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Reminiscence and Recovery from Part List Cuing

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Abstract Two experiments tested the hypothesis that reminiscence and hypermnesia in repeated testing are caused, at least in part, by recovery from initial output interference (Smith & Vela, 1991). Output interference was increased on an initial part-list cued recall test relative to an initial free recall test (e.g., Rundus, 1973). A second test (free recall) was then given to assess reminiscence (items recalled on the retest that had not been recalled on an earlier test) and hypermnesia (the net increase in recall from the initial test to a subsequent retest). Relative to having an initial uncued free recall test, there was greater reminiscence and hypermnesia when the initial test had part-list cues. Recovery from part-list cuing was shown to occur for both pictures and words in Experiment 1. In Experiment 2 the recovery effect was replicated, and further, reminiscence was greater when retesting was delayed. The results support the hypothesis that reminiscence and hypermnesia are due to recovery from output interference, and they further support a similar explanation that attributes incubation effects to recovery from initial blocking (e.g., Smith & Blankenship, 1991; Smith & Vela, 1991, Smith, 2011).

Keywords Reminiscence, Hypermnesia, Part-List Cuing

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1. Introduction

Hypermnesia is an increase in recall levels that often occurs with repeated memory testing (e.g., Erdelyi & Becker, 1974; Payne, 1987; Roediger & Thorpe, 1978, Otani, Von Glahn, Goenert, Migita, and Widner, 2009). The net increase in recall, hypermnesia, is due to having greater reminiscence (i.e., newly recalled material, not recalled on an earlier test) relative to the amount of forgetting that occurs from one recall test to the next (e.g., Payne, 1987). This increase in memory over time (hypermnesia) is very counterintuitive and contrary to one of the oldest and most pervasive findings in the memory literature: without additional practice memory declines over time.

The present study tested the theory that reminiscence (and hypermnesia) can result from a change in the biased pattern of retrieval (i.e., output interference) that develops during initial recall tests. This change in the retrieval set is hypothesized to increase over time; therefore, recovery of memories initially rendered inaccessible by the biased retrieval set will be greater the longer a retest is delayed. A pattern of greater recovery with longer delays could also provide the basis of a mechanism for incubation effects (e.g., Smith, 1994; 1995; Smith & Blankenship, 1991; Smith & Vela, 1991). I will briefly and selectively review research related to initial retrieval set bias, (or output interference), fluctuation of retrieval sets over time, and incubation effects. I will then present two experiments that tested our predictions about memory blocking and recovery.

Retrieval Induced Forgetting

A considerable body of evidence has shown that retrieving a portion of the information associated with a cue can reduce the accessibility of other material associated with the same cue (e.g., Anderson, Bjork & Bjork, 1994; Brown, 1979; 1981; Kliegl, O., Bäuml, K-H T., 2017; Nickerson, 1984; Perfect, T. J., Moulin, C. J. A., Conway, M. A., Perry, E., 2002, Roediger, 1973; 1974; Roediger & Neely, 1982; Rundus, 1973). Such retrieval induced forgetting can arise from a number of methods that involve episodic and semantic memory, such as part list cuing effects (e.g., Roediger, 1973; Rundus, 1973), part set cuing effects (e.g., Nickerson, 1984), and recall of words from their definitions (e.g., Brown, 1979; Smith, Tindell & Balfour, 1995). These phenomena constitute memory blocks if it can be shown that material that is rendered inaccessible can be recalled later, or in changed circumstances.

Although there have been several explanations of the part list cuing inhibition effect, many focus on the notion of output interference, sometimes described as a biased retrieval set (e.g., Raaijmakers & Shiffrin, 1981; Rundus, 1973). A biased retrieval set refers to a situation in which the retrieval process continues to generate the same set of items, rather than finding different memory targets. Presentation of part list cues (i.e., some of the original list items), for example, increases the probability of retrieving the same cues on subsequent retrieval attempts, thereby reducing the chance of retrieving other items from the list. This increased competition at retrieval is usually referred to as output interference (e.g., Rundus, 1973).

Part list cuing has been inferred to cause the same type of retrieval blocking effect via output interference as that which is produced naturally during the course of free recall (e.g., Roediger, 1978). That is, just as presentation of part list cues strengthen associations between those items and the test cues, so, too, do the first items recalled on a free recall test become more strongly associated with the test cues. Whether self induced or experimentally manipulated, this strengthening of associations between items and test cues causes competition at test, producing a memory blocking effect by decreasing the chance that a test cue will elicit other target items in memory.

Contextual Fluctuation

As suggested by Madigan (1976), Roediger and Thorpe (1978), and Smith and Vela (1991), an extension of stimulus sampling theory (Bower, 1972; Estes, 1955) could help explain the phenomena of reminiscence and hypermnesia. In brief, the theory states that stimuli are mentally represented by encoding operators, each of which codes a particular feature. Each stimulus is encoded by the subset of operators that is active when the stimulus is encountered. Because the members of the active subset fluctuate over time, the features of a stimulus that are encoded on two different occasions will vary, with greater variability occurring over time. Thus, a stimulus reexperienced after a long time is likely to be encoded differently on the second occasion, and therefore, might not be remembered.

During recall, output interference instantiates a biased retrieval set (e.g., Raaijmakers & Shiffrin, 1981), such that the same subset of available memories continues to be sampled. According to stimulus fluctuation theory this biased retrieval set corresponds to a situation in which retrieval cues continue to be encoded the same way, producing the same memories on each retrieval attempt. After some time has passed a new active set of operators will code retrieval cues differently, and different material in memory will be accessed. Therefore, reminiscence may result from a release from output interference when time passes, when it becomes more likely that new items in memory will be sampled.

The theory of recovery from a biased retrieval set can be used to explain incubation effects, which are defined as cases in which initial impasses in memory or problem solving are more likely to be resolved if additional work is delayed rather than continued. Evidence of incubation effects has been somewhat sparse (e.g., Smith & Blankenship, 1989; 1991; Smith & Vela, 1991).

Incubation & Recovery

Explanations of the underlying cause(s) of incubation effects have included unconscious work, recovery from fatigue, and spreading activation. Yaniv and Meyer (1987), for example, hypothesized that initial attempts to solve a problem or resolve a memory impasse cause activation to spread towards the target information for which the subject is searching. This activation, initially too weak to exceed a threshold of conscious awareness, nonetheless sensitizes the subject to future encounters with the target or material closely related to the target. This spreading activation hypothesis offers a mnemonic explanation to account for incubation effects.

A different mnemonic explanation of incubation effects was proposed by Smith & Blankenship (1989; 1991). Incubation in problem solving may sometimes result from a decrease in initial blocking when work on a problem is deferred. Initial blocking, caused by retrieval of inappropriate material, prevents retrieval of needed information. The initial blocking of information in memory represents a biased retrieval set; continued attempts to retrieve key information merely generate the same inappropriate ideas that led to initial impasses. Incubation, according to this explanation, results when the passage of time or the changing of contexts leads to a new active set of encoding operators, altering the previous biased retrieval set. With a less biased retrieval set, the key information has a better chance of being accessed.

Smith & Vela (1991) found evidence of incubation in memory using a repeated free recall testing paradigm. Reminiscence was greater on a second free recall test if the second test was given after a delay, as compared to giving the retest immediately after the initial recall test. Smith & Vela (1991) concluded that the output interference that accrued during the initial free recall test diminished over time, thus leading to greater recovery in the form of reminiscence.

In the present study we tested this notion of recovery by more directly manipulating output interference. Rather than relying on output interference building up during initial free recall, we induced output interference by using a part list cuing procedure. Given that part list cuing causes output interference, we hypothesized that more recovery, in the form of reminiscence, would occur following an initial part list cued recall test, as compared to an initial free recall test. We predicted further that reminiscence would increase if retesting was delayed, rather than done immediately after the initial recall test.

EXPERIMENT 1

There were three phases of Experiment 1: list learning, an initial recall test, and a retest. During list learning subjects studied 50 simple line drawings or 50 words (the verbal labels of the drawings). The initial test was either a free recall or a part list cued recall test, with half of the 50 list items given as part list cues. The remaining list items served as the critical test items. A part list cuing effect was predicted; i.e., fewer critical test items were predicted to be recalled by the cued recall group, in comparison to the free recall group, which received no part list cues.

The last phase of the experiment was a free recall test, which occurred immediately after the first recall test. It was predicted that more reminiscence would be observed on the retest for the group that had part list cued recall on the initial test than for those who had an initial free recall test.

Method

Subjects. The subjects were 180 student volunteers who consented to be in the study, and who received credit for a requirement in introductory psychology classes. Because subjects were free to enroll for any session in the present experiment, or other experiments also being offered, there were unequal numbers in the different treatment groups. This experiment was approved by Institutional Review Board (IRB) of Texas A&M University.

Materials. A list of 50 unrelated pictures (line drawings) was drawn from the Snodgrass & Vanderwort (1980) picture norms. Each picture was scanned individually and recorded in digital form on a computer. The 50 items on the word list were the verbal labels of the pictures, and were typewritten in uppercase letters. Both pictorial and verbal stimuli were recorded on videotape directly from a computer output, and were shown on a television screen as black letters or pictures on a white background. One item (i.e., a single picture or word) was shown at a time on the television screen.

The same 50 pictures or words comprised the study list for all subjects. One half of the stimuli were randomly selected for cue list A and the other half for cue list B. The 25 cues (either 25 pictures or the 25 corresponding words from the study list) were printed on a single piece of paper, in either verbal or pictorial format.

Design. The type of target material used on the study list was a between subjects variable, with half of the groups receiving a list of pictures and the other half receiving the list of 50 words. The type of initial recall test given was also manipulated between subjects; half of the treatment groups had an initial free recall test and half had a part list cued recall test. The type of cues given to the part list cuing groups varied between subjects, with half the cued recall groups getting words as cues and the other half getting pictures. Finally, the set of cues used for part list cuing (set A or set B) was counterbalanced between subjects.

Procedure. Before they saw the target list subjects were told that they would see a list of pictures (or words) on the television screen, one item at a time. They were told to try to remember the list for a later test, but the test was not explained until after the list ended. The target list was then shown on the screen, with each item appearing on the screen alone for 5 sec.

After the list had been studied, subjects waited 1 min, and were then given their first recall test. During the minute those in the part list cuing group were asked to look over a list of 25 cues which were presented simultaneously, whereas those in the free recall condition were asked to complete a simple spatial maze. The cue list was taken away after the minute in which it was inspected. Subjects were then asked to recall and write down as many items as they could from the list (barring part list cues in the cued recall condition), and they were told that it was all right to guess. Subjects were given 5 min for this initial recall test.

After 5 min the form for the first recall test was removed, and a second recall test was given. For all subjects in all conditions the second test was a 5 min free recall test for all of the list items (including part list cues, in those conditions). Following the second test subjects were debriefed and dismissed.

Results

Initial Test: Part List Cued Recall vs. Free Recall. A 2 X 2 (initial test X type of target) ANOVA was computed using the number of critical items recalled on the initial recall test as the dependent measure. Initial test was part list cued recall or free recall, and type of target was pictures or words. Critical items were defined as the 25 items that were not used as cues in corresponding cued recall conditions. For the free recall groups, half of the 50 recall targets corresponded to set A and half to set B. Therefore, the number of critical items recalled for free recall subjects was adjusted by dividing the total number recalled by two.1 There was a significant main effect of initial test [$F(1,176) = 6.52$, $p < .05$, $MSe = .051$]; more of the 25 critical items were recalled on the initial test when the test was free recall (Table 1).

Table 1: Mean Number of Critical Items Initially Recalled, Recall at Retest, Hypermnesia, and Reminiscence in Experiment 1 as a Function of Type of Recall Test and Type of Target

	Type of Test			
	Free Recall		Cued Recall	
Type of Target	Pictures	Words	Pictures	Words
Initial Recall	9.86 (3.3)	8.16 (3.5)	8.18 (3.1)	7.22 (3.7)
Retest Recall	9.89 (3.3)	8.36 (3.4)	9.54 (3.2)	8.06 (4.2)
Hypermnesia	.03 (1.2)	.20 (1.5)	1.36 (1.8)	.84 (1.5)
Reminiscence	1.24 (0.9)	.92 (1.2)	2.13 (1.8)	1.53 (1.7)
n	37	37	55	51

Note. The numbers within parentheses are standard deviations.

This result shows the part list cuing inhibition effect. There was also a significant effect of type of target [F(1,176) = 6.72, p < .05, MSe = .051]; pictures were recalled better than words. This result is an example of the picture superiority effect (e.g., Pavio, 1971).

A second analysis examined initial recall for only the part list cued recall groups. A 2 X 2 (type of target X type of cues) ANOVA found no effect of type of target [F(1,102) = 1.78, p = .19, MSe = 11.33], type of cue [F(1,102) = .88, p = .35, MSe = 11.33], or of the interaction between the two variables [F(1,102) = 2.57, p = .11, MSe = 11.33].

Retest: Recovery from Part List Cuing. A 2 X 2 (initial test X type of target) ANOVA was computed using reminiscence as the dependent measure. Reminiscence was calculated as the number of critical items that were not recalled on the initial test, but were recalled on the retest. The effect of initial test was significant [F(1,176) = 10.60, p < .01, MSe = .29]; greater reminiscence on the retest was found for the group that had received an initial part list cued recall test, as compared with the free recall group (Table 1). There was more reminiscence for pictures than for words, as indicated by the significant effect of type of target [F(1,176) = 4.04, p < .05. MSe = .29].

Another 2 X 2 (type of target X type of cue) ANOVA compared the amount of reminiscence observed among the part list cued recall groups. The effect of type of target did not reach significance, although there was a trend suggesting somewhat greater reminiscence for pictures than words [F(1,102) = 3.50, p = .064, MSe = 2.91]. The effect of type of cue was significant [F(1,102) = 6.06, p < .05, MSe = 2.91]; greater reminiscence was found when words, rather than pictures, were used as part list cues (Table 2). The interaction of target type and type of cue was not significant (p > .15).

Table 2: Mean Number of Critical Items Initially Recalled and Reminiscence for Part List Cued Recall Groups in Experiment 1 as a Function of Type of Target and Type of Cue

	Type of Target			
	Pictures		Words	
Type of Cues	Pictures	Words	Pictures	Words
Initial Test	8.34 (3.3)	7.90 (2.8)	6.38 (3.9)	8.08 (3.2)
Reminiscence	2.00 (1.5)	2.35 (2.3)	.88 (1.0)	2.20 (2.0)
n	35	20	26	25

Note. The numbers within parentheses are standard deviations.

Hypermnesia, the net increase in recall of critical items from the first to the second recall test, was analyzed in a 2 X 2 (type of initial test X type of target) ANOVA. There was a significant effect of type of initial test [F(1,176) = 18.04, p < .0001, MSe = 2.36]; greater hypermnesia was found for those who had an initial part list cued recall test, as compared to those who had an initial free recall test (Table 1). The effect of type of target was not significant F < 1.0).

A 2 X 2 (type of initial test X type of target) ANOVA was computed using the total number of critical items recalled on the retest as the dependent measure. Although pictures were remembered better than words [F(1,176) = 7.80, p < .01, MSe = 12.68], there was no effect of type of initial test (F < 1.0).

Discussion

A part list cuing inhibition effect was observed for both word and picture targets in Experiment 1. This part list cuing effect is one of the first reported for pictures. The effect was found whether pictures or words were used as part list cues, although there was more interference when words were used as cues.

Recovery from part list cuing was also found. Reminiscence was significantly greater following an initial part list cued recall test, rather than an initial free recall test. The recovery effect could also be seen in measures of hypermnesia; greater net increases in recall were found on the retest if the initial test involved part list cuing. Therefore, it can be concluded that increasing initial output interference causes increased memory recovery on a retest.

EXPERIMENT 2

In Experiment 2 the part list cuing effect for pictures was again tested, as was the recovery from part list cuing effect. The effects of retest delays were also examined, with the prediction that a delay between the initial test and the retest should increase reminiscence. Incubated reminiscence and recovery from part list cuing were predicted to result in additive effects.

Method

Subjects. The subjects were 172 student volunteers from introductory psychology classes who consented to be in the study. As in Experiment 1, subjects were free to enroll for any session in the present experiment, or other experiments also being offered, so there were unequal numbers of subjects in different treatment groups. This experiment was approved by Institutional Review Board (IRB) of Texas A&M University.

Materials. The same list of 50 items used for the study list in Experiment 1 was also used in Experiment 2. Only pictures were used on the study list in Experiment 2. The study list was presented via a 10 page booklet given to each subject. Each page of the booklet contained five pictures from the study list.

The cues for the part list cuing conditions (including cue counterbalancing sets A and B) were the same as those described in Experiment 1, except that cues were always presented as words in Experiment 2. As in Experiment 1, the 25 cue words were presented on a single piece of paper.

Design. Type of initial test (part list cued recall or free recall) and delay (0 min, 5 min, or 10 min) were manipulated between subjects. Within the cued recall groups, cue sets A and B, described in Experiment 1, were counterbalanced between subjects.

Procedure. For the study session each subject was given a booklet of pictures and was asked to memorize the list. Every 30 sec, on the experimenter's command, the subjects turned a page of the booklet and studied the five pictures on the next page. After 5 min the 10 page study list had been seen in its entirety, and the booklets were taken away.

The initial part list cued recall and free recall tests used the same procedure described for those tasks in Experiment 1 with the exception of the fact that the presentation of the part-list cues were on the same page as the initial recall test. Part list cues were always presented as words in Experiment 2. After a delay that varied in duration between groups, subjects were given a second test, a free recall test, as described for Experiment 1.

Between the initial test and the retest was an interval of variable duration. Subjects were given a task to work on during this interval to keep them from thinking about the list of pictures. Several maze puzzles were given on paper, and subjects were asked to make as much headway as they could on the puzzles. For the conditions in which there was no delay, subjects immediately began the second recall test, as described in Experiment 1. During the 5 min allotted for the second recall test, subjects listed items in a sequential order as they were recalled. Every 60 sec the experimenter said, "MARK," at which time subjects drew a line under their most recently recalled item before going on with the recall test. Thus, it was later possible to determine during which minute an item was recalled on the free recall test.

Results

Initial Test: Part List Cued Recall vs. Free Recall. A 2 X 3 (type of initial test X delay) ANOVA examined the effect of initial test, using the number of critical items recalled on the initial recall test as the dependent measure. Initial test was part list cued recall or free recall, and delay was 0 min, 5 min, or 10 min. Critical items were defined as the 25 items that were not used as cues in corresponding cued recall conditions. There was a significant main effect of initial test [$F(1,166) = 11.44$, $p < .001$, $MSe = 10.46$]; more critical items were recalled on the initial test when the test was free recall rather than part list cued recall (Table 3).

Table 3: Mean Number of Critical Items Initially Recalled, Recall at Retest, Hypermnesia, and Reminiscence as a Function of Type of Initial Recall Test and Delay of Retest in Experiment 2

Type of Initial Test						
	Free Recall			Part-List Cued Recall		
Delay of Retest	0-min	5-min	10-min	0-min	5-min	10-min
Initial Test	10.34 (2.9)	11.04 (3.3)	10.72 (3.4)	8.33 (2.0)	9.07 (4.3)	9.68 (10.9)
Retest Recall	10.29 (3.4)	11.51 (3.5)	11.57 (4.1)	9.55 (2.6)	10.48 (4.5)	10.92 (3.2)
Hypermnesia	-.05 (1.4)	.47 (1.4)	.85 (1.4)	1.22 (1.7)	1.41 (2.5)	1.24 (2.0)
Reminiscence	1.34 (0.9)	1.91 (1.0)	2.28 (1.3)	2.00 (1.6)	2.41 (1.8)	2.56 (1.8)
n	28	34	29	27	29	25

Note. The numbers within parentheses are standard deviations.

This result replicates the part list cuing inhibition effect for pictures found in Experiment 1. There was no effect of delay on initial recall [$F(2,166) = 1.14$, $p = .32$, MSe = 10.46].

Retest: Recovery from Part List Cuing. A 2 X 3 (type of initial test X delay) ANOVA was computed using reminiscence as the dependent measure. There was a significant effect of type of initial test [$F(1,166) = 5.01$, $p < .05$, MSe = 1.98]; greater reminiscence was found for those groups that had an initial part list cued recall test, as compared to those with initial free recall tests (Table 3). This result replicates the rebound from part list cuing effect found in Experiment 1. The effect of delay on reminiscence was also significant [$F(2,166) = 3.99$, $p < .05$, MSe = 1.98]; longer delays between tests produced more reminiscence, replicating Smith & Vela's (1991) incubated reminiscence effect. This incubation effect was not affected by the type of initial recall test ($F < 1.0$). That is, incubated reminiscence and recovery from part list cuing effects were additive effects, as predicted.

A 2 X 3 (type of initial test X delay) ANOVA was also computed with hypermnesia as the dependent measure. There was an effect of type of initial test [$F(1,166) = 10.16$, $p < .0001$, MSe = 3.19]. As with reminiscence, there was greater hypermnesia for the groups with an initial part list cued recall test, as compared with those who had initial free recall tests. This result replicates the rebound from part list cuing effect found in Experiment 1. There was no significant effect of delay on hypermnesia ($F = 1.0$). Apparently, the increased reminiscence that occurred with longer delays was counteracted by greater dropout rates (i.e., items recalled on the initial test but not recalled at the retest), resulting in no net increase with greater delays (Table 3).

Five additional 2 X 3 (type of initial test X delay) ANOVAs were computed to assess reminiscence for each of the five minutes of the retest. There was an effect of delay only for reminiscence that occurred in the first minute of the retest [$F(2,166) = 5.45$, $p < .01$, MSe = .41]; longer delays produced greater reminiscence, but only during the first minute of the retest (Table 4). No effects of delay on reminiscence were found for any of the other minutes of the retest, nor did type of initial test interact with delay in any of the analyses. Thus, the incubated reminiscence effect was found only in the first minute of the retest, replicating the results of Smith & Vela (1991).

Table 4: Reminiscence During Each Minute of the Retest as a Function of Type of Initial Recall Test and Delay of Retest in Experiment 2

Type of Initial Test						
	Free Recall			Part-List Cued Recall		
Delay of Retest	0-min	5-min	10-min	0-min	5-min	10-min
Minute 1	.14 (.27)	.22 (.65)	.45 (.66)	.19 (.47)	.38 (.78)	.68 (.85)
Minute 2	.29 (.37)	.31 (.39)	.47 (.50)	.44 (.68)	.52 (.74)	.44 (.71)
Minute 3	.32 (.37)	.54 (.57)	.48 (.59)	.48 (.74)	.45 (.83)	.56 (.87)
Minute 4	.30 (.44)	.41 (.48)	.41 (.36)	.52 (.78)	.48 (.63)	.48 (1.0)
Minute 5	.29 (.52)	.43 (.55)	.47 (.60)	.37 (.68)	.59 (1.05)	.40 (.65)

Note. The numbers within parentheses are standard deviations.

A 2 X 3 (type of initial test X delay) ANOVA was computed using the total number of critical items recalled on the retest as the dependent measure. There was no effect of type of initial test [$F(1,166) = 2.12$, $p = .15$, $MSe = 12.98$], nor was there an effect of delay [$F(2,166) = 2.11$, $p = .12$, $MSe = 12.98$].

Discussion

The results of Experiment 2 replicate three related findings: A part list cuing effect with pictures (Experiment 1), recovery from part list cuing (Experiment 1), and an incubated reminiscence effect (Smith & Vela, 1991). Furthermore, the results show that the recovery and incubation effects were additive; both initial output interference and delay of retest contributed to the recovery of initially nonrecalled target items. Reminiscence was particularly strong in the first minute of the test when the retest was delayed and part list cuing had been used on the initial recall test (Table 4).

General Discussion

The results of both experiments were predicted by the theory that memories that are blocked on an initial test can be recovered on a later test. In the present experiments memory blocking was self induced by initial recall efforts (Roediger, 1978), and in the part list cued conditions blocking was experimentally increased. Although recovery, in the form of reminiscence, was found even for those who had only self induced blocking (i.e., the free recall groups), it was found that recovery was reliably increased when initial blocking was experimentally increased. Therefore, it can be concluded that at least some degree of reminiscence can be attributed to recovery from memory blocking.

The memory blocking induced by part list cuing was clearly temporary, and did not permanently impair memory for the critical memory targets. Comparisons of free recall and part list cued recall conditions showed blocking on the initial recall test, but on the retest the total number recalled was no longer different for free and cued recall conditions. What had been a memory deficit on the initial test was no longer present on the retest, indicating that the deficit had been caused by a temporary block rather than by a loss in retention of the original memories. (comparison with Anderson, Bjork & Bjork)

Plotting the time course of recovery is complex, and should take into account the diminishing accessibility of both the memory targets and the blockers. As interfering items lose their heightened accessibility, they should have less of a blocking effect, thus allowing more critical items to be accessed. Recovery should occur to the extent that decreased blocking exceeds forgetting of critical targets.

The present results support a blocking and recovery basis for incubation effects (e.g., Smith, 1995; Smith & Blankenship, 1991; Smith & Vela, 1991). This explanation attributes sudden resolutions of problems or memory impasses to shifts away from the initial blocked or biased retrieval set. Consistent with this theory, an incubation effect in Experiment 2 found greater reminiscence when the retest was delayed, an incubated reminiscence effect (Smith & Vela, 1991). Furthermore, the effect was found only in the first minute of the retest, suggesting that at the beginning of the retest the retrieval set had been altered from the biased set that had developed during the initial test. Recovery of initially blocked target memories was greatest in the condition in which part list cuing induced initial memory blocking and the retest was delayed.

The present memory blocking and recovery effects have been explained in terms of a biased retrieval set that shifts over time. The effects might also be explained, however, as an initial inhibition effect that dissipates over time. This theory attributes part list cuing effects to inhibition of target memories, an interpretation that is difficult to experimentally distinguish from interference explanations (Anderson & Spellman, 1995). Nor is the time course of such putative inhibition known, making it difficult to predict if or when such inhibition would dissipate. Future research may be able to determine whether the recovery effects are due to reductions in interference or inhibition.

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