

# A STUDY OF GESTALT PROBLEMS IN COMPLETED AND INTERRUPTED TASKS.

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## PART II.

- I. *On the general psychology of the U-C effect* (pp. 447-56).
  - (1) *Experiment I. Dependency of U-C effect on duration of task* (pp. 447-8).
  - (2) *Experiment II. Verbal U-C tests* (pp. 448-51).
  - (3) *Reverse use of the test* (p. 451).
  - (4) *Experiment III. Verification of the U-C effect by group experiments* (pp. 451-3).
  - (5) *Experiment IV. Control of difficulty* (pp. 453-6).
  - (6) *Experiment V. Influence of repetition on U-C effect* (p. 456).
  - (7) *Conclusions* (p. 456).
- II. *Summary of results (of Parts I and II)* (p. 457).

### I. ON THE GENERAL PSYCHOLOGY OF THE U-C EFFECT.

PART II of this paper serves the purpose of reporting data which supplement the body of facts considered in Part I (this *Journal* (1935), xxv, pp. 365-81). These data bear upon the general psychology of the U-C effect. For convenience they are reported as Experiments I, II, III, IV and V.

#### (1) *Experiment I. Dependency of U-C effect on duration of task.*

In all the U-C tests hitherto applied, as we have seen in Part I, no thorough control was made of the dependency of the U-C effect on the length of time allotted to the various tasks. The following experiment shows that the length of time allotted to a task, irrespective of its being a U- or C-item, materially influences its recall.

A list of 24 tasks was used in the present experiment. The tasks were manual, verbal, and non-verbal, and most of them had been used previously by other workers; they were applied individually, the experimental procedure being the same as that used by Lewin and his co-workers. Usually, however, most of the tasks in a U-C test are allowed

from 3 to 5 min.; others, however, may last only a minute. The U-C test mentioned above was prepared with the object of slightly exaggerating the disparity in time allowed to the various tasks by including more than usual of the longer tasks, as well as some which require less than a minute for completion or before interruption.

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. The correlation between average *time* allowed for the tasks and *frequency* of recall is 0.67. But, in thus exaggerating the difference in times allowed to the various tasks, we have also greatly disturbed the U-C effect. The average value of  $\frac{\Sigma U}{\Sigma C}$  (using Lewin's scoring procedure) is only 1.24, compared with 1.9 for a more regularly constructed U-C test. Obviously, then, it is necessary to maintain at least a crude uniformity of time allotted per task if a U-C effect is to be sought.

In the above test, as well as in others reported by Lewin and Zeigarnik,<sup>1</sup> the manipulative tasks occupied, in some cases, much more time than the verbal tasks, irrespective of their being U- or C-tasks. Preference in recall will, therefore, be given to the former, as is found in fact.

A further experimental control of time is possible by preparing different U-C tests, each with time allowances the same for each task in the test but different for the various tests. (Test I, for instance, was composed of tasks which were all allowed 1 min., as either U or C; those in test II were all allowed 5 min.; and those in test III were all allowed 10 min., etc.) The tasks could be 'matched' from test to test, and could be applied to comparable or 'matched' groups of subjects. It is doubtful, however, whether much could be learnt from such an experiment, although some optimum time allowance might thus be found. We did not undertake the experiment, but proceeded instead to define more rigidly the time allowed per task in some new U-C tests devised for the purpose of the following experiments. Experiment IV, however, brings forward some evidence concerning the U-C effect for tasks of a few seconds' duration only.

#### (2) *Experiment II. Verbal U-C tests.*

It is only feasible to allow the same time for each task when all the tasks involve the same type of activity, either *all* verbal, or *all* non-verbal,

<sup>1</sup> Lewin, K. (1927): "Untersuchungen zur Handlungs- und Affektpsychologie. III. Über das Behalten von erledigten und unerledigten Handlungen. Von B. Zeigarnik". *Psychol. Forsch.* ix, 1.

or *all* manipulative, the reason being that there are marked individual differences in the time taken to perform tasks in which different sorts of activities are involved. It is interesting to determine whether the uniform time allowance has any deteriorating influence on the U-C effect. This is not merely a 'factitious control', because the individuality of the tasks has to be maintained if each has to serve as suitable for either C- or U-items. We experimented, therefore, with tasks of a verbal nature, as being the most convenient for practical testing purposes.

In a U-C test of the verbal type each test item was fairly easy, necessitating the naming of things familiar to the subject. The items were chosen to avoid special interest; that is, a serious attempt was made to invent a list of items that did not go beyond the general knowledge and interest of the subjects. The number of items was increased to 28 from the 18 to 20 of the original tests. This was done in order to secure more even attention and to avoid undue emphasis on any item because of its chronological order. Yet the number was not made too great, since it was necessary to keep the subject free from the effects of fatigue. All items were, as far as possible, of average difficulty, as mentioned above, so that there was no item which the subject could not attempt or complete on account of sheer difficulty.

Before beginning the experiment, the subjects were made easy and comfortable, and everything that might produce associations was removed from the room. Each subject was given the following instructions:

- (1) You will be given 28 tasks one by one.
- (2) Each task requires you to name to me a particular class of objects that you meet in everyday life.
- (3) You should do each task as quickly as possible.
- (4) I shall give you the task first, and then say 'start'; you should then start giving me the names pertaining to that task.
- (5) Sometimes, I might say, 'time please'; of course in that case you are to cease working at the task.

The items were given to the subject one by one, allowing the same time for each answer, viz. 40 sec. on the average. In the case of tasks that were intended to be completed, each answer was terminated by the remark 'that will do' from the experimenter. But, in the case of uncompleted items, the subject was interrupted while answering and the experimenter said "I want ten more or five more". (For example, if the subject was required to give the names of "books that he knew", he was told on interruption to give six more, a definite number.) The idea of doing this was to demand more effort from him. The number, though not

exorbitant, was so chosen that it could not possibly be reached by the subject within the rest of the time left and the experimenter in the case of uncompleted items had to say 'time please'. Thus some of the tasks were relatively completed, others uncompleted.

After the experiment, the subject carried out some activity for a period of 2 min., namely, cancellation of a particular letter from a cancellation sheet. The subject was then requested to close his eyes for a few minutes and directed to give a list of the items that he had answered as they came to his mind, and not necessarily in the order in which they were given to him. The items were recorded in the *order of recall* by the experimenter. Those given after hesitation or pause were recorded separately.

Twenty adults, mostly students and teachers, were tested in this way. The division of items into completed and uncompleted items was a random one, *i.e.* a completed item did not necessarily follow an uncompleted item. This was done in order to minimize the chances of guessing the nature of the tasks (U or C). The number of uncompleted items was equal to the number of the completed even after leaving out of consideration the first and the last items (in scoring).

In order to corroborate the conclusion that the U-tasks were recalled in greater number, and also chronologically first, we used the scoring method suggested previously (this *Journal* (1935), xxv, p. 368), in which 4 marks are allowed for each of the first three tasks recalled, 3 marks for each of the next three, 2 marks for each of the next three, and 1 mark for all others.

The ratio of U- to C-items recalled is 1.8 to 1.0. When scored by the above-mentioned method, the ratio is 1.9 to 1.0 for items prior to the hesitation period; and for total recall it is 1.6 to 1.0. The result, then, compares well with that observed by previous workers.

Another feature of the test was to determine the frequency of recall up to 'hesitation' for the separate tasks, *i.e.* to find the total number of times the respective U- or C-task is recalled for the twenty subjects. The preponderance of the former is marked. We thus found that:

(1) The average score for an uncompleted item for the whole group = 30.

(2) The average score for a completed item for the group = 18 (approximately).

(3) Average value of  $\frac{\sum U}{\sum C}$  by scoring for each separate task = 1.7.

As the system of scoring is based on the order of reproduction, as

explained above, it clearly testifies to the better retention of uncompleted items, even chronologically. In other words, an uncompleted task has *nearly twice* as much priority in recall as a completed task.

(3) *Reverse use of the test.*

The verbal U-C test was again used, with the U- and C-items reversed, *i.e.* items marked as U in the first testing were now given as C-items, whereas those marked as C were given as U-items. Results from testing of 16 adults, comparable in every way with the 20 tested with the test described above, were obtained. The ratio of U's to C's recalled, scored as above, was 1.7 to 1 before 'hesitation'; the same ratio was found when the items recalled after the 'hesitation' period were included.

The conclusion may be drawn, then, that 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 tasks is reversed.

Upon closer examination we see that the items recalled less often in the first form of this test were well recalled in the second reverse form. Thus, the task 'naming musical instruments' was recalled only by one subject when it was a C-task, whereas almost every subject recalled it when it was a U-task.

One observation requires to be made about the above verbal U-C test. The technique was somewhat different from that hitherto used by Lewin and others, in that tasks were made 'U' by making a request for further items after the work on each task had proceeded for some time. This change in technique, necessary for the use of such verbal tasks, is apparently without influence on the U-C effect.

(4) *Experiment III. Verification of the U-C effect by group experiments.*

Since for work on individual differences it is almost essential to have U-C tests that can be applied by group testing, the following experiment was primarily concerned with the development and characteristics of such tests. Dr Lewin<sup>1</sup> has already found that the group tests are feasible.

Our method was to present each task on a separate sheet of paper, the sheets being put together in book form; there was room on each sheet for writing the answers for the particular task. As we have seen, the maintenance of a rough time limit for each task is important. This is somewhat difficult in group testing. Two different techniques were used in our group experiments, *viz.*:

<sup>1</sup> *Loc. cit.*, page 14.

(1) In the case of C-tasks care is needed to ensure that the number of items required for completion is well within the abilities of all the subjects tested. In the case of U-tasks, however, we had to resort to the device of interrupting the group of subjects when, on the average, they were half-way through each U-task. As the subjects worked at varying speeds it was impossible to introduce the interruption so that all were interrupted at the same stage in any U-task. Consequently individual *marking* had to be resorted to, some items intended as U being in fact C-items for certain individuals and, less frequently, the reverse. This procedure is that first used by Lewin and his associates.

(2) To avoid the necessity for individual marking, with its unequal number of U- and C-items, we devised the following technique, which is the same as that used by us in Experiment II. All subjects were allowed to complete the C-tasks. In the case of U-tasks we announced when the tasks had each proceeded for some time that a further number of responses had to be given in addition to those already written. Before the subjects could possibly complete so many, they were interrupted and directed to pass on to the next task. Thus, task 1 (a U-task) asks for as many names of books as possible; after working for 1 min. the directions are "Now name *ten* more books only". Before it is possible for anyone to name the *ten*, the task is interrupted. This method was found to be easy for marking and also yielded better U-C results than the former.

In all group testing two sample tasks were first given on a black-board, and the instructions were clearly given as to the use of the test booklet, especially (a) "Turn only *one* page at a time when you are called upon to do so", (b) "Do not try to look either back or through the book", (c) "Spelling mistakes do not matter".

For a group U-C test, the items are selected to avoid possible associations with objects in the classroom in which group testing in schools usually takes place.

After ending task 24, the subjects are supplied with small booklets containing 20 blank sheets, and are requested to write down the tasks they remember having done—one on each page of the booklet—not in the order in which they were applied, but just in the order in which they are remembered. (Here again they were warned not to look back to previous sheets.) Ten minutes was allowed for recall (a reasonable time to secure complete recall), and no distinction was made between recall before and after 'hesitation'.

*Experiment III a.* Using the above test and techniques (1) and (2)

respectively, two groups of girls were tested, the first (27 girls, age 13–14 years) using technique (1), and the second (27 girls of the same age) using technique (2). The proportion of U- to C-tasks recalled was 1.84 to 1.00 by technique (1); and 1.92 to 1.00 by technique (2).

*Experiment III b.* Another group test was applied to two mixed groups of boys and girls, age 10–11 years. For 28 boys and girls, with technique (1), the proportion of U- to C-items recalled was 2.0 to 1.0; for 29 girls and boys, with technique (2), the proportion of U- to C-items recalled was 2.2 to 1.0.

*Experiment III c.* This U–C test was also applied to 81 subjects (13–14 years) with the U- and C-items as in the first arrangement. It was later applied to a further 75 subjects of the same age, with the character of the tasks reversed (U-tasks being C, and *vice versa*). The ratio of U- to C-tasks recalled was 1.9 to 1.0, and 2.0 to 1.0 respectively, both by technique (2).

The above results show that (i) the U-tasks are recalled twice as frequently as the C-tasks on the average, by group-testing technique, thus confirming the result for individual testing; (ii) that the technique (2) is at least as efficient as (1), and, indeed, apparently more efficient in giving U–C effect.

(5) *Experiment IV. Control of difficulty.*

We have already referred in Part I to Lewin's conclusion that it is not the act of interruption as such or the consequent emotional emphasis, or any other intensification brought on by interruption, that is responsible for the preference in recall of an uncompleted task to a completed one, but that it is the state of completion or incompleteness of tasks that determines the observed effect. It is the urge towards completion, the residual energy at the time of recall in the case of uncompleted tasks, and relaxation of the urge or the discharge of the strained system in the case of completed tasks, which explains the preference in recall of U-tasks.

The question arises, "What happens if some of the tasks are extremely difficult, and are therefore left incomplete through sheer difficulty without any interruption from the experimenter?"

To investigate this problem, we prepared three tests (*a*, *b*, and *c*) in which half the tasks were extremely difficult and could not possibly be completed, whereas the remaining tasks could easily be completed by the subject.

(*a*) *Synonyms test (different letter)*. The subject has to find a synonym for the given word, beginning with the letter printed beside it. For

example, the subject is required to find a synonym for 'Battle', beginning with the letter 'W'. The letters providing clues to the synonyms are so chosen that the subject can easily write down the correct synonyms for *half* the number of words in the list; but for the rest the clues are so chosen as to render solution not only difficult, but, if the reply is to be qualitatively correct, impossible. The easy items were decided upon after a preliminary testing of 30 subjects (10-11 years).

(b) *Synonyms test (same letter)*. The only difference in this test is that the subject has to write a synonym beginning with the same letter as the word itself. For example, the subject may be required to give the synonym for 'Chapel', beginning with the same letter as the word itself (in this case, beginning with the letter C). Again, half of them are very easy and the rest are impossibly difficult.

(c) *Opposites test*. The procedure in this test remains exactly the same except that the subject is required to give the opposite of the corresponding word in the list, the opposite having to begin with a given letter. Thus, he is required to write down a word beginning with the letter 'O', opposite in meaning to the word 'Young'. Half the number of words are easy and others are impossibly difficult.

The *easy* and *difficult* words (as we might conveniently call them) were arranged in random order. The words for each test were printed in a booklet, one on each page, and 15 *sec.* were allowed to find out the corresponding word (synonymous or opposite in meaning, as the case may be).

In a group test of this kind, the usual instructions mentioned in our U-C group tests are given, at the same time making it imperative on the subjects to persevere in finding the corresponding synonym (or opposite). The usual procedure of recall used in our group test is adopted here also.

Table I gives the results of the group tests in order of application, with the mixed group of 24-28 boys and girls (10-11 years) in an elementary school.

Table I.

Order of application	Tests	Average	Diff. score
		U/C	value of av. U/C
I	Opposites	1.3	1.34
II	Synonyms (different letter)	1.2	1.2
III	Synonyms (same letter)	0.9	0.9

The table shows that the average value of U/C was 1.3 for the first test, and 0.9 for the third one; compared with the miscellaneous test which was used previously, then, these tests give little U-C effect. It is, furthermore, gradually reduced by repetition of the tests.



These tests were also applied to another big group of 81 subjects (age 13–14 years), and the time allowed for the solution of each item was curtailed from 15 sec. to 8 sec., since the latter was found to be more than enough time for the solution of an easy item. The results are shown in Table II, and are very similar to those shown in Table I.

Table II.

Order of application	Tests	Average U/C	Diff. score value of av. U/C
I	Opposites	1.2	1.3
II	Synonyms (different letter)	1.2	1.2
III	Synonyms (same letter)	1.0	1.1

From Tables I and II it is apparent that the results obtained from synonym and opposite tests are much poorer than those obtained from miscellaneous U–C tests. Thus *difficulty* of a task does not seem to be conducive to stress and therefore to a marked preference of a difficult (U) task in recall, or else the U–C effect does not hold for tasks of very short duration. Indeed, no doubt both conclusions are warranted. As a matter of fact, no stress is applied in these three tests, as is done in the case of the miscellaneous U–C tests. We could only hope for a stress imposed by the difficulty of the task. This does not appear to have occurred, as is evident from the average results and the fact that most of the subjects reproduced as many *easy* or completed tasks as they did the *difficult* or uncompleted ones.

We observed in the course of Part I that in the U–C effect there seem to be two forces at work—the strain of U-tasks in virtue of an unresolved urge, and the strain of C-tasks in virtue of an accomplished *form*. Were it not for the definite instructions given to the subjects in the beginning that each word had a corresponding synonym (or opposite) and that they had to persevere to find it, a marked preponderance of easy items over difficult items might well be expected in virtue of the completed *form* of the *easy* items, according to the above hypothesis.

This was actually found to be the case by experimenting upon two groups of 20 subjects each (age 10–11 years). The tests applied were the synonyms test (different letter) and the opposites test. The two tests remained the same as described above; but the instruction given in the previous test arrangements, that each word had a corresponding synonym (or opposite), and the subjects must therefore persevere to find it, was omitted. The values of  $\frac{\sum U}{\sum C}$  for the two tests respectively were 0.51 and

0.64, which demonstrates the preference in recall of *easy* items over *difficult* ones (when compared with the previous values 1.3, 1.2 and 0.9).

One obvious conclusion that can be drawn from the two kinds of experiment described above is that 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.

(6) *Experiment V. Influence of repetition on U-C effect.*

A cursory glance at Tables I and II reveals the fact that even the slight U-C effect obtained from the synonym and opposite tests seems to deteriorate with repetition. This, however, required further experimentation on a larger scale and corroboration from the repetition of a miscellaneous U-C test. Two miscellaneous U-C tests were applied to 81 children (13-14 years), with an interval varying from 24 to 48 hours in between the two tests. One of these tests (Miscellaneous test A) was the same as that used in Experiment I. Miscellaneous test B was only another *form* of the first.

Table III gives the results of these two tests in order of application.

Table III.

Miscellaneous U-C tests	Average U/C
I. Test A	1.9
II. Test B	1.5

The results of these tests, together with those in Tables I and II, provide enough experimental evidence to prove that *repetition* has a marked *deteriorating* influence upon the U-C effect.

(7) *Conclusions.*

The above experiments served, as we proposed they should, to verify the U-C effect, and to provide experimental controls of the effects of *duration*, *difficulty*, and *repetition of U-C tests*.

We see that the miscellaneous tests, each with tasks taking 1 min. or so for completion or before interruption, provide the most clear-cut effects. It seems that too short a time interval, or too difficult a task diminishes the U-C effect. A certain minimum time and easy tasks are required before a total urge is satisfactorily set up.

## II. SUMMARY OF RESULTS (OF PARTS I AND II).

1. Uncompleted tasks are recalled (and hence retained) on the average 90 per cent. better than completed tasks.

2. Uncompleted tasks are recalled first in time.

3. Uncompleted tasks are retained better than completed tasks, independent of any consideration of the nature of tasks. In any test the nature of the tasks, completed or uncompleted, can be reversed without affecting the average result.

4. Immediate repetition of a U-C test deteriorates the main effect.

5. The preponderance in recall of uncompleted tasks is not due to any special type of material used, or to any influence of attention, or to any shock effect consequent upon the act of interruption, or to any voluntary intention of the subject to remember such tasks, or to any special interest attached to them.

6. The recall of uncompleted tasks is greatly impaired with lapse of time between performance and recall, but the recall of completed tasks is remarkably improved with such lapse.

7. A description of the content of the tasks given previous to their performance reduces the U-C effect.

8. A condition of fatigue at the time of the performance of tasks, but not at the time of recall, considerably impairs the recall of uncompleted tasks and improves the recall of completed tasks.

9. A task is more often recalled if it occupies a longer time, irrespective of its being a U- or C-item. A crude uniformity of duration of the tasks is therefore necessary to obtain the U-C effect.

10. If a task is extremely difficult and cannot be carried out at all, or is of too short a duration although it is uncompleted it has no preference in recall to an easy and completed one.

11. Affective conditions influence the U-C effect. Those subjects who are easily upset recall fewer uncompleted tasks and many more completed tasks, on the average, than those who are not.

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