A STUDY OF GESTALT PROBLEMS IN COMPLETED AND INTERRUPTED TASKS.

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PART I.

I. The topic for discussion.

Professor Kurt Lewin (1) has recently maintained that the non-completion of a task facilitates its retention and subsequent recall approximately twice as strongly as does its completion. In this paper, Lewin's tests and procedure will be described, and comments will be made upon some of the problems which are involved in their use.

II. The U–C test.

(1) *Description of test.*

Lewin employed a particular technique involving what may be called U–C tests. A U–C test consists of a list of, say, twenty-two tasks, each task being self-contained. Half the tasks, *in random order*, are allowed to be completed and the remainder are interrupted before completion. The test has usually been applied individually, the subject of the experiment being unaware either that retention is being tested or that some items will be completed and others will be interrupted.

Table I ((1), p. 7). *A sample U–C test.*

(The tasks marked * are 'uncompleted'; the rest are 'completed.')

*1. Monograms	12. Counting backwards
2. Pentagram	*13. Drawing a vase
*3. Thread winding	14. Flag at angles
4. Beads	15. Honeycomb pattern
5. Poem	*16. Multiplication
*6. Spiral	*17. Making a chair
*7. Paper-folding	18. Straightening wire
8. Crosses in ellipse	19. Pattern of a carpet
9. Matches	*20. Crotchet
*10. Making a box	21. Riddles
*11. Making quadrilateral figures out of triangles	*22. Printing

A sample U–C test is given in Table I. In task 1, for example, the subject of the experiment is required to make a monogram of the initials of his, or her, own name; in task 2, a drawing of a pentagram is shown, and the subject is required to make a similar figure out of a strip of foil; in task 3, the subject is required to wind a thread in a particular way from a reel on to a hook.

The items marked * in Table I are stopped by the experimenter before completion; the others are allowed to be *completed.* (In a second form of the test the 'completed' and 'uncompleted' items may be interchanged[1].) The instructions given to the subject are briefly: "You are going to have a number of tasks given you. Do them as quickly and as well as possible." The tasks are applied in the order given. The subject and the experimenter sit at a table, the task material being out of view. All material is put out of sight in a way that does not attract the attention of the subject, on the pretext that otherwise the table "would get too untidy."

After the last task the experimenter says, "Now tell me what tasks you have done during the experiment, not necessarily in the order in which they were given to you, but just as they come to your mind. You need not mention the details of each task; just give its short name." The experimenter then records the tasks recalled *in order of recall.*

[1] Used especially by us in order to emphasize the unfinished state of activity.

It is found that, on the average, individuals recall more 'Uncompleted' tasks (U-items) than 'Completed' ones (C-items). Thus, with the test given in Table I, Lewin individually tested thirty-two subjects (students, teachers and children) and nearly twice as many U's were recalled as C's—the actual proportion being 1·9 to 1.

To express this result in a quantitative form, and to eliminate as far as possible individual differences in memory abilities, Lewin adopted the device of reporting each individual score as:

$$\text{Score} = \frac{\text{Number of U-items recalled}}{\text{Number of C-items recalled}}$$

Whether this did in fact 'cancel out' the influence of 'memory ability' was not tested: we see at once, then, the need for a study in which the facts for the U–C tests are compared with those for the more formal 'memory' tests of the kind hitherto used in experimental psychology by such workers as Kelley (2).

Lewin and Zeigarnik ((1), p. 14) also devised U–C tests for group testing. Most of the tasks set were of a verbal nature. As the testees worked at varying speeds, it was found impossible to introduce the interruption in such a way that all individuals were stopped at the same stage in the performance of any U-task. Zeigarnik, therefore, introduced the interruption when about half the testees had finished a particular task. Recall was required as in the individual testing. With populations of forty-seven adults and forty-six children, Zeigarnik found that the average scores for recall were 1·9 and 2·1 respectively for the ratio U/C. The conclusion was drawn that U/C decreased to some extent with age; but the significance of the difference between 1·9 and 2·1 was not given.

The U–C effect then (the preponderance in recall of U items over C items) has been demonstrated for individual and group testing for a wide assortment of tasks, manual, verbal and non-verbal. There is room, however, for improvement in the technique of group testing.

(2) *Reversibility of the tasks.*

But perhaps the differences in recall are determined by the nature of the tasks. That is, in the test given in Table I, if the items which were uncompleted are now made the completed items, and *vice versa*, the interchange might radically alter the proportion of uncompleted and completed items recalled.

A check on this may be made by repeating the test in Table I on a further thirty-two subjects, now using the items marked * as C-items

and the others as U-items. This was done by Lewin ((1), p. 8) and the same proportions of U's and C's were recalled. Thus it appears that uncompleted tasks are retained on the average twice as well as the completed tasks, independent of any consideration of the nature of the tasks.

(3) *The order of recall.*

U-tasks also are, on the average, recalled first. This makes necessary a method of differential scoring. For instance the score U/C arrived at as above would be 1·0 in the case of an individual who recalled all the U- and C-items. He may, however (and generally would), tend to recall U-items before C-items. Thus it may be expedient to allot, say, four marks for each of the first three items recalled, three marks for each of the second three, two marks for each of the next three and one mark for each of the remaining tasks recalled. Such a method of scoring would allow for the influence under discussion.

Again, after proceeding fairly fluently (more U-tasks being recalled than C-tasks), there occurs hesitation while the subject tries to recall further tasks. Thus, Table II gives a specimen of an individual's recall for the test in Table I:

Table II.

	Order of recall	No. of task in Table I	U or C	score
Before hesitation	1	3	U	4
	2	10	U	4
	3	17	U	4
	4	21	C	3
	5	20	U	3
	6	18	C	3
After hesitation	7	9	C	2
	8	13	U	2

The individual recalls six items (1–6) fairly quickly; and then, after the sixth, hesitates for a considerable time whilst he tries to recall more items. Finally two more items are recalled (7 and 8).

With some subjects, a complete deadlock appears to ensue at the stage of 'hesitation'; they seem to take no further trouble to recall more items. The majority, however, appear to try hard to recall more; they assume a definite attitude towards the recall, as though it were a trial of their 'memory.'

Two scoring procedures are now open to us: (*a*) either we may only score for the items recalled *before* hesitation; or (*b*) for all the items

recalled. In both cases, the differential scoring could be used. Thus, the score for the individual whose recall is given in Table II could be:

$$(a)\quad \frac{\Sigma_{1}^{6}U}{\Sigma_{1}^{6}C} = \frac{15}{6}$$

or

$$(b)\quad \frac{\Sigma_{1}^{8}U}{\Sigma_{1}^{8}C} = \frac{17}{8}.$$

Lewin and Zeigarnik have used both methods at various times. But before this ratio method of scoring is adopted it is desirable first to find whether it does what it purports to do, *i.e.* 'cancels out memory.'

(4) *The influence of repeated testing.*

The nature of a U–C test is radically altered if the same individuals are tested *twice*. For obviously they know, at the second testing, that recall is likely to be asked for. The facts are, that the ratio $\frac{\Sigma U}{\Sigma C}$ is greatly diminished in any test after the first. The subjective goal of the test appears to shift from the tasks themselves to the 'memorizing' of them, thus making the test an ordinary 'memory' test. Only one U–C test, in general, can therefore be applied to any one group of subjects, a consideration which greatly restricts the possibilities of making a thorough factor study of the whole U–C effect.

III. EXPERIMENTAL CONTROLS OF THE U–C EFFECT.

An attempt will now be made to review critically the work that has already been done on the U–C effect. It will appear that experimental controls not hitherto employed by Lewin and his associates are urgently needed.

(1) *Type of material.*

It is claimed that the type of material used plays no special rôle in the U–C effect. The tasks in the individual tests given in Table I consist of manipulative, verbal, and non-verbal activities, and the U–C effect is the same whichever tasks are U's and whichever are C's. There are, of course, small preferential recalls for certain items due to associative

influences and the like, but for the most part the U–C effect is claimed to be independent of the material, if a crude uniformity of time is observed in task duration. When the type of material used remains constant (as in the case when all tasks are verbal) an undiminished U–C effect is obtained. Hence it may be inferred that the phenomenon is independent of the type of activities used in the test.

For group tests the tasks must be restricted to those of a verbal, or certainly to those of a pencil and paper, kind. In spite of experimental results obtained so far it seems highly desirable to ascertain directly whether manipulative tasks are better recalled than verbal or non-verbal tasks: the work of Stenquist (3), McFarlane (4) and others has shown that interest in practical activities facilitates recall.

(2) *Influence of attention.*

It may be asked if the better retention of an uncompleted task is due to the longer period of attention given to it in comparison with that given to a completed task. The definite preponderance in recall of the uncompleted tasks is the more remarkable since, as Lewin points out, the completed tasks must have had the advantage in so far as the subject is on the average occupied with them longer.

But no crucial test has been made of the dependency of the U–C effect upon duration of task. Tasks could be devised requiring only a few seconds for completion; others, obviously, could take a lifetime, or experimentally, say, 5–10 min. each. Is the U–C effect dependent on this duration of the task? If it is, then some uniformity in time must be maintained in the performance of tasks in U–C tests. We shall consider this matter further at a later stage.

(3) *Shock effect.*

Another possibility is that U-tasks, in view of the fact that they are interrupted, may have a greater memory weight because of an *emotional emphasis* or an *increased impression*, due to the act of *interruption*. U-tasks may suffer a 'shock effect,' and may therefore be facilitated in recall.

In order to answer the question whether the emotional emphasis, or any other emphasis directly connected with the act of interruption, accounts for the preferential treatment of uncompleted tasks, Zeigarnik (1), pp. 22–3) constructed tests in such a way that the completed tasks, too, were emphasized. Such tasks may be called (U + C) tasks. The emphasis was achieved by interrupting for the time being a number of

tasks, and then during the testing time, before recall, having them completed. The experimenter pretended, on stopping a U-task, to look for the material he required for the next task, and being unable to find it, he closed the interval with the remark "In the meantime complete your task." The pretext applied was varied so much that it appeared quite natural to the subject. The *affect* of the act of interruption in the (U + C) tasks and in those simply interrupted (U) was the same for the subject because he could not foresee whether the uncompleted task would be completed or not. The resumption of a (U + C) task, often unexpected, might in itself increase the emphasis and, since it occurred a second time within the test period, should give it a higher repetition value (5).

Results proved that the tasks interrupted at first and completed later (U + C) are not better, but *worse* recalled than the uncompleted tasks. The (U + C) tasks react on recall, on the whole, just as do those which are completed at once without interruption (C-tasks). The average, from testing twelve subjects, of $\frac{\Sigma U}{\Sigma (U + C)} = 1{\cdot}85$, which coincides well with the average of $\frac{\Sigma U}{\Sigma C}$ in earlier arrangements $\left(\frac{\Sigma U}{\Sigma C} = 1{\cdot}9\right)$. Although the number of subjects is rather small, only one out of twelve had $\frac{\Sigma U}{\Sigma C} < 1$. The preference in memory of uncompleted to completed tasks in the principal tests is not therefore to be attributed to an emotional emphasis or any other distinction that the uncompleted tasks receive from the act of interruption.

This evidence was corroborated by another test arrangement for a group of subjects in which the tasks were divided into three groups, *a*, *b*, *c*, with six tasks in each group. The subjects were given a different test group as completed (C), uncompleted (U), and completed after interruption (U + C), so that in the end every task appeared equally often completed, uncompleted, and 'completed after interruption.' Thus any individual differences in the tasks were eliminated. The results, again, clearly showed that the (U + C) tasks were not better recalled than the completed, but that the average number of (U + C) tasks recalled was equal to the average number of (C) tasks recalled (*2·75* as compared with *2·8*) ((1), p. 25).

There would seem no need therefore for further work along lines of this kind.

(4) *Voluntary remembering.*

It may be asked whether the uncompleted tasks are remembered voluntarily. The subject might think the experimenter intended a subsequent completion of the interrupted tasks and might therefore endeavour to remember them. The *voluntary* intention of the subject to remember the interrupted task would then be the cause of its ready recall. It is well known that the wish to learn facilitates remembrance (cf. the researches of Ball[1]). Further, it might be considered that high *w* individuals, those who, according to Lankes (6), act by reason and principle, might be the most likely individuals to make a *voluntary* intention to remember the U-items. The need for a control experiment, using *w* factor estimates, is therefore apparent: the more so, when we consider that *w* has been explained by Webb (7) as 'Persistence of Motive.'

Zeigarnik ((1), p. 21) successfully demonstrated that knowledge that uncompleted tasks will be resumed by no means causes a greater effort to commit such tasks to memory. He aimed at strengthening or creating in the mind of the subject the supposition that the experimenter intended to have the task completed. The instruction to the subject, in his new test arrangement, was "Now solve this task, please (mentioning the next one), and we will conclude the interrupted task later." One would expect that the retention of the uncompleted task would be strengthened by this device. In reality, however, the results showed that there is no increase in the preferment of the interrupted tasks; the mean $\frac{\Sigma U}{\Sigma C} = 1{\cdot}7$, as compared with 1·9 in the principal test arrangement.

In another control experiment, the interruption was accompanied by the words "That is enough! You will not be required to finish this task." The subject is definitely informed, in contradistinction to the previous test arrangement, that the experimenter does not wish the task to be completed. The results, again, showed no difference in the quotient $\frac{\Sigma U}{\Sigma C}$. The mean $\frac{\Sigma U}{\Sigma C} = 1{\cdot}8$ ((1), p. 28). The *decrease* in preferment that might be expected under these circumstances did not ensue.

The superiority in recall of the uncompleted act is, therefore, not caused by any supposition on the part of the subject that the experimenter intended the completion of the act.

[1] He collected experimental evidence to show that those subjects who know, while committing matter to memory, that the probation will only take place some time after, remember what they have learnt better than those who learn it for a short time only.

(5) *Interesting and uninteresting tasks.*

It is obvious from what has been reported above (pp. 367–8) that the interest attached to a task has no very crucial influence on recall, since the U–C effect, when tasks are first given as U-items and afterwards (in another testing with different subjects) changed to C-items, and *vice versa*, remains unaltered independently of the nature of the tasks and therefore of any 'interest-determination' that they may have. The U–C influence, therefore, is broadly independent of the seemingly fundamental observations made by Bartlett (8) that memory traces are 'interest-determined, interest-carried traces.'

We observed in the course of our own experiments, that certain tasks, such as 'naming tube stations,' 'naming Xmas presents you would choose' and the like, appeared to be especially interesting to children. They attacked such tasks with great avidity and obvious delight; yet we found that these tasks (if C-items) were not recalled. One of the subjects (a young man) stated the first thing he would like to have for a Xmas present would be a wife for himself, yet he hopelessly forgot her, and consequently the item itself, for the item happened to be a C-item for him. A task 'name musical instruments' also appeared to be greatly interest-determined; yet out of twenty subjects only one was able to recall it, since it was a completed task for the group. On the other hand, almost every one in a batch of seventeen subjects recalled it when it was an interrupted (U) task.

Zeigarnik[1] has also had occasion to refer to the ineffectiveness of 'interest in the task' in determining the effect. As he puts it, "To how slight an extent the pleasantness of or interest in the task and how much on the other hand the urge for completion is the motive force, can be seen from the fact that we have never had a case where a child asked for the repetition of a task once completed—no matter how interesting it had been."

Such evidence is based not only upon certain general observations, but also upon quantitative results achieved after exhaustive and elaborate questioning. Each subject was asked by Zeigarnik after the experiment which tasks in the entire test he found interesting and which indifferent. Presumably, they were shown the list of all the tasks at the conclusion of the U–C test proper. A summarized form of the results of this interrogatory is given in Table III.

[1] Also see Ovsiankina (9) cited by Lewin ((1), p. 29) and others.

Table III ((1), p. 45).

Nature of tasks ...	U-tasks performed	U-tasks recalled	C-tasks performed	C-tasks recalled	U's recalled %	C's recalled %
Interesting	36	23	49	32	64	65
Indifferent	130	96	155	60	74	39

We see from this that interest-determination is of marked influence only where out of a given number (49) reported as interest-determined, 65 per cent. were actually recalled, compared with only 39 per cent. of those not reported as interesting. The corresponding figures for U-items show no such tendency. That is, only subsequent to the effect that produces the great preponderance of U-items over C-items, does 'interest' influence the recall of items. It is probable that, had all the items been C-items, 'interest' would have been a more pronounced determiner of the items recalled. It would not, however, necessarily be the only and perhaps not even the most important influence.

We propose to discuss now the problem of the dependence of the U–C effect upon some apparently disturbing influences.

(6) *Obliviscence and reminiscence.*

It will be admitted that the most general effect in memory is the tendency towards oblivion, the process of decay of memory traces. There is, too, the process of 'reminiscence' described by Ballard (10), the opposite but less influential process whereby the memory traces apparently come to a maximum clearness at a time subsequent to learning. Only the former has received the attention of experimenters on the U–C effect.

Investigators have examined the dependency of the U–C effect upon the time allowed to elapse between the end of the test and the beginning of recall. In one test arrangement, (*a*), recall is deferred to the day after the performance of the tasks; in another, (*b*), for a different group of subjects, recall is obtained *immediately* after the performance of the tasks and also on the next day.

The arrangement (*a*), which is essentially that of the usual U–C test, except that there is no immediate recall upon ending the series of tasks, shows that $\frac{\Sigma U}{\Sigma C}$ is decidedly reduced. For immediate recall $\frac{\Sigma U}{\Sigma C}$ is usually 1·9 or 2·0; for recall delayed by one day the value is only 1·14 ((1), p. 72, Table 29). Test arrangement (*b*) gives the same result. But in both

it has been especially noted that the fall in $\frac{\Sigma U}{\Sigma C}$ is due to an *increase* in the number of C-tasks recalled, and to a decisive *decrease* in the number of U-tasks recalled.

That C-task recall should increase is perhaps explicable on a theory of reminiscence, but no such effect emerges for the U-tasks, the recall for which is greatly impaired with lapse of time. Doubtless, however, there is room here for further work, especially on the matter of C-task recall. The main fact is striking enough, namely, that U-task recall is impaired, a fact to be kept in mind when an explanation is sought of this U–C effect. Finally, it may be added that while considering any disturbance in the U–C effect accruing from delayed recall, account should be taken of real occurrences in the interval between recall and performance of tasks, for lapse of time as such cannot alone be instrumental in the disturbance of the main effect.

(7) *Foreknowledge of the sequence of tasks.*

If all the U–C tasks are mentioned to a group of subjects at the beginning of the test, the 'recall ratio' $\frac{\Sigma U}{\Sigma C}$ has been found to be only 1·12, compared with the usual value 1·9 for the normal application of the test ((1), pp. 63–4, Table 23). (The mention, of course, amounts only to a description of the nature of each task, and not to the fact of its being a U- or a C-item respectively.)

Here, for the first time, we may be permitted to introduce 'Gestalt'[1] notions as explanatory of this striking result. The 'Gestalt' psychologists would suggest that the test constitutes, in the above case, a single and cohesive system of strain, a *whole*, comparable to a long and complicated task. In the usual form of the U–C test, on the other hand, separate systems of strain are set up about each single task. Each *task* is a *whole* in the normal form of the test: whereas the *test* is a *whole* when the subjects have foreknowledge about the tasks.

We have used the word 'strain' with the Gestalt implications. Consider, for instance, a single task in the usual form of the U–C test. It is explained to the individual; there is nothing cognitively difficult in the task, so that its meaning is readily grasped; consciously or subconsciously it is 'willed' that the task be proceeded with, and the conative drive then

[1] We use the term widely to refer to the School of Psychology of Köhler, Lewin, etc., without special reference to theories of space perception; in particular we follow the work of Köhler(11) when describing the strain system, etc.

ensues, an urge towards completion of the task. 'Strain' is a physiological-physical explanation given to this urge condition. It is held by Köhler ([11], pp. 254–67) and Lewin that the psychological urge or drive (conscious or subconscious) has a physiological-physical explanation in a state of tension or strain set up in the mental energy of the cortex. This tension or strain is suspended when the 'goal' is reached, *i.e.* when the single task, in the above example, is completed. But should the goal not be reached, then the state of tension persists, unresolved. We see at once the pertinency of such an explanation in the case of the U–C effect. The U-items are recalled, when each task has constituted a 'whole,' because their strain systems remain to facilitate recall: the C-items are not recalled, because their strain systems have been as it were dissolved. Similarly, when the individuals have foreknowledge of the tasks, and no U–C effect is observed, the explanation is reasonable that the foreknowledge has altered the nature of the test, *making it a whole task*, and not a series of smaller separate tasks.

(8) *Fatigue.*

The U–C effect is found to depend upon the state of general fatigue of the tested individuals. Two test arrangements have been tried out by Zeigarnik ([1], p. 68, Test arrangements VI *a* and VI *b*): (i) tests performed while the subjects of the experiment are *tired*, the recall being deferred until they are *refreshed*; (ii) tests performed while the subjects are *fresh*, the recall being deferred until they are *tired*.

In arrangement (i) the subjects tested were students who had attended German lectures for 6–7 hours, and office clerks who had just left their day's work. (The U–C tests were applied at about 7 p.m., and recall was obtained the next morning at 9–10 a.m.) In (ii) U–C tests were applied at the beginning, and recall was required at the conclusion of a day's work.

The $\frac{\Sigma U}{\Sigma C}$ score for the (i) and (ii) arrangements were 0·61 and 1·06 respectively. To what could so remarkable a difference be due? In the first place, the value 1·06 is comparable with that obtained for recall after a day's lapse, when the testees were in a fresh condition both on testing and on recall. Thus, the condition of fatigue at recall is not significant in its effects on $\frac{\Sigma U}{\Sigma C}$. The low value, therefore, must be attributable to the fatigued condition while working at the tasks.

On the theory of 'strain' outlined above, it is easy to maintain that

a certain dynamic persistence is demanded for any firm strain to be set up, and that during mental fatigue the dynamic condition is insufficient. The strains and tensions that are set up by the 'whole' tasks are not maintained in a soft fluid medium, as it were, *i.e.* in the condition of mental fatigue.

Of great interest for our purpose, however, is the fact that the U–C test affords a striking instance of the working of mental fatigue. Experimental work on general fatigue usually fails to obviate the difficulties that arise as a result of influences that are best described as due to 'specific fatigue' (12, 13). How, then, does the U–C test so readily indicate a fatigued condition? The U–C tasks, we must remember, are all 'easy,' and not likely to be specifically interesting to adults. Sheer boredom could be influential during tired conditions.

But a second aspect of the above results has to be considered. The ratio 0·61 shows that the recall of C-items is relatively better than that for U-items. We have already met with a similar condition above (p. 374, "Obliviscence and reminiscence"). Here we approach a question of importance for the U–C tests that has not been mentioned so far in our discussion. The completed tasks have their urge condition resolved, their 'goal' attained. But, once finished, a task becomes in a sense an entire or fixed *form.* On the other hand, although U-items have their urge condition unresolved, the incompleteness leaves an indefinite and vague *form.* Bearing this obvious difference in mind we see that "the main U–C effect gathers greater significance, for U-items are recalled better than C-items in spite of this difference in *consolidation*, or *fixity* of the *form.*" For the present purpose, however, this difference can be invoked as an explanation of the greater recall of the C-items. That is, the C-items persist in a state of strain in virtue of their accomplished *form.* There are, as it were, two forces at work in the U–C effect, the strain of U-tasks in virtue of unresolved urge, and the strain of C-tasks in virtue of accomplished *form.*

(9) *Dependency on duration of task.*

We have already introduced the possibility of the U–C effect being dependent upon the time required for a task to be either completed or ended as a U-task (p. 370). The U-items, conceivably, could be stopped a few seconds after they are begun, or left to run a course of two or three minutes. Tasks may be chosen which require (whether U or C) only a second or two, or which require several minutes. The time for interrup-

tion can be uniformly shorter than that for completion or *vice versa*. A manipulative task may last ten times as long as a verbal task.

Experiments of our own have demonstrated that a task is more often recalled if it occupies the longer time, irrespective of its being a U- or a C-item. Further work on this topic will be considered later. Generally, however, to ensure a rough uniformity of time allowed per task, whether U or C, we found it necessary to limit the tasks so that they were either *all* verbal, or *all* non-verbal, or *all* manipulative in each U–C test. We have found that the U–C effect remains unaltered by the uniformity of task, *so long as the tasks are widely different in content and form.*

(10) *Dependency on difficulty of task.*

If the state of non-completion mainly determines the preferment in recall of U-tasks, it may be argued that the best U-tasks would be those which remain incomplete through sheer difficulty of the task. Suppose, for example, it is required that the testee should give a synonym, beginning with 'f,' for the word 'deter'—a hopelessly difficult task, because no such synonym exists—would a test of this kind show the usual U–C effect? It would seem likely that, as long as the individual is not aware of the impossibility, it should act as a U-item. A realization of the impossibility, however, would perhaps change the task into a C-task in point of stress. We shall give data later upon this issue.

(11) *Dependency upon the affective conditions of the subjects of the experiment.*

It has been found that affective conditions influence the U–C effect. Subjects in an excitable state give reduced $\frac{\Sigma U}{\Sigma C}$ values; an average value 0·78 has been observed ((1), p. 70, Table 28). It would be interesting, on this account, to work with U–C tests in mental hospitals.

Zeigarnik ((1), pp. 74–5) has developed techniques for artificially 'arousing' affective states of various kinds. If the experimenter knows where the interest of the subject lies, he may begin a conversation about it in the period between ending the tasks and beginning recall, and thus obtain recall during a condition of great interest displayed by the testee: a whole group of subjects can be tested in this way, with of course a different 'interest' influence in each case. The results show a marked decline in recall, *i.e.* in the average value obtained for $\frac{\Sigma U}{\Sigma C}$.

Zeigarnik also utilized an artificial situation to arouse the anger or annoyance of his subjects, with the same result $\left(\frac{\Sigma U}{\Sigma C} = 0{\cdot}64\right)$.

(12) *Adaptability of the subjects.*

Another notable observation of Zeigarnik ((1), p. 76) is that $\frac{\Sigma U}{\Sigma C}$ depends on the *adaptability* of the subjects. This is, indeed, one of the few instances of reported individual differences in the U–C effect.

The facts have been observed when new situations are instituted prior to recall, after performing the various U–C tasks. How best to bring the testee out of the old situation (performing the U–C tasks) is, in one test arrangement, left to the discretion of the experimenter. According to Zeigarnik, the experimenter meets with two main types of subjects in such a test arrangement, (i) those who find it difficult to revert to the recall situation, (ii) those who easily 'go back' to the recall situation. This is, obviously, the usual distinction in terms of 'perseverative' and 'non-perseverative' tendencies (6, 14).

It has been found that the latter subjects (ii) have an undiminished $\frac{\Sigma U}{\Sigma C}$ ((1), p. 76), but that the former subjects have a much reduced recall quotient. $\left(\frac{\Sigma U}{\Sigma C} = 1{\cdot}5$ in the case of 'non-perseverators' and 0·77 in the case of 'perseverators'$\right)$. There is need, however, for much further work on this topic; the use of *P*-tests, as controls of such an influence, might supply data of theoretical interest in this connection.

IV. CONCLUDING REMARKS.

In the course of the above description many problems have been indicated, and their solution would broaden our knowledge of the U–C effect. The outstanding need is undoubtedly for more work on individual differences in the U–C effect, since this has scarcely been considered at all in the work of Lewin and his co-workers.

But, before making the study of individual differences, which can best be pursued along correlational lines, several problems of general psychological significance require consideration, the solution of which should go far towards making the study of individual differences easier or more comprehensive.

The study of the significance of the U–C effect in relation to problems of practical ability deserves attention. Spearman, for instance, has ex-

plained the factor of practical ability in terms of a theory of interest-determination—Spearman hints at the boy's instinctive interest in toys, and Rao at psycho-analytic explanations (15). But probably a study of the factor in terms of U–C effect would repay detailed examination. For certainly in other directions, interest-determination seems not to be as fundamental as one would judge it to be from studies such as those of Bartlett (8). Does the interest-determination cover only the cognitive output and not the retentive tendencies? A research into mechanical ability, practical ability and U–C effect might well serve to answer questions of this kind.

Similarly there are outstanding questions of the dependence of the U–C effect on the *duration* of a task, and some of these will be dealt with later. Connected with duration is the question of the *difficulty* of the tasks, whether U or C, and on this also further data will be reported.

Furthermore, in the realm of general psychology, we see that Prof. Bartlett's emphasis on 'interest-determined, interest-carried traces' as critical for retentivity[1], is neither the whole, nor necessarily the most important, description of retentive forces.

In our proposed work on individual differences we shall demonstrate the use of controls of the U–C effect in terms of 'p' factor, 'w,' 'fluency,' and 'memory' in particular.

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[1] Although he uses the much broader term 'attitude,' as crucial in the determination of retentivity.

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