

The effect of task interruption and closure on perceived duration

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On the basis of a version of the Zeigarnik (1927) demonstration, the effect of task interruption and closure on perceived duration was examined. Subjects estimated the time it took to solve a list of 10 three-letter anagrams; this group thus experienced closure when they completed the task. A second group of subjects was presented with a 20-item set of anagrams, the first 10 of which were identical to the items solved by the first group. These subjects were interrupted after solving the first 10 items, then they estimated the time. A significant difference in the perceived duration of the task was found between the two groups: subjects who were interrupted significantly overestimated the time it took to solve the first 10 anagrams. These findings indicate that task interruption has a lengthening effect on perceived duration. Gestalt notions of closure and motivation are discussed.

Research on time perception has demonstrated repeatedly that the duration of two physically equal intervals of time may be perceived differently depending on the task demands occurring during the interval span. Numerous cognitive activities have been shown to affect perceived duration. For example, perceived duration increases with the complexity of the material processed within a given interval (Hogan, 1975; Ornstein, 1969; Schiffman & Bobko, 1974), with the number of events or items perceived within a given interval (Kowal, 1987; Poynter & Homa, 1983) and with memory factors, such as the amount of information retained from an experienced duration (Mulligan & Schiffman, 1979; Ornstein, 1969).

We have uncovered an additional factor, based on a version of the Zeigarnik effect (Zeigarnik, 1927), that appears to have a direct impact on perceived duration. The Zeigarnik effect refers to the classic Gestalt demonstration from Kurt Lewin's Berlin laboratory; specifically, tasks that have been completed are recalled less well than tasks that have not been completed. Zeigarnik administered a series of 20 brief, simple tasks to her subjects (e.g., making words from letters, writing names of cities beginning with the letter L, and the like). Half of the tasks were completed by the subjects; however, the remaining tasks, interspersed throughout the series, were interrupted without any opportunity for resumption. Immediately fol-

lowing the completion of the series, the subjects were required to recall as many of the tasks as possible. The result was that the percentage of interrupted tasks recalled was significantly higher than the percentage of completed tasks recalled (68% vs. 43%; see also Marrow, 1938; Prentice, 1944; Rosenzweig, 1943).

No doubt a version of Zeigarnik's (1927) demonstration of biased retention has been verified, in a more casual way, by most students who have taken a timed examination composed of brief, varied items (e.g., multiple-choice tests). Although interruption *per se* is not directly manipulated in this case, those test items whose answers students are unsure of (i.e., cognitively "incomplete") are the items most likely retained and reflected upon after the examination.

The greater retention of uncompleted tasks is generally explained as owing to the goal-oriented Gestalt notion of "closure." That is, there is a tendency or "need" to complete a task once begun. Accordingly, the finished task—in which case, the goal has been attained—is a completed Gestalt, and cognitive effort is terminated. In contrast, an unfinished task, one in which the completion goal has not been attained, does not offer closure. According to this notion, the lack of closure promotes some continued task-related cognitive effort, accompanied by a preservation of task-related memory traces and thus a tendency for task components to be retained in memory.

Although it is clear that task interruption has an effect upon memory, the question arises whether interruption *per se*, independent of memory effects, contributes to perceived duration. Since the amount of information retained affects time perception, it seems reasonable to propose

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that a variable that affects memory and retention should also have a facilitative-expansive effect on perceived duration. Accordingly, the following experiment was performed to investigate the role of task interruption—as a modified version of the Zeigarnik effect—on perceived duration.

METHOD

Subjects

Twenty undergraduate students served as subjects.

Materials

Two lists of anagrams were used. One list contained 10 three-letter anagrams (e.g., the letter sequence "jbo," which, when rearranged, spells the word *job*). A second list contained 20 three-letter anagrams: the first 10 anagrams on this list were identical to the anagrams appearing on the 10-item list, and the second set of 10 anagrams were comparable in complexity but were different three-letter anagrams. Each anagram list was printed on a single sheet of paper, so that the subjects could observe the total number of items on the list.

Procedure

One group of 10 subjects received the 10-item list of anagrams. They were instructed to solve each anagram as quickly as possible. Once the subject completed the list, the subject was asked to estimate verbally the time spent solving the anagrams. The estimated time and the actual time were recorded by the experimenter.

A second group of 10 subjects received the 20-item list of anagrams. As the other group of subjects had been instructed, they were told to solve each anagram as quickly as possible. When the subject completed the first 10 anagrams, the experimental task was abruptly interrupted and the subject was asked to immediately estimate the time spent solving the first 10 anagrams. The estimated time and the actual time were recorded by the experimenter. The subject was then instructed to proceed with the rest of the list of anagrams. Once the next 10 anagrams were solved, the subject estimated the time to solve the second half of the list. The estimated time and the actual time were noted by the experimenter.

RESULTS

A ratio of estimated to actual time for the (first) 10 anagrams was computed for each subject. This was done by dividing the subject's estimate of the time to complete the (first) 10 anagrams by the actual time it took to complete the (first) 10 anagrams. The average ratio for the subjects who received the 10-item anagram list was 1.109 ($SD = .410$). The average ratio for the subjects who received the 20-item anagram list was 1.646 ($SD = .579$). There was a significant difference between the ratios of the two groups [$t(18) = 2.394, p < .0132$].

Further t tests revealed that the ratio of estimated to actual time for the subjects who received the 10-item list did not differ significantly from a perfect time estimation ratio of 1.0 [$t(9) = 0.8402, p > .05$]. Thus, no significant overestimation of time was observed for this group. In contrast, the ratio of estimated to actual time to solve the first 10 anagrams for the subjects who received the 20-item list was significantly greater than 1.0 [$t(9) = 3.531, p < .0033$]. Thus, the subjects who were interrupted after solving the first 10 anagrams significantly overestimated the time to solve the 10 anagrams.

The ratio of estimated to actual time to solve the second set of 10 anagrams was also computed for the subjects who were given the 20-item list. The average ratio for the second set of 10 anagrams was 1.346 ($SD = .804$); a t test showed that this ratio did not differ significantly from 1.0 [$t(9) = 1.360, p > .05$]. This finding indicates that the subjects did not significantly overestimate the time to solve the second set of 10 anagrams.

DISCUSSION

The results of the present experiment support the assumption that the interruption of a task has an expansive or lengthening effect on its perceived duration. More specifically, these results reveal that interruption of a task lengthens the perceived duration of the portion of the task completed, relative to the identical task when it is presented alone and completed.

Since Gestalt research inspired this study, it is possible that a Gestalt notion of motivation applies to these findings. In the original 1927 Zeigarnik study, subjects who were interrupted while working on problems were overtly disturbed by the interruption and evinced a strong tendency to resume working. This putative "tendency to resume" (which may also have contributed to better *recall* for the uncompleted tasks in Zeigarnik's study) may create some form of attentional mediation of the task material and thereby promote a lengthening of the portion of the total task completed.

Under the assumption that, once begun, subjects are strongly motivated to reach the end of a task, a more general class of motivational factors may underlie or at least play a role in effecting a lengthening of the interrupted task. In the present experiment, the full set of 20 problems was presented on a single page and, hence, was visible to the subjects who were interrupted. Moreover, the individual items consisted of easily solved three-letter anagrams, clearly comprising a completable task, at least with respect to problem difficulty. Thus, for the interrupted group, a well-defined goal-directed task, once begun, was disrupted and left uncompleted.

One might also speculate that the interrupted group, restricted from completing their perceived task, experienced frustration or a form of "failure." The effect of task failure on temporal experience, consistent with the present findings, has been noted by Harton (1939), who reported that with task (mental mazes) and physical time held constant, a group that was informed that they were unsuccessful or making little progress judged the duration of the task as longer than did a group experiencing the identical situation but informed that they were successful. Similarly, Meade (1959, 1960a, 1960b, 1963) found, generally, that judgments made by poorly motivated subjects, informed that they were making poor progress on an experimental task (e.g., stylus maze), judged its time interval as longer than did subjects who experienced the same task and time interval but were highly motivated or instructed that they were making good progress. Applied to the present experiment, perhaps the interrupted group interpreted their performance on the uncompleted task as less than successful with a resultant lengthening effect. It is possible, also owing to the interruption, that the perception of the uncompleted material (an additional 10 anagrams) was in some way incorporated into the time estimation of the segment completed.

Certainly these explanations are not mutually exclusive, nor are they complete or fully satisfactory. What is clear in the present findings, however, is that task interruption promotes a lengthening of perceived duration. Equally clear is that determination of the factors that impose a lengthening of the perceived duration of an interrupted task and the nature of these mechanisms warrant further empirical examination.

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