Chapter - II

BACKGROUND OF PRESENT RESEARCH

The previous chapter was mainly concerned with providing a brief introduction to the problem of the present study which attempts to determine the effects of set, motivation and perceptual organisation on the susceptibility of learned materials to retroactive inhibition. Numerous studies of retroactive inhibition have demonstrated the detrimental effect of interpolated activity but there are very few studies dealing with the factors which minimise the inhibitory effect of interpolated activity. In the present chapter we propose to present some studies which deal with the factors of set, motivation and perceptual organisation in relation to retroactive inhibition, and which bear directly or indirectly on the present research. Before discussing these, we shall first examine some of the relevant studies of retroactive inhibition. They will provide a general background to the present research and will also enable us to understand the nature of some of the variables which determine retroactive inhibition and which are considered important in the context of the present research.

Muller and Pilzecker (1900) are generally recognised as the first workers in the field of retroactive inhibition. They conducted a series of experiments in which the nature of activities interpolated

between original learning and the test for retention were varied in order to determine their effect on the retention of originally learned material. The original material consisted of paired nonsense syllables which were exposed on a memory drum apparatus. The interpolated material consisted of another set of paired nonsense syllables or landscape pictures. In other conditions the time interval between original learning and the test for retention was filled with rest. For major part of their experiment the method of recall was employed and the results were computed by the methods of right associates. In some of the experiments the data were interpreted in terms of saving method. The results of the study published in 1900 clearly showed that the recall of the previously learned activity was not as complete nor as rapid after a period of assigned mental activity as it was after a period of rest. The comparison of the interpolated condition where landscape pictures were used with those where paired nonsense syllables were used showed that the decrement in retention was as great in one case as in the other. On the basis of this finding Muller and Pilzecker were led to conclude that the decrease in retention, the retroactive inhibition, was produced by indulging in any definite activity, as compared with rest during the interval. An interesting finding based on another part of their experiment is that the earlier the activity is engaged in after memorizing or original learning, the greater is the resulting inhibition.

Retroactive Inhibition and Temporal Position of the Interpolated Activity:

Opinion stands divided with regard to the significance of temporal position of the interpolated activity as a determining condition of retroactive inhibition. As pointed out earlier, Muller and Pilzecker had suggested that the earlier the interpolated activity is introduced immediately after original learning, the greater is the amount of retroactive inhibition. When the matter was subjected to experimental test by Robinson (1920), he found no consistent relation and observed that the degree of retroactive inhibition is independent of the temporal position of interpolated activity. On the other hand, the results of an experiment by Skaggs (1925) showed significant relationship between the temporal position of the interpolated activity and retroactive inhibition. His experimental findings tended to confirm the conclusions of Muller and Pilzecker to the effect that where interpolated activity is introduced immediately after original learning, it has a more deterimental effect on original learning. In a major study with 132 subjects, and employing the method of anticipation with lists of 10 adjectives, McGeoch (1933) made a comparison between the amounts of retroactive inhibition after intervals of 20 minutes, 1 hour, 24, 48 and 144 hours, when the interpolated activity was introduced (1) immediately after original learning, and (2) just prior to relearning. On the whole, the results showed that retroactive inhibition was greater under condition 2 where interpolated activity was

introduced prior to relearning than under condition 1 where interpolated activity was introduced immediately after original learning. Swenson (1941) summarised the results of the studies dealing with temporal variables as follows: "... Interpolation immediately adjacent either to original learning or to recall of original learning is more effective in producing retroactive inhibition than is interpolated activity between these two extremes."

Subsequent work has called for a modification of this statement. Ray (1945) suggested that interpolated activity should be more effective at that point where the original habits have been reduced to moderate strength, i.e., not immediately after original learning nor yet after too long an interval, but somewhere in the middle of the retention interval. An interesting study by Postman and Alper (1946) in which 16 days elapsed between original learning and relearning, and in which subjects first learned 20 pairs of monosyllabic words and then had interpolated 20 new pairs having the same stimuli but different responses showed that the greatest per cent of retroactive inhibition occurred when interpolated learning was the day after original learning, when it was midway between original learning and relearning, and when it was just before relearning. Bunch (1946) studied the effect of a highly similar task interpolated either immediately after original learning or after the long interval of 120 days. His results showed that immediate interpolation produced retroactive inhibition while interpolation after a long period produced facilitation. Newton (1955)

with an A-B, C-B design, and Archer and Underwood (1951) with A-B, A-C design, using a 48 hour OL-RL period with IL at 0, 24 and 48 hours, concluded that temporal point of interpolation was not an effective variable. Newton and Wickens (1956) noted that the Archer and Underwood study failed to control for differential warm-up, in that the group with IL immediately before RL benefitted by warm-up, whereas the other two groups had no comparable advantages. They repeated the Archer and Underwood study with the same materials, but gave a warm-up task to the 0 and 24 hour groups. No effects of the temporal intervals were obtained, confirming the previous results. However, they also reported two additional experiments, with an A-B, C-D design, with warm-up provided. Results of both showed that the 48 hour group did show significant retroactive inhibition.

Similarity of Materials:

Among the conditions which determine retroactive inhibition, the factor of similarity between original and interpolated tasks has received relatively greater attention on both the theoretical and experimental levels.

Although a full development of the concept of similarity is beyond the scope of the present research, one cannot overlook the fact that systematic investigations of similarity have been conducted since 1920 when Robinson reported his first study on this problem. In two of his experiments the subjects memorized series of 8 four-place

numbers. In one of these experiments the interpolated material consisted of the memorization of more four four-place numbers, the memorization of 32 digits, the multiplication of two-place numbers by two-place numbers, the observation of pictures of nudes, and the reading of a newspaper. Both these experiments clearly showed decided evidence of retroactive inhibition where original learning and interpolated learning were very similar, and slight evidence of retroactive inhibition where original learning and interpolated learning were dissimilar. Skaggs (1925) was another investigator who published a number of experiments on the problem of retroactive inhibition. On the basis of his experimental findings, he also observed that the effect of the interpolated task upon the recall of the original material is more detrimental "within limits", as the similarity between the original and the interpolated material increases. Similar observations based on early systematic studies of similarity led to the formulation of a general relationship to the effect that "the greater the similarity, the greater the interference." This is the similarity paradox to which Robinson called attention and for which he proposed a resolution, which has come to be known as the Skaggs-Robinson hypothesis. Robinson (1927) formulated it as follows: "As similarity between interpolated and original memorization is reduced from near identity, retention falls away to a minimum and then rises again, but with decreasing similarity it never reaches the level obtaining with maximum similarity."

The series of studies by McGeoch and his associates came in

direct conflict with Skaggs-Robinson hypothesis. McGeoch and McDonald (1931) conducted two experiments in which similarity was quantified in terms of the ratings of large number of judges. They employed the anticipation method and asked the subjects to learn lists of adjectives which constituted original learning material in both the experiments. In one of these experiments, the interpolated learning consisted of adjectives, nonsense syllables, and three place numbers, each rated as to similarity of meaning to the original material, whereas in the second experiment the interpolated learning consisted of synonyms of adjectives used in the original series. The synonyms were divided into three categories by judges on the basis of their degree of relation to the original list. The results of the study showed that retroactive inhibition varies in amount with the kind of interpolated material, decreasing gradually from synonyms to numbers, until with the latter material it becomes very small. Retroactive inhibition also varied directly with the degree of rated similarity of the interpolated material.

In a major attempt to resolve the paradox, Osgood (1949) analysed the available experimental data and tried to clarify similarity function by specifying the degree of similarity. He observed that the effect of similarity upon retroactive inhibition can be understood more clearly when stimulus and response dimensions are considered separately.

In order to explain this point further, we shall report here the study published by E.J. Gibson (1941). As pointed out by Osgood, she followed Kylie's lead in differentiating between stimulus variation and response variation, and she added to this picture the refinement of stimulus generalization, derived from pavlovian conditioning principles. This was actually the first study of the series in which the stimuli, consisting of visual forms, were varied through independently measured degrees of generalisation while the responses, consisting of nonsense syllables, were kept different and neutral. The results of the study showed negative transfer and retroactive inhibition, their magnitude decreasing as stimulus similarity decreased and approaching zero with neutral stimuli. Gibsons two theoretical laws are: (1) If responses are identical, facilitation is obtained, its magnitude increasing with increase in the degree of stimulus generalisation (similarity); (2) If responses are different, interference is obtained, its magnitude increasing with increase in the degree of stimulus generalisation (similarity). Commenting on Gibson's study, Osgood (1956) opined that "Gibson's hypotheses fit much of the data in the field and serve to integrate the phenomena of human learning with those of the animal laboratory."

As shown in the preceding paragraphs, experimental studies of retroactive inhibition have clearly established that decrement in the retention of some learned activity, or forgetting is due to interference from interpolated activity. Interference theories of retroactive

inhibition have generally assumed that inhibitory effects observed in recall can be explained partly by competition at the time of recall between learned responses of different strengths, and partly by the weakening of the strength of the original responses due to their 'unlearning at the time of interpolated learning.' Much of the research in the field of retroactive inhibition has been concerned with the manner in which retroactive inhibition varies as a function of similarity between original and interpolated material or temporal position of interpolation. Relatively little consideration has been given to factors such as subject's set or motivation which could minimize or counteract inhibitory effects and enhance retention. Dynamic and motivational approaches to personality have long maintained that memory is an active selective process. Selection is said to be directed, to a large extent, by motivational forces or conditions of the individual which direct, organise and define the adequacy of his behaviour. It is, therefore, reasonable to assume that these motivational forces consciously or unconsciously influence what will be retained. Material can be differentially retained in accordance with whether or not it is related to these motivational forces, set or attitudes of the individual. In a typical retroactive inhibition experiment, the subject at the time of recall, searches his memory for the proper item, and either gets a wrong one which is similar in form or meaning to the correct one, or is blocked because of confusion and makes no response in the time allowed. If the mental organization representing the residue of the two original

and interpolated, activities is a total inter-associated mass, retroactive inhibition will be maximal. Anything which serves to distinguish one constellation of associations from another will facilitate the desired recall, and thus reduce retroactive effect or interference. Experimental literature in this area is sparse and whatever little work has been done is indicative of the need, importance and fruitfulness of the area for research. In the following paragraphs we shall mention a few studies which bear directly or indirectly on this point and which have influenced the design and planning of the present research.

It has been suggested by several investigators that the set of the subject whether aroused by instructions from the experimenter or in some other way, may be a potent determiner of retroactive inhibition. Lester (1932) reported a study which suggests that the amount of interference varies as a result of the set the subject is given at the time of original learning. Set was defined by Lester as "that mental attitude which is the result of specific work instructions, and which may or may not involve changes in muscular tonus, or the assumption of any particular bodily attitude, on the subject's part. Two hundred subjects were used, and the learning materials, both original and interpolated were lists of 12 three-letter nonsense syllables. Recall was measured after 24 hours and the interpolated material was introduced immediately before recall. The following written instructions,

designed to establish a series of set, were given to the subject at the time of original learning: (a) expectation of recall, (b) expectation of interpolated material before recall, (c) information about the possible effects of the interpolation, and (d) directions urging the subject to make an effort to avoid the possible interference effect of the interpolated activity. The decrements in retention were large when the subjects expected neither recall nor interpolated activity and were given both. With an active attitude to resist the inhibitory effects of the interpolation decrement in retention had become much less than under the conditions which carried no special instructions. Jinkins and Postman (1948) obtained interesting results when they manipulated the set of the subject by changing the method of learning. When original and interpolated learning both take place by the anticipation method, more retroactive inhibition results than when the original learning is by the anticipation method and interpolated learning is by the method of recognition. Similarly, more interference is obtained when original and interpolated learning are both by the recognition method than when original learning is by the recognition method and interpolated learning is by the anticipation method. In all the cases, of course, retention is measured by the method used in original learning.

Nagge (1935) found (a) that less interference appears when the original list is learned in an hypnotic trance and the interpolated list is learned in the waking state, or the reverse, than when both are

learned in the same state (both hypnotic or both waking); (b) that inhibition is less when the original list is learned and relearned through one sensory modality and the interpolated list through another than when both lists are presented to the same modality; and (c) that the decrement is less when the subject who wrote the material as it was learned, wrote the two lists with different hands. These results, and others, imply that retroactive inhibition decreases with an isolation of the interpolated activity from the original, an isolation which may be brought in a number of ways, among which instructions and set are very influential.

Gestalt psychologists have likened the processes involved in retention to those operating in visual perception. The fundamental precept of the Gestalt approach to learning and memory is that perceptual processes persist in and determine mnemonic processes. If as Murphy (1947) points out, memory is a continuation or reactivation of central processes intimately related to perception, we might expect the same motivational influence to apply in retention as in perception. Relating the Gestalt thesis directly to retroactive interference, Prentice (1943) observed that increased ego-involvement in any learning situation has the effect of maintaining for a longer time a high degree of organization in the resulting trace systems, with the consequence that similar traces have a reduced destructive influence and retroactive inhibition is thereby diminished. Comparing the effects of intentional versus incidental learning upon retroactive inhibition, he concluded that

intentional learning minimized the interference effects of retroaction, thereby permitting higher recall after interpolated activity than in the condition where interpolated activity was introduced after incidental learning. That ego-involvement, as a form of motivation, does facilitates retention has been demonstrated by Meyer and O'kelley (1949). In their study, two groups of subjects were given an equal number of trials on a list of 20 nonsense syllables. One group was told that their grade on the test would count a full 10 per cent of their quarter's grade; the other group was told that they were helping to standardize the materials. Although there was no significant difference in original learning between the two groups, differences in retention measured after one week were significant and favoured the ego-involved group.

One concrete hypothesis deriving from the Gestalt view is that the memory traces of isolated items in a list of materials, standing out as figure on a ground, will be more stable than the memory traces of homogeneous items, which suffer the fate of assimilation with others of their kind. The classic studies dealing with the effect of perceptual organisation on retention and on the susciptibility of learned materials to retroactive inhibition were contributed by Von Restorff (1933). She found that when relatively isolated materials of one type were imbedded in lists of other massed materials, recall of the isolated items was clearly superior. Pillsbury and Raush (1943) and Siegel (1943) have also demonstrated the superior learning and/or retention of the relatively isolated items in lists of materials. Katona (1940)

reports a number of experiments in which learning by rote methods is contrasted by understanding methods, retention being definitely superior in the latter case. According to Katona, the 'structural traces' set up by meaningful, organised methods of learning are more stable and persist longer as compared to chaotic individual traces set up by rote memorizing. Koffka (1935) also refers to the low survival value of chaotic units. Thus the results of these studies are interpreted as substantiation of the Gestalt hypothesis which states that memory traces established in original learning will be resistant to assimilation and interference if the materials are well structured, i.e., that retention is facilitated by perceptual organisation. Behaviorists, on the other hand, would interpret these results in terms of reduced intraserial interference.

Aim and Importance of Present Research

In the foregoing sections we reviewed some studies which clearly bring out the factors that enhance retention, or contrariwise, reduce the amount of retroactive inhibition. Special comment is called for with respect to these studies, for they are directly related to the present research and have influenced the design and planning of the present investigation. This will enable us to show in what way the present study marks an improvement over previous work and breaks a new ground in this area of research.

The present investigation was designed to study the extent to

which set, motivation and perceptual organisation of materials help in minimizing the inhibitory effects of interpolated activity and thus enhance retention. With respect to the first factor the only major study, reviewed above, was reported by O.P.Lester. She was able to demonstrate a graded series of results by means of instructions designed to establish a series of sets. There is a constant trend in the data pointing to increasing degree of retention with increasing amount of information given at the time of original learning, although the differences, taken individually, do not prove to be statistically significant. Significantly greater retention was obtained only under the condition where the subjects were urged to make an effort to resist the interference effects of the interpolated activity.

It may be recalled here that in her experimental arrangements, Lester introduced the interpolated activity immediately before recall and after an interval of 24 hours. Those upholding Muller and Pilzecker hypothesis may attribute the results to perseverative tendency. Although there is some evidence which suggests that interpolation prior to recall is equally effective, the question still remains as to whether the results obtained by Lester would change if the interpolated activity is introduced immediately after original learning. This would decide the question as to whether interference with any hypothetical perseverative tendency would in any way change the results obtained, or in other words, whether the directions urging the subject to resist the interference effects of interpolated activity would enhance retention

even when such an activity is introduced immediately after original learning. It was, therefore, considered worthwhile to clarify the uncertainty and to fill up the gap left by Lester. Part of the present research was, thus, designed to answer the question as to whether a set or an active attitude aroused by instructions, urging the subject to avoid detrimental or interference effects of interpolated activity, would increase retention, if such an activity is introduced immediately after original learning.

The other two factors with which the present investigation is mainly concerned are motivation and perceptual organisation of materials. A number of studies suggest that motivational factors are extremely important in influencing what will be retained. The role of motivation as a determiner of retention has particularly been emphasized by Lewin and his co-workers. Reference has also been made to the study of Heyer and O'Kelley which indicates that ego-involvement as a form of motivation does facilitate retention. In none of the earlier studies, however, motivation has been employed to minimize the effect of retroactive inhibition. In setting out the design of the present research it was, therefore, argued that if set aroused by instructions can reduce the amount of retroactive inhibition, motivating instructions arousing ego-involvement of the subjects should have a comparable effect. Consistant with the interpretation of set, it was thus assumed that the amount of retroactive inhibition would be significantly reduced if the

motivating instructions are added over and above the directions urging the subjects to resist interference from interpolated learning. The present investigation is the first of its kind in which set and motivation have been combined to counteract the detrimental or inhibitory effects of interpolated activity.

An equally important aspect of the present research concerns the manner in which organisation of materials can resist interference and facilitate retention. As indicated above, the Gestalt hypothesis states that memory traces are subject to the same grouping or structuring factors that govern the realm of perception. In this sense the Gestalt theory predicts that the perceptual organising forces set up at the time of original learning will persist during the retention interval and produce predictable differences in recall. Thus if the material to be learned is well structured, for example, an isolated item embedded in a series of massed or similar items, it will resist assimilation and interference and will persist longer as compared to the massed or crowded items which suffer the fate of assimilation and loose their identity. The interference theory of retroactive inhibition, on the other hand, suggests that the fundamental condition that produces the decrement in recall is a form of interaction between original and interpolated materials. Of various aspects of the nature of the materials, the factor of similarity between original and interpolated activities is considered to be the most significant determent of retroactive inhibition. It will be recalled here that Gibson gave us a

version of the interference theory which is directly stated in terms of stimulus and response similarity. According to this view, retroactive inhibition should occur when a second task generalizes with one already learned, and this happens mostly when there is a low degree of discriminability between stimuli connecting two different responses. In this sense, when an individual is asked to recall the material from original learning, the stimuli do not help him to distinguish between original and interpolated learning, the result is intrusion during recall of those responses learned during interpolated learning.

At this point, it may be interesting to note that although the Gestalt hypothesis, as it relates to memory per se, is different from behaviouristic approach in terms of concepts and methods used, there are some common ground in the two approaches. Thus the Gestalt conceptions of isolation and assimilation yield about the same predictions as the behaviouristic conceptions of discrimination and generalisation. As mentioned above, Siegel (1943) for example, in the discussion of his results, stated that "Gibson's analysis of memory employing S-R constructs, very nicely generates Restorff's original results." This was an important consideration in introducing the factor of organisation of material in the present investigation.

An assumption has, therefore, been made that the inhibitory effect

of interpolated activity can be minimized by improving the structure of the original learning material, without simultaneously reducing the inter-list similarity which is considered to be the major determinant of retroactive inhibition.