well as physiological changes such as trembling, heart palpitation and dizziness.

Anxious persons are more physiologically and psychologically aroused as compared to normal persons. Infact, the strength of anxiety reactions can be evaluated by a number of physiological measures such as changes in heart-rate, blood-pressure, muscle action potential, respiration and
galvanic skin response. A significant increase in mean blood-pressure, heart rate and respiration rate and significant decrease in digital pulse amplitude is associated with anxiety. (Ray and Brady, 1984). It has also been reported that high anxious subjects have a significantly higher skin conductance, a more frequent spontaneous fluctuations, shorter latency, higher amplitude and longer recovery time than the normals. Anxiety also shows in physical symptoms such as ulcers and breathing problems. Although high anxious persons do not differ cognitively from low anxious persons, they do exhibit significant differences in physiological arousal and psychological reactions. It is definitely impossible for a high-anxious persona to have the same psychological reaction as a low anxious one.

Psychologically, anxiety involves such reactions as fear and feeling of depression. Empirical evidence of different types of anxiety concepts has lead to the identification of two distinct anxiety factors which have been labelled as State Anxiety and Trait Anxiety (S.A. & T.A.).

The State Anxiety factor is based on a pattern of variable that covary over occasions of measurement defining a transitory state of the organism which fluctuates over time. The Trait Anxiety factor is interpreted as measuring stable individual differences in unitary, relatively permanent personality characteristics.
Since anxiety is a warning signal, it is clearly to one's advantage to respond with normal anxiety in contrast to abnormal or pathological anxiety. Generally, the person is conscious of only a disagreeable feeling and rarely of intense discomfort, but he is usually not aware of the cause of his anxiety. Infact, investigations of the effect of anxiety on performance indicate that anxiety has an inverted U-shaped relationship with performance. It was seen that high anxious individuals are significantly poorer in psychomotor performance as compared to their low anxious counterpart (Jain, 1986). High-test-anxious subjects have more task irrelevant thoughts that prevent them from focusing on the task (Sarason, 1980). These ruminative self-deprecatory thoughts are the major distinguishing variable between high and low test-anxious subjects.

Correlation between test anxiety and performance on different types of tasks have been investigated by many investigators, who report that high anxious when compared with low anxious scorers on measures of test anxiety tend to perform relatively poor on various types of ability tests (Phillips, 1982; Sarason, 1960). Although test anxious persons are not deficient in intellective where-withal, rather, the problem seems to be that they exaggerate and personalize inordinately the threat of evaluation that may inhere in a given situation (Mandler and Sarason,
High anxious and low anxious subjects also differ in the quantity and quality of their cue-seeking behaviour. High anxious subjects have been found to be more responsive than low test-anxious subjects to reinforcements given in verbal conditioning situations. (Sarason, 1958, 1965). The high test-anxious scorer is attentive, too, but in a different way. He tends to be self-oriented and to personalize the situations and challenges with which he finds himself confronted. There is considerable evidence that he is strongly self-depreciative and ruminative (Doris and Sarason, 1955). Cues that suggest that his behaviour will be evaluated according to some norm of standard of excellence seem to constrict his focus. Whereas the less test anxious scorer plunges into a task when he thinks he is to be evaluated the highly test-anxious individual plunges inward. He either neglects or misinterprets informational cues that may be readily available to him or experiences attentional blocks.

Anxiety which is one of the most significant area of investigation as a motivational factor in personality dynamics, have also been considered for its influence upon perception. Perception is an adaptive function of the organism. The optimally functioning person mobilizes and directs attention as required by the task in hand. Among the various forces which influence the organism's perception
stress and anxiety constitutes an important source of variation. Performance on detection tasks which require close concentrated attention is generally influenced by any distraction and could lead to increase in errors or time required to complete the task. In those tasks where detection and attention is very important, anxiety and stress plays a vital role. If one person possesses an anxious personality, and if side by side he is also facing a stressful situation (noise) the effects on perception are definitely going to be deleterious, as compared to a mentally healthy person who is free of anxiety. The anxious person is most likely to have a dwindling attention and will be unable to concentrate on his/her work.

The presence of anxiety in a stressful situation is not harmful but its greater magnitude is (a pathological concern) harmful. A state of anxiety can be reduced if a stressful situation is perceived as less threatening. Numerous stressors are encountered in daily life and everyone experiences anxiety states from time to time. A common environmental stressor, noise, a by-product of technological advancement has come up as a major health hazard now-a-days.

The present study has been conducted to determine the effect of noise and anxiety—both of which have an inverted U-shaped relation with performance on perception.
The relevant literature dealing with the individual and combined effect of these two variables, on perception, will be discussed in the next chapter.