CHAPTER III

REVIEW OF LITERATURE

There has been a vast array of research regarding the influence of inferred motivational variables, such as anxiety, on various types of performance, bearing on the theoretical framework of psychoanalysis (Sarason and Mandler) and Hull's Drive theory (Taylor-Spence). A great deal of experimental work dealing with the effect of anxiety on learning has been carried on under the direction of Spence, who conceives of anxiety as an acquired drive, which has the capacity to generally energize the organism. To test hypotheses derived from Taylor (1953, 1956) and Spence (1956, 1958), a series of studies originating in 1950s have been concerned particularly with the effects of anxiety on complex learning. Many more studies to test hypotheses of Malmo (1958), Mandler and Sarason (1952), Child (1954), and Sarason (1956) were related to the same problem, but approached it from somewhat different theoretical positions.

Outside the classical conditioning situation and other nonverbal tasks, in which the Taylor-Spence drive theory has been tested, verbal learning studies have been the primary interest. Research studies reviewed in the following section, by and large, deal with serial learning task, paired-associate learning and academic achievement, as influenced by anxiety, psychological stress, and intelligence. The serial learning and paired-associate learning tasks have been predominantly used in anxiety research. The bulk of available evidence
regarding the drive theory and verbal learning paradigms also provides considerable insight into the nature of learning processes.

In this review, studies dealing with learning paradigms other than paired-associate and serial learning, and which are not related directly to drive theory have also been briefly mentioned.

Studies that have been reviewed in this chapter are arranged according to the number of variables taken in them. First of all, studies dealing with the effect of single-variable, e.g., anxiety (general and test) on serial learning (verbal and nonverbal), paired-associate learning (meaningful and meaningless) and complex learning have been discussed. This is followed by two-variable studies, e.g., effect of anxiety and stress (psychological and physiological) on serial learning, paired-associate learning and complex learning. Then three-variable studies, i.e., effect of anxiety, stress, and intelligence on learning, i.e., serial learning, paired-associate learning and complex learning are dealt with. Studies that have also considered A-state (state-anxiety) are also reviewed. In the last portion researches dealing with anxiety (trait and test), intelligence and academic achievement are reviewed. This is followed by general overview and conclusions.
Single Variable Studies

Effect of Anxiety (General and Test) on Serial Learning:
(a) Verbal (b) Nonverbal

(a) A number of studies (Montague, 1950; Rosenbaum, 1950; Taylor, 1951) have been concerned with an attempt to study the effects of different levels of motivation (anxiety) on performance in a variety of learning situations. In the first of these studies Taylor (1951) proposed hypothesis that (a) the total effective drive (D) strength of a subject was, in part, a function of the level of internal anxiety or emotionality of the subject, and, (b) the level of this emotional state would, in turn, be reflected by the responses made on an anxiety questionnaire. Further, the effects of anxiety vary with the type of material learned. Considerable data on this point have been accumulated in the attempts by Taylor, Spence, and their co-workers to conceptualize the anxiety learning problem within the context of Hull's learning theory (Taylor, 1951; Taylor, 1952; Spence, 1956; Spence and Spence, 1966).

In a classical and oft-quoted study, Montague (1953) assumed that variables of intra-list similarity and association value of items should affect the number and strength of correct and incorrect tendencies in verbal learning situation and this hypothesis he tested by using three different types of lists of nonsense syllables. Ss were selected with the help of the Taylor MAS (Taylor, 1953). The results showed that LA Ss were generally superior on easy list (List I) and their
superiority was more masked after the early trials but began to lessen as learning continued. On list of moderate difficulty (List II) LA Ss showed superiority over HA Ss but a lesser extent and with less indication of the early equality of performance and a reversal in performance took place in the learning of difficult list (List III). Thus, HA Ss might react with greater feeling of frustration or failure to the complex tasks, thereby, arousing interfering responses. Montague's (1953) findings add weight to the growing belief that both drive and associative factors must be considered in performance whether in general area of learning or in clinical area.

A study was undertaken by Hicks (1960) to test the predictions that when subjects are given a number of trials on a learning task, the relative strength of correct-responses would increase as learning progresses and that competing error tendencies would extinguish. Ss for the study were selected on the basis of their scores on MAS (Taylor, 1953). Learning task consisted of 12 CVC nonsense syllables of moderate difficulty (Montague, 1953).

Obtained results provided no difference in the performance of HA and LA Ss at any stage of learning. But the experimental situation was by and large nonstressful. Spence (1953) suggested an explanation that anxiety measured by MAS in such a case is reactive and not chronic, meaning that HA Ss respond with high drive only in situations containing some degree of stress.
In a more recent study in India, Krishna & Vema (1972) selected high-and-low-anxiety subjects and examined their performance on serial learning task of uniform association value. High anxiety Ss had significantly more errors and took more trials to reach the criterion of two errorless serial reproductions. Results were related to previous studies on anxiety and learning. In another study, Gakhar and Luthra (1974) studied serial verbal learning as a function of general anxiety on a sample of 135 high school girls. The results showed the inferior performance of HA group to LA and AA groups. No mention has been made regarding the difficulty level of the learning task.

Very few such studies are available in India which studied effects of anxiety on serial learning to test the predictions of drive theory. Some of the observations based on studies in this area are:

(i) Task variables are important in any experimental situation and they bear important relationship to drive theory.

(ii) Failure to find very distinct anxiety differences suggest that MAS or other general anxiety measures are reactive in nature and anxiety could be evoked only by stress. Performance by and large depends on Ss' effective anxiety, defined by his initial stress tolerance and anxiety proneness. It is important to interpret findings in terms of the amount of anxiety
aroused during the performance. A-state measures have not been taken in any studies mentioned above.

(iii) Studies mentioned above did not interpret their results in terms of stage of practice and the important factor of serial position effect has not been considered in any of them.

(iv) Besides the role of drive in determining behaviour, there are other functions of anxiety which have largely been ignored, including its drive-cue properties.

(b) In addition to these traditional verbal serial learning, there are studies which employed nonverbal serial learning tasks of spatial mazes, two response alternatives being presented at each choice point. On the assumption that anticipatory and preservative tendencies would be present to such a degree that the incorrect choice would be stronger at many choice points than the correct one, it was expected that high drive (MAS) groups would exhibit a greater number of errors over the learning trials than a low drive group. Another assumption that a significant correlation would be found between the rank order of the difficulty of the choice point and the magnitude of the difference between the errors made by the high and low anxiety groups.

An investigation by Taylor and Spence (1952) represented a study of the effect of different drive levels on performance, in a learning situation that involved the presence of strong competing responses. The learning problem
was a serial learning situation and subjects were selected on the basis of MAS (Taylor, 1953). Findings were in line with the theoretical expectations, the performance of HA Ss was found to be inferior to that of LA Ss in the competitive learning situation, and further that HA Ss made significantly more errors than their counterparts. Within the task even Ss differed in performance. It was found that most difficult choice points, provided the greatest difference between the two groups of Ss.

With one exception (Hughes, Sprague, & Bendig, 1954), one of both of the predictions have been confirmed (Farber and Spence, 1953; Taylor and Spence, 1952; Axlerod, Cowen, and Heilizer, 1956; Matarazzo, Ulett, and Saslow, 1955). In these studies, small number of errors at easiest choice points suggested that competing response tendencies at these points were minimal and that the high anxiety group should have been superior in performance to the low anxiety group.

Goodstein, Spielberger, Williams, and Dehlstrom (1955) conducted two experiments to explore the serial position effects and difficulty of task on Bender-Gestalt (B-G) test designs. In Exp.I difficulty and serial position was estimated. In Exp.II Ss were presented with two orders of B-G designs. In one order most difficult designs were placed in the easiest serial position, and in the other order the most difficult design placed in the most difficult serial position. They concluded that the recall
of a given design was a function of both its difficulty level and its serial position in a given order of presentation.

**Effect of Anxiety on Paired-associate Learning**

(Meaningful and Meaningless)

On the assumption that the MAS (Taylor, 1953) scores reflected Ss' drive level, Ramond (1953), predicted that anxiety Ss would be superior on the strongly-associated items but would be inferior on the weak-association items. Two groups of Ss, which differed with respect to anxiety level, were required to learn a list of verbal S-R relationships. Obtained results supported the predictions partially. The anxiety (HA) group was actually slightly inferior to nonanxiety (LA) group on the strong association items, which Ramond explained that the anxiety subjects having higher drive level experience more interference between the learning of lists than the nonanxious group. In general, high drive group was inferior on both the associated and non-associated items, significantly so in the latter case.

Taylor and Chapman (1955) investigated effects of anxiety on paired-associate learning. Results indicated that the superiority of performance of anxiety support the position that the amount of response competition is a relevant factor in determining the interaction between anxiety level and performance.

It was hypothesized by Spence, Taylor and Ketchel (1956) that effect of variation in the level of D upon performance on a paired-associate learning task depends upon the position in the habit hierarchy of the response to be
learned. For the purpose, two lists (competitive and non-competitive) of 14 and 10 pairs of adjectives were constructed from Haagen's word list. Results indicated that HA and LA Ss perform differentially depending upon the extent to which strong incorrect responses are in competition with the correct appropriate response. There was significant interaction between anxiety level and type of paired-associate items, HA Ss being superior to LA Ss when the learning involved a minimum competition and reverse happened in the strong competing response tendencies.

Spence, Farber and McFann (1956) attempted to investigate the assumptions of Spence et al. (1956) and in addition that the Taylor MAS measures degree of emotionality and hence level of D. Two experiments were conducted by making two lists of paired-associate (noncompetitive and competitive). It was found that on the easy list, the HA Ss made significantly fewer errors and required fewer trials to reach the criterion than did the nonanxious Ss. On the contrary, with a competitive or difficult list, HA Ss required significantly more trials to reach the criterion. Thus, it was concluded that the effects of anxiety vary with the type of material to be learned.

Korchin and Levine (1957) selected two groups of Ss (HA & LA) on the basis of the TMAS and a third group was drawn from a psychiatric institute. Two lists of paired-associate originally developed by Ruch (1934) were administered. Students with LA level performed somewhat better on the word-associate list (easy), but were distinctly superior
in learning false-equations (difficult). Patient group performed much like the HA Ss. The performance of the three groups could be best understood as a function of the effective anxiety level, in a particular situation.

L'Abate (1959) verified two hypotheses concerning the role of manifest anxiety in learning material with different associative values. Although it was found that learning becomes more difficult as associative values decrease, neither of the hypotheses was supported.

Standish and Champion (1960) selected three groups of Ss, on the basis of their scores on TMA. Two lists of ten paired-associate each were used. Results were compatible with Spence's theory that performance of HA Ss would be superior to that of LA Ss with medium drive as occupying an intermediate. Results suggested that anxiety present in the testing situation is an important variable in test or any other performance supporting the drive theory predictions that performance of HA Ss, as compared to LA Ss, was superior in simple tasks, where competing tendencies are either low or absent, and relatively inferior in complex tasks, where competing tendencies are high.

It has been found that besides stimulus and response meaningfulness as determinants of task difficulty, response factors are also of greater importance (Noble, et al. 1957). Hunt (1959) has emphasized the procedural differences to be more important in manipulating task difficulty.

Harleston and Cunningham (1961) varied task difficulty by preparing four lists of 12 paired-associate (nonsense-
syllables) each. Independent groups of HA- and LA-Ss (TMAS) learned one of the paired-associate lists. Increasing the associative values of the response items facilitated learning; variations in the association value of stimulus items failed to affect learning. No statistically significant main effects due to anxiety level were found. It was concluded that anxiety effects depend upon both task-difficulty and an ability factor.

Thus, all such predictions relating to meaningfulness and the performance of HA and LA Ss are by and large based on the viewpoint of task difficulty. Harleston and Cunningham (1961) suggested that as task difficulty increases, HA Ss should perform increasingly poorly than LA Ss. However, results of various studies did not support a hypothesis of differential performance of HA and LA Ss on easy or difficult lists (Harleston, 1963; Harleston and Cunningham, 1961; L'Abate, 1959; Lewitt and Goss, 1961). Defined in terms of meaningfulness, predictions of drive theory do not lead to the assumption of interaction between anxiety and task difficulty.

Moreover, some researches have suggested that the relation between anxiety and learning is more complex than shown in early studies. Van Buskirt (1961) found that in the learning of complex material under anxiety, high anxiety Ss outperformed low anxiety Ss under non-ego-involving condition. Results of Wittrock and Huseck (1962) were consistent with Van Buskirt's findings, thereby supporting the interpretation that anxiety may enhance learning and retention of complex material, when that learning does not represent a serious ego-threat to Ss.
Bernstein (1963) selected HA and LA Ss on the basis of TMAS (N=100), and made them perform on a task which required the selection of the correct nonsense syllables in each of 12 pairs. For half the pairs the dominant response was correct and for the other half incorrect. In the second session the same pairs appeared with half the learned responses reversed. Results failed to support the prediction from Hull-Spence drive theory that high MAS Ss would make fewer errors when the dominant response was correct and more errors when the dominant response was incorrect.

Sessenrath, Kight and Athey (1964) selected three groups of Ss on the basis of MAS and the TAS (Handler and Sarason, 1952). Four paired-associate lists varying in difficulty level and competition were learnt. Results indicated that where task difficulty was known to be either high or low, anxiety, as measured by MAS, does not effect the learning of paired-associates. Earlier Underwood and Schulz (1960) suggested that response competition and task difficulty are different variables and should be treated as such.

Solso (1968) examined the influence of generalized drive as measured by MAS, as it related to paired-associate acquisition. The evidence supported the hypothesis that HA Ss learn simple paired-associates faster than LA Ss, but opposite tendencies were noted in complex paradigms.
Haisida and McCormack (1968) reported findings consistent with Spence's postulates regarding the relation of drive level to performance in competitive and non-competitive situations. Stranghan and Dufort (1969) found relaxation to be associated with better paired-associate performance in high anxiety Ss and poor performance in Ss low in anxiety. In contrast with the usual findings Mukherjee (1969) found performance to be positively related to MAS scores, but only when ability indices were controlled.

Several experimenters such as Underwood and Schulz (1960) have laid emphasis on the task variables and procedural components such as difficulty of task and highly motivating instructions as affecting the level of drive in an experimental situation. Presumably, task difficulty increases the anxiety drive and elicits more task irrelevant responses. Task difficulty is predicted to improve the performance of low drive Ss because anxiety and task drive summate.

Effect of Anxiety on Complex Learning:

There have been many studies investigating the effects of anxiety on experimental learning tasks. Although the effects of anxiety on easy tasks have been inconsistent, the general result has been that anxiety does have a debilitating effect on complex learning.

Experiments have shown that anxiety Ss perform less well in maze learning (Diehelm, and Jones, 1947; Matarazzo, et al., 1955; Axelrod, Cowen and Heilizer, 1956; Farber, 1953;
Kumari, 1970) reversed alphabet printing (Taylor and Rechtschaffen, 1959), problem-solving (Sinha and Singh, 1959; Tecce, 1965; Shidfeld, Gluckeberg, and Vernon, 1967) and in general, in more difficult tasks. On the other hand, anxiety Ss show more rapid conditioning to noxious stimuli (Bitterman and Holtzman, 1952; Taylor, 1951; Welsch and Kubis, 1947), on concept learning task Sessernath (1963) reported better performance of HA (D) Ss than LA Ss. Amhoff (1959) correlated TMAS and measures of stimulus generalization and concept-formation task and obtained non-significant results. Maltzman, Bism and Morrisett (1961) reported influence of MA on performance on rational learning, but induced anxiety did not exert any effect.

Another study that reported no relation between anxiety and performance on word-association has been by Davids and Brickson (1955). Findings of Tucker (1964), Singh (1968) and Tecce (1965) supported drive theory of Hull and also the Yerkes-Dodson Law (1908). They concluded that moderate level of MA facilitates performance as it serves as a driving force, but the excess or low level of anxiety does not serve the purpose. Klein, Frederikson and Evans (1969) concluded that test anxiety had consistent curvilinear relationships with performance, poor performance being associated with an intermediate level of test anxiety and there was a significant interaction of anxiety and verbal ability.

Several recent studies have specifically investigated the relationship between anxiety, memory and complex learning tasks.
Sleber and Kamaya (1968) found that HA Ss, with memory support performed as well as LA Ss on a complex learning task, though without memory support their (HA) performance was poorer. Paulson (1969), using a concept learning task, found that LA Ss profited from memory support just as much as HA Ss. 

Sleber (1969) pointed out that an anxiety by cognitive processes by learning task performance paradigm is needed to more adequately understand anxiety-learning relationship.

**Effect of State and Trait Anxiety on Learning:**

A-State is an index of drive (anxiety) aroused in a particular experimental situation. The complex relationship between A-state and performance has been illustrated in many studies involving various tasks, such as Computer Assisted Learning, memory support, and so on. In all the studies, it was consistently found that A-state scores increased while Ss worked on difficult materials and also under stress, specifically ego-stress. A-state has been used as a dependent variable.

However, the nature of anxiety, as well as the relationship between anxiety and drive level is more complex than was originally believed. Stress plays a critical role in evoking differences in drive level for persons who differ in anxiety proneness and drive theory does not account for the effects of stress on anxiety level.

Thayer and Cox (1968) tested two groups of manifest anxiety (MA) on a paired-associate task designed to elicit
two levels of response competition to test the hypothesis that transitory anxiety or activation has advantages over manifest or trait anxiety as an indicator of drive in tests of predictions drawn from Hull-Spence theory. Predictions were confirmed by groups differentiated by self-report (AD-ACL, Zuckerman, 1960) transitory levels of activation scores and not by groups differentiated by MAS scores.

According to State-trait theory of anxiety, differential levels of D in the experimental situation can be aroused only if the situation contains sufficient degree of stress. Therefore, no such studies are available which deal with A-State and performance only; literature regarding this will be discussed in a later section which include stress as a variable.

Effect of A-State on Complex Learning:

A series of studies were undertaken by Spielberger (1970), and Spielberger, O'Neil, and Hansen (1970) to test the hypothesis about the effects of anxiety on Computer assisted learning, in terms of Spence-Taylor Drive Theory and Spielberger's State-Trait Anxiety Theory. Findings were in line with drive theory and also with State-trait theory of anxiety. A-state was uniformly found to be a better predictor of performance than A-trait, and performance was an interactive function of A-state and task difficulty. Lehenissey, O'Neil, and Hansen (1970) did not find any significant effects on A-state as a result of memory support.
Ward and Salter (1974) found that trait anxiety impaired learning in both high and low-state anxiety groups but their expectation that impairment would be greatest in the high A-trait and high A-state due to an additive effect, was not confirmed.

Individuals high in A-trait are more likely to manifest higher levels of A-state in learning relatively difficult materials, thus effects of anxiety, besides other factors, are contingent upon the nature of task. An experimental situation containing some threat to self-esteem, specific situational and task factors also produce high levels of A-state in some Ss, who are low in A-trait. Another probability which has been tested empirically is that effects of threat or stress are result of Ss' 'Cognitive appraisal' of the situation as threatening. Therefore, there should seem to be no meaningful alternative to the actual measurement of A-state as Ss perform on a learning task, but this has rarely been done in investigations of anxiety and learning.

Effect of Stress (Psychological and Physiological) on Serial Learning

The variable of stress, whether Psychological or Physiological, has been used to arouse differential levels of anxiety in high and low anxious Ss and further to explore the resulting possibility of its differential effects on performance of high and low anxious Ss. Stress whenever used by any investigator has been a co-variable in anxiety
studies. So, there are not many studies available concerning the effects of stress on learning, as such.

However, Bardach (1960) used male undergraduates to investigate the effects of situation anxiety on performance. Learning material was a test of 10 nonsense syllables (Glaze, 1928) of 26.67% association value. Four groups of subjects were used, based on the timing and latency of stress. Obtained results indicated that it was late rather than early introduction of situational anxiety that impaired performance.

Results suggested that anxiety as induced by stress is associated with incompatible, interfering responses, and it can best be conceptualized as having both drive properties and associative responses.

**Effect of Stress (Psychological and Physiological) on Paired-associate Learning**

A variety of methods have been used for varying stress in complex learning situations and a frequent finding has been for performance to be impaired under stress. If all other factors are held constant, the level of drive should determine the level of performance and this should be true without regard to the source of any irrelevant drive present.

Castaneda (1956) selected Ss on the basis of preliminary work. Ss were given two learning tasks (S-R pairs). On the first (easy) they were given 32 trials and on the second (difficult) Ss were required repairing of half the S-R pairs learned in the first list.

Main effect of stress did not come out to be significant. However, effects of stress were contingent on the type of
Chiles (1958) induced drive experimentally and placed Ss in two groups: Shock and Buzzer. Task assigned to them was 16 S-R combinations. Each S had to learn what seemed to him to be the correct response. On completion of the task MA scores were obtained. Effect of anxiety did not come out to be significant, the effect of shock and degree of association was significant. Anxiety Ss in the buzzer group were slightly inferior on both types of items. When the effects of anxiety averaged over the shock and buzzer condition, any differences present tended to disappear.

In some situations, manifest anxiety produces results which show it to be related to drive (Taylor, 1951); in others, the results show that increased drive results from the fact that anxiety Ss react more to stressful stimuli than do non-anxious Ss (Spence, Taylor and Ketchel, 1956); and in still other situations anxiety Ss behave as though they actually had lower drive levels than non-anxious Ss (Ramond, 1953; Spence et al., 1956; Spence et al., 1956).

**Effect of Stress (Psychological and Physiological) on Complex Learning**

Most of the experiments in the area of stress and performance have used personality variables which are related to emotional stability or personal adjustment. This indicates the widely held belief that performance under stress is
basically related to adjustment, emotional control or neuroticism (Erickson, Lazarus, and Strange, 1952).

Lazarus and Erickson (1952) investigated effects of threat and performance on digit symbol test. Osler (1954) used an arithmetic test for the purpose, and Castaneda and Palermo (1955) using a psychomotor task found overall differences in performance due to stress to be significant.

Predictions regarding the effects on performance of variations in the drive level require knowledge of the strengths of specific habits involved.

Castaneda and Lipsitt (1959) investigated relation of stress to performance in a motor learning task in which initially dominant position habits were designated. An interaction between stress and compatibility was found to be significantly facilitating in comparison to no-stress condition, but interfering where the dominant response was incompatible, following Hull's assumption concerning the manner in which drive and habit combine to determine response-strength.

Nijhawan and Cheema (1971) studied stylus maze learning under stress in normal and high test anxious children of 11-13 years of age. High anxious children did not perform better than low anxious children. Stress adversely affected the learning of both high and low anxious children. The failure group was most seriously affected than competition and time-stress groups. Clark (1962) found that the effects
of time stress (drive) upon pre-learning competing response hierarchies to be largely compatible with Hullian drive theory. Predictions of early learning performance were supported by the learning data.

Findings of Vogel, Barker, and Lazarus (1958) indicate the complexity of the role of motivation in determining response to stressor conditions and discussed the importance of investigating motivational variables in stress experimentation.

Vogel, Ramond, and Lazarus (1959) administered a battery of tests and procedures, in order to select two groups differing in predominant pattern. Ss were exposed to different stresses and arousal of stress was studied by BP (blood-pressure), GSR, and pulse rate. Results supported the view that the arousal of stress reactions depends upon the type of stresses used and the motive pattern of the subject. Bradshaw and Gaudry (1968) subjected their subjects either to the failure or success conditions on a vocabulary test. The results showed that those under failure condition, scored significantly higher on the subsequent test anxiety scale than those under success.

In general, findings suggested the importance of stress research and theory of such factors as intrinsic motivation, the type of task and the Ss' past history of success or failure within the relevant motivational sphere.
Anxiety and Intelligence

A low negative correlation between intelligence as measured by various instruments and anxiety is the result of the majority of investigation (e.g., Grice, 1956; Kerrick, Hefner and Kaplan, 1959; Singal, 1974). However, relationships are higher and more consistent in studies of children (Ruebusch, 1963) than in studies of college students, which Spielberger (1958) that if the sample contains a wide range of intelligence and a larger number of subjects from the lower part of the range. Correlations may be obscured by variations in selection procedure which curtail the range of intelligence.

Other studies, besides Spielberger (1958), that reported no relation between anxiety and various measures of intelligence one those by Farber and Spence (1955); Dana (1957), Klugh and Bendig (1955), Sarason (1956), Sharma (1977).

More consistent findings have been reported by studies in which test anxiety measures were used, than when MAS or CMAS was used (Forbes, 1969; Sarason et al., 1960; Sarason and Minard, 1962; Sarason, 1963). This may be because intelligence is determined in a testing situation and test anxiety measures are sensitive to this type of anxiety.

Feldhausen, Denny, and Cordon (1965) investigated differences between high and low anxious children in convergent and divergent thinking and found that the difference on divergent thinking was non-significant.
Relationship between anxiety and such complex variables as intelligence and achievement is a complex one. In recent years, studies have been conducted with the digit span subscale of WISC. The early studies in this area produced conflicting results.

Griffiths (1952), Moldawsky and Moldawsky (1952), and Pyke and Agnew (1963) reported negative correlations between digit span performance and anxiety, while Jurjenich (1963) reported a positive relationship, and Jackson and Bloomberg (1958), and Matarazzo (1955) reported no relationship. Atchison (1968) established that level of anxiety tended to be positively related to both intellectual and non-intellectual factors for both high and low groups. Thus, the evidence is not consistent.

A-state and Intelligence:

Spielberger (1966) has made the distinction between state and trait anxiety, the former being the anxiety felt at the moment, the latter being a predisposition toward being anxious. He and his co-workers hypothesized that much of the inconsistency in results of studies quoted above and especially those using digit-span performance, has resulted from the failure to distinguish between these two types of anxiety.

Hodges and Spielberger (1969) tested this hypothesis by using digit span performance task and the findings supported the hypothesis. No relationship was found between trait anxiety and digit-span performance, but high state anxiety did cause a decrement in digit-span performance.
The relationship between intelligence and learning has been studied for many years. Most of the research failed to find a significant relationship between these two variables. Wissler (1901) found little or no relationship between mental tests and scholastic achievement. Woodrow (1946) after a thorough review of research concluded that when individual differences are taken into account the ability to learn cannot be identified with the ability known as intelligence.

A 1962 review by Wallen is quoted, "...inspite of the not uncommon statement that intelligence tests do not predict ability to learn, the evidence that they do continues to accumulate". It might be because none of the studies measured initial individual differences.

Results of Carver and Dubois's (1967) study negated the generalization that learning and intelligence are unrelated, the relationship found was significant but low.

Stevenson, Klein, and Miller (1968, 1970) obtained significant correlations between laboratory tests of learning with intelligence as well as performance in school-setting.

Some of the studies that reported positive relation of IQ and performance in a PA learning task (Ring and Palermo, 1961; Iscoe and Semler, 1964; Rieber, 1964; Rapier, 1968; Gallagher, 1969) and some other have reported negative evidence (e.g. Lott, 1958; Ring and Palermo, 1961; Girardeair and Ellis, 1964; Vergason, 1964).
In a very comprehensive work Vibha (1972), in her doctoral dissertation, evaluated the relationship of Learning with intelligence. Intelligence tests used were Hindi Version of Hundal's General Mental Ability and IPAT Culture-Pair Intelligence test, Form A. Various miniature learning tasks involved verbal mediation tasks (paired-associate learning), tasks of rote type (serial learning), digit learning task, and five measures of academic achievement. It was found that tasks involving verbal mediation correlated with intelligence and school learning. Digit learning task correlated significantly with intelligence measures.

Anxiety, Stress and Performance:

Data bearing on the interaction between anxiety and stress in determining performance, on complex learning tasks have used three major types of stress conditions singly or in combination. These are ego-involving instructions, induced failure experience on a prior-task, and application of noxious stimulation such as electric shock. Indices by which stress-reactions are evaluated have been physiological measures (e.g. changes in heart-rate, blood-pressure, muscle action potential, pulse-rate, and galvanic skin response) as well as self-report measures.

An important issue regarding stress is the effect of different sets or experimental conditions on subsequent learning, i.e., adding the variable of stress, especially psychological, in terms of instruction or otherwise.
It is widely accepted that most people respond to stressful situations with increased anxiety and that anxiety reactions are characterized by feelings of apprehension, tension and activation of the ANS (e.g., Freud, 1924, 1936; Martin, 1961; Spielberger, 1966). A number of self-report measures of apprehension and tension have been developed to measure emotional reactions to stress (Spielberger, 1972). Whether persons who are high or low in anxiety proneness respond to stress with differential elevations in anxiety, by and large, depend on the nature of stress-situation. Performance difference in high and low anxiety Ss are most often found under conditions of psychological stress or ego-involvement (Spence and Spence, 1966). Empirical evidence relating to the interactive effects of stress (different types) and anxiety on the performance of different laboratory learning tasks with special reference to serial learning and paired-associate learning tasks is discussed in the following research studies.

**Interactive Effect of Anxiety and Stress on Serial Learning:**

Experimentally induced failure seems to effect performance in verbal tasks adversely, as does anxiety. Sears (1937), found that subjects made more errors in serial learning of nonsense syllables immediately after being told that they had failed than did subjects who had not failed. Failure may be followed by a state of frustration which has many of the same properties as anxiety.
The findings in experiments which compared the performance of HA and LA Ss on serial learning tasks have been only partially consistent with predictions derived from drive theory (e.g. Lucas, 1952; Lazarus, Deese and Hamilton, 1954). In these studies HA Ss were superior to LA on serial tasks in which competing responses were considered stronger.

Malmo and Amsel (1948) reported that 'psychiatric patients' with 'severe anxiety' made more errors on words at the beginning of a serial list than did 'normal' or less anxious controls. Stress in this study was task-based.

Lucas (1952) administered a test of immediate memory for consonants to investigate the effects of anxiety (TMAS), failure, and intra-serial duplication upon performance and especially to find out the interactions between anxiety and other two variables. Test series consisted of three lists, each having ten consonants, with varying intra-serial duplication. Findings were consistent with the expectation that LA Ss performed significantly better than HA Ss. The presence of failure did tend to create a greater overall superiority of non-anxious Ss over anxious, than in a study by Montague (1953) where no failure was used.

Deese, Lazarus and Keenan (1953) explored the relationships between problems of experimentally induced stress and personality factors. Three experimental groups (control, avoidance and non-avoidance) consisted of equal number of high and low anxiety (MMPI, Winne, 1951) Ss. All the groups were required to learn 12 consonant nonsense
syllables for 12 trials. Findings partially confirmed Taylor's original study that in avoidance learning there is a marked discrepancy in performance between anxious and non-anxious Ss. Anxious Ss show some slight improvement in learning when the stress is such that it can be avoided by means of performance.

Lazarus, Deese and Hamilton (1954) considering the importance of nature of task in anxiety studies, they investigated how anxiety performance interrelationship interact with the nature of task under the experimental condition of stress. They selected subjects with the help of TMAS (HA & LA) and assigned them to three experimental conditions (No-shock, avoidance, random-shock). A list of consonants was composed of great difficulty and intra-list similarity. None of the differences between three groups was significant. No significant differences between the performance of high and low anxiety were found.

Beem (1955) selected Ss with the help of TMAS and made them learn a list of 12 nonsense syllables prior to experiencing a life situation commonly considered to be anxiety-arousing, and another list under emotionally neutral conditions. Results indicated that stress interfered with serial learning. In all the instances Ss tested under stress conditions, averaged more trials and made more errors than did the groups under neutral conditions. MAS scores were not significantly related to any of performance measures. Results were in line with Hullian behaviour theory and consonant with the conception of anxiety as a drive.
Sarason (1956) studied the effect of anxiety and two instructional variables on performance in a serial learning situations with two objectives: (a) Do the effects of verbal instructions on performance depend on degree of anxiety of Ss; (b) the form of relationship between levels of anxiety and verbal learning. Three groups (HA, MA, LA) of Ss selected on the basis of TMAS were kept under two types of motivational instructions (high or low) and two failure conditions (failure report or neutral conversation). Subjects were to learn two lists of nonsense syllables. Among failed Ss, high motivation groups performed at a higher level than did low motivation groups, while among non-failed Ss, high motivation groups performed at a lower level than did low motivation groups. He further concluded that task variable is important in anxiety research as it affected performance differentially for various anxiety groups.

Sarason (1957) investigated the effects of anxiety (TMAS) and differential motivating instructions on serial learning and retention of nonsense syllables by college students. Ss were divided into three groups (HA, MA, LA) and assigned to one of three experimental conditions. Anxiety, motivating instructions and the interaction of these two variables were found to have significant effects on learning. Sarason found that highly motivating instructions were facilitative for only MA and LA groups. HA group given the instructions performed at a significantly lower level than did a HA control group.

In another study, Sarason (1958) in an attempt to study the effects of anxiety, reassurance, and meaningfulness
Kalish, Garmezy, Rodnick and Bleke (1958) selected high-and-low-anxiety Ss and assigned them to two stress conditions to find out the effects of anxiety and experimental induced stress on verbal serial learning. Under no-stress condition no significant differences in performance were found between high and low anxious groups. These results supported Montague's (1953) findings with regard to the performance of high and low anxiety Ss on list of low-association value. The results for the groups under stress indicated that HA group required more trials and made more errors than LA Ss.

In his doctoral dissertation, Florence Marks (1964) studied the relationship between performance and two types of reactions to anxiety and between performance and two kind of stress situation (shock and ego-threat). Results indicated that the hypothesized relationship between the two anxiety groups, three stress conditions and their effect on performance was not substantiated. Singh (1967) studied the influence of audience upon verbal recall of high and low anxious subjects. The recall of high anxious Ss was more detrimentally affected by the presence of superior audience.
In most of the serial verbal learning studies effects of anxiety on serial position phenomena has largely been ignored. Kalish et al. (1958) found in response to failure stress that HA Ss made fewer errors than LA Ss for words in the middle and at end of the serial list. Another study which explored effects of serial phenomena has been that by Spielberger and Smith (1966), who selected their Ss with the help of TMAS and induced stress by false information relating learning to be a function of intelligence. Performance of HA and LA Ss showed differences attributed to drive level in an 'ego-stress' condition but not in neutral condition. Further, performance of HA Ss was inferior to that of LA Ss early in learning and superior later in learning. There was evidence that intelligence like task-complexity, may interact with anxiety to influence performance on learning tasks. It was concluded that HA and LA Ss reflect differences in drive level only in situations, where the experimental arrangement contain some degree of stress. An earlier experiment by Hicks (1963) conducted with the same design and task, but without inducing stress, failed to produce differences in high and low anxiety Ss.

Brown (1966) investigated the effects of anxiety (TMAS), stress (shock), and task difficulty (association value of nonsense syllables). Levels of task difficulty were combined with each level of anxiety and shock conditions. Analysis of variance revealed that the only significant effect was due to task difficulty ($P \leq .01$).
Catalana and Kirkpatrick (1968) conducted two experiments to study the effects of verbal approval and anxiety on serial learning. Subjects were selected on the basis of TMA S scores and task was a list of nonsense syllables with low association value. For the second experiment task was same as in Montague's (1953) study and the Experimenter (E) said right only on the right response. In the first experiment, LA group was superior to all the other groups. Under the non-reinforced condition, HA Ss performed better than LA Ss. The difference is in the second experiment were not significant. The motivational effects of verbal approval are similar to those of ego-orienting or stress-inducing instructions.

Saramon and Harmatz (1965) investigated effects of anxiety (TAS) groups and two experimental conditions on verbal learning involving two difficult lists of disyllable words. During experiment the investigator commented on performance by saying either "Good" or "Try Harder". Results provided no differences in the performance of three anxiety groups under the neutral instructions. It was also found that while HA Ss made fewer errors of omission under the neutral than under the other experimental conditions, just the opposite result was obtained for LA Ss. Ss given the Good comments by male experimenter performed at a higher level than did all other groups in the experiment.
Taylor (1958) selected extreme scorers on TMAS. Study was designed to provide experimental arrangement in which the effects of increasing drive level would be expected to result in differences between HA and LA Ss in the opposite direction to those expected if extra-task, interfering responses were aroused by the stress condition. Two stress conditions and two experimental lists were designed in such a way that intratask competition was minimized) employed. Results indicated that on the first experimental list HA Ss exhibited superiority in performance under neutral conditions, thus supporting predictions of drive theory. Although the stress condition had the effect of interfering with performance, HA Ss did maintain their previous margin of superiority over the LA Ss. However, the major effect of stress was to arouse extra-task irrelevant responses, which interfered with efficient performance.

Waite, Sarason, Lighthall and Davidson (1958) compared performance of Ss scoring at high and low ends of general and test anxiety scales and assigned them to failure, success and neutral conditions. Learning task was to memorize the number that was associated with each figure. Analysis of the data revealed better performance of LA Ss than HA Ss under stress. The most interesting finding was significant difference between the anxiety groups and apparently there were no effect of instructions.

Charlotte (1961) selected Ss who achieved extreme scores on TMAS and assigned them to two experimental conditions
of shock or no shock after four initial trials on 15 S-R pairs. Four lists of five pairs of common adjectives from Haagen's (1949) list were used. The results with the second mixed list indicated that an increase in D significantly facilitated performance. When the dominant habit was incorrect an increase in D significantly impaired performance. Results, contrary to Spence's (1958) hypothesis that manifest anxiety is reactive in nature, provided evidence for manifest anxiety to be chronic, i.e., present in experimental situations regardless of stress or no stress.

Lewitt and Goss (1961) concerned with the single and joint effects on P-A learning of four task variables, and two presumed drive variables: MA (manifest anxiety) and failure stress. Results showed that the learning speed varied directly with the differences in associative value of both S-R pairs and inversely with similarity. Stress had no effects on acquisition of stimulus members of high and low associative values; anxiety had no effect on response members of varying similarity. The form of interaction of stress with similarity was consistent with Spence's drive dominant initial response analysis rather than with an interference analysis of role of drive in complex tasks. It has been found that response learning is facilitated under response similarity if it is not subject to competitive tendencies (e.g., Horowitz, 1962; Jung, 1965; Underwood et al., 1959).

Katahn and Pagano (1965) investigated effects of shock, ego-threat, and neutral conditions on P-A learning. Subjective ratings of effective experience made by Ss engaged in P-A
learning were not differentially affected by any experimental condition. Ss with high scores on TMAS rated themselves as experiencing significantly more negative effect than did LA Ss. No interactions of anxiety by instruction condition was obtained.

Lipsitt and Spears (1965) varied anxiety and stress on two-studies of paired-associate learning. Neither anxiety, nor stress had a reliable effect on low competition pairs. Learning on high competition pairs was reliably poorer for HA and for high stress Ss. The error mechanisms underlying responses to the low-association pairs, however, were different for the anxiety and stress conditions.

Sineps (1968) assigned half his Ss to ego-involvement instructions and half to task-oriented or neutral ones. Three anxiety groups were taken. Although some significant differences emerged from analyses, major hypothesis was not supported HA Ss were not characterized by greater proportions of errors categorized as irrelevant to the task. However, the medium anxiety Ss behaved differently on number of dependent variables in the ego-involvement as contrasted to the task-oriented instructions, and often differed from the high and low anxiety Ss.

Peltonen (1970) selected upper and lower quartiles in respect to measured anxiety (16 PF). Ss were to learn a moderately difficult list of P-As, under differential instructions. Analysis of the obtained data failed to
to reveal any significant effects attributable to experimental variables.

Hogan (1971) investigated effects of anxiety (D), stress, task difficulty and stages of learning on performance in paired-associate learning. He selected three groups of Ss and assigned equal numbers to three conditions of stress. Level of difficulty was achieved by varying degree of intralist similarity and association value of stimulus and response. Results revealed that the performance of HA group on an easy task was essentially the same as the performance of both HA and LA Ss. No significant difference in the performance of three anxiety groups on medium difficult and difficult tasks was obtained. Under stress conditions performance of all the three anxiety groups on easy tasks was equivalent.

Predictions of theory of emotionally based drive hold only under certain qualitative conditions, i.e. under ego-stress instructions, failure-reports, and situations where the HA Ss dependency needs are not gratified. Studies of anxiety and experimental conditions suggest that there is a combined effect of experimental conditions, anxiety and level of difficulty of the task used.

Another important factor is the time interval between administration of the threat and the performance on a task (Sarason and Ganzer, 1970). Further, task complexity may itself be a significant independent variable (Riebusch, 1963; Sarason, 1960). There is evidence that the performance
of low anxiety scores on complex tasks is better under achievement-orienting than under neutral conditions. On any given occasion, these determinants may exert a combinative effect on task performance.

Interactive Effects of Anxiety and Stress on Complex Learning:

A considerable body of research, reviewed earlier, using anxiety scales reported poorer performance of high anxious Ss on complex or difficult tasks (e.g., Montague, 1953; Ramond, 1953; Koren and Levine, 1957; Lucas, 1952; Spence, Farber and McFann, 1956; Casteneda, 1961; Standish and Champion, 1960; Westrope, 1953; Katchmer, Ross and Andrews, 1958; Davidson, Andrews and Ross, 1956), while Axelrod, Cowen and Heilizer (1956), Spence, Taylor and Ketchel (1956), were unable to support this prediction. Majority of these investigations concerned with the interactive effects of anxiety and stress, have utilized verbal tasks (serial learning and paired-associate). A good number of studies are available which have utilized non-verbal and motor learning tasks. Carron and Morford (1968) in a motor learning task found no difference in the performance of high and low anxious Ss, this may be because in motor learning difficulty of task can't be determined.

Sarason and Palola (1960) found that high difficulty of task and highly motivating instructions combined to effect detrimentally the performance of HA Ss. Similar results were reported by Sarason and Minard (1962) and Wrightman (1962). These findings suggest that task
variables and instructions are important variables in anxiety research. Saltz (1961) reported significant effect of stress and anxiety on free-association task. Lawrence (1962) established that under experimental instructions HA Ss scored significantly lower than LA Ss, but in other conditions anxiety was unrelated to test performance.

Perkes (1963) on the basis of his results concluded that situational stress, trait anxiety, and ego-involvement are separate and distinct constructs which carry with them their own characteristic effects on behaviour. Similar results were obtained by Block (1964) and in addition he emphasized the importance of having measures of aroused anxiety while interpreting stress and predominant anxiety effects.

Findings of Walker, Neilson and Nicolay (1965) provided some support to the necessity of stressor which initiates anxiety before performance, but did not support the hypothesis that testing itself is a crucial stress situation.

Results obtained by Nash, Phelan, Demas and Bittner (1966), Gorsuch and Spielberger (1966), and Diamond (1967) uniformly found that anxiety level had no distinct effects on task performance in the nonstressful conditions and noted a significant contingency between anxiety level and task performance under stressful conditions.

Matsuda and Matsuda (1963) concluded that test anxiety interfered with learning. No difference was found
in the high- and low-anxiety Ss under low motivating instructions.

Allison (1970) administered TASC and CMAS to 6th graders. Intelligence test was administered under various stress conditions. Results did not support the hypothesis that high anxiety subjects would be more adversely affected by stress and that test anxiety was more directly related to test performance than general anxiety.

Poehley (1970) obtained results contrary to the predictions of drive theory. He found significant main effect of anxiety with LA group always performing better than HA Ss. Oros, Johnson, Lewis (1972) found that induced anxiety had a significant impact on performance, with the performance IQ most affected.

Rtaugh and Graffam (1973) assigned high and low anxiety Ss to two stress conditions to test stress on a task of rule-acquisition (CF) and found that HA significantly impaired performance, stress had effects similar to anxiety - on the easy portions of the task, anxiety and stress did not have any effects.

Marton, et al. (1973) found that stress-inducing instructions had a positive effect upon learning, but were not significantly related to the level of anxiety in the learning phase.

Glover and Cravens (1974) tested predictions from Spence's, Spielberger's and Saltz's interpretations of trait anxiety in a complex verbal learning task under
conditions of failure, pain and neutral instructions. Results supported Spielberger's and Spence's predictions - performance of HA Ss under failure and LA Ss under pain was disrupted.

There are a few studies which found results consistent with the inverted U hypothesis (e.g. Sarason, 1961; Neuringer and Orwick, 1968; Garrish, 1966; Young and Brown, 1973).

Studies mentioned above have used some or the other means of inducing stress but none of them attempted to measure stress-effects, besides considering performance to be an index of differentially aroused anxiety due to stress.

However, there are a few studies which used physiological measures, presuming that these indices are a measure of autonomic nervous system activity, which is considered to be an important characteristic of anxiety (Malmo, 1957; Martin, 1961; Silverman, 1957). GSR has been measured as based resistance and as nonspecific skin activity (Greiner and Burch, 1955; Silverman, Cohen and Shmavonian, 1959). Both GSR have shown to increase in response to stressful stimulation. Harleston, Smith and Arey (1965) concluded that the physiological correlative index was sensitive to both anxiety level and the task situation.

General review of researches involving anxiety, stress, and various performance tasks has been mentioned in the above section. Results have been generally consistent with the drive theory predictions and suggest that effects
of stress and anxiety vary with the nature of task. Most of studies mentioned used tasks of moderate difficulty or highly difficult. An important feature of stress in the psychological sense implies that stress depends upon the anticipation of something harmful, which is determined by Ss' past-experiences and beliefs etc. Whether or not a stimuli is reacted to as threatening depends upon the cognitive appraisal of the situation by the subject (Lazarus, 1964). What is most important and most lacking too in the above studies is failure of these studies to make effective measurements of the stress effects, which are independent of the skills required by the task itself. Most of the researches considered performance to be index of induced stress. A-state measures seem to be imperative for any systematic program of research dealing with effects of stress on anxiety and performance.

Interactive Effects of A-state and Stress on Complex Learning:

Hodges and Spielberger (1966) evaluated the effects of threat of shock as measured by changes in HR (heart-rate), Ss selected on TMAS were assigned to threat or no-threat condition. In the threat group HA and LA Ss showed an immediate and substantial increase in HR, as they worked on verbal conditioning task, but contrary to predictions there were no differences for anxiety groups.

Hodges (1968) evaluated effects of anxiety, ego-threat and threat of pain on A-state and performance on digits
backward. As expected, ego-threat and physical danger evoked different patterns of A-state and ego-threat group showed poorest performance. No differences were found in AACL scores for shock or no-threat conditions.

Lamb (1973) evaluated the effects of an ego-stressor and physical stressor on HR and self-report measure before, during and after performance. A-state scores increased for both the anxiety groups differentially during the ego-stressor condition. In contrast, A-trait measures remained remarkably stable.

Spielberger contended that physical stresses do not differentially affect performance but psychological or ego-stress induce differential levels of anxiety. Evidence obtained in research on computer-assisted learning (CAL) suggests that self-report scales may provide more sensitive measures of A-state in ego-threat situations than psychophysiological measures such as HR and BP (e.g., Spielberger, O'Neil, and Hansen, 1972). Measures such as A-state scale are specifically designed to evaluate changes in state anxiety, whereas physiological measures may be influenced by other emotional states.

Findings of various studies supported the view that it is meaningful to posit state and trait anxiety as separate and distinct anxiety constructs in research on anxiety and learning and also demonstrated the differential influence of stressful conditions on empirical measures of these two concepts (Johnson, 1966; Johnson, 1968(a)).

Leberissey, O'Neil, Heinrich, and Hansen (1970) selected three groups of Ss on the basis of STAI and tested them on CAI. High A-trait was associated with high levels of A-state. Findings suggested that decreased memory load might lead to better performance of Ss high in A-state.

Knox and Grippaldi (1970) reported curvilinear relationship and interaction effects of anxiety between state-trait anxiety and performance on WAIS subtests. Performance of DS was highest for each medium group.

Hodges and Felling (1970) supported Spielberger's hypothesis that Ss high in trait anxiety report anticipating greater fears in situations involving psychological stress and not in situation containing physical danger. In his doctoral dissertation Morris (1971) investigated the state anxiety reactions of Ss differing in level of A-trait to two kinds of threat, on a digit performance task. A-state scores were higher for high A-trait Ss than for low A-trait Ss in all the experimental conditions (failure, shock, and no-threat). Similar results were obtained by Morris and Liebert (1973).
Gaudry and Poole (1972) found that anxiety level increased for the failure group and decreased for the success group. Findings have relevance for the explanation of higher anxiety levels often observed in children in lower stream classes.

Negative feedback constitutes a threat to self-esteem and thus is perceived as more threatening by high A-trait than by low A-trait, a prediction from state trait anxiety theory was supported by O'Neil (1972). However, his results failed to support predictions from Drive theory.

Millimet and Gardner (1972) examined high and low anxiety Ss in relation to manipulation of psychological stress. Both groups exhibited a significant increase in state anxiety under stress conditions. Results tend to support a reactive view of anxiety proneness. The confirming evidence to this contention is also provided by Sharma (1977) on a sample of Indian school students.

According to drive theory the Ss who are high in A-trait respond with high levels of A-state to difficult tasks and have a higher probability of error. Johnson, Horn, and Dunbar (1973) tested this assumption of taking two anxiety (HA and LA) groups and assigning them to a difficult or easy task. High A-trait Ss did not demonstrate higher levels of A-state than low A-trait Ss on easy task, but did so on difficult task.

Meyers and Martin (1974) examined two predictions regarding relationship between anxiety and concept learning.
Results confirmed both of them. Performance of high A-state Ss was significantly inferior to that of low A-state Ss, whereas in A-trait groups no difference was observed. Ego-involving instructions increased A-state, but task completion reduced it.

Finch, Kendall, Montgomery, and Morris (1975) assigned their Ss to either a failure group, a failure and ego-involving instructing group, or to a test retest control group. The group receiving failure and ego involving instructions reported the greatest anxiety increase for both A-state and A-trait. Results indicated the vulnerability of A-trait to stress, especially with emotionally disturbed children.

On the basis of evidence obtained in a number of recent studies on anxiety and stress, it is clear that changes in A-state are related to general measures of A-trait, such as MAS and STAI A-trait scale, under conditions of psychological stress, but not where physical dangers such as threat of pain or imminent surgery are used (e.g., Auerbach, 1973; Hodges, 1968; Katkin, 1965; Martinez-Urrutia, 1975). Results, by and large, confirm the reactive view of anxiety according to which Ss predisposed to emotional arousal exhibit greater state anxiety in response to situations of increasing stress (O'Neil, 1972; Millimet and Gardener, 1972; Morris, 1971; Morris and Libert, 1973; Finch, et al., 1975; Johnson et al., 1973).
Interactive Effects of Anxiety and Intelligence on Serial Learning:

No such studies are available which used anxiety as a drive and intelligence as a variable in serial learning performance. However, there is one study with test anxiety measures, that of Passi and Singh (1972) who studied the major and interactional effects of organismic variables, intelligence (Raven's Progressive Matrices) and anxiety (TASC), and task variables upon the learning of nonsense syllables of CVC pattern. Learning criterion was serial reproduction of nonsense syllables in the fifth trial. It was found that intelligence, anxiety and interaction of intelligence by anxiety by association by difficulty had a significant effect on learning of nonsense-syllables. The serial position effect was not considered. In another study, Gakhar, Joshi and Passi (1973) reported a significant intelligence X anxiety interaction in verbal serial learning. They also did not consider serial position effect.

Interactive Effects of Anxiety and Intelligence on Paired-Associate Learning:

Goulet and Mazzai (1969) divided 96 male graduates into four anxiety and intelligence combination. These Ss learnt a list of paired-associates of high or low stimulus similarity. Lists were learned more slowly by HA Ss, irrespective of stimulus similarity. An analysis involving the determination of the trial at which each response was emitted, correct or incorrect, suggested the deleterious
effect of withholding responses by the high anxiety Ss. This was most apparent for the high anxious group of low ability.

Gaudry and Spielberger (1970) selected Ss in the age-range of 17-26 years, whose MAS and intelligence scores were available. Ss were required to learn a list of five easy paired-associates and were given instructions emphasizing the need to respond as quickly as possible.

Anxiety and intelligence had different effects on performance at different stages of learning. Early in learning HA facilitated the performance of HIQ Ss and lowered the performance of LIQ Ss as compared with their respective counterparts.

Results were consistent with the assumption that the learning task generated few competing response tendencies for HIQ Ss than for LIQ Ss, and that correct-responses became dominant earlier in learning for HIQ than for LIQ. Performance of the HA-LIQ group was inferior to that of LA-LIQ group. The interaction was not significant for latter trials. For overall, intelligence and anxiety proved to be significant, while no anxiety by intelligence interaction was found in this analysis.

Harleston (1963) tested the hypothesis that the operation of anxiety effects depends upon both task difficulty level and ability level. Ss were selected on the basis of TMAS and were divided into fast and slow learners. For the easiest list, Harleston found a significant trial blocks by ability
level by anxiety interaction. This interaction indicated that HA Ss, who were slow learners (presumably lower in IQ) performed more poorly than did LA Ss of comparable ability early in learning but in later stages HA Ss performed better than LA Ss.

Grice (1955) and Kerrick (1955) found that superiority of LA Ss in performance was due to intellectual differences rather than differences in anxiety level and suggested a possibility of a relation between anxiety measures and intellectual variables, whereas Ruesbush (1960) reported that HA Ss of low and middle levels of ability perform better than LA Ss on a task requiring a cautious approach. It can be inferred, therefore, that besides anxiety and intelligence, nature of the task involved has to be considered.

Findings of Waite (1965) confirmed the possible role of intelligence and nature of task in yielding significant anxiety by task interaction. In one type of performance LA Ss out-performed HA Ss and in another HA Ss performed better than LA Ss.

Katahn (1966) on a task of moderate difficulty found interactive effects of anxiety and intelligence. Collens (1969) reported performance of high anxious and high intelligence (HA-HI) Ss, on digit span to be the best one. Results of Fischer and Awrey's (1973) study revealed significant main effect of intelligence and also its interaction with anxiety. In general, significant decrement in performance of the LI-LA group as compared to HI-LA and
LI-HA was found by Ebyal and Forsyth (1972) reported no significant relationship between anxiety and intelligence on a problem-solving task.

Two studies which found the relationship of anxiety and intelligence on performance to be curvilinear are by Stabler and Dyal (1963) and Zlotowicz (1963).

**Interactive Effects of Anxiety, Stress and Intelligence on Complex Learning:**

With a concept-identification task of moderate difficulty, Denny (1966) found that high intelligence subjects exhibiting high level of anxiety perform better than those with low anxiety, but this difference is reversed for subjects of low intelligence and the findings were consistent with expectations based on Drive Theory. A similar study has been conducted by Sinha (1968).

Dunn (1968) found that WAIS information performance was significantly affected by test anxiety, but not by situational stress; digit span was significantly affected by stress; but not by anxiety.

Katehn, Durlak and Snyder (1971) retested the findings of three studies, i.e., Montague (1953); Nicholson, (1958); Spielberger and Smith (1966) on a sample of 144 Ss. They examined Spielberger's (1966) extension of Spence-Taylor drive theory to include the effects of intelligence. The learning lists (serial verbal learning) and the experimental procedure were the same as described by Montague (1953), with the addition of ego-orienting stress instructions and standard task oriented instructions. Two different
 experimenters were used. Obtained results were not exactly of either Montague's or Nicholson's pattern of results. Neither the interaction between anxiety and difficulty was significant, nor anxiety by instruction. Anxiety by trials blocks interaction also did not reach level of significance. Results though not significant were somewhat consistent with the results of Spielberger and Smith (1966) and with Spielberger's (1966) extension of drive theory: high anxiety facilitated the performance of high aptitude Ss and impairs the performance of low aptitude Ss.

Verma (1973) in a bid to study the effect of anxiety (test), task difficulty (easy and difficult) and reinforcement (Praise, reproof, praise and reproof) on paired-associate learning task, at three levels of intelligence, demonstrated significant interactions among the variables. In general on easy tasks and at upper and middle levels of intelligence, anxiety facilitated learning, but on difficult task anxiety significantly impaired performance at the lower level of intelligence. LA Ss under praise always performed better. It was concluded that it is not the task difficulty but the experimental conditions that determine the learning and in addition suggested intelligence to be an important variable in researches on anxiety and learning.

Sharma and Wangu (1976) investigated effects of trait-state anxiety (STAI) and intelligence (Hundal's General Mental Ability Test) on serial verbal learning task of moderate difficulty level on a sample of 72 Ss. RGo-stress instructions were invariably given to the Ss of all the four anxiety-
intelligence groups prior to learning. Interaction between anxiety and intelligence was not significant. Learning was interpreted in terms of stage of practice. On the whole, results with trait anxiety did not support the Drive Theory and its extension by Spielberger to incorporate intelligence. Analysis with A-state scores did not provide any additional information. Authors have cited two possible reasons for their contradictory findings: First being, that task proved to be rather difficult as Ss could not learn it till the criterion of 25 trials. Secondly, there might be cross-cultural differences in Indian and American students in reactions to threats to self-esteem.

**Interactive Effects of A-State, Stress and Intelligence on Complex Learning:**

Bachor (1973) studied the effects of stress, cognitive style and trait anxiety on the state anxiety. Ss were assigned to four groups and within groups to a stress and no-stress treatment. Measures of A-state were taken at the beginning of performance. The stress, no-stress and A-trait effect was significant but the effect of non-verbal intelligence was not. Results were consistent with state-trait anxiety theory. Not many studies available which have considered the interactive effect of State anxiety (A-State) and Intelligence and Stress.

**Anxiety and Scholastic Achievement:**

In recent years, there has been a gradual recognition of the fact that personality and motivational variables are important correlates of scholastic achievement in the same way
that intellectual aptitudes have been regarded as being important. Personality theorists have shown considerable discrepancy between the potential and scholastic performance and hold that personality attributes, especially anxiety are significant factors in producing this discrepancy.

Various measures of anxiety have been used which include Manifest Anxiety Scale (MAS) by Taylor (1953), Test Anxiety Questionnaire (TAQ) by Sarason and Mandler (1952), Test Anxiety Scale (TAS) by Mandler and Cowen (1958), Test Anxiety Scale for Children (TASC) by Sarason et al. (1960), Achievement Anxiety Test (AAT) by Alpert and Haber (1960), Children Manifest Anxiety Scale (CMAS) by Castaneda, McCandless and Palermo (1956), State-Trait Anxiety Inventory (STAI) by Spielberger et al. (1970), Sinha Anxiety Scale (1966), Sharma Anxiety Scale (1970).

Academic performance has been assessed in a variety of ways such as grade point average (GPA), performance on standardized tests such as the Stanford Achievement Test (SAT), the Science Research Associate (SRA) tests, and scores on essay type examination etc. In many studies performance in various courses, such as mathematics, reading, and other areas, has been the variable which has been linked with yet another aspect of performance in the classroom: the verbal behaviour of HA and LA children.
There has been quite a number of studies in which CMAS scores of children, primarily between ages 10 to 12, have been related to the measures of achievement. These studies report low negative but significant correlation between anxiety scores and achievement measures (e.g. McCandless and Castaneda, 1956; Hafner and Kaplan, 1959; Hafner, Pollie and Wagner, 1960; Cowen et al., 1965; Phelps, 1968; Keller and Rowley, 1962; Sinha, 1972).

Essentially the same relationship holds when other anxiety index such as TASC is used (Brown, 1959; Atkinson and Litwin, 1960; Davidson, 1959; Sarason, 1963; Ruebush, 1963; Carrier and Jewell, 1966; Muroy, 1968).

Sarason (1963) suggested that anxiety scales which are specific to certain kinds of situations may prove to be more useful in academic situations than the general anxiety scale. His results supported this suggestion and there was a more significant negative correlation between test anxiety and achievement than between general anxiety and achievement. Negative correlation was stronger for females than males.

In some studies more than one anxiety measure has been used. Lunnborg (1964) gave three anxiety scales, the TASC, CMAS, GASC, to 213 boys and girls in grades 3 to 6. There was a negative correlation between anxiety and achievement measures for each grade. The negative correlation between anxiety (TASC) scores (specific anxiety measures) and achievement scores tended to be larger than was the case for other two general anxiety.
measures. Further, the negative correlations tended to be larger for boys than for girls. Similar results have been reported for elementary school children by Sarason et al. (1960), Stevenson and Odom (1965), Frost (1968), Leary, Grooch, and Keller (1969). But in Stevenson and Odom (1965) results, the negative correlation between test anxiety and achievement was more or less equally strong for both boys and girls of 4th and 6th grades. Similar results that there is no consistent pattern of differences for boys and girls were reported by Hill and Sarason (1965). Commenting on sex-differences, Gaudry and Spielberger (1971) conclude on the basis of similar other studies that "most likely conclusion appears to be that the relationship between anxiety and achievement is equally strong for the two sexes overall, but this relationship may vary as a function of complex, situational factors, such as, the sex of the teacher or a teacher's value system." McKeanie (1969) has shown that when students are taught by teachers characterized by expectation of high standards, the relationship between anxiety and achievement is affected.

Two studies on the school sample have supported the Yerkes-Dodson law, which states that the relationship between motivation (anxiety) and learning takes the form of inverted U-shaped curve which means that the optimum level of motivation for effective performance lies in the middle ranges, rather than at the high or low ends.

Cox (1960) evaluated the school marks of ten and eleven year old boys as function of anxiety level measured by TAS.
The results supported the Yerkes-Dodson law. Sharma (1970) investigated the nature of relationship between general anxiety (SAS) and school achievement of Indian adolescents. The eta co-efficients for the whole group and for boys was significant beyond the .01 level, while the eta co-efficient for the girls was significant at .05 level. The conclusions were that the relationship between the two variables is curvilinear and this relationship holds for both males and females.

Another study in line with Yerkes-Dodson law is by Leith and Davis (1972), on school as well as college sample. They found inverted U relationship between CA (New Junior Maudsley Inventory) and achievement. They further found that average or above average anxiety is facilitating to younger school children, whereas, for older Ss it becomes more debilitating – to the point where high anxiety hinders.

Sinha (1972) found that anxiety (TMAS) was significantly and negatively related to academic achievement, further that high and low achievers could be differentiated on the basis of manifest anxiety scores. It was concluded that manifest anxiety symptoms have a debilitating effect upon scholastic achievement.

Tryon, Leib, and Tryon (1973) demonstrated that high achievers increased, low achievers decreased, and middle achievers remained unchanged in test anxiety with increased grade placement. Females in general and female high achievers were high in test anxiety than males.
There are, however, some studies which found no relationship between anxiety and achievement measured on the school sample (Wirt and Brown, 1967; Kitano, 1960; L'Abate, 1960; Chasbell and Thomas, 1967).

Carrier and Jewell (1966) used TAS and AAT and correlated these scores with final examination scores of 125 multiple choice questions. They obtained significant negative correlations. Earlier, Alpert and Hadler (1960) had compared the gross ability of six anxiety scales to predict college achievement. Their results showed that specific anxiety scales like TAS, AAT and AAT tend to have higher negative correlations with measures of academic achievement than general anxiety scales like MAS.

Sessarenath (1967) and Endler (1964) reported significant negative correlation between test anxiety and achievement. On Indian college students, Sinha (1966), Saxena (1965), and Hundal, Suchakar and Sidhu (1972), Rao (1974) have reported low negative but significant co-efficients of correlations.

Littig (1970) suggested that measures of personality such as the TAQ are much more sensitive to states induced by the contemporary status of the individual than to the sort of long term psychological dispositions they purport to measure.

There are studies at college level which provided evidence for inverted-U hypothesis. A study by Fain (1961), using IPAT anxiety questionnaire on nursing students obtained curvilinear relationship between anxiety and achievement.
Sweeney, Smouse, Rupiper, and Munz (1970) selected 120 college freshmen out of 242 on the basis of their scores on AAT and administered final examination under three levels of arousal (high, low, normal) in order to test the assumption that the inverted-U hypothesis which shows performance as a function of arousal mediates the relationship between achievement anxiety reaction type and achievement test performance. This study provides strong support for inverted-U hypothesis.

Muns, Costello, and Korašik (1975) tested the assumption of inverted-U hypothesis mediates the relationship between achievement anxiety and academic test performance by comparing the Alpat-Haber achievement anxiety test scores. Results supported the predicted relationship between achievement anxiety reaction type and academic performance, but partially supported the inverted-U hypothesis.

Osterhous (1975) found negative linear trend between anxiety level and academic performance. Moderate test anxious Ss tended to obtain slightly higher examination scores as compared to HA and LA Ss.

Spielberger, Wetz and Denny (1962) showed that those anxious freshmen who regularly attended group counselling sessions showed more improvement in their academic performance than students who were not counselled or who did not regularly attended counselling. But Garlington and Cotler (1968) and Emery (1967) reported that changes in test anxiety by systematic desensitization were not significantly reflected in better performance on course examination and final grade.
Prell (1973) studied influence of anxiety on three measures of examination: term paper, essay type and multiple choice test. The correlations between the debilitating anxiety score and total achievement was significant for the whole group. The total scores based on all three measures was most strongly correlated with achievement in the multiple choice test, less strongly with essay achievement, and least strongly with term achievement. Anxiety Ss, especially females, were reported to have a significantly lower essay score.

Most of the studies reported significant negative relationship and some suggested curvilinear relationship. However, there are some studies which found no relationship between anxiety and achievement (Calvin, McGuigan, and Sullivan, 1957; Davids and Erickson, 1955; Sarason, 1956; Matarazzo et al., (1954); Sarason and Mandler, 1952; Grooms and Endler, 1960; Singh, 1966; Buchin, 1966; Singal, 1974).

Anxiety, Intelligence, and Achievement (School and College);

Most of the studies reported earlier did not control intelligence or systematically vary it. This raises the possibility that the relationship between anxiety scores and academic achievement may be being observed by an intelligence by anxiety interaction.

Accordingly, Gaudry and Fitzgerald (1971) analysed the performance of junior high school pupils on a variety of school subjects as a function of test anxiety and intelligence. The performance of children in 12th grade, seven schools was examined.
Considerable support was found for the experimental hypothesis that anxiety would facilitate the performance of most able students while lowering that of the remainder when compared with their low anxiety counterparts. HA was found to be associated with the greatest performance deficit at the second highest of the five levels of ability.

Gjesme (1972) examined relationship between test anxiety and school performance in light of a motivational theory. Results supported the predictions that subjective probability of failure in school work is determined by the individual's knowledge of his own relative ability and is inversely related to the pupil's level of ability. Girls tended to overestimate their probability of failure.

Nickel, Schiliiter, and Fenner (1973) examined performance of extreme groups of anxiety in mother tongue (German) and mathematics for correlations and comparisons and found that girls admitted more anxiety at the age of 12. Anxiety diminished with age and intelligence and many more factors as quality of education, higher social class and with increasing introversion and dominance of the teacher.

A number of studies have been done on college population. Spielberger and Katsmeyer (1959) using Taylor manifest anxiety scale, reported a significant negative correlation between anxiety and grade-point average. They further determined the effect of intellectual ability on this relationship. It was found that grades varied inversely, with anxiety at a higher significant level, for the average scholastic
aptitude subjects. College work appeared to be too diff. for the low aptitude Ss whose poor grades were unrelated to their MA8 scores. High aptitude students tended to obtain good grades regardless of their anxiety level.

Spielberger (1962) investigated this relationship taking into account the intellectual level of students. He found that anxious students (MA8) in the middle ranges of ability obtained lower grades than non-anxious students of comparable ability. Students of low ability earned poor grades irrespective of their anxiety level. For the very superior students, it appeared that anxiety had actually facilitated academic performance. But Pervin (1967), using Alpert and Haber (1960) AAT, correlated anxiety with measures of academic performance. Low negative correlation was obtained. The moderator analysis did not indicate that anxiety was differentially related to performance for different ability levels.

Banemelsher and Colon (1974) examined the relationship between anxiety (STAI-A-Trait), sex, general ability and academic achievement, LA and female Ss showed higher academic achievement. Results were discussed in terms of state trait theory.

Lewis and Adank (1975) found positive interrelationships among the measures of intelligence, achievement, and self-esteem, for all groups exposed to different models of instruction (individualized and traditional self-contained model). There was a lack of significant negative correlation for the group exposed to individualized instructions.
Anxiety, Stress, and Achievement:

There are a few studies which considered, besides anxiety and intelligence, ego-involving or other experimental conditions also. Rosmarin (1966) studied the problem of chronic academic underachievers in high ability students in terms of their perception, experience, and reaction to stress and anxiety. Overall results suggested that the under-achievers might in fact display behaviour characterized by some degree of avoidance and denial which is his way of dissipating initially experienced stress and anxiety. Sinclair (1969) assumed that the extent to which interference to performance is caused by anxiety depends upon the level of ego-involvement and task complexity. He tested three groups based on TAS (Mandler and Cowen), assigned them to two conditions (stress - No-stress) and made them perform on factual learning and reasoning test. In the former no significant differences were found in the low ego-involving condition. In high ego-involving condition, performance of LA Ss was superior to that of MA and HA Ss. Performance of LA Ss in high ego-involvement was superior to that of LA Ss in low ego-involvement, while for the HA and MA groups performance was similar under the two conditions. For the Reasoning measure, all anxiety groups performed better in high ego-involvement condition.

Johnson (1970) demonstrated consistently lower performance of MA and LA (TASC) Ss on the estimates of reading achievement as compared to LA Ss. No interaction between anxiety and reinforcement was reported.
Donald (1973) found a significantly higher correlation between group acceptance and achievement, for anxiety Ss than for nonanxious Ss.

Findings of Tobias (1973) suggested that decrements in achievement attributable to experimental conditions are best interpreted in motivational terms.

**Anxiety and Achievement in Various School Courses:**

The studies discussed earlier had, by and large, taken up total achievement scores. However, there is a good number of studies that attempted to investigate the relationship between anxiety and achievement in different school subjects.

Lynn (1957), on British samples of 4th and 5th grade children, and Cox (1964), on Australian samples, reported significant negative correlation between test anxiety and arithmetic.

Zlotowicz (1963) reported negative correlation between manifest anxiety and arithmetic. These results are consistent with other studies by McCandless and Castaneda (1956), Sarason, et al., (1960). Lynn (1957) and Cox (1964) further reported that reading scores were uncorrelated to TASC scores.

On the other hand, Sarason (1960) and Stevenson and Odom (1965) Kestenbaum and Weener (1970) reported that reading achievement was more negatively correlated with test anxiety than arithmetic. Scarborough, Hindsman, and Hanna (1961) investigated the relationship between anxiety and performance in language arts as compared with other academic achievement areas for VII grade children, and suggested that anxiety level
makes a difference in children's reading and language achievement when intelligence is a factor.

In their longitudinal study, Hill and Sarason (1966) reported that reading and anxiety (TASC) were more strongly correlated in the early grades than arithmetic and anxiety. They further concluded that reading anxiety correlations and reading arithmetic correlations tended to become more similar in the later grades. They have suggested the possible explanation for these. Cotler (1969) obtained results confirming negative relation between test anxiety and reading achievement. HA Ss read more slowly and inaccurately than LA Ss and tended to show less improvement from the base line.

In a study by Reese (1961), arithmetic test was given under a time limit to 4th and 6th grade children. The scores on CMAS were negatively correlated with arithmetic achievement. Partialling out IQ had little effect on correlation, but on the other hand, the combination of anxiety with IQ did not appreciably increase the occurrences of predicting performance. They concluded that although the relationship between manifest anxiety and performance is not a result of the relationship between anxiety and intelligence, manifest anxiety has relatively little influence on scores on achievement test used in this study. Further Feldhausen and Klausmer (1962) and Lunneborg (1964) found no consistent differences in the relationship between anxiety, arithmetic and reading.

Keller and Bowley (1964), on a sample of 7th and 9th grade boys and girls, found the CMAS scores were negatively
related to science achievement. Gaudry and Braddaw (1970), using TASC scores for pupils of 14 secondary classes, correlated these scores with mathematics marks in both progressive and terminal examinations. The result were that while high anxious groups performed worse than their low anxious counterparts, high anxiety has a less interfering effect under progressive examining than under terminal examination. This supported Sarason et al. (1960) claim concerning the effect of test anxiety on performance in situations varying in 'test' like characteristics. Rustin (1966) reported a significant negative relation between anxiety and verbal reasoning, arithmetic, English and school record.

Merryman (1974) compared high, medium, and low manifest anxiety Ss on performance on reading tests. Moderate and low anxiety groups did significantly better than HA groups on comprehension and vocabulary tasks. Reading task prove to be more anxious because of the urgency placed on it by teachers and parents. Barton, Bartsch, and Cattell (1974) standardized achievement test in social studies, science, mathematics and reading. Most important finding was that extreme scores on either end of anxiety and extraversion dimensions were related to high achievement. Findings have implications for teachers, counsellors and researchers.

Conclusion and Comments:

A review of the studies shows that there is conflicting evidence as to the nature of relationship both at school and college level. This is not surprising in view
of differences in age, intelligence, socio-economic status, geographic location, cultural background, education system among the samples studied, not to mention the actual differences in the criterion of achievement test used, i.e., the techniques used for scoring academic attainment. While all the measures of achievement may well show fairly high correlations, they shall represent alternate definitions of attainment, which could have different personality correlates. Indian students who are examined less frequently but through a more stressful examination may show different anxiety-achievement relationship than their counterparts in western countries (Sharma, 1970). These examining conditions and learning environments may appreciably influence anxiety achievement relationship.

Besides, it is essential to differentiate between GE (general emotionality) and anxiety. Anxiety as a concept implies direction as well as level, whereas GE may imply level of arousal (without any specific directionality) which in turn implies ease of acquisition of negative signs. The greater the degree of GE the greater the likelihood of (signal) anxiety. GE and anxiety as measured by questionnaire are more likely to refer to (1) likelihood of being threatened by the external world and (2) a specific way of reacting to such threat (Frost, 1968).

In spite of these factors, the most consistent general finding is that there is a negative correlation between different measures of anxiety and variety of measures of
achievement. It has been found that specific anxiety scales e.g. (TASC, TAQ, AAT) are better predictors of academic success than due the general anxiety scales. Evidence has further shown that there are different relations between anxiety and school subjects such as reading, arithmetic, science, etc. Anxiety is more strongly related to reading than to arithmetic in the early elementary or junior high school years but the difference weakens during the course of elementary school years and disappears in the late elementary or junior high school years. Thus, it would be important to investigate how anxiety is related to achievement in different school courses in science, humanities and social studies rather than taking total achievement scores.

Evidence has also been cited that supports the proposition that anxiety and intelligence have interactive effects on performance. It is desirable that intelligence is taken into account while attempting to discover the relationship between anxiety and achievement. A low negative correlation between intelligence as measured by various instruments and anxiety is the result of majority of investigations. However, the relationship is higher and more consistent in the studies of children (e.g. Ruesbush, 1963), and when the TAS or TASC was used as measure of anxiety than when the MAS or CMAS was used (e.g. Sarason, 1963). Spielberger (1958) explains such results by pointing out selection factors that operate in college students reduce the range of ability present in the sample and thus lower the correlation between these two variables. It seems likely that
the relationship between anxiety and academic achievement is a complex one and cannot be ascertained by two variable correlational procedure. Further, anxiety scales should be administered in close proximity to the achievement test. In addition to these factors, age, social class, sex, social mobility, defensiveness, type of school, teaching methods, teacher's personality etc. play a part in determining the size and direction of correlations between these two main dimensions under consideration.

Most of the research reviewed here involved the use of various correlation techniques. While these methods of analysis have distinct advantage in terms of ease of communication, they do have definite weakness. Firstly, cause-effect generalizations can not be made. It is possible to dismiss a non-linear relationship in reporting an insignificant product moment coefficient of correlation and also to ignore the possibility of important interaction between the variables. Further, correlations average out the relationship over the whole sample, ignoring possible differences between sub-groups. Thus correlation technique, if to be applied, should be applied to sub-groups, when these are known in advance. It would be better if multivariate experimental designs are used while designing various experimental studies (e.g. Spielberger, 1962; Gaudry and Fitzgerald, 1971). According to I.G. Sarason (1972 p.382), "while correlational and experimental explorations are occasionally seen as being at odds with one another, they share a complementary relationship. This is certainly true
in so far as performance on intelligence, achievement and aptitude tests is concerned."

Further, the various findings suggest a number of questions: If anxiety factors do play a considerable role in performance on academic tests, how much of the variance in the scores on college admission tests is a result of these factors? What non-anxiety personality variables interact with anxiety to influence examination performance? Do the effects of anxiety vary with the type of examination (recall, recognition, etc.)? What situational conditions effect examination performance, and can the detrimental effects be reduced?

To conclude, the area of research covering anxiety-learning-achievement has great significance for psychological theory and educational practice. There are formidable obstacles to research of this kind, but it may be crucial to overcome them.

Selection of Learning Tasks:

Review of available literature has reflected some flaws and inconsistent findings in the previous studies. For the present study two laboratory learning tasks, i.e., serial verbal learning and paired-associate learning and academic achievement as real life learning have been selected. In serial learning studies (e.g., Deese, Lazarus, and Keenan, 1953; Lazarus, Deese, and Hamilton, 1954; Lucas, 1952; Montague, 1953) two factors of considerable importance have been ignored: (a) the relative strength of correct and incorrect tendencies changes during
performance, as irrelevant responses are eliminated, response being a function of D X H. Implications of these changes in S-R tendencies, for drive theory, have been given little attention; (b) - another factor of concern is that in most studies influence of serial position on performance was ignored. However, in two serial verbal learning studies, in which the effects of anxiety and serial position were evaluated, the findings did not support drive theory (Kalish, et al. 1958; Malmo and Amsel, 1948). Spielberger and Smith (1966) replicated the experiment by Hicks (1960) and found that influence of anxiety was different for hard and easy words at different stages of learning. The evaluation of the joint influence of anxiety and intelligence for all subjects revealed a tendency for HA to facilitate performance of HIQ subjects earlier in learning than was the case of LIQ subjects, but these trends have not been statistically significant. Moreover, serial position effects in serial learning studies are important.

To the extent to which predictions of drive theory for paired-associate learning have been examined, they have received little empirical support. In most studies of anxiety and paired-associate learning which present performance curves, the results indicate essentially parallel performance of HA and LA groups, after the first few trials (e.g., Spence, Farber and McFann, 1956; Spence, Taylor, and Ketchell, 1956). This may be due to lack of consideration for the IQ of the subjects. Studying effects of anxiety and intelligence on achievement seem to be quite significant. Considerable research has been
carried out on complex relationship between anxiety and academic achievement, both at the school and college level. The most consistent finding is that HA is associated with low performance. This conclusion is based on a number of different studies between different measures of anxiety and academic aptitude and achievement (e.g., Lunneborg, 1964; Sarason et al., 1960; Endler, 1964; Frost, 1968; Stevenson and Odom, 1965; Sinha, 1966; Cowen et al., 1965). Fein (1963) and Sharma (1970) provided evidence for a curvilinear relationship. All these studies hardly considered the possibility that anxiety might be differentially related to grades for students with different intellectual abilities. Spielberger (1962) explored this and found HA students obtained poorer grades than did LA in broad middle range of ability.

Further, studies are available which indicate that specific anxiety scales (e.g., TAQ) tended to have higher correlations with measures of academic achievement than did general anxiety scales (Sarason, 1961; Alpert and Haber, 1960). Anxiety is differentially related to different school subjects (Lynn, 1957, Hill and Sarason, 1966, Cox, 1964). However findings are not consistent.

Present Hypotheses and Objectives:

Hypothesis for the study are primarily drawn from Spielberger's work. It was observed from the mean scores on the anxiety scales (STAI A-Trait and A-State) that the level of anxiety was very high in both high and low anxiety groups. A very large preliminary sample has been used in the present
study which permitted the formation of very extreme anxiety
groups. Western studies that are based on small samples,
the HA and LA groups are, in fact, not the extreme groups.
In small sample studies the terminology of groups is misnomer,
in the sense that Ss seem to fall in the middle ranges rather
than at the extremes. This is the reason that Spielberger's
work may be true under non-stress condition for our sample
but not under stress condition. HA and LA Ss in the present
sample are quantitatively much higher than those used in
Western countries. Further, the anxiety aroused in an
experimental situation, with the help of ego-stressor, has
been so high that it seems necessary to form separate hypothesis
for both the experimental conditions, i.e., stress and control.

Hypotheses For Analysis Involving Trait Anxiety:

(a) 1. Ego-stress instructions would induce differential
levels of drive (D) in HA and LA Ss.
2. Early in learning HA would facilitate performance of
HI Ss, while leading to performance decrements in Ss
with LI.
3. Effects of anxiety and intelligence on performance would,
further, depend on the experimental conditions of stress
and control:
   (a) Under the experimental condition of stress, LA
would have facilitative effects on performance of
HI Ss, while HA would lead to impairment in
performance of HI Ss under the same experimental
condition. These effects would be more pronounced in
the early stages of learning. Similarly, effects
of anxiety would be more debilitative for HA Ss than for LA Ss at LI, more specifically so in the early stages of learning.

(b) Under the control condition, it is expected that HI-HA Ss would perform better than their HI-LA counterparts, especially so in the early stages than in the later stages. At LI level LA Ss would perform better than HA counterparts, though the difference in performance may not be significant.

4. Facilitative effects of HA would occur in learning for words at the extremes of the list than for the words embedded in it. These facilitative effects would be more for HI-HA Ss than for LI-HA Ss. These effects, too, would further depend upon the experimental condition under which the Ss are performing.

Hypotheses for paired-associate learning are also some, except that serial position effects (Hyp.No.4) are not to be explored.

(b) Hypotheses For Analysis Involving State Anxiety

1. State-anxiety scores are better predictors of performance (SL and PA) than Trait anxiety scores.

2. Interactive relationship between A-State and intelligence may be of higher significance level than for A-Trait and intelligence.

3. It is expected that LA (A-State) would have facilitative
effects on the performance of both the intelligence groups (HI and LI) than HA counterparts. These facilitative effects may occur at all the stages of learning.

(c) The following hypotheses would be tested for Academic Achievement:

1. Anxiety and intelligence would be negatively correlated
2. HA Ss at lower range of ability (LI) would achieve less as compared to their LA counterparts. HA would facilitate academic achievement of the Ss of higher intellectual ability.
3. Anxiety and intelligence would effect differentially achievement in different school courses.