THE RECALL OF INTERRUPTED TASKS: A REVIEW OF THE LITERATURE

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Submitted to the Graduate Faculty of Political and Social Science of the New School for Social Research in Partial Fulfillment of the Requirements for the Degree of Master of Arts

1951

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INTRODUCTION

The chief value of Kurt Lewin's concepts of interpersonal organization comes from the light these throw on questions of the behavior of needs or tension systems. Lewin's theory of motivation stands out in its opposition to the analysis of motives, either on the basis of kinds of psychological processes, or on the basis of superficial and largely a priori classification of behavior. Lewin insists, instead, on an empirical approach as the means of deciding how needs behave.

Lewin and his collaborators have been interested chiefly in the problem of tensions within the organism, in terms of the ways in which these tensions are released; as shown, for instance, by persistence of activity, satiation in a task, spontaneous return to unfinished tasks, and modes of reaction to frustration.

According to Lewin, all behavior may be viewed as the result of specific tensions discharging in specific fields. Any psychological behavior is assumed to depend upon energy related to system under tension. This tension persists in determining the nature of the individual's behavior until that goal is reached. Completion of activities is the most common way by which tensions are discharged and equilibrium restored. "Conceptually, tension refers to the state

of one system relative to the state of the surrounding systems. The essence and the purpose of this construction is to include a tendency for change in the direction of equalization of the state of neighboring systems. The construct, therefore, presupposes a geometric representation of the person and a distinction of functional subparts or 'systems' within the person, with a definite position in regard to each other (16, p. 20).

Lewin does not approach the problem through a direct study of needs. Rather, he proposes to investigate the relatively low level of tension represented by "quasi-needs" or "intentions", as a means of getting at the analysis of human motives. The tension back of real and quasi-needs is qualitatively the same, Lewin assumes, differing only in intensity.

In all of the experiments that followed this line of thought, "quasi-needs" or intentions were studied, such as the intention to perform some specific laboratory task. At the moment that the subject plans to execute the task in accordance with the instructions given, a quasi-need arises which impels him toward completion of the task. Dynamically, this is assumed to correspond to the setting up of a tension system which strives for release. The solution of the task then signifies a discharge of the tension, a satisfaction of the quasi-need.

Several very interesting consequences were derived from this hypothesis. When a task is undertaken but not completed, it is assumed that a need exists to complete the task. Since this need is unsatisfied, the system is maintained in a state of tension. On the other hand, the tension in the psychical system corresponding to the completed task may be assumed to have been resolved when the task is completed.

Evidence in favor of these assumptions was first provided by a series of experiments performed by Zeigarnik, on the recall of finished and unfinished actions, carried out in the years 1924 to 1926. This investigation initiated a considerable literature on the effects of interruption of activities. It will be the task of the present paper to review this literature. While our emphasis will be on the differences between complete and incompleted activities in recall, it will be necessary also to consider some of the consequences of the interruption of tasks.

CHAPTER I

ZEIGARNIK'S EXPERIMENTS: THE RECALL OF INTERRUPTED TASKS

The purpose of Zeigarnik's experiments was to provide a first experimental test of the theory of the structure of tension systems.

In Lewin's terminology this theory contains two basic assumptions: (1) The intention of reaching a certain goal (of carrying out an action leading to the goal) corresponds to a system under tension within the person; (2) The tension is released if the goal is achieved.

In accordance with these two assumptions Zeigarnik formulated the following hypothesis: If a purpose or intention corresponds dynamically to a tension system, the state of the tension system should be evidenced in retention. Thus the tendency spontaneously to recall interrupted activities should be greater than the tendency to recall finished ones. The tension in the first case remains, but, in the second, it is discharged through fulfillment of the activity.

Experiment I:

Zeigarnik approached this problem by administering 18 to 20 simple tasks to 32 subjects. The activities were presented one after another during a simple experimental

session. Among the tasks were the following: molding an animal from clay, filling a sheet of paper by drawing crosses over its entire surface, counting backwards from 55 to 17, solving matchstick puzzles, naming 12 cities beginning with "K", stringing beads, finishing the drawing of an incompleted pattern, combining the pieces of a jigsaw puzzle. Most of the tasks required from three to five minutes for completion; only a few could be finished in less than two minutes.

One-half of the tasks presented to the subjects were interrupted before they could be completed, and the other half were completed. The interrupted tasks were left incomplete. A random order was followed in the presentation of the tasks to be completed and those to be interrupted. Zeigarnik interrupted each task at the point of maximal contact between the subject and the task, i.e., when the subject appeared to be much interested in it.

It is interesting to note that the subjects often objected to the interruption and attempted to resume the interrupted act.

In order to control the possibility that certain of the tasks were more interesting and, therefore, more easily recalled than other tasks, those which were completed by half of the subjects were interrupted for the other half, and vice versa.

Immediately after the last task had been given, the subject was asked to recall as many of the activities as he could. (In order to avoid any clues that the presence of the material might furnish, all tasks were removed from sight upon completion or interruption). The subject's introspections were obtained afterwards to get information about his insight into the purpose of the experiment, etc.

The results obtained were calculated in terms of the ratio of recalled interrupted/recalled completed tasks, or RU/RC. This ratio was 1.9 [1] in Experiment I, a finding which tends to substantiate the hypothesis. The recall of incompleted tasks was much better than that of the completed tasks.

Other facts confirm this striking superiority of the unfinished performances. An incompleted task was named first in the free report three times as often as a finished task. Unfinished activities also dominated the second place. Moreover, the marked superiority of the incompleted tasks is all the more surprising in the light of the longer time spent upon the finished ones.

Experiment Ia:

In order to confirm the results obtained, Zeigarnik repeated the experiment with a new group of 15 subjects.

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1. This ratio was later corrected; see p. 58 infra.

The same procedure and 20 similar tasks were used. The results agreed substantially with those of Experiment I. Here also the unfinished tasks were recalled twice as well as the finished tasks, the RU/RC being 2.0.

Experiment II and IIa:

Experiments II and IIa investigated the same problem as Experiment I but were conducted as group experiments. Experiment II was carried out with a group of 47 university students. The subjects of Experiment IIa were a group of 45 children, 13 to 14 years old.

Simple written tasks such as multiplication, printing one's name, etc., were used in both experiments.

In order to deal with the group,a modification of the procedure in regard to the point of interruption was introduced. The subjects were interrupted when half of the group had signaled that they had finished the task. It thus became impossible to have all the subjects complete exactly half of the tasks.

After all the 18 tasks were performed, a test of recall was given. The subjects were instructed to write down all the tasks that they could remember, and to separate by a line those tasks that they recalled only after some blocking. The test of recall was followed by a few questions. The subjects were asked what they thought the reason for the interruptions; how they felt when they had to start a new

after an interruption; and how they liked the experiment.

The result of the test of recall, in terms of the ratio RU/RC, confirms closely the findings on the preceding experiments. In Experiment II the ratio was 1.9 and in Experiment IIa, 2.1.

The difference between the ratios obtained with adult subjects and children did not prove to be statistically significant. The question of differences between the results of adults and children will be considered again in connection with later experiments.

Certain considerations regarding the behavior of the subjects are of interest for understanding the results. According to Zeigarnik three different reasons could be mentioned to account for the desire of the different subjects to complete the tasks as well as possible. The first is a kind of feeling of obligation toward the experimenter. The subject believes that, for scientific reasons, the experimenter wants to compare his work with that of other subjects so he tries to do the work creditably. He believes that the experimenter wants something in particular, and he tries to direct himself according to the experimenter's wishes. This wish to please the experimenter is evidenced by behavior and questions, through which the subject tries to find out whether the experimenter is satisfied with the performance.

A second reason for trying to do well in the exper-

iment is ambition. A laboratory situation usually gives the subject the impression that his ability is being tested. The desire of the subject to show up well or to test himself is shown in questions like these: "How did the other subjects do on these tasks?" "Probably no one was as stupid as I on this one!"

Finally, Zeigarnik mentions a third reason for subjects' desire to do well in the experiment, viz, the motivation set up by the tasks themselves. Being a problem, the task appears as a challenge to the subject. And then, "the object itself engenders the desire to do the task" (35, p. 28).

Zeigarnik went on to test several hypotheses to account for the greater recall of the unfinished tasks, and also to determine the circumstances under which finished tasks would be better remembered.

Experiment III:

The possibility that the emotional shock involved in the interruption may have acted to enhance the recall of unfinished tasks was tested in another experiment by Zeigarnik.

The hypothesis could be made that the interruption may result in an emotional response or shock. One might suspect, therefore, that the unfinished tasks are better recalled because of their affective emphasis or greater im-

pressiveness, which would make them persevere in memory. If this hypothesis is correct, unfinished tasks would be recalled more frequently than finished ones, not because of the persistence of systems under tension, but because they were more stressed at the time of carrying them out.

In order to test whether recall of unfinished tasks is higher because of the emotional effect of interruption, Zeigarnik devised a situation in which the same emotional effect was produced for both incompleted and completed tasks.

This was done by arranging that half of the tasks would be interrupted. The other half were interrupted, but the subjects were allowed to complete them later. In this way the unfinished tasks (U) as well as the unfinished tasks which were later completed (U+C) suffered the interruption, and thus were equal with respect to any emotional emphasis deriving from the interruption.

If the hypothesis is correct it should be expected: (1) that these U+C tasks should be recalled at least as well as the U tasks since they have received the same emphasis of the interruption; and, indeed, (2) that they should be even better recalled than the U tasks because the subject had two different opportunities to work with them. Thus one should expect that R(U+C) > RU > RC.

Eighteen tasks--half were interrupted and later completed and the other half remained unfinished--were given to 12 subjects. In all other respects, the same procedure

as in Experiment I was followed.

The results showed that the U tasks were better recalled than the U+C tasks and that the U+C tasks were remembered, on the whole, about as well as the completed tasks in the other experiments. The ratio RU/R(U+C) was 1.85, demonstrating that "it is not the shock effect of the interruption that is the cause of this better retention, but rather the state of the psychical systems involved at the time when the subject is asked to recall" (15, p. 244).

Experiment IIIa:

This experiment was a repetition of Experiment III, but with the inclusion of tasks that could be completed by the subjects.

A group of 18 tasks was given to 12 subjects. Of these 18 tasks one-third were completed (C), one-third interrupted (U) and the other third interrupted and later completed (U+C).

In general the results confirmed those outlined in the experiment above. The ratio RU/RC was 1.9 and the ratio RU/R(U+C) 1.94. A high positive correlation of 0.8 was found between subjects' ranks on the two ratios, showing agreement between R(U+C) and RC not only on the average, but also for individual subjects.

Experiment IV:

A special series of experiments was designed to

answer the question of whether the subjects deliberately tried to remember the unfinished tasks because they anticipated completing them after the interruption. In this case the better recall of interrupted than completed tasks would be explained by "intentional memorizing" rather than by their state of incompletion and corresponding systems under tension. The intention to learn would favor the interrupted tasks in memory.

Twenty-two tasks were given to a group of 12 subjects. The instructions were phrased so as to emphasize the point that the tasks would be completed later. At interruption the subjects were told: "Please start on the next task now; later we shall complete the interrupted one" (35, p. 27).

If the hypothesis under investigation is correct, it should be expected that such emphasis on later completion would increase the recall of the U tasks. However, such were not the results.

The results showed a slight reduction of the RU/RC ratio to 1.7. Thus, in this experiment the superiority of interrupted tasks over completed ones was not greater than in the main experiment. This experiment "served to prove that it is not the experiences connected with the interruption itself which are the cause of the result but the reaching of the goal" (16, p. 19).

These results proved, according to the experimenter,

that by refusing to permit completion of the tasks, she prevented the only natural way of releasing the tension system. The superior memory value of the interrupted tasks is due to the energies existing at the time of recall rather than to those at the period of interruption.

Experiment IVa:

In order to test these results Zeigarnik devised a new experiment that is in essence the reverse of Experiment IV. The impression was given to the subjects that completion was not so important.

Another group of 12 subjects was used in this experiment. Here 18 tasks were employed. The same procedure as in Experiment I was followed. However, when interrupted, the subjects were told: "Now this is enough; you will not continue the task" (35, p. 27).

The ratio RU/RC obtained in this experiment was 1.8. From this and the preceding experiment it may be concluded that the superior recall of U tasks over C tasks is not due to the fact that subjects have the intention to recall these tasks. Zeigarnik says that "the preference given to U tasks is therefore not caused by the belief on the part of the subject that the experimenter wished him to complete the U tasks, nor is it dependent quantitatively upon this factor" (35, p. 28).

The explanation of the results of all these experiments is given by Zeigarnik in terms of Lewin's theory of tension. Not the conditions existing at the time of interruption, but the fact that the tasks were not completed is decisive for their better recall. The better recall of the U tasks is due to the unsatisfied quasi-need at the time of the recall test, i.e., is due to the continuation of tension.

Several points of interest relating the effect of interruption and the better recall of the U tasks are discussed by Zeigarnik.

1. Studying the relation between the subject's desire to do well and the recall situation, Zeigarnik showed that, when there existed an especially strong impulse to remember, the subject will tend to reduce the relative preference given to U tasks. This lowering of the RU/RC ratio is, generally speaking, not due to a worse recall of the U tasks (RU), but rather to a better recall of the finished tasks (RC) under strong motivation to recall.

2. Quasi-needs may develop varied structures, depending upon the type of tasks; Zeigarnik analyzed these in great detail. We may speak of tasks externally finished but internally unfinished. It is very important for any interpretation of the results to determine whether tasks considered completed by the experimenter were also considered

as such by the subject. Several considerations--such as dissatisfaction with the completion, doubts about his ability to solve the task, the existence of more than one solution to a task--might lead the subject to experience a subjective incompletion. On the other hand, in some cases the externally unfinished tasks could be viewed by the subject as internally finished. This would be the case when the need to complete the task has been satisfied although the task is not completed.

If we consider individual cases, says Zeigarnik, we would not always note an agreement between external and internal completion.

A differentiation between "continuous" and "end" activities has also to be made. When the results of Experiment I are reexamined in the light of this distinction, different ratios are obtained for the two kinds of task. The recall of the "end tasks", i.e., tasks with a clearcut completion, as for instance, puzzles, arithmetical problems, etc., gives a RU/RC ratio of 1.8; while the recall of "continuous tasks", without a clearcut end point, such as drawing of crosses, gives a RU/RC ratio of 1.1.

From this Zeigarnik concluded that completed continuous tasks tend to be recalled as well as the U tasks of this kind. Interruption in the case of continuous tasks is not felt as a psychological incompleteness. "The low values

of both RU and RC found by Zeigarnik show that the continuous task, no matter whether outwardly interrupted or finished, is psychologically finished" (16, p. 25).

It should be noted at this point that Zeigarnik's conclusions about the recall of continuous tasks are based on four tasks only.

3. In demonstrating that recall is dependent on need tension, Zeigarnik showed also how the intensity of the tension influences the amount of recall.

Zeigarnik arranged to interrupt her subjects at different stages of solution of the tasks and found that the percentage of recall for middle and terminal interruptions was 90 per cent as compared with only 65 per cent for work which was interrupted near the beginning. A plausible explanation seems to be that the subject is more involved in the work toward the end. There may be said to exist a correlation between the intensity of the tension and the degree of involvement with the task.

Studying the relations between the quasi-needs and true-needs, Zeigarnik showed once more that the intensity of the subject's relation to the task has an influence on the RU/RC ratio. It is to be expected that subjects who are particularly ambitious will show a quasi-need of greater intensity than the average subject, whereas subjects whose involvement in the activity is particularly weak should

have particularly weak quasi-needs.

Zeigarnik grouped separately nine subjects of Experiment I who, according to their behavior in the experiment, could be characterized as "ambitious". They were, for instance, subjects who criticized their own performance of the tasks. When the RU/RC ratio of this group was calculated separately, a greater tendency to recall the U tasks was found than for the group as a whole; RU/RC was equal to 2.75.

According to Zeigarnik the ambitious subject develops a higher tension; thus when this tension remains unresolved, he may recall more U tasks than the subject lacking in ambition.

4. Zeigarnik also pointed to the relation between a given tension system and the field in which it existed. According to her a ratio RU/RC$\leq$1 could be explained by a lack of separation of the tension systems corresponding to the several tasks. This would be the case if the group of tasks as a whole created a single tension system without any differentiation between individual tasks. This was demonstrated when the RU/RC ratios of the subjects were grouped according to their attitudes toward the tasks. Comparing the RU/RC ratio of a group of children who performed the tasks just to obey the experimenter, who acted simply as subjects and nothing else, with those who related specifically to the

individual tasks, it was noted that the ratio of the former was particularly low. In this group the subjects felt themselves dependent upon the experimenter and viewed the whole experiment as a single task to be performed. The RU/RC ratio obtained by this group was equal to 1.03. The test situation became one single situation, so that no individual tension systems were formed. For these subjects it was just the same to finish one task or to leave it unfinished, and to work on another. The task lost its separate and particular character, so that in the recall test both types of tasks were mentioned with equal frequency.

The RU/RC ratio of 1.03 is specially low in comparison with the ratio of 2.1 for the group of children (Experiment IIa).

Experiment V:

The experiment was designed to show that the formation of individual independent tension systems is essential in order to obtain a ratio RU/RC>1.

As was mentioned above, if a system C and a system U are not sufficiently separated the RU/RC ratio should be about 1. "... if these various systems are subparts of one comprehensive unit without much separation no great differences in tension can persist. In this case there may be differences in the tension levels of those greater units but no differences between the various subsystems within the

larger units" (16, p. 23).

An experiment was devised to investigate the effect of weakening boundaries between individual tasks. The procedure of Experiment I was used with eight subjects. However, here the subjects were told in advance all the tasks that were to be performed during the experimental session. Under such conditions the quotient was found to be about 0.97. Since the initial listing of all the tasks had the effect of making all subparts of a single system, this result is taken as supporting the hypothesis.

Besides these experiments on the effect of the communication between tension systems on the RU/RC ratio, Zeigarnik devised others concerned with the influence of the nature of the medium in which the tension systems are established.

Experiment VI:

In previous experiments it was observed incidentally that in the case of fatigued subjects the U tasks were not better recalled than the C tasks.

The analysis of this deviation required a special experiment to determine the influence of the dynamic properties of the field on the establishment of independent tension systems. The hypothesis was made that fatigue corresponded to a fluid medium which might prevent the setting up of any considerable tension difference between segrega-

ted systems in an individual.

The subjects of this experiment were university students who had had six to seven hours of course work the same day, and a few official employees tested immediately after work.

The same tasks of Experiment I were used in this experiment. A kind of control was provided by including among the subjects five individuals who had served previously in Experiment I. The results obtained by these five individuals would make possible the comparison of the performance of the same individuals in a state of fatigue and in a normal state.

The RU/RC ratio for the whole group of ten subjects was 0.74. It was also shown that four out of the five control subjects showed, in the state of fatigue, a ratio significantly smaller than in a normal state. The change of ratio, however, was due mainly to the decrease of the recall of U tasks. The tired subjects had on the average a RU equal to 3, while for the subjects in the normal state, RU amounted to 6.8. This reduction in the recall of the U tasks was accompanied by a slight <u>increase</u> of the recall of C tasks. The tired subjects had on the average an RC of 4.25. From this it can be seen that the subjects in the state of fatigue preferred completed rather than incompleted tasks in recall. This result will be explained below after the effects of fatigue have been further analyzed.

Experiments VIa and VIb:

The following experiments were designed to test whether fatigue prevents the formation of tension systems or merely interferes with the effects of the tension system in the recall test.

In Experiment VIa a group of seven subjects performed the tasks while tired and were tested for recall after 13 or 15 hours, when no longer in a state of fatigue. In Experiment VIb a group of eight subjects performed the tasks when fresh, and were asked for recall that evening after a hard day's work, i.e., the reverse of the former procedure.

The RU/RC quotient was smaller for the subjects who were tired when they performed the tasks than for those who were fresh. The RU/RC ratio was 0.61 for Experiment VIa and 1.06 for Experiment VIb, indicating that it is largely the state of the medium while performing the tasks, rather than the conditions during recall, that determines the RU/RC ratio.

Now, the results of Experiment VII, to be summarized below, show that when the test of recall does not occur immediately after the performance of the tasks the RU/RC ratio approaches 1. Therefore, the results of Experiments VIa and VIb are not comparable to those of Experiment I, but to others in which the same time interval between performance of the tasks and test of recall is used. Experiment VIb

shows the same results as experiments where the same interval of time is used, and when both parts of the test are performed in a state of rest.

From this it can be concluded that the cause for the small RU/RC ratio in Experiment VI is not due to the influence of fatigue on the recall test but its influence upon the performance of the tasks. This fact is explained by Zeigarnik by saying that in order for a tension system to be formed and retained for a certain time the system must show a sufficient dynamic stability, otherwise the tension would be discharged. In general the symptoms of fatigue are seen as indicating a state of increased fluidity of the psychological system. Thus, the medium being unstable, no tension can persist. If the task is interrupted no persistent individual tension systems remains. This explains the small RU/RC ratio obtained in these experiments.

It is significant that the recall of C activities does not decrease but is actually slightly increased in fatigue as compared with the normal state. The following is the hypothesis presented by Zeigarnik in order to explain this curious fact. According to her the U task differs from the C task not only because quasi-need is absent in the latter, but also because the C task represents a completed, more stable form than the U task, the leaves a more stable

memory trace. The U task can be considered as incompleted, unstable, an indefinite system which lacks the feature of completeness.

It can now be seen that the previous experiments show that the quasi-need corresponding to an unfinished task has a greater significance for recall than the stability of the trace left by a completed task. It can also be seen that in the fluid medium existing in a state of fatigue the unstable system cannot persist. From the higher recall of C tasks than U tasks performed in a state of fatigue, it follows that a stable tension system may, however, persist in a state of fatigue. These hypotheses explain not only the differential recall of C and U tasks in a state of fatigue, but also why the fatigue at time of recall has no effect on the persistence of systems under tension.

The hypothesis that persistence of need tension is prevented in a state of fatigue due to the fluidity of the medium in that condition was confirmed by the performance of subjects in a state of excitement. It was observed that subjects who came to the experiment in a bad mood and subjects who became upset during the experimental session showed a RU/RC ratio of 0.78. This ratio was obtained from six subjects from the various experiments.

In Zeigarnik's opinion it may be assumed that a state of excitement likewise corresponds to a more fluid

medium than the normal state.

Experiment VII:

In accordance with Lewinian theory, Zeigarnik assumed that the tension level is gradually equalized even though no specific activity occurs to release the tension. Therefore, in time the tension of a system may be gradually released, the rate of release depending on the strength of the boundaries of the system.

The aim of Experiment VII was to investigate the influence of time on selective recall.

The procedure of Experiment I was repeated with 11 subjects with the single exception that the subjects were not given the recall test until 24 hours after the original experimental session.

Under these conditions the RU/RC quotient decreased to 1.14. The difference between these results and those of experiments where the test of recall follows immediately after performance of the tasks is clearly demonstrated when the recall of eight of the subjects of this experiment is compared with their results in Experiment I, performed six months earlier. These subjects showed a RU/RC ratio of 2.0 in Experiment I as against 1.13 in Experiment VII.

From these results Zeigarnik concludes that unreleased tensions persist, but that they weaken with the lapse of time; tension systems do not remain segregated indefinitely.

Experiment VIII:

At this point it might be asked whether the effect of time upon the RU/RC ratio is due to mere passage of time or to intervening activity. Zeigarnik put forth the hypothesis that these spontaneous changes of the tension level are not due to the time as such, but to happenings during the interval of time.

In order to test this, Zeigarnik once more introduced a modification in the procedure. After the performance of the tasks and before recall, an emotionally charged situation was produced for the subjects. It consisted in discussing with the subjects, for 10 to 30 minutes, their plans for future careers.

The 13 subjects used in this experiment were divided into three groups according to the effect of the discussion upon them. A group of six subjects showed a RU/RC ratio of 0.64. These subjects were the most excited by the discussion and showed the greatest difficulty in returning to the experiment. They showed about the same RU/RC ratio as that previously reported for the excited subjects (0.78). The same explanation, therefore, would seem to hold also for this group.

A second group of four subjects showed a RU/RC ratio of 1.5 which is not greatly different from the ratio of 1.9 obtained in the main experiment. For these subjects the dis-

cussion changed the situation only slightly and the return to the test was not difficult.

Finally, three subjects formed a group, for whom the discussion caused a simple change of the situation, but the return to the test was very difficult. Their average RU/RC ratio was equal to 0.77.

The difference between the RU/RC ratios of the first and third groups and the RU/RC ratio of the second group is taken by Zeigarnik as evidence favoring the hypothesis of the influence of the intervening activity upon the RU/RC ratio. For the subject of the first and third group the discussion interpolated between the performance of the tasks and the recall led to the formation of other tension systems besides those resulting from the performance of the tasks themselves. This was not the case with the second group whose subjects were not much involved in the discussion and thus returned more easily to the tasks.

Experiment IX:

The last experiment reported by Zeigarnik is one concerned with individual differences and their influence upon the RU/RC ratio.

The procedure of Experiment I was repeated with 30 children ranging in age from five to ten years.

The results showed a RU/RC ratio of 2.5.

At this point two comparisons need to be made. It was mentioned above that the RU/RC ratio of 1.9 obtained with adult subjects in Experiment IIa were not significantly different. The RU/RC ratio of 2.5 obtained with the children in Experiment IX showed a greater difference from the results of the adult subjects. In this regard it should be noted that while in Experiment IIa the subjects were children ranging in age from 13 to 14 years, in Experiment IX the children were five to ten years old. Any account of the difference in the results of these experiments should note also that Zeigarnik employed different procedures in them, Experiment IIa being a group experiment.

In order to explain the higher RU/RC of children as compared with adults, Zeigarnik made the following hypotheses: It might be said that the types of tasks used in this experiment were more suitable for children than for adults, that they were more interesting to them, and that the effect on the residual need tension was therefore more marked.

But on the one hand, it had been demonstrated that with adults the more interesting tasks were not best recalled; and on the other hand, that the difference between the results of adults and children is in the recall of C tasks and not of U tasks. This would lead one to think that the differences are due to the fact that children take the experiment more seriously than the adults. Thus the children par-

ticipated more deeply in the experimental situation, showing spontaneous responses and a reproduction less controlled than that of adults.

Other facts agree with this hypothesis. The children not only showed more resumption of the unfinished tasks, but they asked for them later in order to complete them.

Differences among the children could be noted. The unintelligent children showed an extremely strong preference for U tasks in recall, while children who had a more mature attitude in relation to the experiment showed a RU/RC ratio of 1.1. This difference is confirmed by the results of "childish adults" whose ratio was 2.9.

Zeigarnik's conclusion was that for the children entering fully into the experimental situation, "real needs" were involved to a larger extent, while for the adults the experimental activities merely set up "quasi-needs".

It is undeniable that these experiments of Zeigarnik's represent some of the best experimental work which has developed out of Lewinian theory, not only for the ingenuity of the technique developed but also for the careful working out and systematic testing of hypotheses.

With the exception of Experiment I, I believe, however, that a general and basic criticism can be made of Zeigarnik's experiments. Serious questions may be raised about

the results of almost all experiments in view of the small, sometimes almost ridiculously small, number of subjects employed. The statistical treatment of the data is very weak not only in reference to the use of the RU/RC ratio (cf. below) but especially in reference to the significance of the differences between the very small groups of subjects. Tests of the significance of differences are completely omitted in Zeigarnik's paper.

Problems similar to those dealt with by Zeigarnik have been investigated extensively by a number of other psychologists. A summary of the literature that followed these experiments will be the purpose of this paper. This summary, therefore, aims to give, together with a report of results and theories, a more detailed criticism of Zeigarnik's work.

as such by the subject. Several considerations--such as dissatisfaction with the completion, doubts about his ability to solve the task, the existence of more than one solution to a task--might lead the subject to experience a subjective incompletion. On the other hand, in some cases the externally unfinished tasks could be viewed by the subject as internally finished. This would be the case when the need to complete the task has been satisfied although the task is not completed.

If we consider individual cases, says Zeigarnik, we would not always note an agreement between external and internal completion.

A differentiation between "continuous" and "end" activities has also to be made. When the results of Experiment I are reexamined in the light of this distinction, different ratios are obtained for the two kinds of task. The recall of the "end tasks", i.e., tasks with a clearcut completion, as for instance, puzzles, arithmetical problems, etc., gives a RU/RC ratio of 1.8; while the recall of "continuous tasks", without a clearcut end point, such as drawing of crosses, gives a RU/RC ratio of 1.1.

From this Zeigarnik concluded that completed continuous tasks tend to be recalled as well as the U tasks of this kind. Interruption in the case of continuous tasks is not felt as a psychological incompleteness. "The low values

to the inequality of the tasks employed and suggests that differences in the subject's interest in the tasks, rather than their completeness or incompleteness, may be responsible for the difference in recall. He undertook, therefore, to repeat the experiment with more homogeneous material.

For this second experiment he selected tasks requiring the substitution of a letter in nonsense syllables. For one group of subjects, the syllables were presented with certain instructions. Sometimes the task had to be carried out and sometimes left in a state of "determined intention" (33, p. 11).

To the other group of subjects the same syllables were shown but without any instructions, i.e., the nature of the activity was left free.

The results showed a predominance of the purely intentional attitude of the subjects and from this Schlote concluded that there is a greater persistency in memory of attitudes involving completed tasks. We believe that "the preferential character of incompleted acts may be explained by the determining tendency concept" (33, p. 11).

Certain criticisms can be made of Schlote's experiments and interpretations.

1. That the subject's interest in the tasks as such is decisive for the superiority of unfinished activities in

recall may be challenged. It seems that Zeigarnik was not unaware of the interest of the subject in the tasks as a possible factor, though not the decisive one as Schlote postulates. Her discussion of the effect of different attitudes toward the experiment can be mentioned as evidence of this.

The explanation given by Schlote cannot be accepted due to his failure to test interest as a factor in his results. The factor of interest could be tested simply by reversing the tasks which were completed and incompleted for different subjects, as Zeigarnik did.

2. It is not clear, in Schlote's second experiment, if a real "interruption" was achieved. Many experimenters using Zeigarnik's experimental technique, among them McKinney, showed the importance of, and the problems involved in, the obtaining of interruption in the laboratory. A clear test of the importance of interruption is found in Marrow's work. By reversing the instructions and thus changing the meaning of interruption, after the performance of the activities and before the recall test, Marrow showed that the change of the subject's attitude toward the completed and incompleted tasks affects the RU/RC ratio.

3. If we now consider the tasks used in Schlote's second experiment, we see that they lack one very important

characteristic. Each task is not an entity in itself, with a clear point of completion. These tasks tend to be viewed by the subject as a whole. Thus they cannot be expected to lead to the formation of differentiated systems in tension. As the boundaries between the tasks and, consequently, between the systems in tension, are weakened by the similarity of the tasks, the tension resulting from the incompletion of a task finds a solution in the completion of the other task.

2. Brown's experiments:

Brown investigated a different aspect of the problem opened up by Zeigarnik's work, viz., that of the rate of diffuse resolution of the tension corresponding to unfinished tasks under different conditions. Specifically, he formulated his problem in the following way: "Will the speed of diffuse resolution of tension, i.e., the speed of the general change in a psychological system under tension depend on the degree of reality of the action in question?" (6, p. 4).

Reality was considered as the difference between actions taken seriously and those not taken seriously, between socially significant actions and those insignificant for the subject. While questions may certainly be raised as to the adequacy of Brown's definition of psychological reality, it

is a legitimate psychological problem to study the differences in diffuse rate of tension between activities of much and of little consequence for the individual.

This problem was studied by a modification of Zeigarnik's experimental technique. All tasks were interrupted. Half of them were presented as a test of intelligence, the other half were presented merely to fill in the rest periods introduced between the various problems of the intelligence test. The test tasks were assumed to possess a high degree of reality and the "fill in" tasks a low degree of reality.

It was Brown's hypothesis that the psychological medium corresponding to greater "reality" (greater seriousness for the individual) was less fluid than that corresponding to lesser "reality", that is, that changes occur less readily in the former than in the latter medium. In this case one should predict greater diffuse resolution of tension and thus quicker forgetting in the case of the unimportant tasks than in that of the test problems.

Experiment I:

Those tasks which were presented as test problems to Group A were presented to "fill in" the rest periods for Group B, and vice versa. Thus any difference in results for the two kinds of tasks could not be attributed to the particular character of the tasks employed. The same amount of time was allowed for both types of tasks. Twenty activities

were presented, ten of each kind.

A test of recall was given at various intervals after completion of the tasks, different groups of subjects being used for the different intervals. The following intervals were used: 5 minutes, 30 minutes, 24-48 hours (an average of 36 hours), and one week for Group A; and 5 minutes, 36 hours, and one week for Group B.

The results of Group A were calculated in terms of a ratio of the retained "real" tasks to retained "less real" tasks. The ratios for the various intervals of time were: 1.34, 1.75, 2.53, and 3.79. There is thus an increasing disparity between the two kinds of tasks with increasing time intervals.

This progressive difference between the two types of activities was shown to be due to a steady drop in the retention of the "less real" tasks, while retention of the "real" ones remained constant (from 30 minutes to one week). This means, according to Brown, that the systems under tension in the "real" stratum remained almost unchanged during the week, while those of the "unreal" stratum changed significantly, appearing to lose their tension.

It was further noted that, when the ratio of retained "real" to retained "unreal" activities was computed for only the first half of the tasks recalled by each subject, the difference between the two kinds of tasks was greater, and

the progressive disparity with larger time intervals was more marked than when the whole recall series was considered. Brown regards this finding as analogous to Zeigarnik's finding that incompleted tasks (system under tension) tended to be recalled earlier than completed ones (system not under tension).

"If our assumption is correct, namely that psychological systems in unreal strata release tension more easily because of the greater fluidity of this stratum, then one should expect the difference between retained real and retained unreal tasks to be greater if we consider only the first half of the reproductions" (6, p. 13). This expectation was verified in the results obtained.

The results with Group B confirmed those obtained with Group A in all essential respects. The tasks used were the same as those given to Group A, but tasks which were presented as test problems to Group A were "fill in" tasks for Group B and vice versa. Thus the results are shown not to be dependent upon the individual nature of the tasks themselves; presumably they are to be attributed to differences in the medium corresponding to the two kinds of activities.

Another possible factor, Brown points out, could explain the results, independent of the concept of differences in the fluidity of the medium corresponding to the two kinds

of tasks. The attention or interest which the subject gives to the test tasks while performing them might lead to greater tension than in the case of the "fill in" tasks. That this explanation is unlikely is shown by the small difference between the retention of the "unreal" and "real" actions after the first interval of 5 minutes. Nevertheless Brown decided to test it specifically.

Experiment II:

In order to determine whether the difference in retention between the two kinds of tasks was due to differences which existed while the subjects were performing them rather than to differences in the medium in which the corresponding tension systems existed, another experiment was carried out. At first the procedure of Experiment I was followed. After all the tasks had been performed, the experimenter said that for technical reasons he had had to deceive the subjects: the tasks given as "fill in" tasks were actually the problems of the intelligence test, and the scores would be computed from them alone. The tasks presented as test activities were, in actual fact, "fill in" tasks, and they would "not be" scored. In this manner the meanings of the two groups of tasks were changed after their actual performance, the tasks which were originally unimportant now becoming significant and vice versa.

The memory test was given only once, after one week.

The results were computed in terms of the ratio of remembered "real" tasks to remembered "unreal" tasks, the designation corresponding to the degree of "reality" at the end of the experiment. The ratio was 1.64 for the whole series and 2.40 when only the first half was considered.

Brown concluded that: "The subsequent changing of the degree of reality shows impressively that our earlier results on the significance of the degree of reality of an action for memory rest not on secondary differences in the execution of the action itself but essentially they are conditioned by the belonging of the action to a stratum of a particular degree of reality" (6, p. 15).

From the whole study he concluded that "the unreal strata are dynamically to be characterized as more fluid than the real strata" (6, p. 23).

Leaving aside the discussion of Brown's problem, which would lead us far from our topic, we shall restrict ourselves to the discussion of the experiments in their relation to Zeigarnik's experimental technique and results.

Our starting point for these considerations is the modification in the arrangement of the laboratory situation introduced by Brown. By interrupting all tasks, Brown changed a very important point of the procedure. For his subjects, interruption becomes part of the "routine" of the experiment and loses the meaning that it has when it appears along

with completed tasks. Prentice, referring to this point, says that "persistent interruption may affect the attitude of the subject toward the entire experimental situation" (26, p. 333). This problem will be referred to again in connection with Prentice's work. For the present it is mentioned only because it raises a question about the meaning of Brown's results in relation to those of other experiments employing the interrupted task technique.

Another possibility is one suggested by Lewis in her studies on the role of the ego in work (cf. below). It might be that Brown's "real" tasks may be considered as involving an ego-oriented attitude toward the tasks. In this case an interruption would be seen as a "failure" by the subject. The "less real" tasks of Brown's experiment might create a "task-orientation" in the subject, involving only interruptions, not failure. In regard to this it would be said that the difference between task- and ego-orientation is not just a matter of degree of tension. They are according to Lewis "two fundamentally different approaches to reality" (17, p. 113).

If this interpretation of Brown's experiment is correct, the difference in frequency of recall between the two types of tasks could be explained as a difference between "ego-oriented" and "task-oriented" activities in recall. It should be noted, however, that such an explanation of Brown's

results would contradict everything in the literature about the effect of failure on recall. In experiments to be discussed below, especially in Chapter III, failure will be shown to inhibit rather than to enhance recall. There is, however, one point in Brown's experiment that makes it different from the other experiments involving failure. "Rosenzweig's technique compares systems under tension, while Brown is, perhaps considering two systems that are not so affected, since all his tasks are interrupted" (26, p.333). There is the possibility that repeated failure acquires a new meaning; or that the comparison with repeated interruption is what makes the difference.

Another difficulty in the interpretation of Brown's results has been referred to above. In this connection we are in agreement with Lewin's opinion: "It is possible that the experiment of Brown does not deal with differences in the degree of reality but rather with differences between more peripheral activities as against more central ones on approximately the same level of reality. In this case, his experiment would show that the more peripheral region of a person has to be regarded as more fluid" (16, p. 22).

3. McKinney's experiments:

McKinney approached the problem of the recall of interrupted tasks in a rather different way. He raised the question: Does the interruption affect the reproduction of

the task itself as well as the memory of the task, or does the condition which the interruption causes influence the retention of only some specific part of the task?

All that can be said about the results in this field, McKinney pointed out, is that the name of an interrupted task is retained longer than that of a completed task. "Nothing can be said, however, regarding the retention of the act as a whole or the retention of any part of the act, except this particular symbol (name) associated with the activity" (21, p. 268).

McKinney therefore tried to ascertain whether the retention of a standard, complex, motor-learning task performed under usual laboratory conditions would also be increased by interruption, as is the case with retention of the names of simple tasks. He had 50 subjects learn mazes and interrupted them during the performance, while 50 other subjects learned without interruption.

The standard method of maze learning, with the recording of time, trials, and errors, was used. Both groups learned according to the same criterion. The interrupted group were told, however, that they were to continue practice until they had achieved three errorless trials; they were then interrupted at the end of the first errorless trial. When the subjects of both groups were asked to repeat the solution of the maze after a week, the results failed to show any significant increase in retention due to the interruption.

According to McKinney, the ambiguous results of the experiment with these two groups of subjects might be explained in several ways. One possible factor which might be responsible for the results is that the time interval between the learning and the testing of the retention of the mazes might have weakened the effect of interruption.

In order to test this assumption the experiment was repeated with a group of 44 subjects. The same procedure was used as in the first experiment except that retention was tested on the day following practice rather than after a week.

The results show a tendency for the interruption of the task to enhance slightly the degree of retention of that task over a period of twenty-four hours.

These results are interpreted by the investigator as failing to agree with those of Zeigarnik. Several factors were mentioned by McKinney as probable explanation for the difference between his findings and those of Zeigarnik.

1. <u>The subject's attitude</u>. It is very important to know how the particular interruption was interpreted by the subject. McKinney found some evidence in post-experimental discussion that the subject did not always take the interruption seriously. "In one sense these tasks were not incomplete tasks at all in that the subject did learn the maze to the point where he could traverse it without a single

error; they were merely tasks interrupted after a degree of completion" (21, p. 278).

2. The interval between learning and recall. Zeigarnik showed that an interval of 24 hours lessened the effect of interruption. Thus, in her Experiment VII concerned with the effect of time upon recall, she showed that the RU/RC ratio was only 1.14. According to Zeigarnik, the time and especially the intervening activities during this interval of time facilitate the release of the tension corresponding to the incomplete task.

The same explanation could be applied to McKinney's results. The delay between the performance of the tasks and the test of recall favored the release of the existing tension so that the interrupted tasks should lose their advantage in recall. Actually, if McKinney's results are compared with those of Zeigarnik (Experiment VII) in which the same time interval between performance of the tasks and the test of recall is introduced, no difference is found.

3. The nature of the maze problem. According to McKinney the difference between the tasks employed in the two investigations could not explain the disagreement between his results and those of Zeigarnik, since we may assume that the mazes used in these experiments are more meaningful than the tasks used by Zeigarnik.

4. In McKinney's opinion the most important reason

for the difference lies in the inherent difference in the experimental arrangement between this experiment and Zeigarnik's experiments. "This experiment aimed to test the effect of the interruption on the retention of a newly learned task and not the retention of the name of an habitual task... Interruption would be very potent influence if it were able to affect advantageously all the associations made in learning to traverse one of these mazes perfectly" (21, p. 279).

A second series of experiments was conducted by the same author to test further the hypothesis that a task interrupted in acquisition is retained longer than one that is not interrupted.

This time a verbal learning task (two lists of 11 two-syllable nouns) was used and retention was tested after one day. Interruption was produced in the same manner as that described above.

The results obtained show even less conclusively that those obtained with the maze task any greater retention due to the interruption. The results with the verbal task were similar to those obtained with the maze.

The data thus showed that the effects obtained are independent of the nature of the tasks employed. McKinney's general conclusion is that "Zeigarnik's findings of a marked increase in retention of the names of interrupted tasks do

not hold for the retention of the task itself" (21, p. 287).

In a third study using both maze and the verbal learning tasks, the same problem was investigated with a different interruption procedure. The interruption was introduced before any degree of completion had been reached. In one part of the experiment the subject was interrupted "at the end of that trial at which the subject had reached the point of perfection, involving four or less errors" (21, p. 288). The choice of this point of interruption was completely arbitrary. The results obtained showed that such an interruption was not at all effective; the subjects were not sufficiently close to the completion and the interruption lost its meaning. In a second part of the experiment this was avoided by introducing the interruption at the first one-error trial.

The test of recall given a day after learning consisted, as in the previous experiments, in asking the subject to repeat three times the solution of the maze or the list of nonsense syllables.

In the case of both tasks, better retention of the incompleted tasks than of the uninterrupted tasks was obtained.

The results of this study show that "one reason for the great difference between the findings of the ... investigations above and those of Zeigarnik and Schlote is due

to the fact that the interruptions in the former investigations were not real interruptions, as brought out in the beginning of this study" (21, p. 294). It seems to the present writer that the significance of this point should not be minimized. If McKinney, by his own admission, is not dealing with true interruptions, the relevance of his investigation to the problem studied by Zeigarnik is highly doubtful.

Another possible reason for the difference in results it would seem to me, is the difference in the tests of recall used in the two experiments: in the one case the method of retained members, in the other the method of relearning. Furthermore, as mentioned above, McKinney failed to employ a time interval between learning and recall which is suitable for demonstrating a superiority of interrupted tasks in recall; in this respect, too, his conditions are not comparable to Zeigarnik's.

For all these reasons, we are forced to conclude that, although McKinney has raised an interesting and important question with regard to the recall of interrupted activities, the conditions of his investigation were not suitable for finding an answer to it.

4. Pachauri's experiments:

One of the first attempts to consider some of the problems posed by Zeigarnik's experiments was made by A.R.

Pachauri. In a series of three articles (23, 24) he presents his contribution in the form of a critical review of the work on what he calls the U-C effect.

In reviewing the work on the U-C effect, Pachauri speaks of the necessity of employing certain experimental controls not used by Lewin and his associates. He considers it necessary to control certain variables concerning the nature and duration of the tasks, and concerning the condition of the subject. In this connection more work is needed on individual differences in the U-C effect, a point that, according to Pachauri, had scarcely been considered at all in the work of Lewin and his co-workers.

Pachauri's experiments were concerned with the effect on duration, difficulty and repetition of the U-C tasks.

Experiment I:

The first experiment was devised to test the dependence of the U-C effect upon the duration of the task.

Here 24 tasks of three types--manual, verbal and non-verbal--were given to each subject, following the experimental procedure used by Zeigarnik. The only difference was in the disparity of time allowed for the various tasks. One task required less than a minute for completion, and others more than five minutes. "It was observed that, irrespective of its having been completed or interrupted, a

task is more often recalled than others if it occupies a longer time" (23, p. 448). Where considerable difference existed in the time allotted to the various tasks the U-C effect was disturbed, as seen by the ratio of only 1.24.

From this it is concluded that "it is necessary to maintain at least a crude uniformity of time allotted per task if a U-C effect is to be sought" (28, p. 448).

Experiment II:

Experiment II was concerned with the influence of the type of activity upon the RU/RC ratio.

Since it had been shown that the time taken to perform different sorts of tasks varied markedly with the individual, and since the amount of time spent on a task influences recall, an experimental series was set up which consisted of tasks which involved the same type of activity and for which a uniform allowance of time could thus be prescribed.

The purpose of this experiment was "to determine whether the uniform time allowance has any deteriorating influence on the U-C effect" (23, p. 449).

Twenty-eight verbal tasks of average difficulty were used. Specifically, the tasks all called for naming the items of a specified class. The same amount of time was allowed for each response, viz., 40 seconds on the

average. When the subject had reached a certain point in his work, the experimenter said: "I want five (or ten) more items" (of the class the subject was enumerating). In all cases the number asked for could never be completed by the subject. This technique is different from that used by Zeigarnik but showed no influence upon the U-C effect. The order of the U and C tasks was random in order to prevent the subject from guessing at the nature of the succeeding task. At the end of the 28th task a new activity was introduced for two minutes. The subjects were asked to cancel a particular letter from a cancelation sheet. Only after that was the subject asked to recall the tasks he had performed in the order that they came to his mind. These were recorded by the experimenter in the order of recall. The tasks recalled after hesitation or blocking were separately recorded.

The results obtained compare well with those of previous investigators. The ratio of U- to C- tasks recalled was 1.8.

A new scoring system was devised in order to take into account the priority of recall of the tasks. Four points were given for each of the first three tasks recalled; three points for each of the next three; two for each of the following three; and one for any other. When the recall test was scored this way, Pachauri found that both in the sequence and the amount of recall U tasks were predominant. The aver-

age value $0 \leqq U/C$ was equal to 1.7.

In order to test for any possible influence of the tasks per se, in the second part of this experiment the tasks were reversed. The previously interrupted tasks now appeared as completed tasks and vice versa. Sixteen adult subjects were tested, and almost the same ratio of 1.7 was obtained. This similarity of the ratio shows that the specific character of the tasks is not important for the U-C effect. In other words, "on the average no characteristic importance of its own is attached to any task, since the ratio of U to C recalled remains almost unaltered when the character of the task is reversed" (23, p. 451).

Experiment III:

This experiment was concerned with the development of a procedure for group testing. Subjects were given booklets, on each sheet of which one task was presented. Two different experimental techniques were devised. In one case (technique 1) the subjects were asked to signal when they had completed a task. Care was taken to give completed tasks which were within the abilities of all subjects tested. The U-tasks, however, were interrupted when about half of the group had indicated that they had finished. The results of any subjects who had not completed at least half of the tasks were treated separately. This was the same technique used by Zeigarnik in her group experiments. In the second

case, in an attempt to use the results of all subjects, the technique of Experiment II, described above, was used. In the case of U-tasks the experimenter at a given time asked for a specific number of responses and interrupted the subjects before they could possibly complete all of them. In both techniques, the group was instructed to perform the tasks in the order in which they were presented in the booklet. After the 24 tasks, subjects were asked to write down the tasks they remembered having done.

Six different groups of girls and boys of 10-14 years were used in this experiment. Both experimental techniques were used in two series, tasks completed in one series being interrupted in the other, and vice versa.

The results showed that in group testing, as in individual testing, the interrupted tasks are recalled on the average about twice as frequently as the completed tasks. Also, the technique of prescribing a number of tasks before interruption was found to be the slightly more effective for giving the U-C effect.

Experiment IV:

If Lewin's explanation of the U-C effect in terms of tension systems is correct, a question arises about the difficulty of the tasks. This question was the problem of the fourth experiment of Pachauri. More specifically he asked: "What happens if some of the tasks are extremely

difficult, and are therefore left incomplete through sheer difficulty without any interruption from the experimenter?" (23, p. 453).

Three different tests were used, namely two synonyms tests and an opposites test. Each item in the test constituted one "task" and thus required only a few seconds. Each one of them contained tasks half of which could easily be completed and the other half of which could not possibly be. The subjects were a group of girls and boys of 10-11 and 13-14 years of age.

The procedure of Experiment I was followed. The instructions emphasized the necessity of persevering in finding the solution.

The results showed no marked preference for difficult interrupted tasks in recall. The RU/RC quotients ranged from 0.9 to 1.3.

Discussing these results Pachauri observed that the U-C effect seems to be the result not only of the force set up by the tension resulting from the incompletion, but of the fact that a C-task being a completed form has a more stable memory trace. Following this hypothesis a marked preponderance of easy items over difficult ones should be also expected once the easy items would give more completed form.

To test this hypothesis, two tasks (the synonyms test and the opposites test) were given to two groups of 20

subjects each (age 10-11 years). The same procedure as in Experiment IV was followed. With these subjects, however, the part of the instructions that asks the subject to persevere in finding the solution of the task was omitted.

The ratios of 0.51 and 0.64 demonstrate the preference in recall of easy tasks over difficult ones. "... the most essential condition for securing the U-C effect is that each task should be easy enough to be carried on successfully, and presumably for a period of time longer than a few seconds, irrespective of subsequent completion or interruption" (23, p. 456).

However, in Experiment IV there seems to be a confusion of two different things. It seems that there is a difference between a task that is interrupted when the subject is working on it and one that cannot be started because it is too difficult for the subject. If this distinction is maintained, the results obtained by Pachauri in this experiment may not bear on the findings of Zeigarnik.

Experiment V:

This experiment was concerned with an experimental test of the influence of repetition on the U-C effect. Two miscellaneous tests (one was the same as that used in Experiment I and the other, another form of it) were given one after the other to a group of 81 children (13-14 years). In the first test the ratio equaled 1.9 and in the second,

1.5, showing that "repetition has a marked deteriorating influence upon the U-C effect" (23, p. 456).

In summary, Pachauri's contribution to the understanding of the phenomenon first studied by Zeigarnik consists in large measure in a careful study of the effect of some of the variables left untested by Zeigarnik.

5. Marrow's experiments:

Marrow presents his contribution to the understanding of the U-C effect in three experiments. Three major tasks were undertaken: (1) to check Zeigarnik's findings employing an improved procedure; (2) to test the validity of the results of Experiment I, reversing the subject's interpretation of the interruption through a change in the instructions; (3) to investigate the influence of motivating factors such as encouragement and discouragement on the recall of completed and incompleted tasks.

Experiment I repeated Zeigarnik's experiment but with several improvements. The improvements consisted in the control of the time allowed for each task, in the presentation of a more uniform series of tasks, in the standardization of instructions, and in the control of the order of presentation of the incomplete and complete tasks.

Twenty pencil-and-paper tasks were selected, each of which required about the same time for completion. This

factor was seen to play a role in the U-C effect in Pachauri's experiments. Manual tests were avoided after some preliminary experiments had shown that manual tasks were recalled better than paper-and-pencil tasks, whether interrupted or not. This difficulty was not mentioned by Zeigarnik, a fact which Marrow thinks might be explained by the difference in the age between Zeigarnik's subjects and his own. In addition, the tests were so arranged as to have a specific point of completion and thus reduce the possibility of inner incompleteness of objectively completed tasks for the subject.

One hundred and eight students of elementary psychology (18-35 years) were the subjects. Each subject performed the experiment individually.

The tasks were presented in three different serial orders. There were as many completed tasks in each series, and an irregular sequence of incompleted and completed activities within the series. "Each occurrence for one subject of a completed (or interrupted) task in a particular position in a series was matched by the occurrence for another subject of the same task interrupted (or completed) in the same position" (19, p. 17). Thus each task could be observed in both the completed and incompleted form in more and less favorable serial positions.

Before each task the instructions were repeated in

order to emphasize the individuality of the tasks. This point was considered important since, as Marrow said: "If the single performances have no individual unity for the subject, then the entire experiment forms only one tension system" (19, p. 19).

In view of the findings of Zeigarnik that tasks interrupted toward the end are better recalled than those interrupted earlier, the interruption was introduced when the subject had finished about three-fourths of the task. After the 20th task, as another test, the subject was asked to recall the tasks in the order in which they occurred to him. The subject verbally named or described the tasks and his responses were recorded by the experimenter. This recording can be considered a better method of testing recall than having the subject write out the tasks because, as Marrow said: "This prevents the subject from concentrating on a single elusive task or from attempting to recall others because of serial proximity" (19, p. 19). In Zeigarnik's original technique the subjects were asked to write down the tasks that they could recall.

In order to facilitate comparisons of this group of subjects with those tested in subsequent experiments, Marrow limited the discussion to the last 30 subjects of the total of 108 subjects participating in Experiment I. Their results correspond very well, however, with those of the whole group.

According to Marrow the RU/RC ratio used by Zeigarnik gives a clear picture of the recall of the individual subject. However, when used to express group results it may introduce a distortion in the actual relations between the RU and RC. The group average thus obtained "is not statistically sound because a given amount of superiority is differently reflected in the ratio RU/RC, depending upon the direction in which the superiority lies" (19, p. 24). Marrow therefore introduced a correction, obtaining the ratio of the average RU and the average RC for the group. In addition, he obtained the percentage of the total tasks recalled that was represented by the incomplete tasks, or RU/RT.

From both ratios it could be concluded that, under the conditions of the experiment, there is a superiority in recall of interrupted over completed tasks which is statistically significant. If the RU/RC ratio is used, and the individual ratios are averaged, an "illegitimate procedure", a ratio of 1.77 is obtained. This value compares with the RU/RC ratio of 1.9 obtained by Zeigarnik. If the corrected ratio is used, the results of this experiment would be RU/RC equals 1.57. This figure also agrees well with Zeigarnik's results when the ratio is corrected, and RU/RC ratio for Zeigarnik's data being 1.61.

Besides confirming Zeigarnik's results, Marrow drew

several other conclusions from this experiment. He showed: (1) that individuals possessing superior memory ability have a tendency to show a reduced RU/RC ratio; (2) that the results were independent of the particular serial arrangement of the tasks; (3) that the "total recall was greatest for position 1 and 20. It was smallest for positions 2-5 and increased consistently as one advances from earlier to later positions within the series" (19, p. 34). As mentioned above, the greater the total recall, the lower the RU/RC quotient. Thus in so far as serial position influences total recall, it affects the RU/RC quotient. It was also noted that RU was less subject to the effect of retroactive inhibition than RC. (4) that the ratios depend very much upon the nature of the task, in the sense that the task may lead to a subjective incompleteness that does not correlate with the external completion or incompletion. This point was extensively considered by Zeigarnik (pp. 14-18 of this paper).

Experiment II:

This last finding was further investigated in a second experiment. Those tasks which were objectively complete were made subjectively incomplete for the subject; those which were objectively incomplete were made psychologically complete. This was done to determine whether the superiority of recall of incompleted tasks is due to some

other factor than the "incompleteness", (for example, "to an enhancement of attention to a task by the process of interruption") (19, p. 37).

Thirty students of elementary psychology ranging in age from 19 to 27 were the subjects. The procedure was identical to that employed in the former experiment except in regard to the instructions to the subjects. The aim was to change the attitude of the subject in relation to the interruption.

Marrow instructed his subjects in such a way that interruption signified "success" in the task, since they were allowed to continue only so long as the experimenter was not sure the method for completion had been grasped. The following was a part of the instructions: "I am going to give you a series of pencil-and-paper tests. These will be given to you one at a time. At the signal 'Begin' start working as rapidly as consistent with accuracy. Both of these factors are of equal value in your final score. On such tasks as you indicate to me by your manner of handling and by the speed with which you work that you have sufficient mastery of the task, it will not be necessary for you to finish that task ..." (19, p. 38).

If the better recall of the interrupted tasks in the former experiment is due to their "subjective incompleteness" then, in this experiment, the objectively com-

pleted tasks should be better recalled than those objectively incompleted. This was indeed the case. The ratio of mean RU/RC was 0.74 in this experiment as compared with 1.57 in Experiment I. Since all other conditions were the same for the two experiments, the difference in results can be interpreted in terms of the change of the subject's attitude toward the completed and incompleted tasks.

These results, in Marrow's words, "cannot be explained on the basis of such factor as the superior attention given to the tasks which were experimentally interrupted, for in Experiment II the interrupted tasks were less effectively recalled. To that extent, Lewin's interpretation in terms of satisfied and unsatisfied Quasi-Bedürfrisse seems confirmed" (19, p. 45).

Experiment III:

Zeigarnik reported that indifferent subjects or those lacking interest in the experiment showed lower RU/RC values than the average. If this is true increased motivation and increased tension should increase the Zeigarnik ratio. In this experiment Marrow studied the effects of encouragement and discouragement on the Zeigarnik function. Experiment III repeated the general procedure of Experiment I with the exception of the verbal instructions to the subjects which introduced two motivating factors--encouragement and discouragement.

In Experiment IIIa encouragement was the motivating factor. Quantitative results are presented for 30 subjects (out of a larger group of 60). Their age ranged from 18 to 27 years. This group received a generalized form of encouragement and a rivalry incentive in the instructions at the beginning of the experiment, and personalized remarks of encouragement after the fifth and fifteenth tasks.

As in Experiment I, recall was asked for after the twentieth task. The ratio of mean RU/RC is 1.93, a marked increase over the ratio of mean RU/RC of 1.57 obtained in Experiment I.

In Experiment IIIb the influence on the U-C effect of increasing motivation through "discouragement" was tested. By "discouragement" was meant the attitude aroused in the subject by telling him that his performance was inferior in a competitive situation.

Forty-five students of elementary psychology, ranging from 18 to 25 years of age, were used. Of this group 30 subjects were again considered for quantitative treatment. In the verbal instructions given before the experiment, generalized words of discouragement were included, and a personalized reproof was added after the fifth and fifteenth tasks.

The recall asked for after the 20th task showed a ratio of average RU/RC of 1.71. Thus the superiority of in-

terrupted over completed tasks in recall is greater than in Experiment I, where no special motivation was introduced, but somewhat less than in Experiment IIIa, where encouragement was given.

As a general conclusion from these Experiments IIIa and IIIb it can be said that the increase of motivation leads to an increase of the tension of the system corresponding to the interrupted tasks and, therefore, to a greater difference in recall value between them and completed tasks.

These results fully agree with those obtained by Zeigarnik with ambitious subjects. These more highly motivated subjects also showed a greater tendency to recall the incompleted tasks than did the average subject.

6. Prentice's Experiments

In a paper dealing with the interruption of tasks, Prentice tried to clarify somewhat the contradictory findings of the various investigations of the problem. Besides a theoretical discussion he refers to results of his own experiments.

Experiment I:

By comparing a series of 15 interrupted tasks with another series of 15 completed ones, Prentice hoped to compare a series under tension with a series which was presum-

ably free from such influence.

The results showed that the series of uniformly incomplete tasks were no better recalled than a set of uniformly complete tasks. Therefore, "the results challenge the traditional treatment of these matters, for consecutive interruption of all the tasks in a series appears to rob interruption of its characteristic tendency to produce heightened recall" (26, p. 333).

These results are the more striking because they were obtained under conditions of instruction and other experimental conditions which should be favorable for the standard Zeigarnik effect.

The discrepancies between these results and those of Zeigarnik lead Prentice to draw the following tentative conclusions: "First, the development of tensions from interruption may be a relational affair determined by the presence of similar systems existing in a completed state. Second, persistent interruption may affect the attitude of the subject toward the entire experimental situation..." (26, p. 333).

Experiment II:

In a study of the relationship between the recall of completed and incompleted tasks in the standard retroactive inhibition experiment, two groups of subjects were used. To one group of ten subjects, a series of 16 tasks

was given, half of which were interrupted and half completed. At the end of this series and after a short intermission, eight completed tasks were presented. Finally, the subjects were asked to recall the tasks of the first series.

To the other group of ten subjects the same 16 tasks were given but, instead of the second series of tasks, the subjects read an interesting book for the same period of time.

The results in terms of the mean ratio RU/RC were 0.904 for the first group and 1.396 for the second group. The difference is statistically significant.

Zeigarnik found, it will be recalled (cf. supra, pp. 25ff.) that the RU/RC quotient was reduced when the continuity of the experiment was interrupted by the interpolation of an emotionally charged experience between performance of the tasks and recall. "In terms of Zeigarnik's hypothesis," Prentice points out (26, p. 334), "it might be expected that the second group would experience the less continuity between the first and second parts of the experiment, since the work on another series of tasks was treated as a simple continuation of the original experiment and was apparently so accepted by the subjects." Here, however, those subjects who apparently experienced greater psychological change between the two parts of the experiment (Group II) showed a higher, not a lower, RU/RC quotient.

The results suggest, therefore, that any kind of intervening activity tends to destroy tensions. It may be, furthermore, that similarity determines the amount of such interference, by determining the degree to which the tension systems interact, suggesting a relation to retroactive inhibition. A further hypothesis presented by Prentice to explain these results refers to the phenomenon of substitution. "...the effect here demonstrated may arise from the tendency for completed tasks in the second series to serve as substitutes for the interrupted ones in the first set. Thus the original tension may have been released by success on later tasks" (26, p. 334).

Prentice mentions two facts revealed by his experiments whose explanation is difficult: "(1) that some completed tasks are necessary before interruption becomes effective, and (2) that the addition of a few more completed tasks will begin to obliterate those effects" (26, p. 334).

In his discussion of this literature Prentice points to two main weaknesses: one weakness is related to the conceptualization and representative of the variables involved and the other concerns the inadequacy of the experimental methods.

With regard to the first, the concept of tension alone simply does not explain the effects of interruption. It is insufficient, in explaining them, to confine ourselves to the events in the "inner personal regions." A crucial

point is how the individual perceives the testing situation, what the cognitive structure of the situation is for him. As Marrow and others have shown, the problem of interruption of tasks can only be explained in terms of the total experimental situation as it is seen by the subject. We have to consider, as Lewin mentions, "the direct relationship between the momentary state of the individual and the structure of his psychological environment" (15, p. 76).

In Prentice's experiments the problem already discussed in connection with Brown's experiments arises again. His Experiment I suggests that when completed tasks are not included in the same series with the interrupted tasks, the interruption loses the meaning that it had in Zeigarnik's experiments.

7. Lewis' Experiments:

Zeigarnik's experimental technique was used by Lewis to study the influence of attitudes operating in the work situation. She dealt specifically with the problem of the role of the ego in work.

According to Lewis the hedonistic theories of motivation are insufficient to explain all the possible relations between the person and the goal. The basic motivational pattern, according to these theories, is a single pattern of relationship between the individual, the task and the goal:

the individual uses the task as a means to secure "satisfaction". "The goal of the individual is thus an ego goal--the attainment of reward--and the completion of the task is a means toward the completion of this goal" (17, p. 114). In this theory there is, therefore, no place for occasions in which the individual's goal is the completion of the task. In this latter case, the situation may be called a task-involved one, as distinct from the first case--an ego-involved situation.

The second type, or task-involved situation, would include situations where the individual "enters upon and pursues tasks in order to help others or to help achieve an ideal" (17, p. 115). In these instances, "the person is objectively oriented, pursuing directly the solution of problems posed by his environment without necessarily pursuing hedonistic aims" (17, p. 115).

This essential distinction between ego-involved and task-involved situations can be applied to the study of competitive and cooperative work. The principal feature of cooperative work, according to Lewis, is a diminution of ego-demands in favor of those of the objective situation and of the other person. In such work it is more important to attain the common goal than any personal objective. In the competitive situation the ego-objective becomes more important than any common goal.

These considerations lead Lewis to two predictions: "(1) Satisfaction in work should be obtained from the co-operating person's activities as well as from one's own... (2) When the ego is focal, when the objective situation is seen only as it relates to the dominant ego-needs, then activity will be directed toward only part of the objective situation, principally that part which offers satisfaction for ego-demands. The parts of the situation which satisfy the ego will stand out; the parts which wound, or do not satisfy it may be avoided, or even repressed" (17, p. 116).

To test these predictions was the object of a series of experiments.

Experiment CW:

In the first experiment, to be referred to as Experiment CW, a cooperative work situation was devised. College students performed 18 varied tasks together with another student who acted as a "planted co-worker" (CW).

The subjects were asked to help the co-worker who said, "Oh, I will finish that up," and proceeded to do so. The other half were completed by the subject, the co-worker withdrawing from the work and saying, "Oh, you finish that."

During the entire experimental session an observer was present who inconspicuously kept a record of the time of each task, and the subject's comments. At the end of the experiment, the subjects were asked to recall the tasks that

they had performed. Following the recall they were given an extensive interview with questions relating to their interpretation of the purpose of the work,etc.

The results obtained under these experimental conditions were in contrast to those obtained by Zeigarnik. The average RU/RC ratio was 0.94 or, with the correction introduced by Marrow, 0.88.

This experiment demonstrates that "interrupted tasks completed by a cooperating partner are not recalled any more often than self-completed tasks" (17, p. 117).

The interviews made clear the reason for the discrepancy between these results and those obtained by Zeigarnik. The main finding which emerged from the protocols was that all the tasks were considered finished.

These results bear out the first prediction of the author. It would seem that the tension corresponding to an unfinished task may, in a cooperative situation, be resolved by the work of a cooperating partner. At the same time these findings offer evidence that "motivation in work need not necessarily be egotistical, ... and that, on the contrary, the person is frequently motivated directly by the demands of the objective situation, including the requirements of another person" (17, p. 126).

Differences in recall ratios obtained with individual tasks lead to one of the most interesting discussions in

Lewis' paper--the analysis of the tasks. It became necessary to distinguish several kinds of tasks. An analysis of the relationship between recall of the tasks in cooperative work and the nature of the task revealed that "in exchange-of-ideas, non-routine tasks, solution by the CW was not 100 per cent satisfactory; these tasks are therefore recalled slightly more often in the interrupted condition. Routine, division-of-labor tasks are satisfactorily completed by the partner. Since, however, the partner is something of the 'boss' in the work, the Ss' own tasks are slightly better recalled by him than the partner's tasks" (17, pp. 124-125).

Thus the equality of completed and interrupted tasks in recall obtained in this experiment is dependent upon two basic conditions: (1) the existence of task-orientation, and (2) the use of tasks capable of joint solution. The latter condition requires, as a minimum, that the task have a clear-cut end and that there be equality between the partners.

With the collaboration of M. Franklin, Lewis devised four additional experiments to cast further light on the findings just reported.

Experiment I and Ia:

The major purpose of this experiment was to check on the tasks and conditions of the CW experiment by repeating Zeigarnik's experiment. This was done to determine whether the striking difference between the findings of the two ex-

periments were indeed a function of the cooperative character of the work in the former, or rather of some unknown difference between Zeigarnik's conditions and those of Lewis.

Two groups of 12 college students were the subjects of this experiment. The tasks used in the previous experiment were given to both groups. Following the usual technique, nine of the 18 tasks were interrupted and left unfinished, and nine were completed by the subjects without interruption. In order to control any possible difference in recall due to the nature of the tasks, each task was administered as a completed task for half of the subjects and as an interrupted task for the other half.

In order to control and direct the attitude of the subjects, different instructions were given to these two groups. To one group (Experiment I) it was said that the experimenter was interested in testing the tasks, which were to be used in future experiments. The instructions given to the second group (Experiment Ia) were much less explicit in assuring the subject that no test of him was intended. The authors believed that the first instructions would develop a "task-oriented" attitude and the latter instructions would induce an "ego-oriented" attitude.

The recall ratios showed that the experimenters succeeded in inducing the desired attitudes in the two groups of subjects. Group I--the task-involved group--recalled more

interrupted than completed tasks, while the subjects of Group II--the ego-involved group--recalled more completed than interrupted tasks. The ratio of the Average RU/Average RC was 1.74 for the task-oriented group. Thus this group showed a preference in recall for unfinished task fully as great as that obtained by Zeigarnik (corrected ratio, 1.61) and by Marrow (1.57). The ego-oriented group showed a ratio of 0.625. The difference between the ratios of the two groups is statistically significant.

The results of these experiments show "that interruption does result in recall advantage for interrupted tasks when the tension-systems aroused by the entire experimental situation are predominantly task-completion tension-systems and not ego-enhancement systems" (18, p. 199).

At this point in the presentation of the results Lewis and Franklin raise the question of "whether the factors operating to create a ratio of 0.88 in the CW Experiment were not the same factors operating in Experiment Ia to create a ratio of 0.626" (18, p. 200). A study of the protocols of the subjects revealed, however, an essential difference between the two experiments. In Experiment Ia the subjects were concerned with their personal success or failure in performing the tasks and in Experiment CW the major concern of the subjects was the task itself.

The result leads the authors to propose three hypotheses:

(1) When the subject is ego-oriented, the interruption of the task is likely to arouse feelings of failure.

(2) In such cases, therefore, where the goal is not task-completion, but ego-enhancement, "interruption should not result in a difference in magnitude between the task-completion tension-systems for interrupted and completed tasks" (18, p. 201). In other words, the ego-oriented subject should recall the same number of interrupted and completed tasks.

(3) Interruption will more probably give rise to feelings of failure than will completion. Conversely, completion will more probably give rise to feelings of success than will interruption.

On the basis of these hypotheses, Lewis and Franklin present two possible explanations for the ratio of 0.625 obtained in Experiment Ia. In line with the Freudian theory it could be said that the subject "repressed" the interrupted (failed) tasks because they represented a blow to ego-status. Therefore, according to the authors, "if repression is occurring in Experiment Ia, then one should expect an 'abnormally' low percentage of interrupted (failed) tasks in recall... If, on the other hand, repression is not at work, then ... the recall ratio should ... show a preponderance of ego-satisfying, i.e., completed tasks, without a serious absence of interrupted tasks" (18, p. 201).

When these hypotheses were applied to the data of Experiment Ia no evidence was discovered of any "special forces of repression" operating in this experiment. Lewis and Franklin's interpretation of the results of Experiment Ia "favors an hypothesis which suggests that the greater recall of completed tasks reflects a tendency for ego-enhancement experiences to appear in the recall of ego-oriented Ss" (18, p. 202).

Experiment II:

The second experiment was designed to study the fate of the tension systems in cooperative work, when the interrupted tasks were left incompleted. This variation was introduced because it might be argued that the failure to find a difference between interrupted and completed tasks in recall in the CW Experiment might simply be " a function of the failure of specific tension-systems to arise at all in our cooperative work.... It might be argued that working jointly with another person prevents the assumption of responsibility for any particular task on the part of either worker..." (18, p. 203).

For the most part, the procedure of the CW Experiment was repeated in Experiment II and the same 18 tasks were used. But now both subject and co-worker were interrupted by the experimenter on half of the tasks.

The results show a favoring of the unfinished tasks

in recall. The ratio of the Average RU/Average RC is 1.50, which is comparable to the ratio of 1.74 obtained in Experiment I.

These results showed that tension-systems to complete tasks are indeed aroused in cooperative work. Lewis and Franklin add that "the crucial factor in the CW Experiment seems to have been that the interrupted tasks were completed by the cooperating worker and so regarded as finished" (18, p. 205).

Experiment III:

The results of Experiment II, when compared with those of the CW Experiment, showed that the completion of a task by the co-worker may, under cooperative conditions, be as satisfactory as completion by the subject himself. Experiment III is an attempt to study the role of task-completion in recall in a non-cooperative situation. More specifically, the experiment was designed to determine the effect upon the recall of tasks of objective completion by another individual.

In this experiment the subject, working alone, carried out the 18 tasks employed in the previous experiments. The experimenter interrupted him on half of the tasks, in the usual manner, but then finished them herself in front of the subject.

The ratio of the average number of interrupted tasks recalled to the average number of completed tasks recalled

is 1.20. Thus there is an advantage of the interrupted tasks in recall, although not as great as in Experiment I (1.74).

In an attempt to explain these results, Lewis and Franklin examined the protocols of the subjects and concluded that this ratio of 1.20 is a reflection of several different processes acting upon the subjects in the experimental situation. "When the S is task-oriented, then objective completion may offer some release of the task-completion tension-system. This release is effected either by actual vicarious experience, or because completion is 'better than letting things hang in mid-air'. In other cases, interruption signifies such a break in the task that it changes 'ownership' and completion by another is not completion of my task, but of his" (18, pp. 208-209). According to the authors, "these two factors, together with three ego-oriented Ss, account for the obtained ratio of 1.20" (18, p. 209).

A comparison of the results of the CW Experiment with those obtained in Experiment I, II, and III combined showed that "the difference between CW and the others is in recall of <u>interrupted</u> tasks" (18, p. 213). The number of interrupted tasks recalled is smaller in the CW Experiment than in the controls, showing that "completion by the cooperating partner did effect a release of the task-completion tension-systems in the CW Experiment" (18, p. 213).

The results of the CW Experiment and of Experiment III,

according to Lewis and Franklin, "offer support to the thesis that man's motivation in work is often a direct function of the requirements of the task he has undertaken." They add that "... on certain occasions, man's selfish needs are so little a part of the motivational system which guides him that participation of his 'self' in a task is not even necessary for the achievement of his goal. The goal is reached when the task is done; the agency of doing need not be the self" (18, p. 214).

8. Harrower's Experiments:

In a paper demonstrating "organization" of higher mental processes (specifically those involved in the understanding of jokes), Harrower utilizes Zeigarnik's technique in two of her experiments. Only the experiment more directly related to our present discussion will be mentioned here. This experiment was performed to compare incompleted and completed activities in recall. It differs from other work in this field in that the material is new in relation to the present problem.

A list of 16 jokes was read aloud to a group of 25 subjects. Half of the jokes were completed and the other half incompleted, each joke being presented in each condition to different subjects.

Immediately following the reading, the subjects were asked to list as many jokes as they could remember. An in-

terval of time between these two parts of the experimental session was avoided in order to prevent the completion of the jokes by the subject.

The results revealed that 48.5 per cent of the unfinished jokes were remembered as against only 29 per cent of the finished ones. Only for one subject was the number of completed jokes recalled greater than the number of incompleted jokes.

Five subjects of this same group were tested again three weeks later and the results showed that in spite of a slight decrease in recall the relation found in the first recall was maintained (45 per cent of incomplete jokes recalled and 26.2 per cent of the complete jokes).

These results are interpreted by the author in terms of Zeigarnik's theory: When a task is begun a 'tension' is set up, which is relieved only by the completion of the task. In referring to this explanation Harrower says that "it seems reasonable, then, to assume just such a factor in the explanation of the better retention of the incompleted jokes over the completed ones, for the incompleted structure of the joke is equivalent to the still existing tension of the unfinished task. Conversely, we might expect to find that a structure which is perfectly completed does not leave any tension behind, and therefore lacks this factor powerful for recall" (13, pp. 99-100).

At the same time a point of disagreement between Harrower's and Zeigarnik's results must be mentioned. Instead of a decrement in the advantage of the incompleted tasks in recall with the lapse of time, Harrower found that even after three weeks the RU/RC ratio remains almost constant. One possible explanation for this difference in findings might be found in the difference of material used in the two experiments.

However, before this can be considered to be a real difference, it would be necessary to repeat the experiment using different subjects for the immediate and delayed tests of recall. It is quite possible that the first test influenced the second, producing a spurious constancy in the results. In any case the number of subjects from which this result was obtained is too small to permit confidence in the finding.

PART II:

In this part of our paper we shall be concerned with experiments whose results differed from those obtained by Zeigarnik.

1. Boguslavsky's and Guthrie's Experiments:

According to the authors, a critical analysis of Zeigarnik's experiment reveals that (a) the control of the

variables was inadequate and (b) that the statistical treatment of the results was insufficient.

In order to check Zeigarnik's results under more adequate conditions, a similar experiment was performed by Boguslavsky and Guthrie.

The subjects were 80 college students. Twenty short tasks were used. As usual in this technique, half the tasks were completed by the subject and the other half were suddenly interrupted shortly before completion, the two kinds of tasks being presented in random order. As a control for differences in the nature of the tasks, those tasks which were completed by one subject were interrupted for the following subject. A test of recall was introduced after the completion of the 20 tasks.

The results obtained did not confirm Zeigarnik's findings. Recall showed a slight favoring of the completed tasks. Thus, interruption did not enhance the recall of tasks as Zeigarnik had found.

These authors noted that the "predominance in recall of those tasks which follow interrupted tasks when compared with those which follow completed tasks," (5, p. 576) was very significant.

Lack of details about the procedure followed prevents us from fully evaluating this experiment. As has been pointed out above, the atmosphere of the experimental situation

and the meaning of the tasks for the subject are very important conditions for Zeigarnik's effect. It is quite possible that subtle differences in these respects are responsible for the differences between the findings of Zeigarnik and those of Boguslavsky and Guthrie.

2. Abel's Experiments:

Abel proposes the Zeigarnik technique as a measure of certain dynamic aspects of behavior among adolescents in school--the tension of unfinished work. According to her, this technique has the advantages of revealing individual differences as well as group trends, of being applicable to groups, and of not requiring very much time nor any elaborate equipment.

Two groups, one of 206 high school students and the other of 71 high school students plus 66 college freshmen were the subjects in this experiment. Different instructions were given as to the reason for administering the tasks to the two groups. In one group competition was stressed, and in the other interest in the task *per se* was made central, regardless of the subject's performance on them. This was done in order to study the effects of differences in motivation suggested by the work of other investigators, such as Zeigarnik, Marrow, and Rosenzweig.

Eighteen paper-and-pencil tasks were given to the

subjects in small groups of 10-15 each. These tasks were not particularly interesting; they could be understood immediately by the subjects, and they were short and not very difficult. Also, since these considerations were shown by previous authors to be important, tasks were chosen which, objectively, had clearly marked points of completion. They required different modes of thinking for their solution, and were suitable for both sexes.

Completion by the subjects was permitted for the first two tasks in order to increase the tension for the finished tasks. Thereafter, half of the activities were completed and half were interrupted. The subjects were allowed to work three minutes on each of the tasks to be completed. According to the author, most of the subjects had finished the task in that time. The other half of the tasks were interrupted after 30 seconds of work.

At the end of this part of the experiment the subjects were asked to write down the names of the tasks performed in the order of presentation. They were told to separate with a line the names that were recalled without any hesitancy from those that were remembered only after blocking. In the results only 14 tasks were taken into consideration. The first two completed tasks and two other tasks, considered too interesting because of the high number of recall, were eliminated.

In summary it was noted that:

"1. No marked tendency to recall predominantly interrupted (I) tasks was shown for any group as a whole.

"2. College freshmen recalled more completed (C) tasks than did high school students" (1, p. 25).

According to Abel, this result is in agreement with Rosenzweig's report that younger children recall more unfinished tasks than do older ones. Rosenzweig explained this difference in recall at the various levels of age by saying that the older subjects have more "pride" than the younger ones and consequently "repress" memory of unfinished tasks. Abel noted that the "college students seemed, in general, worried about doing the job well, ... so that the factor of pride may well have been stronger with them than with the younger Ss (1, p. 14).

In regard to this interpretation the following two points need to be considered: (1) Rosenzweig's point about "pride" applies to children. It may be asked if it necessarily holds too when the difference is the small difference between high school students and college freshmen--all relatively mature. It seems, therefore, that Abel's explanation of the difference between the two groups of subjects is not convincing. (2) Rosenzweig's explanation of the better recall of completed tasks by his "proud" subjects in terms of a

mechanism of repression is hardly acceptable. This problem is treated in more detail in Chapter III of this paper.

3. The girls recalled more I tasks than the boys. This point fails to confirm the findings of Pachauri. The latter reported a mean quotient (I-to-C tasks) of 1.84 for the girls and 2.0 for the boys, though he did not mention differences in the frequency of recall of I and C tasks considered separately.

4. No differences were found between the two groups tested under supposedly different motivations. In explaining the disagreement of these findings with those reported by Rosenzweig, the author points out that the subjects of the experiments had frequently taken intelligence or scholastic aptitude tests and, in spite of the instructions to the contrary, both groups took the tasks as a test.

5. No significant correlations between scores on intelligence tests (measured by the test of the American Council on Education) and the recall of I and C tasks were found. In other words, there were no clear-cut relations between any given pattern of recall and intelligence.

After presenting the results of the experiment, Abel emphasizes the importance of developing tests of this kind for measuring conative aspects of behavior, such as persistence, freedom for load, flexibility. "For purposes of selection, classification and adjustment of students in the

school situation, measurement of conative as well as cognitive modes of psychological functioning is indicated" (1, p.3).

It is very difficult for us to follow Abel in this discussion. She started by saying that it would be useful to develop techniques for supplementing the measurement of intelligence and scholastic aptitude and other types of interviews and inventories. In this connection Zeigarnik's technique is introduced as a valuable test. In using it, Abel tried to "carry over into a test situation a methodology worked out in the laboratory" (1, p. 23).

We agree, of course, about the necessity of tests focusing on the dynamics of behavior. However, it seems that Zeigarnik's technique is far from meeting this requirement. In our opinion, in spite of the great number of investigations on this problem, the conditions of Zeigarnik's effect are not clearly determined. More work is needed in this field before the technique can be used as an instrument in the study of the dynamics of individual behavior.

In Abel's words: "If a teacher understands that a pupil who develops tensions for unfinished tasks is not stupid but finds it more difficult than some of his peers to leave something undone, that he is really having a hard time adjusting to the task of multiplying mixed fractions after leaving a long-division problem unsolved, she may have more patience with him. The teacher may even think up ways and

means of helping this pupil become more flexible, rather than spend her time despairing over his seeming stupidity" (1, p. 24).

In this paragraph two notions extraneous to Zeigarnik's effect have been introduced, one the concept of rigidity, and the other a value judgment connected with the better recall of completed tasks. To say that the individual who recalls completed tasks better is more flexible than the one who prefers incompleted tasks in recall is to deny the results of the experiments mentioned above which devised conditions under which one or the other of these two patterns of recall is favored. If, on the one hand, as Abel mentions later in discussion, the tension of incompleted work shows an inadequate adjustment of the individual to interruption situations, still, on the other hand, this tension shows that the individual is very much interested in what he is doing. A balance between the two aspects should be desirable.

We would like to emphasize along with other authors like Rosenzweig and Marrow, that the fact that all the subjects in both groups viewed the experimental situation as a test might well explain the results obtained by Abel. In this situation better recall of the completed tasks seems to be the rule. Furthermore the considerable discrepancy in the time allowed for completed and incompleted tasks must be

noted. As Pachauri has shown (cf. supra, pp.46 ff.), only under conditions where the duration of the two kinds of tasks is roughly equivalent, is the Zeigarnik effect to be expected.

CHAPTER III

EXPERIMENTAL STUDY OF REPRESSION BY ZEIGARNIK'S METHOD

Under certain conditions investigators employing a technique similar to Zeigarnik's found a superiority of completed tasks in recall; and this led them to look for relations between this finding and the Freudian theory of repression. Such a relation was already suggested by Zeigarnik (35, p. 77).

The Freudian theory of repression holds that painful impulses and content associated with them are banished from consciousness. According to Freud, "the essence of repression lies simply in the function of rejecting and keeping something out of the consciousness" (10, p. 86). It is a mechanism whose function is to protect the ego from pain. Accordingly, certain investigators have held that under conditions where interruptions may be interpreted as failures--i.e., as ego-wounding experiences, they will not be enhanced in recall, but rather repressed, so that completed activities will be favored in memory.

The first to study this problem systematically was Rosenzweig.

1. Rosenzweig's Experiments:

Experiment I:

The first experiment, carried on in cooperation with Mason, was performed with the intention of studying, under laboratory conditions, the action of the mechanism of repression. A technique reminiscent of Zeigarnik's was employed.

Forty crippled children--25 boys and 15 girls--of ages ranging from five years and six months to 14 years and 8 months served as subjects in this experiment. The experiment was conducted as a contest. The subjects were asked to solve a series of jigsaw puzzles; a prize was promised to the one who did best.

The puzzles were selected according to the age and ability of each child. The number of puzzles undertaken depended upon how many could be done in the experimental period. Thus some subjects did only four puzzles, others as many as fourteen. In all cases half of the puzzles were completed and the other half were interrupted by the experimenter when the subject had assembled half of the pieces. At this point the subject was sufficiently involved in the work so that the interruption could be assumed to lead to an actual experience of frustration. The experimenter's comments were designed to produce feelings of success in the case of the completed tasks, feelings of failure in the interrupted

ones.

After about forty-five minutes of work with the puzzles, the subject was asked to recall the name of each picture puzzle that he had done. After the subject had mentioned all the names that he could remember, the experimenter read the list of all the puzzles and asked the subject to tell which ones he liked and which he disliked. Next he was asked to indicate which puzzles he had finished, etc. Along with these data, a record of behavior was kept throughout the experiment.

On the basis of their results, the subjects may be divided into three groups: (1) the "positive group"-- 16 subjects recalled more completed than incomplete tasks; (2) the "negative group"-- 13 subjects recalled fewer completed than incomplete tasks; (3) the "neutral group"-- 9 subjects recalled an equal number of complete and incomplete tasks; and two recalled none of the puzzles.

Examining the results of this experiment in relation to the mental age of the subjects, Rosenzweig and Mason found that "those subjects who were oldest mentally remembered the C's (successful puzzles) better and that those who were youngest mentally recalled evenly, while those of intermediate mental age recalled the X's (unsuccessful puzzles) better" (27, p. 256). A parallel trend was noted between recall

and ratings on the "trait of pride".[1]

The authors conclude that "given an individual of sufficient intellectual maturity and commensurate measure of pride, experiences that are unpleasant because they wound self-respect--perhaps it should be added in a social situation--are, other things being equal, less apt to be remembered than experiences that are gratifying to the ego" (17, p. 258). This was the case with the 16 subjects who formed the "positive group".

Subjects of the negative group "were presumably not enough wounded (by failures) for repression to operate" (27, p. 259). The failures led rather to feelings of protest and perseverance which brought about the preference for unfinished tasks in recall. These subjects seemed to take "a more objective attitude toward the test... Their need for mastery of the environment was aroused, but failure to satisfy it did not wound their egos or arouse feelings of inferiority" (27, p. 259).

In the positive group, on the other hand, the repressive tendency was stronger than the perseverative tendency. In general it is concluded that "the results of this experiment seem to support certain aspects of the Freudian theory of repression" (27, p. 264).

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1. Pride was defined as "Desire to stand well with the group, and pleasure in one's own achievement" (27, p.257). All ratings were made by teachers.

Experiment II:

A second experiment was designed to check these results. Meanwhile Rosenzweig had elaborated the theoretical basis of the experiment.

According to Rosenzweig, two types of reaction to frustration should be differentiated. We may speak of need-persistive reactions which "serve to fulfill the frustrated need despite momentary obstructions," and ego-defensive reactions to frustration which "tend to protect the integration of the personality if and when the latter is threatened with disruption" (28, p. 64).

In accordance with this distinction, the mechanism of repression is seen to include both reactions, involving as it does the inhibition of a need and the defense of the ego.

With this distinction in mind, Rosenzweig tried to set up two experimental situations with groups of subjects which would reproduce the differences in recall which derived from personality differences in the case of the children of the earlier experiment.

Two groups of 30 college students acted as subjects. A series of jigsaw puzzles was used. Before the presentation of each puzzle, a miniature picture of it in completed form was shown to the subject for about 15 seconds.

The experimental conditions were different for the

two groups in order to obtain different reactions to the frustrating situation of interruption. In one group--the informal group--the subjects were asked to help the experimenter in a test of the puzzles that had been constructed for use in future experiments. These subjects were told that the experimenter was interested in finding out something about the tasks, and that work on any puzzle might be interrupted when the experimenter had learned what he wanted to know. To the other group--the formal group--the tasks were presented as an intelligence test and the experimental situation was such as to arouse tension in the subject.

In the first group, then, not the individual but the puzzles were being tested; in the second group, it was the individual who was being examined. Or, to state the difference in another way, "... any tension aroused with the informal group of subjects would pertain primarily to the accomplishment of the task in hand qua task. On the other hand, the subjects in the formal group were intended not only to have such task-tension aroused in them but were in addition being aroused in a personal way that would involve their attitude of self-esteem, pride, etc." (28, p. 67). For this latter group, interruption meant failure.

In both cases the subjects were permitted to finish half of the puzzles but were interrupted in the case of the remaining half. As usual in this technique, recall was re-

quested immediately after the work on the last puzzle had been concluded.

The results showed differences between the two groups of subjects. In the formal group, 17 subjects remembered more finished than unfinished tasks, 8 did the opposite, while 5 showed no preponderant tendency. The ratio average RI/average RC, although not presented by Rosenzweig, is relevant. For the formal group it was 0.97. In the informal group, 19 subjects remembered more unfinished than finished tasks, 7 did the opposite, while 4 showed no preponderant tendency. However, the ratio average RI/average RC was only 1.14, a much smaller ratio than that noted by Zeigarnik (1.6) and by most other experimenters under informal conditions. This ratio was not used by Rosenzweig because according to him the importance of this experiment is the comparison between individuals working under different conditions and not the pooled total of remembered and forgotten tasks.

The justification given by Rosenzweig for his neglect of this ratio is not completely convincing. His argument rests on the contrast between the results obtained under formal and informal conditions. The latter he regards as confirming Zeigarnik's findings, in opposition to the results of the formal condition. It is important, therefore, to be able to compare Rosenzweig's results with Zeigarnik's. If, as our figures show, he has not been able to obtain any marked

superiority of unfinished tasks in recall in the informal situation, then he lacks any real control with which to compare the formal situation. The interpretation of the results obtained in both situations is therefore in doubt.

According to Rosenzweig's reasoning, task-oriented tensions were aroused in both groups when the tasks were interrupted. Such tension would account both for the greater recall of interrupted tasks by the informal group, and for the fact that the formal group also remembered a large number of such tasks. In order to explain the differences between the two groups, Rosenzweig utilizes the concepts of repression and need-persistive and ego-defensive reactions to frustration. "... the complete mechanism of repression ... involve(s) not only the ego-defensive forgetting of the unpleasant, but the need-persistive retention of the unfinished. Such a view of repression closely approximates the clinical psychoanalytic usage" (28, p. 74). In the informal group the recall favored the unfinished tasks "because need-persistive responses alone would not be operative and would make for the easier recall of tasks with which undischarged tension was associated" (28, p. 67). With the formal group, the predominance of recall of the finished tasks "could have appeared only by overshadowing the countervalent effects of need-persistence and of certain aggressive types of ego-defense" (28, p. 71). The injury to self-esteem which the interruption

produces may here lead to the repression of the failed tasks.

The fact that the experimental data show a superiority of successes over failures for the formal group would, as Rosenzweig says, "lend considerable support to the concept of repression as a very general mechanism of defense." He adds: "... the only explanation that could be adduced for such predominant effects of repression as were observed would need to invoke a presumed greater availability of repression than of other defense mechanisms in subjects and situations like the present" (28, p. 71).

Rosenzweig's interpretation is not altogether convincing. It has already been pointed out that since he failed to reproduce the Zeigarnik effect under his informal conditions, the meaning of his results is open to question.

Several other criticisms have also been made of his experiments, and specially of his interpretation of the results. The criticisms refer to various aspects of the experimental set-up which were held to be responsible for the results obtained. One of the more obvious criticisms concerns the selection of the subjects of Experiment I. Referring to the crippled children, Alper says: "It may be that <u>any</u> test situation, even if it were not labeled an intelligence test, would serve as an 'ego' or self-esteem threat to such a group. All unstructured situations may be potentially more threatening to these children than to a group of 'normal' children"

(3, p. 415). In this case incompletion may more often be interpreted as personal failure than in the case of normal children.

Another point should be also considered, in Sanford's opinion. According to him the different reactions obtained from these subjects in the test situation could be explained in terms of their personality organization. It is legitimate to suppose that the crippled children of Rosenzweig's experiment have their "ego development ... considerably less advanced than that of normal children of the same age." Again, there is reason to suppose, generalization from this special population seems risky.

Criticisms have also been made of the teachers' ratings of the pride of the children. These ratings could hardly be taken as entirely reliable measurements. In Sanford's opinion, the "trait of pride" as measured "might spring either from an achievement drive or from a need for recognition, (and) is not the same thing as self-respect. And, it is quite different from the frame of mind which leaves a person 'too proud to retreat'" (32, p. 238).

But the major criticism is centered on Rosenzweig's interpretation that these experiments present evidence in support of the thesis that experiences of failure are repressed.

An analysis of the results of Experiment II shows

that the formal group not only remembered more of the completed tasks but also that they recalled almost as many of the unfinished tasks as did the informal group. "More conclusive evidence for repression would have been offered had the ego-oriented group (the formal group) recalled a considerably smaller number of interrupted tasks" (8, p. 79). The same opinion was expressed by Lewis and Franklin: "... extreme caution is necessary before the concept of repression is invoked to explain what is essentially a greater recall of success tasks rather than an actual absence of failure tasks in recall" (18, p. 202).

Furthermore, one may raise the question of whether Rosenzweig's experiments fulfill the conditions of a laboratory test of repression. According to Zeller, such a laboratory demonstration should fulfill three requirements: "First, it must demonstrate that the material in question has been learned by the individual. Second, it must demonstrate that the introduction of an inhibiting factor causes inability to recall or a significant decrease in the recall of the material. Third, it must show that the removal of the inhibiting factor results in the reinstatement of the ability to recall the material" (36, p. 40). No laboratory test would be complete if one of these parts is lacking. "Any experiment which does not include this (last) crucial step is not complete and the results can be attributed to other factors such as

set, differential learning, differential motivation, practice, etc., rather than to active repression (36, p. 46).

New criticisms of Rosenzweig's interpretation of his experimental results have recently been made by Glixman. He pointed out that "no matter how Rosenzweig may choose to interpret his results, there is no decrement in recall of incompleted tasks when a stress situation is compared with a neutral one" (11, p. 496). This point was also mentioned by Lewis and Franklin. According to them, "if ego-wounding experiences are being avoided, or pushed aside (repressed) in recall, then one should expect very few of the failure tasks to appear in the recall ratio... Such an abnormally low percentage of interrupted tasks is at least a minimum statistical criterion for the existence of repression" (18, p. 201). Glixman too concludes: "If a decrement of recall is set up as a minimum criterion for repression, then there seems to be no justification for Rosenzweig's statement that he had achieved 'a closer approximation to the full concept of repression'..." (11, p. 496).

2. Sanford's Experiments:

Sanford undertook to check Rosenzweig's results on the influence of age and other factors on the recall of interrupted tasks. In his experiment chronological age (C.A.) and mental age (M.A.) were considered in connection with

other age-linked factors such as "pride," "self-criticism" and perseveration on unfinished tasks.

The same procedure and the same experimental materials used by Rosenzweig and Mason were utilized by Sanford. Certain differences in the experimental conditions must, however, be mentioned. (1) The subjects were 49 normal children in a private school, not crippled children in an institution, as Rosenzweig had used. (2) Instead of the prize Rosenzweig offered for the best performance, the subjects were instructed to do the best they could. Since in this private school intellectual achievement was valued greatly, the children could be supposed to be highly motivated to complete the tasks. (3) One more success than failure was allowed, rather than an equal number of successes and failures, as Rosenzweig had used.

The experiment consisted of two sessions with the same subjects. In the first session a set of puzzles was presented to the 49 subjects and two and a half years later a different set of puzzles was given to 26 of these same subjects.

The results revealed that:

1. With increasing C.A. subjects recall relatively more failures than successes. When these results are compared with those obtained by Rosenzweig and Mason there is an apparent contradiction. Sanford suggests, however, the unread-

ability of Rosenzweig's results for the 13-14 year age level (based on six cases). If this is taken into account, Rosenzweig's results would show the same tendency found in this experiment.

2. With increasing M.A. there is an increase in the preference for failures in recall. Such a relationship between M.A. and memory for failures was not observed by Rosenzweig and Mason.

3. On the basis of "self-criticism" (the response to the question 'Do you think you did well?' and general behavior during the experimental sessions) it was possible to distinguish three groups: (a) the highly critical subjects, (b) the moderately critical, and (c) the subjects who showed little or no self-criticism.

The more self-critical subjects recalled more failures than those who were less self-critical. The author concludes: "Self-criticism, which is associated with the better recall of failures, increases with C.A. and M.A. and so does the tendency to recall more failure" (32, p. 237). Thus this factor may account for the increased recall of failures with increasing C.A. and M.A.

4. It was also noted that in both sessions there was a positive correlation between the tendency to perseverate on unfinished tasks and the tendency to remember failures better than successes.

According to Sanford, Rosenzweig's explanation of the better recall of completed tasks with increasing C.A. goes against common sense. The more mature and proud subjects would not "repress" failures (the incompleted tasks); forgetting all about one's failures would, rather, be an immature response.

Another point mentioned by Rosenzweig in support of his argument that the more mature subjects repressed their failures is the result of the comparison of the behavior of the same subjects with respect to resumption. The children who recalled their successes better than their failures preferred to resume failed tasks, and vice versa. He also showed that resumption of interrupted tasks increases with age; therefore, he concluded that "repression" should also increase with age.

Sanford's results, however, showed that with increase of age (either M.A. or C.A.) there is an <u>increase in the recall of failures</u> and not of "<u>repression</u>".

In order to explain the contradictory results, Sanford says that a distinction should be made between forgetting a failure and overcoming a failure... "forgetting the threats to self-esteem is one device for self-defense and attempting to overcome one's failure is a totally different one" (32, p. 238). The use of one or the other mechanism probably varies with the individual and with the situation.

In this experiment Sanford found that the more mature subjects tended to show an increasing use of "overcoming" and a decreasing use of "forgetting". Thus "repression" is a characteristic of the weak ego, "which attempts to solve its problems simply by not facing them" (32, p. 239), not of the strong ego.

At this point another distinction is needed. "A strong need to defend the ego and strong ego defenses are two entirely different concepts" (32, p. 239). If such distinction is maintained, Rosenzweig's subjects seemed to show more the first type of response, i.e., need to defend the ego, rather than a strong ego defense. The need to defend the self (or, ego involvement) in Rosenzweig's results increases with mental age of the subject, and with pride. Probably, Sanford points out, a certain minimum of both is needed for the experimental situation to be experienced as a threat to the self-esteem. In any case, however, this type of response can neither be considered a sign of maturity nor would it necessarily lead to "repression".

According to Sanford the discrepancy pointed out between his results and those obtained by Rosenzweig might be explained "on the basis that rather different levels of mental age or maturity were represented in the two groups of subjects" (32, p. 239). Rosenzweig's subjects were relatively retarded in intellectual development. Besides, there is

no doubt that the fact of dealing with crippled children living in an institution introduces new variables in the situation. Such subjects might well show less advanced development than normal children and thus might not all be ego-involved in the experimental situation. It is Sanford's opinion that "all of his own subjects were ego-involved, and that variations in their eagerness to do well were not so much associated with C.A. as they were conditioned by numerous personality and situational factors. Being ego-involved, they reacted to failure according to their personality organization, the less mature ones trying to put a good face upon things by forgetting their failure and remembering their successes, the more mature ones trying to stick to reality (which would decree that they recall successes and failures evenly), accepting responsibility for their failures and thinking of how to erase them, even remembering failures as an expression of their tendency to keep in consciousness their conflicting attitudes toward themselves" (32, p. 329).

It is Sanford's conclusion that "the more mature subjects were goaded by their pride into remembering their failures precisely because they hoped somehow to erase them or make up for them" (32, p. 240).

3. Alper's Experiments:

The problem of selective recall is studied by Alper

from a rather different point of view. Her experiments were based on the premise that "the incidental recall of an unbiased sample of subjects is typically neither 'pleasant' nor 'unpleasant' because incidental selective recall is meaningfully related to the personality needs of the individuals who comprise the group rather than merely to the hedonic tone of the material as intended by the experimenter" (3, p. 403).

A study of the relationship between personality and selective recall is the purpose of the experiment. Zeigarnik, Rosenzweig, Pachauri and Abel had earlier suggested a relation between the recall of uncompleted tasks and some factors of the subject's personality, but this relationship had not been specifically investigated.

Alper points out that studies of this relation should include certain experimental controls regarding: (1) the personality structure of the individual subject to be ascertained through "broad clinical studies"; (2) different situations of recall; "The selective recall of the same individuals should be studied in two different psychological contexts, the one designed to threaten self-esteem, the other designed objectively not to threaten self-esteem;" (3) "Self-esteem should be more unequivocally threatened than in previous studies in this field" (3, p. 405).

Twenty college undergraduates served as subjects

in this experiment. Half constituted the control group and the other half the experimental group. An intensive study of the personality of the ten subjects of the experimental group had been made in connection with other studies at the Harvard Psychological Clinic.

All subjects were tested in two one-hour sessions. In the first session they were placed in an "informal, friendly and non-threatening to self-esteem" situation. Failure in this session could be attributed to the difficulty of the tasks rather than to inadequacy of the subject. The second hour session, one week later, presented the subjects with a situation objectively threatening to self-esteem. The tasks were presented as tests of intelligence and failure in the tasks now assumed a meaning different from that which it had in the previous session.

The tasks in each experimental session consisted of a set of twenty-word sentences. Each sentence was presented to the subjects in the form of ten disarranged two-word phrases which the subjects were asked to arrange into a meaningful sentence. The tasks were grouped into two sets of twelve sentences each. Half of the sentences in each set were considered easily solvable, and the other half consisted of difficult sentences, four unsolvable, and the other two never solved by the control subjects in less than three minutes. Each one of these sets of sentences was used in one

session only. Another point on the procedure is important--the fact that all the solvable sentences had more than one solution. This was introduced to make sure that the subject couldbe kept at the task for the full period allowed, but it probably had the effect--as Glixman points out--of making the completed tasks psychologically incomplete for the subjects, since there were always additional solutions they had not found.

Besides these tasks other material was used for "fill-in" tasks. Before both sessions the subjects were asked to draw "moon faces". Again, in Session I, between the sentences and the recall the subjects were asked to draw "moon faces" for five minutes. This was followed by five minutes of free drawing. In Session II, this free drawing was replaced by a projective test, the Mind-Reading Test. This test is considered as "a particularly sensitive project technique for measuring reactions to immediately past experience" (3, p. 407).

The tasks were presented to the control group in both sessions in a very informal way, the subjects being asked for their help in testing certain materials for further psychological experiments. In Session I, for the experimental group, the experimenter followed almost the same procedure. The tasks were presented in a friendly and informal atmosphere. As with the control group, in this Session I, the subjects were asked to draw some "moon faces" for five minutes.

Then the sentences were introduced. When the subject had finished the work with the twelve sentences, he was asked to draw more "moon faces" for another five minutes. This drawing was followed by five minutes of free-drawing before the recall was requested. In Session II, self-esteem-involvement was experimentally induced in the subjects of the experimental group. The sentences were presented as a test of intelligence for selecting candidates for the Army Officer Training School. The assumption was made that these instructions would serve as a potential threat to pride, or self-esteem, and accordingly, would induce an ego-involved attitude. It was further assumed that, in the absence of such a ruse, merely a task-involved orientation would exist.

The threatening character of the situation was enhanced by having a planted subject present during this session, who kept announcing successes, thus introducing a high fictitious standard; and by having an attractive female assistant present in the experimental room. In this session nine of the sentences of the set were first given to the subject; this was followed by five minutes of drawing outline faces. The tenth sentence was solved in cooperation with the planted subject; following this, two easy sentences were given to be solved individually. This part of the session was followed by the Mind-Reading Test. After the ten minutes spent on this test recall of the sentences was requested.

The results of the control group showed that the two sets of sentences used in the two sessions were comparable in difficulty.

The results of the experimental group, on the other hand, showed very important differences between the two sessions.

1. "The experimental conditions of Session II were found to be significantly less favorable for productivity than were the experimental conditions of Session I" (3, p. 411). Since the results of the control group showed that there was no difference in difficulty between the two sets of tasks, and since the conditions and results of Session I were comparable to those of the control group, the poor performance obtained in Session II could only be attributed to the special experimental conditions. Session II was such as to disrupt performance and to threaten self-esteem.

2. "Disruption of the performance" was found to be significantly greater in the later part of Session II than in the earlier, after failures had piled up, suggesting that there is a point beyond which the subject no longer counteracts the effects of failure.

3. No difference in productivity in the interpolated task (drawing moon faces) was found between Session II and Session I for the experimental subjects.

4. The experimental subjects showed poorer recall for

sentences in Session II than in Session I.

5. However, in contrast to results obtained by other investigators, Alper reports that "differences in selective recall within a given session were found not to be statistically significant" (3, p. 413). According to Alper this finding supports the basic hypothesis of this experiment: "In a given sample of S's, unselected for personality factors, there will be no statistically significant difference between the incidental recall of completed and incompleted tasks if, experimentally, there is an equal number of completed and incompleted tasks to be recalled" (3, p. 413).

In order to explain the results Alper presents two different lines of argument. "First, it is conceivable that the experimental procedures may not have created the particular psychological atmosphere intended by the experimenter" (3, p. 414). This point is considered very important by the author. There are very important individual differences in regard to situations leading to a threat to self-esteem. Given constant conditions these will be taken differently by different subjects, depending on their ego strength. Therefore one cannot expect clear-cut group results. The second argument concerns the fact that neither the experimental conditions nor the tasks in this experiment are completely comparable to those used in previous experiments. Alper points out that the tasks used by Zeigarnik are child-

ish; being childish, the incompletion would not mean a threat to the self-esteem. Under Zeigarnik's conditions, then, "so long as there is an absence of hedonic tone in the situation, and an absence of personal reference with regard to the obtained results, Zeigarnik's theory could hold and more incompleted than completed tasks would be recalled" (3, p. 415).

The performance of each subject of the experimental group was related to the personality data obtained through an intensive study made with test and interview procedures. This correlation had the purpose of testing two hypotheses: (1) "Under conditions where equal numbers of completed and incompleted tasks are to be recalled, Ss who recall a preponderance of completed tasks will exhibit consistent differences in personality from Ss who recall a preponderance of incompleted tasks. (2) The direction of selective recall of a given S differs in a non-self-esteem involving laboratory situation and in a laboratory situation where self-esteem is objectively threatened in a manner which is consistent with the self-esteem needs of that S" (4, pp. 104-105).

Both hypotheses were believed by Alper to be confirmed. The comparison revealed that the recall of uncompleted tasks and the recall of completed tasks by a given subject in a context of personal failure are dynamically dif-

ferent from the recall of completed and uncompleted tasks in an impersonal context. What determines the context, says Alper, is not the experimental situation but the personality structure of the subject. Two patterns of selective recall were isolated by the author according to personality characteristics of the subject; "The recall of incompleted tasks when self-esteem is objectively threatened is a pattern characteristic of the Strong Ego who needs to protect his self-esteem only when it is objectively threatened. The recall of completed tasks in an objective non-self-esteem-involving situation and of incompleted tasks when self-esteem is objectively threatened is characteristic of the Weak Ego who can protect his self-esteem only when the threat is not objectively present" (4, p. 135).

Alper concluded that the non-significant difference found in the recall of completed and incompleted tasks is explained by the dynamic relations that seem to exist between the recall of completed and incompleted tasks and the personality, and, in particular, the frustration-tolerance of the subject.

Such results, however, cannot be taken as conclusive. Alper's experiment can be criticized for the very small group of subjects used. There is also considerable doubt, as mentioned above, about whether Alper's completed tasks were really complete.

It should be pointed out that: "1. She did obtain selective recall, though not of the nature to be predicted from current theories; 2. Other investigators who likewise did not select their subjects for personality factors, obtained selective recall, though not always of the same sort as in Alper's results; 3. Only a minority of Alper's subjects show the recall pattern she considered characteristic of Weak Egos and Strong Egos. Individual differences are apparently more complex than here envisaged."[1]

4. Glixman's Experiments:

Glixman's experiment aimed at determining the effects of increasing threat to self-esteem on the recall of completed and uncompleted activities. Through this experiment he hoped to determine the factors which influence selective forgetting.

In order to investigate the recall of completed and incompleted activities in neutral and stress situations, two equivalent forms of 20 pencil-and-paper tests (for instance, Word Construction, Maze, Opposites, etc.) were given to 120 college students. These tasks were presented to the students in three situations, presumably varying in the degree of threat to self-esteem. Situation I was intended to be "neutral". The whole emphasis was placed upon the subjects' per-

1. Personal communication from Dr. M. Henle.

formance. This situation was considered less stressful than the others, though not wholly lacking in stress. It was considered by Glixman to be impossible to have subjects not ego-involved in the neutral competitive atmosphere of the classroom. Situation II was more formal, in that the subjects were led to believe that their performance on the tasks would be used as basis for evaluating their ability. The subjects were indirectly told that not to finish a task meant failure. The tasks were presented as tests to be used for future selection of candidates for the university. Thus emphasis was put upon the subjects' performance. In situation III, the emphasis upon the good performance was further stressed in such a way that the potential threat to self-esteem would increase. The subjects were told that their performance in the test would be used as an indication of their success in school. The procedure was more complicated than we have described it, due largely to the inclusion of a test for resumption, but since the results of this procedure are not discussed, all reference to it will be omitted here.

Analysis of covariance revealed that with increasing stress there is a decrease in the recall of incompleted tasks but "that increased stress does not affect significantly the recall of completed activities" (12, p. 290).

In order to compare these results with those obtained by previous investigators, Glixman re-analyzes their data

which were presented in terms of recall-ratio or recall-difference-scores. He objects that these scores do not give a clear picture of the results; rather, they "often obscure the trends of the component scores" (12, p. 292). For Glixman the important thing is to know what happens to the two kinds of items in recall.

This comparison showed two things: (1) That the significant decrease of the recall of incompleted activities as stress increases noted in Glixman's experiments is not confirmed by Rosenzweig's results. In Alper's findings, however, there is a near-significant decrease in the recall of incompleted activities with increasing stress; (2) Alper's finding of a significant decrease in the recall of completed activities as stress increases is completely atypical.

These discrepancies among the results of the three investigators, says Glixman, can only be reconciled by assuming: (1) that in Alper's experiment the completed tasks were not psychologically completed, that they did not bring about feelings of completion for the subjects. This is likely since all tasks were known to possess more than one solution. (2) That there is a difference in the degree of stress produced in the three different experiments. In Glixman's experiment, as in Alper's, the stress situation was more threatening than in Rosenzweig's. If the latter falls below a certain as yet unspecified critical point, this could ex-

plain why Rosenzweig found an increase of recall of the completed activities but no significant change in the recall of the incompleted activities. (3) That "increased recall of completed activities is a more superficial defense mechanism than is decreased recall of incompleted activities, and as stress is increased beyond a critical point the increase in recall will disappear" (12, p. 293).

According to Glixman, from this reasoning two hypotheses consistent with all available data would follow: "As threat to self-esteem is increased, two tendencies may be observed: (1) as stress is increased to a critical point, there will be an increase in the recall of completed tasks; beyond that point the increase will disappear and there may be a decrease in the recall of completed tasks; (2) somewhere above the point in the stress-scala where the increase in completed tasks starts, increased stress will result in a decreasing recall of incompleted activities" (12, p. 239).

We agree entirely with Glixman when he says that it is more fruitful "to maintain the distinction between the forgetting produced in this experiment and 'repression' as defined by clinicians. Whether the same set of dynamics is involved in the two processes is an empirical question" (12, p. 294).

We may now consider the implications of the results

and theories reported in this chapter for the general theory of task interruption.

In general, the interpretation of the experiments just reported is that under conditions where self-esteem is objectively threatened the ego defends itself by recalling its successes; under objectively non-self-esteem involving conditions or in a child too immature intellectually or chronologically to experience failure on a laboratory task the ego requires no defense and task-tensions alone prevail. In such cases interrupted rather than completed tasks are better recalled.

The explanation in terms of the mechanism of repression of the RU/RC ratio smaller than 1 under ego-threatening conditions, proposed particularly by Rosenzweig, appears not to be acceptable. "Such an explanation seems hardly justified in view of the facts that: (1) None of the experiments under consideration--those of Rosenzweig, of Glixman and of Alper--obtained a RU/RC ratio substantially greater than 1 even under non-stress conditions; the failure to obtain such a quotient under stress conditions may therefore have occurred for precisely the same (unknown) reasons that produced it under the non-stress conditions. (2) None of these authors has thought out a sensible experimental criterion of repression in relation to our clinical knowledge of this mechanism. (3) The results of the three investigators differ, so they

cannot all be attributed to repression in any case."[1]

However, it should be emphasized that these experiments represent a contribution to the problem proposed by Zeigarnik in that they indicate that the attitude of the subject toward the work in which he is engaged will determine whether the Zeigarnik effect is obtained, or whether, on the contrary, completed tasks are better recalled than interrupted ones.

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1. Personal communication from Dr. M. Henle.

CHAPTER IV

SPECIAL PROBLEMS

Besides the considerable number of experiments already reported, a survey of the studies on the effect of interruption of tasks should include those other experiments which also used Zeigarnik's technique, though not concerned specifically with the problem of recall. I am referring to experiments such as those reported by Freeman, by Abel and by Postman and Solomon.

1. Freeman's Experiments:

Freeman was interested in measuring muscular tension during the solution and interruption of various tasks. This work leads the author to an interpretation different from that offered by Zeigarnik and others for the superiority of unfinished over finished tasks in recall.

Several investigators have demonstrated the existence of a relationship between mental activity and muscular tension. However, very little is known about the conditions of such relationship.

In the experiments of Freeman, therefore, several kinds of activities were used, and both naive and trained subjects were employed. The measurements of muscular tonus

were taken by patellar-tendon deformation. "The recording device was, in essential, a lever serving to depress the patellar tendon. This lever was connected with an aptical lever which magnified changes in tendon deformation approximately 500 times" (9, p. 311). The experimenter simply read off the level of muscular tension.

This method of patellar-tendon deformation requires an isometric quadriceps muscle. In this experiment a muscle of the leg was used. This, according to Freeman, introduced certain experimental restrictions such as imposing a certain immobility on the subject which could create an increased general tension; likewise there was a limitation of the tasks to those which could be performed in a sitting position.

Experiment I:

A first series of experiments was conducted with the intention of determining the tonus changes occurring during mental work preceded by periods of relaxation. The measurement of muscular tension was taken from the right quadriceps muscle.

The experiments were conducted with ten subjects and with tasks which utilized continuous unitary operations (canceling f's, writing a's, continuous addition, counting verbs and adjectives), discontinuous unitary operations (S reacted to the seen movement of a small visual object by a manual movement in the opposite direction" (9, p. 313)), and

several alternative operations (sets of calculations involving all four simple arithmetical operations).

Generalizing, the results showed that "mental work involves an initial increase in muscular tension which decreases as the performance progresses towards completion" (9, p. 332). This observation holds both for mental and mental-muscular work.

Experiment II:

In a second series of experiments, Freeman was interested in measuring the tonus change during equivalent periods of interruption and uninterrupted mental work.

Each one of the ten subjects who participated in the experiment was asked to solve two series of ten simple tasks: one was a series of purely mental tasks, the other involving movements of writing and puzzle solving. Five of the ten tasks in each series were interrupted after one minute. The interruptions were in some cases made to appear "accidental" and in some cases "deliberate". Care was taken to make both kinds of interruption appear natural to the subjects. After the interruption, an opportunity was given for the subject to resume the task.

During both phases of the experiment--before and after the interruption--muscular tonus was determined by measurement of tendon deformation. The comparison of tonus

changes occurring during equivalent periods of interrupted and completed mental work was the aim of this experiment.

The author found that "a comparison of average tonus changes for equivalent periods of interrupted and continued mental work indicates an increased spread of neural excitation when interruption is attempted" (9, p. 328).

Thus a striking difference in the direction of tonus changes corresponding to completion and interruption of the tasks was observed. In Freeman's opinion "the initial spread of excitation to centers producing tonic activity is a consequence of a 'set' which is initiated by instruction. This set is normally ended by completion of the task. The neural mechanism returns to a state of equilibrium which approximates its status quo ante. Interruption of a task introduces a complication into this normal progress towards equilibrium. The accompanying increase in muscular tension cannot be dismissed solely as the result of spread from a new excitation. Instead there is evidence of a reciprocal effect, the tonic activity apparently reinforcing the neural action involved in the task-set" (9, p. 329).

The results also revealed that resumption of the task is usually followed by a decrease in tonus.

The amount of change in tonus varied from task to task and from subject to subject. Other factors such as the nature of the interruption, and the motivation of the subject

played a role in this variation, influencing the amount of increase or decrease of muscular tension.

In discussing his results, Freeman criticizes the Lewinian explanation of the difference between completed and incompleted activities in recall. Two major objections to Lewin's explanation are made by Freeman:

1. The Lewinian theory is opposed to neural tradition. According to Freeman, Lewin's concept of "psychic tension" can only be understood "in terms of hypothetical energy-transformations" (9, p. 329). This concept seems to fit best the idea of some special form of "mental" energy. However, if this concept is combined with the psycho-physical parallelism postulated by the Gestalt hypothesis of isomorphism, Lewin would have to assume that his tensions are correlated with nervous stresses. He would seem to be committed to a quantum theory of nervous energy, one of the more controversial points in the literature of this field. In line with this theory, in order to explain "how the kinetic energy of a tension-producing present behavior may, upon interruption of that behavior, become potential," it should be admitted that "the energy equivalent of a 'psychic-tension' must be capable of being stored as a specifically directed quantum to be released at a later time" (9, p. 330). Psychological and psychophysiological investigations do not support the hypothesis of energy transformation.

2. In order to avoid these difficulties Freeman derives a simpler explanation for the interruption and resumption of tasks in terms of neuro-muscular research. The results of Freeman's experiment are in agreement with those of Lewin. Freeman observed that "initiation of a task does set up an organic disturbance which is normally equilibrated by completion. Tasks once initiated tend to be continued in spite of interruption. The experimental facts indicate that these interrupted task-sets never completely lose their directive influence on the behavior" (9, p. 330). The author believes that in the explanation of these facts he is in a better experimental position than Lewin because he measured the neuro-muscular effects of interruption. To explain the change in tonus following the interruption of mental work, we must assure, according to him, that "when the organism is under the dominance of a particular task-set, distracting stimuli may facilitate as well as inhibit the objective performance" (9, p. 330).

The resumption of the tasks, in line with the results of the experiment, could thus be explained by <u>reinforcement</u> of the task-set "either derived from or expressed by the tonic activity of the bodily musculature," (9, p. 330) and/or by the reciprocal <u>inhibition</u> of irrelevant responses. And, "instead of assuming the directive influence of a blocked 'psychic tension', we find a neural analogy of task resumption

in the competition of rival impulses for a final common path... In "this competition the pattern connected with task solution has this great advantage over all others conditioned by rival stimuli; ..." (9, pp. 330-331). Being the dominant response pattern, it tends to be reinforced through the action of other centers.

Therefore, according to this explanation, neural competition, reinforcement and inhibition would explain the resumption of interrupted work. In Freeman's opinion, this explanation would be simpler than that presented by Lewin and more adequate because it employs well-known physiological principles. "Although they were discovered in the reflexes, there is no a priori reason why they cannot be applied to the dynamics of mental work" (9, p. 332).

Neither Freeman's experiment nor the explanation that he offers of the results gives any explanation of the relationship between mental work and muscular tension. In the opinion of the present writer we are not ready for a physiological theory of these phenomena.

2. Abel's Experiment:

A second experiment focusing upon certain physiological aspects of the problem of the recall of finished and unfinished activities was performed by Abel. Specifically, the relation between recall and neuro-circulatory efficiency

was investigated.

In order to study this relationship, the recall of finished and unfinished tasks was compared with the Schneider index, a physiological measurement of neuro-circulatory efficiency. This index is computed from measurement of pulse rate and blood pressure under various conditions. "The highest index obtainable is 18. This index measures functional capacity or neuro-circulatory efficiency rather than physical fitness, as it eliminates any requirement of effort... A low score of 6 or less indicates instability in neuro-circulatory activity" (2, p. 380). Such low Schneider indices "... indicating a significant degree of functional unfitness ..." (2, p. 380) are shown by psychotic and neurotic subjects.

Comparing the results of the experiment on recall (reviewed in this paper pp. 81-87) with the Schneider indices of the subjects in question, the following results were obtained. In the group with high indices the majority of subjects showed a greater recall of incompleted than of completed tasks. In the group with medium indices, the number of subjects recalling more interrupted tasks was more or less equal to that recalling more completed tasks. In the group with low Schneider indices, the results were the reverse of those for the high group. The differences were statistically significant.

These results, according to the author, "indicate

some definite relationship between the Schneider index and the recall of interrupted and completed tasks" (2, p. 381).

Discussing the significance of the results, Abel adopts Rosenzweig's explanation of the better recall of completed than incompleted tasks by sophisticated individuals. According to him these subjects tend to repress the unfinished tasks because they appear to them as failures. Correspondingly, Abel assumes that "those subjects have low Schneider indices, as suggested by our results, and, consequently, are less easily adjusted and adaptable to situations in which they find themselves. They are less concerned with the activity of the task than with their personal achievement" (2, p. 382). The subjects who recalled unfinished tasks better and showed high Schneider indices were "not concerned primarily with success and failure, but entered wholeheartedly into the task situation" (2, p. 382).

Abel concludes that these results indicate that "apparently different tension systems released by memorial recall are related in some way to neuro-circulatory balance within the organism" (2, p. 382).

Certain difficulties exist in the interpretation of Abel's results. It is not clear that she has established the Zeigarnik effect. As we noted[1] her group as a whole did not favor the unfinished tasks in recall.

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1. Cf. supra, p. 83.

We agree heartily with Abel that "... a good deal more work needs to be done in order to understand the development of tension systems within the organism and their subsequent release by memorial recall, as well as the significance of the relationship of these tensions to neuro-circulatory balance" (1, p. 23). To this we would add--and other physiological measures.

3. Postman and Solomon's Experiments:

Postman and Soloman were particularly interested in the relation between the Zeigarnik effect and perceptual sensitivity. They set out to investigate whether the perceptual recognition of incompleted tasks is more rapid and more efficient than that of completed tasks. Their study is thus an effort to see whether the same factors operate in perception as in memory.

Two variables, (1) completion versus incompletion of tasks, and (2) recency of perception, were investigated to determine their effect upon perceptual sensitivity. In the present report, we shall be concerned mainly with the former.

The experiment was conducted with 18 students as a part of the required laboratory work. A series of ten seven-letter anagrams was used as tasks. These tasks were equated for difficulty and the anagrams were selected on the basis of the time required to solve them.

The experiment has two parts: 1. The performance of a series of tasks, and 2. The determination of recognition thresholds for the stimuli representing these tasks.

The subjects were asked to work on a test in problem solving which consisted in forming a meaningful English word from the scrambled letters. As the experiment was carried out in a group, the interruption was effected when half of the subjects, by raising their hands, had indicated that they solved the given anagram.

After the interruption the experimenter announced the correct response. The subjects were asked to encircle the answer if correct and write down the correct answer in case of failure. This was done "in order to equalize the recency of exposure of all the words" (25, p. 351).

This procedure introduces a modification of the Zeigarnik technique. The interrupted tasks cannot actually be considered incompleted. Nevertheless, they remain incompleted by the subject, and thus viewed as failure.

The procedure of asking subjects to raise their hands when they had finished a problem was introduced with the purpose of creating a competitive atmosphere where incompletion would be viewed as a failure. The group procedure, however, made impossible a specific control of individual interruption. In the way the experiment was set up, any given task was completed in 50 per cent of the cases and remained in-

complete in the 50 per cent of the cases.

After an interval of ten minutes, the second part of the experiment began.

In order to determine the recognition threshold for task words and control words, a new series was constructed consisting of the ten words used in the first part of the experiment and ten new control words of equal difficulty. These words were projected on a screen one by one, at different exposure speeds. Twenty-one exposures of each word were given. This part of the experiment was also conducted as a group experiment and the subjects were asked to write down everything they saw or thought they saw. The recognition threshold was measured by the number of times the stimulus word had to be presented before it was correctly recognized.

The results revealed a significant difference in the recognition threshold for task words and control words. As these two sets of words were of equal length and difficulty the difference in recognition speed could only be attributed to the difference in prior experience with the two sets of words. "This significant difference in speed of recognition for task words and for control words points to recency of prior exposure to a stimulus as one determinant of perceptual sensitivity to that stimulus" (25, p. 354).

When the threshold for completed and incompleted tasks were compared, almost identical average recognition

thresholds were obtained for the two types of tasks. When, however, individual thresholds were examined, it was seen that the majority of the subjects showed a significant difference of sensitivity in favor of either one or the other type of task.

According to the authors these results are in agreement with Alper's conclusion that in an unselected group of subjects, working under stress, no average difference in recall of completed and incompleted tasks is evidenced. When the results are individually examined a significant difference tends to appear, favoring one or the other type of task.

Postman and Solomon conclude by remarking that these results constitute partial evidence for the influence of completion or incompletion of a task, i.e., success or failure, upon the subsequent perceptual sensitivity to that task. "There is every reason to suppose that, as in memory, so in perceptual recognition, the direction of the difference depends of the subject's habitual ways of 'handling' his successes and failures" (25, p. 357).

4. Martin's Experiment:

Martin undertook to investigate the problem of

reminiscence[1] in the light of Zeigarnik's findings. Criticizing the various theories of reminiscence, McGeoch had suggested that the phenomenon might be related in some way to the observations of Zeigarnik. Following this suggestion, Martin elaborated the following hypothesis: "...the appearance of reminiscent material at the time of the second recall is to be accounted for in terms of this latter tension reinforced by the persisting stress resulting from the incompleted earlier recall" (20, p. 5).

In Lewinian theory, any incompleted task sets up a tension toward completion. The recall of all the tasks is in itself a task and is accompanied by a tension toward its completion. Thus, according to Martin, a condition of incompleted recall must exist in order that reminiscence can take place. This tension plus a tension set up by the request for a second recall would explain the reminiscence.

In line with the same hypothesis, it should be expected that "the available reminiscent material having the greatest stress at the time of the second recall should show the greatest reminiscence, since its stress will give relatively greater strength to the tension set up by the second recall" (20, p. 5).

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1. Reminiscence is defined by McGeoch as "the improvement in recall of incompletely learned material after an interval of time without intervenient formal learning or review" (20, p. 1).

An experiment utilizing the Zeigarnik technique was devised to test these hypotheses.

Two hundred young men (ranging in age from 18 to 19 years) attending an industrial school for delinquents served as subjects. These subjects were selected at random from the school population, the intelligence quotient of which was 80 or above.

The experiment was introduced as part of the regular school routine. Each subject was given twenty tasks to perform. An effort was made to select tasks which would be neither too easy nor too difficult for the subjects. The tasks were ones that could not be completed mentally. Furthermore, they were quite heterogeneous; items such as the following were used: write the names of ten different trees, crayon a picture, solve a puzzle, draw from a model. It was impossible to complete any single task in less than one minute, seldom was more than five minutes required for any individual task.

Ten tasks were interrupted before completion, while the subject was permitted to finish the other ten. The tasks were interrupted when the experimenter noted that the subject was close to the solution, and that he was showing considerable interest in the task. The order of C and I tasks was reversed for alternate subjects.

After the last task and before the first test of

recall, the experimenter asked a number of routine questions about the institution for two or three minutes.

The tasks recalled were noted by the experimenter. The subject was allowed to take as much time as he wanted in this part of the experiment. This first session of the experiment ended with a conversation similar to conversations that the subjects were accustomed to have with social workers or institution officials.

At this point of the experiment the subjects were divided arbitrarily into four groups. Group I to Group IV were given the second recall after intervals of two minutes, two days, one week, and two weeks respectively.

In the second experimental session each subject was asked to recall the names of the tasks that he had performed. The subjects of Group I were told that by accident the results had been misplaced and that a new recall was necessary. In the case of the other groups, the experimenter pretended that he had forgotten that particular test the subjects had performed and asked for their help in a new recall.

The results of the first recall confirm Zeigarnik's findings. They showed a superiority of the I (incomplete) tasks over the C (complete) tasks at the time of the immediate recall. The I/C ratio for the total group was 1.61. Differences in the I/C ratios of the various groups were

not significant.

The recall of the second recall are presented only in so far as they relate to reminiscence. Thus, only the tasks not available in the first recall will be discussed. An extensive statistical treatment of the data obtained from the second recall revealed that "The I reminiscent tasks show a gradual decrease in appearance from the two minute recall to the two week recall, while the C reminiscent tasks show a sharp increase in appearance at the two day recall followed by a gradual but less rapid decline than that observed for the I tasks at the one week and two week recall" (20, p. 26).

The results of this experiment, as was mentioned, confirmed the results obtained by Zeigarnik. According to Zeigarnik's findings the better recall of the I tasks is the result of two factors deriving from the two tensions: one directed toward the recall of all tasks and the other toward the completion of the unfinished tasks themselves. The short lapse of time between the recall tests with the subjects of Group I was not sufficient to dissipate these two tensions. Therefore, these existing tensions plus a new tension, derived from the need to complete the second recall, would explain why both I and C tasks appear in reminiscence with this group of subjects. It also would explain why the I tasks favored by the persisting stress re-

sulting from task incompletion would show stronger reminiscence, while for the C tasks there was only the stress of imcomplete immediate recall.

When the interval between the two recall tests is increased, distracting experiences of everyday life dissipate the tensions set up in the first part of the experiment. This explanation is also in agreement with that of Zeigarnik in connection with the influence of time span upon the recall of I tasks. It was shown by Zeigarnik that I tasks lose their preferential position in memory with the passage of time. She had concluded that the tensions become weakened and lose their effectiveness for recall over a lapse of time due to intervening significant events during this interval. This dissipation of tension would also account for the decrease of the reminiscent tasks.

In order to explain the increase of the C reminiscent tasks, Martin refers to the Gestalt theory of memory. According to Koffka, with the passing of time the relative advantage of the C tasks in recall is enhanced due to their more stable organization resulting from their completion. "The marked increase in the appearance of reminiscent C items at the two day recall is what is to be expected in consideration of the Gestalt theory underlying the relationship of process and trace as developed by Koffka" (20, p. 29).

In line with this theory, the trace of the C items of this experiment are assumed to possess better organization by virtue of being complete. This organization plus the changes that the memory trace undergoes with the passage of time would explain not only the increase of C reminiscent tasks at the two day recall, but also the decrease after that period of time. It may be supposed that the memory trace tends to change in the direction of greater stability with the passage of time, thereafter beginning to disintegrate. This fact, plus the effect of distracting experiences in the time interval, accounts for the results with Group II, III, and IV.

"The results of this experiment support the hypothesis that the tension of the second recall, reinforced by the persisting stress of the first recall, accounts for the appearance of reminiscent material" (20, p. 32).

CHAPTER V

THE RESUMPTION OF INTERRUPTED TASKS

In addition to the study of the recall of unfinished activities, the investigation of need tension has proceeded by the study of the resumption of interrupted tasks. While this literature is not the concern of the present paper, a few of the directions of research will be indicated because of the interesting similarities and differences between this problem and that of the recall of interrupted tasks.

Ovsiankina, likewise a student of Lewin's, set out to study the effects of persisting need tension through the resumption of unfinished activities (22).

The technique of the experiments was similar to that of Zeigarnik. Subjects were asked to perform specific tasks. Some of these tasks were interrupted before completion. Finally, a free period was introduced during which the subject could resume the interrupted task or not, as he chose.

Ovsiankina used subjects, of whom 108 were adults and 16 children from 13 to 16 years of age. Twelve tasks, very different from one another, were employed. The interruptions were in some cases made to appear accidental (for instance, the experimenter dropped a box containing many

small objects and the subject was asked to help pick them up); in the other cases the work was interrupted by the presentation of a second task. The kind of interruption changed in an irregular order; different kinds of interruption were used for the same tasks with different subjects.

Ovsiankina found resumption of the unfinished task in 100 per cent of the cases where the interruption appeared to be accidental, and in 79 per cent of the cases for deliberate interruption. The longer the duration of the interruption, the less frequent the resumption, although in some cases resumption occurred even after very considerable intervals.

In subsequent experiments Ovsiankina determined some of the factors which influence the frequency of resumption. (1) The structure of the specific task. As in Zeigarnik's work it was found useful to distinguish "continuous" tasks from "end" tasks. End tasks were resumed in 70 per cent of the cases, while the continuous tasks were resumed in only 46 per cent. (2) The time of interruption. It was discovered that the greatest number of resumption occurred when the interruption was made shortly before completion of the task, fewer when the subject was interrupted before he had become much involved in the work. (3) The subjective attitude of the subject toward the task. Ovsiankina found that resumption occurred most frequently (a) when the subject

was interested in the task; (b) when the subject had a special aptitude for the particular task; (c) when the subject was highly ambitious. It should be mentioned, however, that ambitious subjects who fear failure may show less frequent resumption. Such subjects resume those tasks which promise success and avoid those which promise failure.

These factors found by Ovsiankina to influence the frequency of resumption of interrupted tasks are the same ones which Zeigarnik and other investigators have found to influence the recall of interrupted tasks. Therefore, the two effects have been pretty generally regarded as expressions of the same underlying condition, a system in state of tension.

On the other hand, referring to this relation between the force which produces resumption and the force which produces recall implied in the writings of Lewin and his students, Prentice made the following remark: "One difficulty concerns the relation between resumption and recall, for some evidence points to the conclusion that they may be expressions of different psychological forces" (26, p. 329).

For example, the influence of lapse of time seems to work differently in recall and in resumption. Resumption may occur even after rather long intervals while the same is not true in regard to the superiority of recall of interrupted tasks. The effect of ego-involvement also appears

to be in the two different cases. A certain degree of ego-involvement appears to be assumed for resumption to take place. By the contrast, the superiority of interrupted over completed tasks in recall is assumed to disappear under conditions of ego-involvement (e.g., Lewis's experiment).

Another interesting problem in this connection is to see how success and failure influence recall on the one hand and resumption on the other. Ovsiankina reported that ambitious subjects will resume those tasks which promised success and avoid those which promised failure. We agree fully with Prentice when he says that "If this is true, the expectation of success or failure is an important variable in the resumption situation and the determinants of such expectancy will need thorough understanding before we can make successful predictions about the outcome of experiments involving interruption" (26, p. 330).

An experiment by Rosenzweig presented one of the first contradictory results in this area. The same group of subjects used in experiments on the recall of interrupted tasks[1] were tested for resumption. According to the Lewinian theory a subject who has a strong tension system resulting from the interruption of a task may be expected to show two correlated effects: a tendency to resume the task and to re-

1. Cf. supra, p. 89.

call it.

In Rosenzweig's results this correspondence was not found. Children who preferred to resume interrupted jigsaw puzzles rather than completed ones tended to recall the completed ones better than the interrupted ones, and vice versa.

One explanation of these results is offered by Rosenzweig in terms of the two variables introduced in this experiment: success and failure. According to Rosenzweig's interpretation, "any threats to the subject's view of himself as a successful individual will produce a tendency to forget those threats, but also to overcome them. The mature subject, or the subject who has sufficient pride will be more sensitive to such threats" (26, p. 331). Such an explanation was criticized by Sanford. In his opinion, "reacting to one's failures by forgetting all about them does not seem to be a very mature response, any more than does letting a drive for social status get one into such a state that he has no recourse but to distort reality" (32, p. 327). Sanford adds: "If those who resume are those who repress, then repression must also increase with age..." (32, p. 238). But, if 'repression' of failures increases with age, we should expect adults to show a significant preferences for successes in recall. This has not been found in repetitions of Rosenzweig's experiments. The fact that 'repression' of failure does not increase with age is used by Sanford "to call into

question Rosenzweig's assumption of an inverse relationship between resumption and recall" (32, p. 238).

The problem of the influence of success and failure upon resumption was mentioned in investigations carried on by Henle (14) and by Winter (34). The former investigator found that the frequency of resumption of interrupted tasks is increased after success as compared with neutral conditions; the latter found that failure reduces the incidence of resumption.

However, recent researches have not solved the fundamental problem of the influence of success and failure on resumption in relation to the influence of the same variables on recall of interrupted tasks.

The work of Ovsiankina had shown that if an activity is interrupted there is a strong tendency to resume it as a result of the tension system which corresponds to the quasi-need of completing the task. Lissner, Mahler, Henle, and others later showed that when the interrupted task is followed by a second similar task, completion of the second task may resolve the residual tension. Thus, if the tension is released, there is no longer a need to resume the unfinished task; the second task is said to have substitute value for the first. The phenomenon of substitution has also been investigated by means of Zeigarnik's technique in unpublished experiments by Henle. The technique is a cumbersome one and

the results not very striking, but they suggested that substitution might be demonstrated in recall.

In summary, while the resumption of unfinished tasks suggests certain interesting parallels to the recall of interrupted activities, certain differences are also indicated. Before any conclusions can be drawn as to whether the two phenomena are expressions of the same underlying conditions, more systematic investigation of this problem is needed.

CHAPTER VI

CONCLUDING REMARKS

If the scientific value of an experiment could be deduced from the number of investigations that it inspired we would have to conclude that Zeigarnik's experiment is one of the most important in present psychological literature.

However, in spite of the numerous investigations that followed Zeigarnik's experiments, the problems posed by them have by no means all been solved. The several attempts to challenge or to confirm as well those directed to more detailed analysis of the results obtained by Zeigarnik do not give a clear-cut explanation of the selective recall of completed and interrupted activities.

Zeigarnik's initial generalization that interrupted tasks are retained better than completed tasks has been modified by later investigators. It is now clear that much depends on how the subject interprets the facts of completion or interruption. Therefore, the tendency to prefer interrupted or completed activities in recall depends on the particular attitude of the individual, as related to his personality characteristics, and not to the interruption

itself. In other words, it is not so much completion or incompletion per se that makes for the difference in retention; rather it is the subject's view of the completion or incompletion of his task which determines significant differences in retention. For instance, Rosenzweig and others have shown that the introduction of success and failure into the interruption experiment produces quite different and rather complicated results.

The results of the reported investigations definitely suggest that two points are to be taken into consideration in future investigations. On the one hand, we have the question of the establishment of a tension system as a necessary condition for its maintenance. On the other hand, we have to consider what factors might interfere with the maintenance of the tension system, once it has been established.

We are left with the question: What are the essential conditions of the Zeigarnik effect? In the investigations reported many variables were mentioned as influencing this effect. But it seems to us that the simple enumeration of these variables will not lead to a full understanding of the problem until sufficiently and sensible relations between the experimental variables have been established.

In this regard we think that before any effort is made to reconcile the contradictory results obtained by the several investigators of this problem, a more careful and

comprehensive check of their general validity should be made. We know that such a task is not an easy one, in view of the lack of procedural details about the original experiments, but it seems a possible way to reduce and perhaps solve many problems posed by a comparison between the results of Zeigarnik and those of her critics.

However, this is only one part of the problem. Another part is the more general question of the theoretical basis of Zeigarnik's research. The confusions and contradiction that have arisen since Zeigarnik's original contribution seem to have diverted attention from its former meaning. These subsequent investigations in general have not been concerned with the concept of tension systems as related to the significant problem of quasi and real needs.

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