Journal of Experimental Psychology: General

VOL. 113, NO. 3 SEPTEMBER 1984

Dreams and Reality Monitoring

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SUMMARY

Experiment 1 tested the counterintuitive prediction that memories for one's own dreams should not be particularly easy to discriminate from memories for someone else's dreams. Pairs of people reported dreams to each other that they had either dreamed, read, or made up the night before. On a test requiring subjects to discriminate events they had reported from those reported by their partner, subjects had more difficulty with real dreams than with dreams they read or made up.

Experiment 2 provided evidence that real dreams do not simply produce overall weaker memories; the deficit for dreams was eliminated with more time to respond and with more detailed cues. In addition, subjects' ratings of various characteristics of their memories (e.g., vividness, personal relevance) indicated that dreams were not generally weaker or impoverished.

The results are interpreted within the framework for reality monitoring described by Johnson and Raye (1981): Memories for real dreams are proposed to be deficient in conscious cognitive operations that help identify the origin of information generated in a waking state. At the same time, real dreams are embedded in a network of supporting memories that can be drawn on for reality monitoring decisions under appropriate circumstances. Finally, a comparison of recognition and recall indicated that dreams may leave persisting memories that are difficult to access via free recall.

We have been working on a general class of memory problems called *reality monitoring* (Johnson & Raye, 1981). That is, how does information derived externally through perceptual processes and information generated internally through thought, imagination, dreams, and fantasies differ in memory? What factors are involved in discriminating these two sources of information in memory?

To summarize our previous research and to guide further research on such questions, we suggested a model of reality monitoring (Johnson & Raye, 1981). According to the model, reality monitoring decisions involve two types of processes. The first evaluates whether the characteristics of a target trace are more typical of the class of externally derived memories or are more typical of the class of internally generated memories. The second type of decision process is based on more extended reasoning drawing on supporting memories or related knowledge. Typically, the second type of process would require more time than the first because it takes time to revive and consider related knowledge. In this article, Experiment 1 was concerned with the role of information about cognitive operations in the first type of decision process. Experiment 2 explored, among other things, the consequences of allowing more opportunity for the second type of process to influence reality monitoring decisions.

The first type of process presumes that there are characteristic differences between internally generated memories and externally derived memories. One of the proposed differences is that internally generated memories typically have more information about cognitive operations than do externally derived memories. Cognitive operations include such things as reasoning, search, decision, and imagery processes that take place when a memory is originally established. Even within the class of internally generated events, phenomenal experiences differ in the amount of cognitive operations that create those experiences. For example, imagining a square involves fewer operations than does imagining an elephant in a derby riding a bicycle. The main point is that although deriving information externally through perception also involves cognitive operations, these operations are generally more automatic and produce less residual effect in memory than those more conscious and voluntary operations involved in generation.

Such a characteristic difference could be used as a discriminative cue; it could form the basis for a decision process. For example, a particular memory with a lot of information about cognitive operations would be judged to have been generated, whereas one with very little information about cognitive operations would be judged to have been perceived. Of course, the success of such a decision rule depends on the average differences between the two distributions to be discriminated. If we do something to increase the amount of information about cognitive operations that is stored during a self-generation, we should increase the accuracy of reality monitoring (Johnson, Raye, Foley, & Foley, 1981). Conversely, ideas that are generated automatically, with fewer cognitive operations, should yield memories that are very likely to be later confused with memories for perceptions.

This aspect of our model led us to a counterintuitive prediction about dreams. Dreams should be a class of internally generated events that are not particularly easy to discriminate from similar externally derived events (e.g., someone else's dreams) because dreams are like perceptions in that they do not involve conscious cognitive operations. Hence, dreams should be lacking one of the most salient cues that would help to identify their source.

In Experiment 1, we asked people to discriminate their own dreams from those reported to them by a partner. This reality monitoring of real dreams was compared with people's ability to discriminate the origin of dreams read or made up in a waking state. The read and made-up dreams provided an estimate of discrimination of origin for material that is roughly comparable in content to real dreams. We expected the identification-of-origin performance to be best for the made-up dreams, next best for dreams that were read, and worst for the real dreams. This prediction follows from the assumption that the dreams people make up while awake should have the most cognitive operations, and the dreams they have while asleep should have the least. In the read condition, subjects were encouraged to actively try to imagine the dream as if they were actually experiencing it. Thus, although reading is more perceptually driven than making up a dream, compared with real dreams, this sort of elaborative reading should require considerably more cognitive operations.

Experiment 1

Method

Subjects

Ten pairs of people who lived together and who reported dreaming frequently were selected from those answering an ad. Fifteen women and 5 men began the study, and 12 women and 4 men completed it. Two subjects were not students; 2 were graduate students, and the others were

This research was supported by National Science Foundation Grant BNS 78-13054, National Institute of Mental Health Grant MH 37222, and a Grant-in-Aid of Research from Sigma Xi, the scientific research society.

We would like to thank Harry Bahrick, Esther Coke, Michael Watkins, and an anonymous reviewer for their helpful comments on an earlier draft of this article.

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Table 1
Procedure and Tests for Experiments 1 and 2

Phase	Experiment 1	Experiment 2
1: Dream journal	Both partners record dreams	Both partners record dreams
2: Experimental	Both partners generate and report the next morning	Both partners generate and report the next morning
	Real dreams	Real dreams
	Read dreams	Read dreams
	Made-up dreams	Made-up dreams
3: Test	Identification of origin (timed)[a]	Identification of origin[c]
	Ratings of memory for events[b]	+ How do you know?
		Identification of condition[c]
		+ How do you know?
		Ratings of memory for events[b]
		Cued recall[c]

[a] Stimuli for this test were single-sentence cues randomly excerpted from real, read, and made-up dreams and from new dream events. [b] Stimuli for the ratings task were three-sentence cues excerpted from the beginning of real, read, and made-up dreams (no distractors). [c] Stimuli were three-sentence cues excerpted from the beginning of real, read, and made-up dreams (including distractors excerpted from new dreams).

undergraduates from the State University of New York at Stony Brook. Subjects' ages ranged from 18 to 33 years old, with a mean age of 20.0 years. Four of the undergraduates received extra credits in a psychology course, and the other subjects were each paid $20.

Procedure

The study was conducted in three phases (outlined in Table 1). Subjects were told this was a study of communication and mood. We collected daily mood ratings but these are not discussed because they were simply a cover task. During an initial orientation session, each pair of subjects was given a tape recorder, a code name to preserve anonymity, and instructions for the first phase, the dream journal.

Phase 1: dream journal. Starting with the following morning, partners used an alarm to wake up at the same time and then told their dreams to each other with the tape recorder running. Subjects consulted a schedule to determine who would report first. The subjects to report first then turned on the recorder, gave their code names, date and time, and spent up to but not more than 5 min reporting their dreams from the night before to their partners. The partners were not to speak during this time, only to listen. The subjects' roles were then reversed. When both subjects finished reporting, they privately filled out mood sheets. If subjects did not have dreams to report, they gave their code names, the date and time, and indicated on the tape that they had no dreams to report. Such subjects still listened to their partners' dreams, and then both subjects privately filled out the mood sheets. Subjects also filled out mood sheets just before they went to bed, using the same procedure as after the morning reports.

This procedure was followed each morning and evening until 4 nights of dreaming had been reported. Subjects were instructed never to listen to tapes or to talk about the dreams other than when recording them, and to avoid thinking about or discussing their responses on the mood checklists.

This first phase had several purposes: It helped subjects get used to reporting their dreams to each other, and according to the dream literature, reporting dreams increases the likelihood of remembering them (Reed, 1973). The most important function of Phase 1 was that it generated materials for Phase 2.

Phase 2: experimental. Phase 2 introduced the experimental manipulation. Each night before bed, subjects opened envelopes containing instructions that told them which of three types of report they would make in the morning: dream, read, or schema. Partners were asked to try to remember and report that night's dreams, if any, the next morning; or they were asked to read a dream before bed and then report it from memory the next morning; or they were asked to make up a dream from a schema and then report this made-up dream from memory the next morning. Thus, all conditions involved recall in the morning, but they differed in the amount of conscious processing engaged in when the target memories were originally established.

For the read condition, 16 dreams from Phase 1 were typed with minor editing. An attempt was made to ensure that selected dreams represented the range of themes and lengths of reports available in the pool. Any identifying facts were removed, for example, names were replaced with pronouns; long sequences strung together with "and then . . . and then" were broken into sentences, and so forth. Table 2 shows a sample of dreams used in the read condition.

Each dream used in the read condition was also used for some other subject in the schema condition. For the schema version, four to six elements of the dream were selected and were typed on separate small pages in booklet form (see Table 2).

Subjects were instructed to spend no more than 5 min reading or making up a dream, to imagine the read and schema dreams as if they were actually their own, and to report them that way the next morning. On any given night, both partners were in the same condition and knew this, so no attempt was made to fool subjects about the nature of the information their partners were reporting.

Table 2
Examples of Read Dreams (A) and the Corresponding Cues for the Schema Condition (B)

A_1 I am in a Fotomat booth. It is a very large one with very long concrete steps leading down to a parking lot, and the route driver pulls up in a maroon van. Somehow I notice that the van is not white. It is really large. He comes into the store, and I start complaining, and he keeps telling me not to complain because the place is bugged. I am able to see the little men in the back of the booth with all of their equipment and the microphones listening to what I am saying. Now I am running out of the store.	B_1 in a Fotomat booth a maroon van I start complaining microphones
A_2 I am in front of a house, and there is this big sink there. It has a lot of different compartments to it, and I am out with the Brillo cleaning the sinks. My grandfather is on the side of the house. He is talking to a neighbor, and they are talking politics or something, and the guy says he is the president, and my grandfather doesn't know what is going on. My grandfather says, "All you do is go to Florida every winter." Then he comes back around the side of the house and tells me to go inside and shut off all of the lights. Then a friend and I are sitting in a building on campus, and we are at a big table with all of these papers stacked up. To the left there is a table with coffee and donuts on it, and this girl comes out of a classroom, walks over to us and says, "You can't say anything in there." She looks really upset, and so we give her a donut, and I tell her to throw out all of our dirty coffee cups, and she just looks at me and walks away.	B_2 cleaning sinks grandfather talking politics lights looks upset

During a given week, each subject read a dream once, made up a dream from a schema once, and reported a real dream twice. The experimental phase lasted 2 weeks. We ran the real dream condition more often because, based on Phase 1, we expected subjects to remember their real dreams in the morning only about 50% of the time. By the end of Phase 2, each subject had reported two reads, two schemas, and at least two dreams. If more than 2 nights of dreams were reported, two were randomly selected for Phase 3. The order of conditions was random and counterbalanced across subjects. In addition, two stimulus sets were created so that subjects who in Phase 1 contributed dreams to one set received stimuli from the other set in Phase 2.

Phase 3: test. In Phase 3, each subject came to the lab individually, about 2 weeks after the end of Phase 2. Two surprise memory tests were given. The first test was an identification-of-origin test. The test items came from Phase 2 reports. Phase 2 reports had been transcribed, and the protocols were divided into five segments of equal length. One test item was randomly selected from each segment. A test item was a sentence or a phrase that expressed a complete idea (e.g., "My arms went out of control"; "Some girl I knew was having a baby"). Test lists consisted of 30 items from subjects' own reports, 30 items from their partners' reports, and 40 distractor items from another pair of subjects. A total of 100 test items were presented verbally by the experimenter in random order. For each item, subjects indicated the source: whether it was theirs, their partners', or new. Subjects were told to respond as quickly as possible by pressing one of three response buttons, and response times were taken in order to encourage fast responding. The response times were not, in fact, analyzed because of the large variability created by differences in length of the test items.

Following the identification-of-origin test, subjects rated their memory for the dreams along a number of dimensions; this procedure is discussed later along with similar data from Experiment 2.

Results

In the following discussion, all analyses are regarded as planned. The basic strategy was first to conduct the three comparisons implied by viewing the experiment as a 2 × 3 within-subjects design: namely, the main effect of origin (self, partner), the main effect of condition (dream, read, schema), and the Origin × Condition interaction. Subsequent analyses were then contingent on the outcomes of these comparisons (Keppel, 1982, p. 160). The maximum number of additional comparisons would be six. For example, if the Condition × Origin interaction were significant, up to six additional pair-wise comparisons might be made: dream versus read, read versus schema, and dream versus schema, each within self and within partner. Applying the procedure and logic outlined by Keppel (1982, pp. 146–165) for controlling "familywise" (experimentwise) error rate using the modified Bonferroni test (for six conditions with 5 *dfs*), the per-comparison significance level should be set at .04. Significance levels for subsequent comparisons are reported, so that the reader can evaluate them against this guideline.

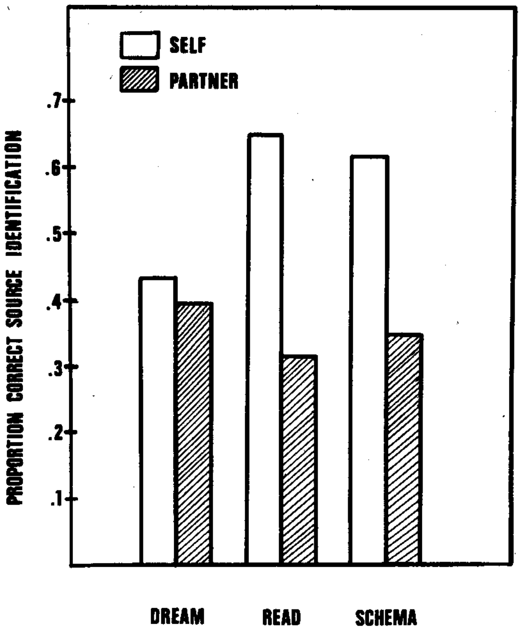

Figure 1. Proportion correct for identification-of-origin test in Experiment 1.

Identification of Origin (IDO)

The results of the identification-of-origin (IDO) test are shown in Figure 1. The dependent variable is the proportion of test items of each type (dream, read, or schema) attributed to the correct source (either self or partner).

There was a Type of Event × Source interaction, $F(2, 30) = 4.93$, $MS_e = 0.07$, $p < .01$. In identifying the partners' reports, type of report made no difference. For their own reports, however, the type of event did matter. Subjects recognized their reads more often than their dreams, $F(1, 15) = 10.31$, $MS_e = 0.06$, $p < .01$, and they recognized their schemata more often than their dreams, $F(1, 15) = 5.95$, $MS_e = 0.09$, $p < .03$. Subjects recognized their reads and schemata equally well. Another way of looking at the results is that for dream items, subjects were not better at identifying the source of their own dream items compared with their partners', whereas on both read and schema items, subjects were better able to identify their own, $F(1, 15) = 42.86$, $MS_e = 0.04$, $p < .001$, and $F(1, 15) = 17.19$, $MS_e = 0.07$, $p < .001$, respectively.

Old/New Recognition

A similar pattern was found for simple old/new recognition (see Table 3). In an analysis of misses (old items called new), there was a significant Origin × Condition interaction, $F(2, 30) = 4.46$, $MS_e = 1.74$, $p < .02$. Within partner-generated events, there was no effect of type of event, $F(2, 30) = 0.58$, $MS_e = 1.67$, $p > .05$, and subjects were no more likely to recognize their own dreams as old than their partners', $F(1, 15) = 0.61$, $MS_e = 2.06$, $p > .05$. However, subjects did recognize their own read and schema items better than their partners'; $F(1, 15) = 40.34$, $MS_e = 1.01$, $p < .001$, and $F(1, 15) = 15.55$, $MS_e = 1.85$, $p < .001$, respectively.

In order to determine whether a bias to respond *self* was involved in the greater recognition accuracy of self-generated events compared with partner-generated events, we analyzed the false positives (i.e., judging a new item as old). If a bias to respond *self* existed, then we would expect subjects to respond *self* more often than to respond *partner* to new items. There was no evidence of such a response bias. In fact, the tendency was in the other direction. The means were 4.43 and 6.25 for self and partner, respectively, $F(1, 15) = 3.15$, $MS_e = 12.14$, $p < .10$. This result is consistent with previous work on reality monitoring in which false positives tended to be judged as originating from an external source (Johnson et al., 1981).

In summary, the overall pattern of the IDO scores was consistent with the assumption that real dreams are deficient in information about cognitive operations that help identify the self-generations we create when we are awake. However, our initial expectation that made-

Table 3
Experiment 1: Mean Number of Misses on the Identification-of-Origin Test

	Condition		
Origin	Dream	Read	Schema
Self	2.78	1.81	1.93
Partner	3.06	3.41	3.28

Note. Maximum per cell = 10.

up dreams would yield higher identification-of-origin scores than read dreams was not confirmed. Although it is possible that reading and making up events typically do not differ in the amount of cognitive operations they require, we think it is more likely that the instructions given in our read condition, emphasizing that the subjects should actively imagine themselves having the dream, produced an unusually high level of cognitive operations. Also, the fact that the same subjects served in both read and schema conditions, alone, might have tended to raise the overall level of imaginative activity in the read condition. With hindsight, it might have been better to have the read and schema as between-subjects conditions and to de-emphasize imaginative activity in the read condition to make it less like the schema condition.

Experiment 2

The results of Experiment 1 were consistent with the hypothesis that dreams do lack an important type of discriminative cue to their origin, namely a record of conscious cognitive operations. At the same time, the results are consistent with the hypothesis that dreams simply produce overall weaker, less vivid memories. The argument that dreams have some more specific deficit would be strengthened if dreams were at less of a disadvantage under some circumstances and by other measures of memory. As mentioned in the introduction, our model of reality monitoring proposes that decisions about the origin of memories of both internal and external events benefit from extended reasoning. For example, even if you had no residual cognitive operations, you could reason that a dream was yours if it reminded you of a party you recently attended. That is, although identification of origin is helped by information about cognitive operations, it does not depend exclusively on it. Either a high level of cognitive operations information or an appropriate supporting memory may be sufficient to identify the internal origin of a target event. However, it should take time to engage in extended reasoning because the activation of information in addition to the target memory is required. If identification-of-origin decisions took place under conditions that allowed subjects to draw on this type of supporting information, dreams would perhaps be at less of a disadvantage.

In Experiment 2, the identification test was changed in two important ways that should maximize the usefulness of other information preserved in memory. Whereas in Experiment 1, a single sentence out of context was given as a cue, in Experiment 2, the first three sentences of the dream report were used as cues, thus increasing the amount of detail available during the origin decisions. Furthermore, subjects were given unlimited time to respond, allowing subjects time to revive other, related memories and to consider the idiosyncratic content of the dream. In contrast, if dreams simply produce overall weaker traces than waking experience, we would expect dreams to still be at a disadvantage, even under these more favorable test conditions.

To provide additional evidence about the characteristics of memories for dreams compared with the reads and schemas, we also had subjects judge condition (dream, read, or schema) as well as origin (self or partner) and had them try to explain the basis of their decisions. Afterward, subjects also rated the dreams, reads, and schemata on a number of characteristics, such as sensory vividness, personal relevance, and bizarreness and attempted to recall the original events. These various measures, in combination with the results of Experiment 1, were designed to give us a more complete picture of the memories created by dreams. Specifically, they should help us evaluate the plausibility of the hypothesis that real dreams produce overall less vivid or stable memories than dreams that are read or made up. Although the procedure and instructions in the read condition were probably not ideal for producing an intermediate level of cognitive operations, we did not change the instructions, so that the overall pattern of results obtained in Experiment 2 could be compared with that of Experiment 1.

Method

Subjects

Ten new pairs of subjects, 13 women and 7 men, were selected by the procedure outlined for Experiment 1. All subjects completed the study. Subjects' ages ranged from 18 to 24 years old, with a mean age of 20.55 years. All subjects were undergraduates from the State University of New York at Stony Brook. Four students received extra credits in a psychology course; the others were each paid $20.

Procedure

Phases 1 (dream journal) and 2 (the experimental phase) were essentially the same as in Experiment 1. In Phase 2, the dreams subjects were given to read and the schema cues were the same as those used in Experiment 1. For Phase 3, subjects reported individually to the lab between 2 and 3 weeks after the end of Phase 2, and completed four tests: identification of origin, identification of condition, rating, and cued recall (see Table 1).

Identification of origin or of condition. Each subject was presented with 18 three-sentence, written excerpts, an equal number from self, partner, and new reports. Excerpts were from the beginning of the dream reports originally recalled during Phase 2 (e.g., "I was in France or someplace foreign. I was with a bunch of friends. And there was this queen who had two sons.").

Subjects made origin judgments for half of the excerpts. They were instructed to decide whether the excerpts came from reports they made to their partners, from reports their partners made to them, or from a new report. After indicating who reported the dream, subjects rated their confidence in that decision on a 7-point scale ranging from *guessing* (1) to *very sure* (7). In addition, subjects were asked about the basis of their decision with the question: "How do you know whose report this was?"

For the other nine excerpts, subjects judged what type of dream event the excerpt came from. Subjects were told that the excerpt could be from reports made by either themselves or their partners about a real dream, a made-up dream, or a dream that was read, or the excerpt could be new, that is, from someone else's dream. Thus, subjects were asked specifically to respond with what type of dream the excerpt was from, and not whose dream it was. Subjects then rated their confidence in this decision using the same 7-point scale described earlier. Again, subjects were asked about the basis of their decision with the question: "How do you know whether this was a real dream, a made-up dream, a read dream, or a new dream?"

Judgment (origin or condition) order was counterbalanced across subjects; half of the subjects made origin judgments first, and half made condition judgments first.

Rating task. For the third task, subjects rated the characteristics of their memories for six dream events. Excerpts were verbally presented to subjects one at a time and in random order. Subjects were told that the excerpts could be from the beginning of either one of their dream reports or one of their partners'. For a given excerpt, subjects were instructed to try to get the whole dream in mind. Subjects then rated their memory for that dream along 28 bipolar dimensions using a 7-point scale. Rating dimensions included the following: sensory characteristics, comprehensibility, organization, temporal information, contextual information, personal relevance, affect, generative processes, cotemporal thoughts and feelings, and supporting memories.

Stimuli for this task were excerpts previously presented to subjects during the identification-of-origin (or identification-of-condition) test. There was one excerpt each from a subject's and a partner's real dream, read dream, and made-up dream. Both members of a pair received the same set of excerpts in the same order. For each of the six excerpts, subjects were given 4 min to complete the ratings.

Cued-recall test. For the fourth and final task, subjects attempted to recall the content of six dream events. The cues were excerpts previously presented during the identification-of-origin (or identification-of-condition) test that had not been used as stimuli for the rating task. Stimuli included one excerpt each from a real dream, a read dream, and a made-up dream from both a subject's and the partner's dream reports.

Excerpts were presented verbally to subjects in random order; their partners received the same excerpts in the same order. Subjects were told that the excerpts would be from the beginning of either one of their own or their partner's dream reports. Subjects were instructed to try to get the whole dream in mind once the cue had been presented and then to try to recall out loud as much as possible of the event; they were told to recall anything they could remember and that order did not matter. Subjects were also told that the recall task would be tape-recorded.

Results

Identification of Origin and of Condition

Judgment order (origin–condition or condition–origin) was counterbalanced across subjects. Because order did not interact with any other variables, the data were collapsed across order in the analyses reported here.

Origin judgments were weighted by confidence ratings (e.g., a score of +7 for a *very sure* correct response and a score of −7 for a *very sure* incorrect response, etc.). For dream, read, and schema, the means were, respectively, for self: 4.15, 2.90, and 3.80; and for partner: 2.60, −1.55, and 1.25. In an overall analysis, there was a substantial advantage for self-generated items over partner-generated items, $F(1, 19) = 6.44$, $MS_e = 37.83$, $p < .02$. In addition, there was a marginal effect of condition, $F(2, 38) = 2.80$, $MS_e = 27.23$, $p < .07$. Subsequent analyses suggested that subjects were more confident about the origin of dreams than about the origin of reads, $F(1, 19) = 4.98$, $MS_e = 29.27$, $p < .04$. In contrast to Experiment 1, a subject's own dreams clearly were not at a disadvantage in identification-of-origin judgments in Experiment 2.

Judgments of condition were weighted by confidence in a similar manner. For dreams, reads, and schemas, the means were, respectively, for self: 3.15, 5.20, and 4.30, and for partner: 0.15, −1.40, and −0.85. Subjects were more confident about their own reports than about their partners', $F(1, 19) = 27.36$, $MS_e = 26.51$, $p < .001$. Neither a main effect of condition nor the Origin × Condition interaction approached significance. A comparison of the confidence data for origin and condition judgments supports the idea that these judgments draw on somewhat different characteristics of memories. Although subjects were relatively confident about the origin of their own real dreams under the conditions of Experiment 2, they appeared somewhat less confident about their ability to identify their own dreams as dreams.

Old/New Recognition

The responses from the first test may also be scored to yield information about the subject's ability to discriminate old from new items, without regard for whether origin or condition was correct. For dreams, reads, and schemata, respectively, the mean proportion of misses (calling an old item new) were the following: for self, .20, .08, and .08; and for partner, .30, .53, and .28. There were fewer misses for self than for partners' reports, $F(1, 19) = 13.57$, $MS_e = 0.14$, $p < .01$, as well as a Condition × Origin interaction, $F(2, 38) = 4.75$, $MS_e = 0.07$, $p < .01$. Relative to the schemata, the real dreams tended to be at a disadvantage in the self-generated items, $F(1, 19) = 4.13$, $MS_e = 0.04$, $p < .06$, whereas the reads were at a disadvantage in the partner-generated items: dream versus read, $F(1, 19) = 5.94$, $MS_e = 0.08$, $p < .02$; schema versus read, $F(1, 19) = 5.00$, $MS_e = 0.13$, $p < .04$.

The number of times a subject said *old* to a new item (false positive) was also evaluated. Given 120 opportunities across the two judgment conditions, there were only 3 false positives during origin judgments (1 *self* and 2 *partner*) and 11 during condition judgments (7 *dream*, 3 *read*, and 1 *schema*).

Thus, overall, there was a clear advantage for self reports. In addition, there was some evidence that, as in Experiment 1, self-generated dreams were at a disadvantage in recognition compared with dreams read or made up in a waking state. Unlike Experiment 1, dreams were not at a disadvantage in the identification-of-origin test in Experiment 2. This was especially clear when identification of origin was weighted by confidence. A comparison across experiments suggests that the more favorable retrieval conditions (longer time to respond, more detailed cues) especially benefited real dreams on the reality monitoring test. Of course, comparisons across experiments should be made with caution. Nevertheless, our confidence in comparing across experiments is increased by the extreme similarity of the ratings subjects made of the dream events (to be discussed later) in the two experiments. This supports the assumption that we had a comparable selection of dreams and subjects in the two experiments.

Subject Reports ("How Do You Know?")

After subjects attempted to identify either the origin or the condition of an excerpt in the first task, they also attempted to describe the basis of their decision. Three subjects were eliminated from the following descriptive analysis because they apparently misinterpreted the question. Our coding scheme was a modification of one developed previously to analyze similar introspections regarding autobiographical memories (Johnson, in press). The codes include references to various features of the target memory itself (e.g., sensory quality, specific striking detail), to supporting memories (e.g., events or thoughts prior to or subsequent to the target event such as, "I actually did see this little house on a walk one day with my boyfriend," or "[The dream] dealt with a conspiracy we talked about later that morning") and reasoning processes (e.g., "This is not the sort of dream I ever have"), or metamemory assumptions ("If I [had] heard it before, an image would have come to mind"), or to a dimension of familiarity/unfamiliarity (e.g., "I've never heard this before"). The coding scheme used in the present study is given in Table 4, along with the number of times each code was used in scoring protocols for correctly identified items.

Even though remembering a particular detail does not imply the origin or condition of the detail, subjects most often (frequency = 38) justified correct origin and condition judgments by referring to a detail in the excerpt (e.g., "I especially remember the part about teeth falling out"). (The numbers in parentheses refer to frequency of response.) Other frequent responses were that they remembered some related event (i.e., a supporting memory) that happened prior to or after the target (32), that they remembered reporting or hearing their partner report (22), that they remembered how they thought or felt at the time (18), that they remembered generating the target (17), or that they remembered reading the dream (7). In judging condition, subjects often mentioned origin (25), whereas in judging origin, they were less likely to mention condition (9).

Decisions about the origin or condition of real dreams, compared with read or made-up dreams, clearly depended more on the availability of related supporting memories (26, 3, and 3, respectively). In contrast, decisions about read or made-up dreams depended more on the memories of generating the events or of reading (0, 11, 13 for dream, read, and schema, respectively).

New items were rejected overwhelmingly because they seemed "unfamiliar" (67). New items were also rejected on the basis of extending reasoning, such as subjects' assumptions of how memory works (17) or that the content or style of the report was not characteristic of themselves or of their partners (15).

Ratings

For the rating task in both Experiments 1 and 2, subjects were read excerpts consisting of three sentences from the beginning of a

Table 4
Coding Scheme and Scoring Frequencies for Correct Origin Judgments and Correct Condition Judgments

	Origin							Condition						
	S-generated			P generated				S-generated			P generated			
Code	Drm	Rd	Sch	Drm	Rd	Sch	New	Drm	Rd	Sch	Drm	Rd	Sch	New
Detail	3	3	4	5	2	4		2	7	5	1	1	1	
Sensory	1	4	1							1				
Contextual														
Clarity	2				1					1				
Completeness	1	1												
S remembers:														
Generating		1	6						4	6				
Reading		1							5	1				
Schema cues														
Own thoughts and feelings	2		2	1	1	3		4	2	2			1	
P's thoughts and feelings				1										
Reporting	1	3	2						1					
Hearing				5	2	4					2	1	1	
Supporting memories														
Overt	6	1	1	4	1	1		5			5	1	1	
Covert	3			1				2						
Extended reasoning	2					1	6	2				1		
Content unlike S/P			1	1	1	1	6		1		2	1		9
Metamemory assumptions							8							9
Type/origin mentioned	1	3	2	1		2		2	5	7	5	2	4	4
Familiar	1	2				1		1	2					
Unfamiliar							32							35
Other	1	1			1		2	1	2	3	1	1	6	1

Note. Drm = dream, Rd = read, Sch = schema, S = self, P = partner.

Table 5
Rating Dimensions Along Which Self-Generated Events Did Not Differ From Partner-Generated Events

Dimension	Scale	M: Self	M: Partner
Smell	Little/a lot	2.23	1.92
Taste	Little/a lot	1.93	1.70
Story line	Bizarre/realistic	3.92	3.95
	Simple/complex	3.80	3.90
Dream seems	Short/long	3.47	4.00
Overall tone	Negative/positive	3.93	4.08
Talked about	Not at all/many times	1.90	1.50
Remembered from when dream reported in morning:			
Partner's feelings	Nothing/a lot	3.42	3.92
How partner looked or sounded	Nothing/a lot	3.38	4.02
Partner's reaction	Nothing/a lot	3.58	3.67

Note. All $Fs(1, 19) \leq 2.82$, *ns.*

report. For each, they were asked to get the dream in mind and then were asked to rate their memory for the event along a number of dimensions. There were several minor changes and additions in the questionnaire between Experiments 1 and 2; for the most part,

Table 6
Rating Dimensions Along Which Self-Generated Events Differed From Partner-Generated Events

Dimension	Scale	M: Self	M: Partner	F	MS_e	$p <$
Overall, event remembered	Hardly/very well	5.02	3.33	10.88	7.81	.01
Memory for this event is or includes	Dim/sharp or clear	5.28	3.67	11.19	7.00	.01
	Black & white/ entirely in color	4.97	4.07	4.18	5.81	.05
	Visual detail: none/ a lot	5.37	4.03	10.00	5.33	.01
	Sounds: none/a lot[a]	3.87	2.95	5.23	4.82	.03
	Touch: none/a lot	3.33	2.05	13.39	3.68	.01
Location where events in dream take place	Vague/clear or distinct	5.47	4.38	4.71	7.47	.04
	Unfamiliar/ familiar[b]	4.10	3.12	3.15	9.22	.09
Things remembered from when dream reported in a.m.:						
Some of exact words used	Nothing/a lot	4.72	3.28	7.04	8.76	.02
Subject's own feelings	Nothing/a lot	4.57	3.23	8.17	6.53	.01
Subject's thoughts about report[c]	Nothing/a lot	4.62	3.42	12.54	3.44	.01

[a] Dream (3.95), read (2.77), schema (3.50), significant at $p < .05$. [b] $p < .09$ in Experiment 2, but in Experiment 1, self (4.23) greater than partner (2.98), $F(1, 15) = 20.37$, $MS_e = 3.14$, $p < .001$. Also in Experiment 1, dream (3.90), read (2.89), schema (4.03), $F(2, 30) = 3.59$, $MS_e = 6.29$, $p < .04$. [c] Dream (4.50), read (3.35), schema (4.20), significant at $p < .02$.

however, the questions were the same, and the subjects' responses in the two experiments were quite similar. Therefore, for clarity and brevity, only the results from Experiment 2 are presented. In Tables 5, 6, and 7, dimensions are listed along with the end points of the 7-point scale subjects used during the rating task. The bodies of Tables 5 and 6 contain mean responses for self-generated items and partner-generated items collapsed across the dream, read, and schema conditions.

Table 5 shows the dimensions along which self-generated events did not appear to differ much from events reported by partners. These were the amount of smell and taste, the bizarreness and complexity of the story line, the length of the dream and its overall tone, the number of times subjects claim to have talked about the event, and how much the subject remembered about what the partner was feeling as well as how the partner looked, sounded, or reacted during the morning reports.

Table 7
Rating Dimensions Yielding More Complex Patterns

			Condition			Comparison		
Dimension	Scale	Origin	Dream	Read	Schema	$F(2, 38)$	MS_e	$p <$
1. What dream reveals about subjects	Not much/a lot	Self[a]	5.00	2.00	4.00	Origin × Condition		
						8.25	3.37	.001
		Partner[c]	1.75	1.80	1.10			
2. How event related to subject's current life	Not much/a lot	Self[b]	4.60	1.70	2.65	Origin × Condition		
						10.27	2.99	.001
		Partner[c]	1.45	2.05	1.40			
3. What dream reveals about partner	Not much/a lot	Self[c]	2.10	1.55	1.45	Origin × Condition		
						2.94	3.09	.06
		Partner[b]	5.30	2.85	3.85			
4. How event related to partner's current life	Not much/a lot	Self[c]	1.85	1.50	1.45	Condition		
						3.32	3.46	.05
		Partner[d]	4.40	3.00	2.85			
5. What subject remembers about how partner felt	Nothing/a lot	Self[c]	3.10	3.60	3.55	Origin × Condition		
						3.46	4.04	.04
		Partner[b]	4.85	3.00	3.90			
6. What subject remembers thinking in morning	Nothing/a lot	Self[c]	4.60	4.05	5.20	Condition		
						4.47	3.18	.02
		Partner[a]	4.40	2.65	3.20			
7. What subject subsequently thought about event	Not at all/a lot	Self[d]	4.50	2.05	2.70	Origin × Condition		
						4.40	3.26	.02
		Partner[c]	1.65	1.95	1.40			

Note. For all dimensions, self-generated events differed from partner-generated events at $p < .05$.
[a] Dreams > reads; schemata > reads; dreams = schemata (1. $p < .01$; 6. $p < .02$). [b] Dreams > reads = schemata (2. $p < .001$; 3. $p < .01$; 5. $p < .05$). [c] Dreams = reads = schemata. [d] Dreams > reads; dreams > schemata; reads = schemata (4. $p < .05$; 7. $p < .05$).

Table 6 shows the dimensions along which there were differences between events generated by subjects and their partners. Subjects rated their overall memory for their own reports as better than their memory for their partners'. According to subjects' ratings, self-generated events were sharper, included more color, more visual detail, more sounds, and more touch. The location where events took place was clearer and more familiar, and subjects remembered more of the words they used during the report and how they felt and what they thought for self-generated reports, compared with their partners' reports.

In general, when the data showed condition effects, dreams and schemata tended to be more alike than reads; reads had less sound, took place in less familiar locations, and resulted in less memory for thoughts occurring during the reports (see footnotes to Table 6).

Table 7 shows a number of other dimensions yielding interesting condition effects. Subjects felt their own dreams and schemata were more revealing and more related to their current lives than were the dreams they read; similarly, they felt that their partners' dreams and schemata were more revealing about their partners and that partners' dreams, especially, were more related to their partners' current lives. They seemed to have the greatest memory for how their partners felt when partners reported real dreams. There was also a tendency for subjects to better remember what they, themselves, had been thinking during partners' real dreams compared with partners' reads and schemata. The greater attention to partners' real dreams reflected in these ratings perhaps accounts for the tendency (though nonsignificant) for subjects to do better on partners' dreams than on partners' reads or schemata on the identification-of-origin tests. Also notable was that subjects subsequently thought about their own reports, especially their real dreams, more often than they thought about their partners' reports.

Recall

The original taped morning reports and the recall protocols were transcribed and divided into idea units by two independent raters, and the recall was scored by two independent scorers. In all cases, differences were resolved by a third person. The mean number of ideas originally reported during Phase 2 tended to vary as a function of condition: dream (29.75), read (17.81), schema (19.37); $F(2, 30) = 3.18$, $MS_e = 211.62$, $p < .06$. Therefore, recall was expressed as a percentage of the number of ideas in the original report. (The same pattern of results was obtained when mean recall was compared for a subset of morning reports selected to equate dream, read, and schema conditions on the number of ideas in the original report.)

Table 8
Experiment 2: Mean Percentage of Ideas Recalled According to a Lenient Scoring Criterion

	Condition		
Origin	Dream	Read	Schema
Self	18.62	19.44	26.62
Partner	6.44	3.12	4.56

Two measures of recall were computed, which varied in the strictness of the criterion for accuracy. Both yielded the same pattern of results, and only the more lenient is reported (see Table 8). The lenient criterion gave recall credit for minor changes in meaning (e.g., "I just floated around" was recalled as "I just kind of went real slow"); increases or decreases in specificity (e.g., "for some reason she was wearing wire frame glasses like Joe's" was recalled as "she was wearing glasses"); or the recall of events, actions, or objects that were not mentioned specifically in the original report but that were clearly implied (e.g., for the original idea "you told me that I couldn't touch the meat without wearing special gloves," recall included the following inference: "you couldn't just pick it up with your hands"). There was a main effect of origin: self (21.56%) versus partner (4.71%); $F(1, 15) = 14.00$, $MS_e = 486.82$, $p < .01$. Neither condition nor the Origin × Condition interaction was significant.

The recall protocols were also scored for distortions, such as the merging of two ideas, or importation of ideas not in the original. For example, 1 subject recalled the two separate ideas in the original report, "we walked to the high school" and "we got to a staircase," as "we were walking down the stairs." In the original report, the subject did not report walking down the stairs, although some action took place next to the stairs. This type of distortion was very rare. Importations of ideas were somewhat more frequent than distortions—self = 1.31, partner = 0.35; $F(1, 15) = 6.75$, $MS_e = 3.26$, $p < .02$—and could represent confusions between reported and unreported dreams, actual ideas from the correct dream that were not included in the original report, or reconstructive intrusions.

In summary, under cued-recall circumstances, subjects recalled on the average only about 20% of their own reports and recalled even less of their partners' reports. Most of what the subjects did recall was clearly a reasonably accurate paraphrase of what they reported originally. There was surprisingly little in the way of intrusions and distortions.

Discussion

Identification of Origin

In these experiments, our major interest was in the consequences of unconscious generation for later reality monitoring. According to the Johnson–Raye reality monitoring model, the more information from cognitive operations preserved as part of a target memory, the easier it should be to identify it as self-generated. We expected that unconscious generation would result in traces missing these potentially powerful cues about origin. In Experiment 1, as expected, the origin of unconsciously generated information (real dreams) was not as readily identified as that of consciously generated information (read and schema dreams). Furthermore, old/new recognition of real dreams suffered as well.

The fact that one's own real dreams were at a disadvantage relative to reads and schemata does not mean that information from real dreams is less likely to be preserved in memory. With more cues and time, identification of origin and recognition of real dreams were more nearly equivalent to those of reads and schemata (Experiment 2). We think the additional time allows other information in memory to come into play. For example, subjects in Experiment 2 reported they used related supporting memories as a basis for reality monitoring decisions about real dreams. Also, subjects acknowledged on the rating task that they thought about the real dreams more frequently than they thought about the reads and the schemata. Evidently, thinking about the dreams does not simply strengthen the target memory. Rather, it is as if these thoughts produce related memories that later take time to be revived or evaluated.

Other evidence that memories for dreams are not simply weaker comes from the rating data. Memories for self-generated events were rated as being significantly sharper, with more visual detail, more color, more sounds, and more touch. Importantly, the real dreams were rated as high as the reads and the schemata on these characteristics. Furthermore, subjects rated their dreams (and their made-up dreams) as more relevant to their current life and more revealing about themselves than the dreams they read. Clearly, neither sensory vividness nor personal relevance predicts the pattern of identification scores in Experiment 1. At the same time, the rating data indicate that memories for subjects' own dreams were not deficient in all characteristics compared with reads and schemata (e.g., clearly, dreams were not lower in imagery or personal meaning). Therefore, although subjects' memories of their dreams were vivid and relevant, they evidently lacked some important cue, compared with the memories of the dreams they read or made up. We would like to argue that at least some of these important cues come from specific cognitive operations that take place at the time a memory is established. Later, such cues contribute to reality monitoring, forming a basis for discriminating perceived events from imagined events in memory.

Thus, we think at least part of our eventual understanding of reality monitoring would have to be framed in terms of the characteristics of conscious versus unconscious processing—for example, conscious processing is a consequence of cognitive operations (Johnson & Raye, 1981; Russo & Wisher, 1976), reflection (Johnson, 1983), effort (Hasher & Zacks, 1979; Tyler, Hertel, McCallum, & Ellis, 1979), and attention (Kahneman, 1973; Shiffrin & Schneider, 1977). The record of such activity is coded in memory and provides a potential discriminative cue for origin. If this record is missing or deficient, the subject would have difficulty quickly identifying self-generated information. With more time or supporting cues, the absence of a record of conscious activity while the target entries were made may be compensated for by other information in memory, for example, the record of later thoughts about the target. The origin of the target may often be inferred from the contents of such later thoughts.

Although we have focused on one interpretation of our findings, this interpretation should be viewed as tentative. For example, one way that self-generated events differed from those of the partner was that the partner's reports were experienced only once (during the report), whereas self-generated events were experienced twice—during the initial generation and during the report. This could explain any overall advantage of self-generated events over partner-generated events, but it, alone, could not explain the interaction between origin and condition found in Experiment 1, specifically the low performance on self-generated real dreams. In fact, subjects reported subsequently thinking about their own real dreams significantly more often than they thought about the dreams they read or made up (see Table 7). Assuming their reports were accurate, reality monitoring judgments based on frequency of occurrence actually should have favored the real dreams.

Another possibility is that the match between the verbal description generated in the morning and the original experience (and, perhaps, subsequent thoughts about it) might have been poorer for real dreams than for read or made-up dreams. The test items were taken from the verbal reports; hence, inferior test items might have produced the disadvantage in the dream condition. Although the instructions in both read and schema conditions strongly emphasized that the subjects should imagine the event as a dream they were actually experiencing, the read and made-up dreams might nevertheless have been primarily verbal and less visual than the real dreams. There was, however, little support in the ratings subjects made for the idea that dreams that were read or made up were less visual than real dreams. Among self-generated events, dreams were not rated as having more visual detail or other sensory information. Of course, even though dreams may not contain more sensory detail, they may still contain less verbal detail, so the morning report for real dreams may represent considerable translation from one mode to another. Thus, the real dreams might have suffered from greater problems related to stimulus reinstatement (McGeoch, 1932) or to encoding specificity (Tulving & Thomson, 1973).

Explanations of our findings in terms of either a deficit in cognitive operations or of a poor match between target and test cue are not, of course, mutually exclusive. Both factors could be operating. Also, both may be facets of the same phenomenon; the test cue may not match at least partly because the target was generated unconsciously, whereas the test item was generated consciously (during the report). Unfortunately, our results cannot be unambiguously interpreted. They are generally consistent with the predictions of our reality monitoring model (Johnson & Raye, 1981) and thus suggest the model is applicable beyond our previous laboratory studies to more complex, natural memories. At the least, the present studies and the questions they raise provide a point of departure for further work on memory for autobiographical events such as dreams.

Dream Recall

The current studies also offer a unique picture of the characteristics of memory for dreams after substantial retention intervals. Long-term memory for dreams recalled previously has not been systematically studied. Most studies conducted in the area of memory for dreams have been concerned with factors aiding or inhibiting the recall of dreams either on awakening in the morning at home or on being awakened duing a REM period in the laboratory (Cohen, 1979; Goodenough, 1978). We know of one study of recall of dreams previously reported (Meier, Ruef, & Ziegler, 1968). Meier et al.'s subjects attempted to recall dreams in the morning that they had reported earlier in the night after being awakened from REM periods. Meier et al. found that the morning recall of dreams reported earlier in the night could be predicted by such familiar variables as recency, intensity, amount of material, and intraserial interference (e.g., when few dreams were recorded during the night, a higher proportion of them were recalled than when many dreams were recorded during the night).

There are two quite striking findings from the recall test in our Experiment 2. First, recall was quite low after the 2-week retention interval. Recall of one's own dreams was below 20%. Recall of dreams the morning after they happen is notoriously poor. In the present case, we measured recall of dreams that had already survived this first hurdle. Yet forgetting even of these initially recalled dreams was substantial. This might be accounted for by appealing to dynamic factors such as repression of unwanted ideas represented in the dreams (Freud, 1900/1950). However, the made-up dreams and the dreams that were read suffered the same fate as the real dreams. Furthermore, we know from studies using more conventional materials that recall depends critically on how readily information is comprehended and organized (e.g., Bransford & Johnson, 1973; Tulving, 1968). Thus, dreams may be difficult to recall because they tend to be incomprehensible and lack coherent organization. That the dreams do persist even though they are difficult to recall and are not simply fleeting thoughts with no long-lasting consequences is suggested by the relatively good performance of subjects on the recognition tests (hits on real dreams were 72% in Experiment 1 and were 80% in Experiment 2).

Second, there was a notable lack of distortion in recall. One would think that the recall of relatively unusual and unstructured material would provide ideal opportunities for intrusions and distortions (especially if dynamically driven) as in the classic Bartlett (1932) studies. However, our results are in line with more recent reports (e.g., Zangwill, 1972) in which such errors have been rare.

In summary, the poor recall of dreams may lead one to suppose that the memory for dreams degrades rapidly. However, the relatively good performance of subjects on the recognition test indicates that dreams persist in memory for substantial intervals but are inaccessible under ordinary free-recall circumstances. Dreams were at a disadvantage compared with comparable material that had been read or made up on the timed identification-of-origin test in Experiment 1. We suggested that the advantage of consciously processed material is related to information resulting from cognitive operations preserved in memory that can function as a discriminative cue, in effect signaling that a memory was self-generated. It is also plausible that the test items represent a better match to the original experience in the case of dreams that were read or made up than in the case of real dreams. With more time and more extensive cues (Experiment 2), subjects were able to overcome the lack of cognitive operations cues and the perhaps poorer match between cue and target by drawing on related memories and extended reasoning processes. Overall, the results suggest that dreams are no less persistent in memory than is other information, but rather that they differ in the relative distribution of types of characteristics they embody and, hence, in their relative accessibility under different test conditions.

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Received October 28, 1983
Revision received February 9, 1984 ■