On the Representation of Events:  
A Study of Orientation, Recall, and Recognition

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Examined the representation of real-world events in memory as a function of orientation toward a videotaped sequence in which 2 people play a board game. In 4 experiments, analyzed subjects' segmentation of the videotaped sequence into events, using a technique developed by Newtson (1973). A comparison of segmentation patterns with performance on recognition, recall, and cued-recall tasks indicated that recall of events changed as a function of subjects' orientation toward the videotape, whereas recognition of events did not. The authors conclude that orientation toward an episodic sequence affects how rather than what events are represented in memory. An account of how orientation might affect the encoding and the representation of events is offered.

Within the last decade, a number of researchers have adopted an ecological approach toward research on memory. Proponents of an ecological approach argue that one cannot necessarily generalize from the simple stimulus material often used in the laboratory to the complex stimuli found outside the laboratory. Rather, if one wants to study how people behave in the world, one should study behavior that occurs in the world (Bruce, 1985; Hirsh & Levine, 1985; Neisser, 1978). Researchers have responded to this concern by studying topics such as "flashbulb memories" (R. Brown & Kulik, 1977), autobiographical memories (Linton, 1982; Reiser, Black, & Abelson, 1985), eyewitness testimony (Buckhout, 1974; Loftus, 1979), and memory for stories (e.g., Bartlett, 1932; Bransford & Johnson, 1972; Neisser & Hupcey, 1974). We extended this list by examining memory for a complex event such as playing a game of Monopoly.

Two points about the structure of events should be noted at the outset. First, they have boundaries. Whatever the extent that events are "in the world" or a product of construction and interpretation, they clearly are units with beginnings and ends. These boundaries may be fuzzy; the exact moment of transition between one event and the next may not be clear. As one reaches for a piece of toast and picks it up, the transition between reaching and picking up may be smooth, but the lack of a precise boundary does not imply that reaching and picking up are not discrete events. Events, like object categories, can have fuzzy boundaries and yet still be distinguished from one another.

Second, any event can be divided into smaller events, and as research on story structure (e.g., Kintsch, 1974; van Dijk, 1977; Winograd, 1977), event perception (e.g., Cutting, 1981), and event memory (e.g., Bower, Black, & Turner, 1979; Kolodner, 1985; Reiser, 1986) indicates, smaller events can be embedded into larger events in a hierarchical fashion. Thus the event going to the movies can be divided into events such as buying a ticket, going into the theater, watching the movie, and leaving the theater. These events, too, can be further subdivided. The event buying a ticket can be divided into getting out a wallet, handing money to a cashier, and so forth. Exactly when this process of division ends is unclear, but certainly events can become quite small. One not only hands a cashier money but also places a hand on the counter. Leans forward, smiles, and so on.

We are concerned with how orientation toward events affects both the perception of and the memory for those events. Presumably, an observer perceives events as a function of his or her orientation toward those events. A driving instructor will be much more likely to perceive such small events as shifting gears, braking, and signaling when he or she is riding with a student than when he or she is riding with a friend to the beach. In the first case, orientation is directed by interest in the subevents of the driving event, whereas in the second case a less fine-grained analysis is warranted. It is possible that the structure of events, like that of object categories, contains a basic level (Rosch, Mervis, Gray, Johnson, & Boyes-Braem, 1976) that specifies how events will be typically represented. However, this basic level may vary across individuals as a function of expertise and/or orientation toward an event sequence.

Prompted by an interest in how orientation toward events affects social attributions, Newtson (1973) developed a technique to examine the segmentation of episodes into events. He asked subjects to attend to small or large events while they viewed a videotape of an event sequence, such as assembling a model. To monitor subjects' orientation, he instructed them to press a response button whenever they believed that a different event was initiated. Newtson found that people can readily shift their orientation toward events and that they demonstrate considerable agreement about event boundaries. If asked to attend to large events, subjects pressed a response button less often than when they were asked to attend to
small events. In addition to this kind of goal-directed segmentation, it is possible for the perception of small and large events to be data driven. For example, subjects have been shown to press more frequently during unpredictable sequences and less frequently during more predictable sequences (Wilder, 1978).

The orientation adopted toward an event may affect not only the perception of the event but also memory for the event. Increasingly, there is evidence to suggest that the way in which information is represented in memory can affect which events in an episode are easiest to recognize and recall (e.g., Abbott, Black, & Smith, 1985; Bower et al., 1979; Lichtenstein & Brewer, 1980; Reiser et al., 1985). For example, Abbott et al. (1985) found that recognition of events was best at the scene header level (a level above a scene action and below a script header). They suggested that scene headers may act as a basic level for representing familiar episodes. Using a different vocabulary, Reiser et al. (1985) came to a similar conclusion, suggesting that autobiographical events may be organized around "activities." Asking subjects to report specific memories, they showed that the presentation of an "activity" cue (e.g., getting a haircut) produced faster retrieval of a personal experience than did the presentation of a more general "action" cue (e.g., paying the cashier).

We explored the effect of orientation on the mnemonic representation of events by examining whether a change in the perception of an event boundary affects the way events are remembered. Our approach to this problem was to use Newson's (1973) task to monitor subjects' orientation toward a videotaped episode and then to compare the segmentation pattern yielded by this task to the kind of events that subjects were able to recall and recognize in subsequent testing. Our interest in examining subjects' ability to both recall and recognize events stems from the well-established finding that recall performance is more sensitive to encoding strategies than is recognition performance (see J. Brown, 1976; Kintsch, 1970). This general principle of memory performance, combined with the fact that the ability to recognize is usually a more robust measure of memory than is the ability to recall, suggests that recall performance may reflect how information is represented in memory, whereas recognition performance may be viewed as a measure of what information is represented. We reasoned that if orientation toward an episode has any effect on the representation of events, then a comparison of recall and recognition performance should provide the means to determine whether the effect was one related to the encoding (what) or to the organization (how) of the mnemonic representation.

There are at least three ways in which orientation could affect the representation of events. First, an episode could be represented in memory in a form reflecting the level of analysis that one adopts while viewing it. So, for example, if subjects attend to large events, the large events would be represented, and many details would be lost. On the other hand, if subjects attend to small events, events would be represented at a more fine-grained level of analysis, and the mnemonic representation would contain more details than one resulting from an orientation toward larger events. Here, then, events more fine grained than the adopted level of analysis would not be represented and, consequently, would be inaccessible to any subsequent probe of memory. Thus one possible scenario is that orientation affects both the encoding and organization of a mnemonic representation. If this is the case, then we should expect to find both recall and recognition of events to vary as a function of orientation instructions.

A second possibility is that orientation affects not what information is represented in memory but rather how it is represented. It may be, for instance, that under any orientation condition, small and large events are equally likely to be represented in memory, but the accessibility of events will depend on the adopted orientation. If an observer attends to large events, then smaller events may be encoded but not organized in a way that makes them easily accessible. However, if an observer attends to small events, then the small events may be incorporated more directly into the representation of the attended episode. If this hypothesis is correct, then recall performance should be readily affected by orientation instructions, whereas recognition performance should not.

The final, least interesting possibility is that orientation has no effect on the representation of events. In this case, the representation in memory of all types of events is equally likely and independent of an observer's orientation. Thus the mnemonic representation of events is presumed to be data driven rather than a function of the observer's attentional strategies. Should this hypothesis be true, then both recall and recognition should be unaffected by orientation instructions. Thus an examination of recall and recognition performance may provide initial insight into the effects of orientation on the representation of events in memory.

General Method

We monitored subjects' orientation to events in all four experiments by having them watch a videotaped episode and press a handheld response button whenever they believed a new event was beginning. Subjects' responses were recorded by a Commodore PET microcomputer. In all but one experiment (Experiment 2), subjects were specifically oriented toward either small or large events. Memory for the episode was tested after presentation of the videotape.

Stimuli

A videotape of a common event sequence was created. This sequence was developed to conform to the general concept of a script (Schank & Abelson, 1977): that is, it included typical events that followed a natural temporal order. In this way we hoped to present to subjects an episode that had plausibility in terms of real-world events.

The 7-min tape depicted two people playing a game of Monopoly (game tape). The tape was soundless and in color. The camera was maintained in one position throughout taping, and no cuts or other editing techniques were used.

Neither of the actors in the game tape were professionals. They were a graduate student in Princeton's physics department and his wife, a freelance writer. Before taping, a script was written and consisted of a number of events, each of which was defined by an action, an actor, and the object of the action. Thus one event might be man opens game box. We ensured adherence to the script by
telling the actors exactly what to do at each moment. The actors rehearsed the episode several times before taping began. These practices served to familiarize the actors with the events in the sequence and to decrease unexpected behaviors (e.g., looking at the camera).

The game tape showed a young man and a young woman playing a game of Monopoly. The man entered a room and set up the game on a table. The woman entered the room twice. The first time, she brought in two glasses of orange juice, which she placed on the table; the second time, she brought in a basket of pretzels, which she also placed on the table. After the woman sat at the table, she and the man began to play. Each player took a couple of turns, and then the game was interrupted by a phone call. After the phone call, the woman got up and left the room. The man put the game away, and then he also left the room.

In addition to the game tape, which was used as the stimulus tape, a practice tape and a distractor tape were created. Like the game tape, each of these tapes was soundless, was in color, used one camera position, and followed a script. The practice tape was presented before the game tape in each experiment in order to familiarize subjects with the button-pressing task. The practice tape was 2 min long and showed a young woman taking an exam. The actors were a faculty member and a graduate student in Princeton's psychology department. The distractor tape was presented in each experiment after termination of the game tape and before any memory tests. It was 5 min long and depicted a woman ordering coffee in a restaurant. A secretary in Princeton's psychology department and her daughter acted in the practice tape.

Equipment

A Panasonic videocassette recorder and a 19-in (48.3-cm) color television set were used to present the videotapes. Responses were collected with a Commodore PET microcomputer interfaced to five response buttons. Each button could be held in the hand, and all were designed to be silent when pressed. The five response buttons provided the opportunity to test a maximum of 5 subjects simultaneously.

Before the start of a videotape, subjects saw the word "ready," then a countdown from 5 to 1, and then the word "press." Each subject was instructed to press the response button when he or she saw the word "press." This first response initiated the program used to record button presses. The program was designed to monitor all response buttons. Each button could be held in the hand, and all were designed to be silent when pressed. The five response buttons provided the opportunity to test a maximum of 5 subjects simultaneously.

Instructions

General instructions concerning the nature of events was given to subjects in all experiments before they viewed any videotapes. Subjects were told,

You will be shown two tapes. As you are watching each tape, I would like you to press the response button whenever you think an event is beginning. An event is any action or set of actions that seems meaningful to you. So, for example, going to the movies might be considered to be an event. Within this event, buying a ticket, getting popcorn, and finding a seat could also be viewed as events. Moreover, each of these events could include other events. So, for example, the buying a ticket event might include reaching for a wallet, pulling out money, handing money to the ticket seller, etc. As you can see, there are no right or wrong answers. What is considered to be an event is entirely up to the viewer.

Segmentation Analysis

In all four experiments, we analyzed the segmentation data by (a) tabulating the number of responses that each subject made while viewing a tape and then (b) comparing patterns of responses across subjects. In order to evaluate the degree of consensus on the perception of event boundaries (i.e., would subjects press the response button at the same point?), the test tape was divided into 1-s bins, and the number of responses (presses) that were made at each bin was tabulated. This definition of "same point" for a response was rather strict (in prior work with this technique, Newton, 1973, used 2-s bins). A mean frequency and a standard deviation of the number of responses were then calculated from the frequency distribution tabulated across bins. A criterion response frequency 1.65 standard deviations above the mean was selected as the cutoff for significant agreement. Assuming a normal distribution, there was approximately a .05 probability that a value this distant from the mean would be found for any single bin.

Experiment I

In Experiment 1 we had two goals. The first goal was to establish that observers can readily segment a videotaped episode into meaningful units and, moreover, that similar orientation instructions will produce similar patterns of segmentation. The second goal was to examine what (if any) effects orientation could have on the recall and recognition of events.

Subjects were told to press a button whenever they felt that one event was ending and another was beginning. Thus, at the very least, subjects' responses should correspond to what one might intuitively call "event boundaries"; that is, subjects' segmentation of the videotape should reflect meaningful units. Furthermore, if the instructions effectively oriented subjects toward a certain level of the event hierarchy, subjects would concur in their patterns of segmentation; that is, subjects oriented similarly should select similar event boundaries. In addition, if small events are subunits of large events, then the segmentation pattern of subjects oriented toward small events should be embedded within that of subjects oriented toward large events. In other words, the hierarchical nature of events should be preserved so that one should be able to find for large events a small event that shares the same beginning. Verification of these three predictions would provide support for the contention that subjects' segmentation reflects their orientation to the event hierarchy.

Method

Subjects. Twenty-four Princeton undergraduates were paid $3 each for their participation. Twelve subjects were asked to orient toward small events, and 12 were asked to orient toward large events. Subjects participated in groups of 1-5 during any experimental session.

Stimuli. The practice, game, and distractor tapes were used. Memory was tested with a free-recall task and a questionnaire containing 24 items. For each item on the questionnaire, a T, an F, and a rating scale (0-5) were provided. Half of the statements on the
questionnaire were true about the game tape and half were false. Items on the questionnaire were descriptions of discrete actions that either had occurred in the game tape (true items) or had not, but could have, occurred (false items). For example, a true item was “A man handed play money to a woman,” and a false item was “A woman handed dice to a man.” Recognition items were designed to capture information that would be available from a single frame without reference to either frequency of occurrence or temporal order. These items were in fact descriptions of recognition stimuli used in a pilot study.

In the pilot study, subjects’ recognition performance was tested with individual frames taken from the game tape and two foil tapes. One foil tape depicted the same actors and objects as the game tape, but the actors performed actions that had never occurred in the game tape. The second foil tape depicted the same actors performing the same actions as in the game tape but with different objects (e.g., a black, rather than a white, telephone). After subjects viewed the game tape, their recognition performance was tested with individual frames from the game, action foil, and object foil tapes. Subjects’ ability to correctly identify stimulus items and to reject foils was quite good.

In addition, all recognition items were typical of a game-playing situation; true and false items were equally typical. Nineteen individuals who were blind to the purpose or design of Experiment 1 rated the typicality of the times used on the recognition questionnaire. On a scale of 0 (not very typical) to 5 (highly typical), true items received an average rating of 2.71, whereas false items received an average rating of 2.85. Thus the ability to infer the truth value of recognition items for a game-playing situation did not differ across true and false items.

Procedure. Subjects were told that the purpose of the experiment was to see “how people perceive and remember events in everyday situations.” They were told that they would be shown a few short tapes and that their memory for the tapes would be tested. Subjects were given the general event instructions (see the General Method section) and were then shown the practice tape.

After these instructions, subjects were presented with the practice tape. Each subject was asked to press the response button whenever he or she judged that a new event was occurring. After viewing the practice tape, but before viewing the game tape, half of the subjects were told to press for small events and half were told to press for large events. Subjects in the small event group were told,

For the next videotape that you will see, I would like you to press the response button every time you think a small event is beginning. For example, a small event in the movie-going example I gave you earlier would be reaching for a wallet, as opposed to the large event buying a ticket.

Subjects in the large event group were told,

For the next videotape that you will see, I would like you to press the response button every time you think a large event is beginning. For example, a large event in the movie-going example I gave you earlier would be reaching for a wallet, as opposed to the small event buying a ticket.

Subjects in both groups were reminded that their memory for the tape would be tested. Immediately after presentation of the game tape, subjects viewed the distractor tape. Orientation to the distractor tape was the opposite of that directed toward the game tape.

After viewing the distractor tape, subjects were asked to “describe in as much detail as possible everything you remember about the tape in which two people played a game.” No time limitations were imposed, and subjects were given sheets of lined paper on which to write. On the average, subjects spent approximately 15 min on the task; no subject took less than 10 or more than 20 min. After the free-recall task, subjects were given the 24-item questionnaire. Subjects were told that for each item they should (a) decide whether the described event had occurred in the tape and (b) provide a confidence rating for this decision. Subjects circled T if they thought that a test item had occurred in the tape and F otherwise. They rated their confidence in each decision by circling a number from 0 (no confidence) to 5 (very confident).

Results

Segmentation. Subjects pressed significantly more often under the small-event instructions (90.83) than under the large-event instructions (16.75), t(22) = 5.07, p < .001 (see Table 1). Did subjects in the same orientation condition produce similar segmentation patterns? We tallied responses generated at each second in the game tape. Over the 419 s of the game tape, the average number of responses made in each 1-s bin by subjects in the small-event condition was 1.99 (SD = 1.48). As described in the General Method section, a criterion for significant agreement was set at 1.65 standard deviations from the mean (in this case, four or more responses). For the large-event condition, the mean number of responses per 1-s bin was 0.51 (SD = 0.81). Two or more responses in any 1-s bin were used as an indication of significant agreement.

Points in the tape in which responses met the criterion for significant agreement were treated as event boundaries. If subjects in the same orientation condition were perceiving similar events, then observed agreement among boundaries should exceed what was expected by chance. Given the 1.65 standard deviation criterion used to determine significant agreement at any single bin, 5% of the 419 bins (20.95 points) could be expected, by chance alone, to have achieved significant agreement. Consensus on 64 event boundaries (15% of the 419 points examined) was found for subjects instructed to press for small events, $\chi^2(1, N = 419) = 93.12, p < .001$, and 48 points (11% of the 419 points examined) were agreed upon by subjects pressing for large events, $\chi^2(1, N = 419) = 36.77, p < .001$. Events occurring between the boundary points obtained from subjects oriented toward small and large events are shown for the first 60-s of the game tape in Table 2.

Eleven points in the tape met the criterion for significant agreement by both groups. On the basis of the joint probability that both groups would agree that the same point was an event boundary, 6.91 shared event boundaries could be expected by chance (.15 x .11 x 419). The observed number of shared event boundaries did not exceed the number expected by chance, $\chi^2(1, N = 112) = 2.58, ns$; however, at several

<table>
<thead>
<tr>
<th>Type of data</th>
<th>Small</th>
<th>Large</th>
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<tbody>
<tr>
<td>Presses</td>
<td>90.83</td>
<td>16.75</td>
</tr>
<tr>
<td>Recall</td>
<td>48.67</td>
<td>33.83</td>
</tr>
<tr>
<td>Recognition</td>
<td>18.42</td>
<td>17.41</td>
</tr>
<tr>
<td>Confidence</td>
<td>3.82</td>
<td>3.76</td>
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</table>
points in the tape where subjects in one group agreed that an event boundary had occurred, the other group also agreed within the next second that an event had occurred. Moreover, these points of relative agreement did not overlap with the points already designated as shared event boundaries.

We decided to liberalize the shared event criterion to include any points that met the criterion for agreement for each group independently and occurred within 1 s of each other. Under this new criterion, we found 11 additional shared event boundaries. With the inclusion of these additional points, a total of 22 shared event boundaries were observed \( \chi^2(1, N = 112) = 35.12, p < .001 \). Thus approximately a third (22 of 64) of small-event boundaries and nearly half (22 of 48) of large-event boundaries were seen by subjects as common to both small and large events. This result suggests that small events are seen as subsets of larger events and argues that the representation of events is hierarchically organized.

**Free recall.** Without exception, subjects recalled the game tape in sequential order, although instructions to this effect had not been given. In fact, subjects made great effort to insert at the appropriate place particular actions that they recalled after that part of the description had been written.

Each subject's description of the game tape was compared to the script of the game tape. The recall data were scored so that one point was assigned for each correctly remembered event. To be scored as correct, a statement must have specified the subject, action, and object involved. Scoring was based on explicitly stated actions. Summary statements such as "He set up the game" received one point, whereas statements such as "He put the tokens, dice, and cards on the board" received three points. Similarly, statements such as "He drank two or three times" was given three points (he drank four times in the tape), whereas "He drank a lot" was scored. Errors of commission were ignored.

Subjects in the small-event group recalled an average of 48.67 items, whereas subjects in the large-event group recalled an average of 33.83 items, \( t(22) = 2.08, p < .05 \) (see Table 1). Thus orientation to small and large events significantly affected recall performance. To check the reliability of these results, an independent judge who was unfamiliar with either the purpose or the design of the experiment was asked to score the recall data, using the same scoring criteria outlined earlier. A Pearson correlation between the experimenter's scoring and the judge's scoring was significant \( (r = .90, p < .001) \).

**Recognition.** Subjects in the small-event group correctly responded to an average of 18.42 items (77%), whereas subjects in the large-event group were correct an average of 17.41 items (73%), \( t(22) = 1.21, ns \) (see Table 1). Hits and false alarms were also similar across the two groups. The proportion of hits averaged 84% for small-unit perceivers, whereas large-unit perceivers averaged a hit rate of 80%, \( t(22) = 0.73, ns \). The percentages of false alarms for small- (30%) and large-unit perceivers (35%) also did not differ, \( t(22) = -0.70, ns \). Apparently, the level of analysis used to perceive an episodic sequence had little effect on subjects' ability to segregate true items from false items correctly.

As for confidence, small- and large-unit perceivers were equally confident about their decisions, \( F(1, 22) = .08, MS_1 = 0.52, ns \) (see Table 1), and both groups were more confident about true items than about false items, \( F(1, 22) = 94.72, MS_1 = 0.25, p < .001 \). Using the method described by Kintsch (1970) for constructing an operating characteristic from confidence ratings, we plotted hits against false alarms for the combined group data (see Figure 1). Subjects' recognition performance did not seem to reflect either floor or ceiling effects.

**Discussion**

The results suggest that the segmentation task is indeed monitoring subjects' orientation. Subjects segmented the videotape into meaningful units. Moreover, subjects' segmentation reflected their orientation: The small-event group segmented the game episode more finely than did the large-event group. More important, subjects with the same instructions performed equally well, \( t(22) = 0.32, ns \). The percentages of shared event boundaries did not differ, \( t(22) = 0.32, ns \). Hence, the level of analysis used did not affect the segmentation of events, although the level of analysis did affect the accuracy of the segmentation.

Table 2

<table>
<thead>
<tr>
<th>Game tape time</th>
<th>Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>(in s)</td>
<td>Large</td>
</tr>
<tr>
<td>3</td>
<td>Man enters room</td>
</tr>
<tr>
<td>5</td>
<td>Man reaches for board</td>
</tr>
<tr>
<td>6</td>
<td>Man reaches for board</td>
</tr>
<tr>
<td>9</td>
<td>Man opens board</td>
</tr>
<tr>
<td>11</td>
<td>Man sets box on table</td>
</tr>
<tr>
<td>17</td>
<td>Man opens box</td>
</tr>
<tr>
<td>26</td>
<td>Man takes out money</td>
</tr>
<tr>
<td>54</td>
<td></td>
</tr>
<tr>
<td>58</td>
<td></td>
</tr>
<tr>
<td>59</td>
<td></td>
</tr>
</tbody>
</table>

The table shows the events as designated by subjects in Experiment 1 in the first minute of the game tape.
boundaries are consistent with the hierarchical representation of events outlined earlier. Moreover, this finding emphasizes once more the consensus about event boundaries that can be obtained with this simple button-pressing method.

The recognition and recall data indicate that orientation did not affect which events subjects encoded but did affect the way in which they organized these events. The results show that when subjects were oriented toward small events, they recalled more about the episode than when they were oriented toward large events. On the other hand, changes in orientation had no discernible effect on recognition. The lack of any effect on recognition cannot be attributed to either ceiling or floor effects (see Figure 1). Moreover, given that true and false items were rated as equally typical of a game-playing situation, it is unlikely that the equivalent recognition performance demonstrated by small- and large-unit perceivers is due simply to large-unit perceivers' ability to make correct inferences. Thus it appears that both small and large events are encoded in memory, regardless of an observer's orientation.

Experiment 2

In Experiment 2 we examined how orientation toward events can be influenced by an observer's intention to memorize those events. One group of subjects was forewarned that a memory test would follow presentation of the videotapes (intentional group), and another group was not (incidental group). In order to observe shifts in orientation as a function of whether a memory test was expected, subjects in both groups were allowed to use whatever level of segmentation they felt was appropriate, rather than being oriented specifically toward small and large events. In this way, the design of Experiment 2 provided an opportunity to examine the effect of an observer's intention to remember on both the segmentation of an episodic sequence and the retention of event information.

Method

Subjects. Twenty-four Princeton undergraduates were paid $3 each for their participation. Half of the subjects were assigned to the intentional memory condition and half to the incidental memory condition. Subjects participated in groups of 1–5.

Stimuli. The practice tape, the game tape, and the distractor tape were used as in Experiment 1. The 24-item questionnaire used in Experiment 1 was used to test recognition memory.

Procedure. Subjects in the intentional memory group were told that the purpose of the experiment was to see "how people perceive and remember events" and were warned that their memory would be tested after presentation of the videotapes. Subjects in the incidental memory group were told that the purpose of the experiment was to see "how people perceive events" and were not told that a memory test would follow presentation of the tapes. Subjects in both the intentional and incidental groups were given the general event instructions (see General Method section) before viewing any of the tapes. All subjects were instructed to press the response button whenever they believed a new event was beginning: no specific reference to either small or large events was made.

Subjects viewed the practice tape, then the game tape, and finally the distractor tape. After presentation of the distractor tape, subjects were asked to "describe in as much detail as possible everything you can remember about the tape in which the two people were playing a game." When they had completed the free-recall task, subjects were given the 24-item questionnaire to complete.

Results

Segmentation. Segmentation data for 2 subjects in the intentional group were lost because of equipment failure. The analyses presented in this section were based on 10 subjects in the intentional group and 12 subjects in the incidental group (see Table 3). Subjects in the intentional group pressed an average of 48.6 times; those in the incidental group pressed an average of 59.2 times, t(20) = 0.48, ns.

As in Experiment 1, a criterion was determined for significant agreement on event boundaries. Subjects in the intentional group pressed an average of 1.16 times for each 1-s bin (SD = 1.11). Subjects in the incidental group pressed an average of 1.69 times per 1-s bin (SD = 1.49). Three or more presses were used as the criterion for significant agreement on an event boundary for the intentional group, and four or

Table 3

<table>
<thead>
<tr>
<th>Type of data</th>
<th>Intentional</th>
<th>Incidental</th>
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<tbody>
<tr>
<td>Presses</td>
<td>48.6</td>
<td>59.2</td>
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<tr>
<td>Recall</td>
<td>45.33</td>
<td>42.00</td>
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<tr>
<td>Recognition</td>
<td>17.08</td>
<td>18.67</td>
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<tr>
<td>Confidence</td>
<td>3.72</td>
<td>3.89</td>
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more presses were used for the incidental group. Thirty-eight points of agreement (9%) were found for the intentional group, \(X^2(1, N = 419) = 14.61, p < .001\), and 56 points (13%) for the incidental group, \(X^2(1, N = 419) = 61.73, p < .001\). Thirteen points in the tape were seen as event boundaries by both groups, \(X^2(1, N = 94) = 14.13, p < .001\).

Free recall. The scoring procedures outlined in Experiment 1 were used to score subjects' descriptions of the game tape. The scores assigned by the experimenter correlated significantly with those assigned by an independent rater who was blind to both the experiment's purpose and its design (\(r = .98, p < .001\)). As in Experiment 1, subjects recalled events in the order or presentation without specific instructions to that effect. Subjects in the intentional group recalled an average of 45.33 actual occurrences, whereas subjects in the incidental group recalled a mean of 42.00 actual occurrences, \(t(22) = 0.40, ns\) (see Table 3). Thus instructions to memorize the tape did not significantly affect recall performance.

Although subjects were not instructed to attend to either small or large events in this experiment, there was quite a range in the number of presses that subjects made, the lowest number of presses being 3 and the greatest number being 226. In order to see whether the natural variation in the number of perceived events had had an effect on memory performance, incidental and intentional memory subjects were grouped together, and then individual subjects were ranked ordered by the number of presses that they had made while watching the game tape. Only the 22 subjects for whom the segmentation data were available were studied.

The 11 subjects who had pressed most often were placed in the small-unit group, and the remaining subjects were placed in the large-unit group. The mean number of presses made in the small-unit group was 90.82; the mean number of presses in the large-unit group was 17.91, \(t(20) = 4.90, p < .001\). In addition to demonstrating significant differences in the number of perceived event boundaries, small- and large-unit perceivers also exhibited significantly different recall performance (see Table 4). Subjects in the small-unit group recalled an average of 50.09 actions, whereas subjects in the large-unit group recalled an average of 34.82 actions, \(t(20) = 1.87, p < .05\), one-tailed.

Recognition. Subjects in both the intentional and the incidental groups correctly recognized approximately 70% of the 24 items on the questionnaire (see Table 3). The number of correct responses averaged 17.08 (71%) for the intentional-memory subjects and 18.67 (78%) for the incidental-memory subjects, \(t(22) = -1.49, ns\) (see Table 3). As in Experiment 1, neither ceiling nor floor effects seemed evident. The average proportion of hits for the intentional-memory subjects (78%) equaled that of the incidental-memory subjects (82%), \(t(22) = -0.80, ns\). Both groups also averaged the same proportion of false alarms: Intentional-memory subjects averaged 36%, and incidental-memory subjects averaged 26%, \(t(22) = 1.24, ns\). Intentional- and incidental-memory subjects were equally confident about their recognition decisions, \(F(1, 22) = 0.45, M_S = 0.81, ns\) (see Table 3), and both groups were more confident about true items than about foils, \(F(1, 22) = 137.92, M_S = 0.13, p < .001\).

The recognition data were reanalyzed according to the small- and large-unit grouping described earlier (see Table 4). The mean number of items recognized was 18.09 (75%) for the small-unit group and 17.73 (74%) for the large-unit group, \(t(20) = 0.29, ns\). The mean percentage of hits for the small-unit group (83%) did not differ from that for the large-unit group (77%), \(t(20) = 1.31, ns\). The mean percentages of false alarms made by small-unit perceivers (32%) and large-unit perceivers (29%) were also similar, \(t(20) = 0.34, ns\). Once again, recognition performance seemed to be free of ceiling and floor effects. Small-unit perceivers were as confident about their recognition decisions as were large-unit perceivers, \(F(1, 20) = 0.21, M_S = 0.89, ns\) (see Table 4), and both groups were more confident about true items than about foils, \(F(1, 20) = 116.33, M_S = 0.14, p < .001\).

Discussion

The results of Experiment 2 can be summarized as follows: (a) Intentional- and incidental-memory subjects demonstrated similar patterns of segmentation; (b) intentional- and incidental-memory subjects performed equally well on the recall task and on the recognition task; and (c) subjects who spontaneously segmented the game sequence into small events demonstrated better recall, but not better recognition, than subjects who used larger units of analysis. The results of Experiment 2, then, corroborate those of Experiment 1 concerning orientation effects on recall and recognition.

These results suggest that instructions to memorize an episode produce no systematic effect on orientation, but this finding may reflect the vagueness of the task rather than any real dissociation between intention to remember and orientation. Although subjects in the intentional-memory group were forewarned that their memory would be tested, they were not given any information about the level of detail to be tested. Consequently, some subjects may have anticipated a test that probed their knowledge of the gist of the episode and oriented themselves toward large events, whereas other subjects may have anticipated a test on the details of what they had seen and oriented their attention toward small events. Still others may have hoped to adequately remember the episode by using their natural viewing behavior as a guide for segmentation. The wide range of segmentation patterns obtained is consistent with this interpretation. Consequently, a reasonable conclusion to be drawn about memory instructions is that a simple statement about a forthcoming memory test is not enough to systematically alter subjects' orientation toward the episode.

Table 4

<table>
<thead>
<tr>
<th>Type of data</th>
<th>Small</th>
<th>Large</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presses</td>
<td>90.82</td>
<td>17.91</td>
</tr>
<tr>
<td>Recall</td>
<td>50.09</td>
<td>34.82</td>
</tr>
<tr>
<td>Recognition</td>
<td>18.09</td>
<td>17.73</td>
</tr>
<tr>
<td>Confidence</td>
<td>3.87</td>
<td>3.73</td>
</tr>
</tbody>
</table>
Experiment 3

The results of Experiments 1 and 2 indicate that recognition performance is unaffected by either segmentation patterns or intentional memorization. However, in both of these experiments, subjects performed the recognition task after first recalling what they could remember about the game tape. It is possible that having subjects recall information before performing the recognition task could have influenced subsequent recognition performance (J. Brown & Packham, 1967; Lockhart, 1975).

On the surface, if recall influences recognition, recognition might be expected to improve as recall improves. However, the results of Experiments 1 and 2 do not conform to this prediction, which suggests that the recall task did not affect recognition performance. Nonetheless, we decided to specifically test subjects' recognition of events without a preliminary recall task. Subjects viewed the game tape under either small- or large-event instructions and then were surprised with the 24-item recognition task used in the last two experiments.

Method

Subjects. Twenty-four Princeton undergraduates were paid $3 each to participate. Half were oriented toward small events when viewing the game tape and half were oriented toward large events. Subjects participated in groups of 1-5.

Stimuli. The practice tape, game tape, and distractor tape were presented to subjects. The 24-item questionnaire used in Experiments 1 and 2 was used to test memory for the game tape.

Procedure. As in Experiments 1 and 2, subjects saw the practice tape, then the game tape, and finally the distractor tape. Subjects were given the general instructions about pressing for events before viewing the practice tape (see General Method section). Before seeing the game tape, half of the subjects were told to press for small events, and half were told to press for large events. Before viewing the distractor tape, subjects were given instructions to press for large events if they had looked for small events during the game tape and vice versa otherwise.

After viewing the distractor tape, subjects were surprised with the 24-item recognition task.

Results

Segmentation. Subjects in the small-event group pressed an average of 83.33 times; subjects in the large-event group pressed an average of 26.00 times, t(22) = 10.99, p < .001 (see Table 5). According to the technique described in the first three experiments, subjects in the small-event group pressed an average of 2.38 times for each 1-s bin (SD = 1.86). Large-unit perceivers pressed an average of 0.74 times (SD = 1.01). Five or more presses for any bin were interpreted as significant agreement for small-unit perceivers, whereas two or more presses were used as the significance criterion for large-unit perceivers. Fifty-seven points of agreement (14%) were found for subjects oriented toward small events, \( \chi^2(1, N = 419) = 65.12, p < .001 \), whereas 66 points of consensus (16%) were found for subjects oriented toward large events, \( \chi^2(1, N = 419) = 101.97, p < .001 \). At 17 points in the tape, both groups agreed that an event boundary had occurred, \( \chi^2(1, N = 123) = 6.68, p < .01 \).

Recognition. Subjects correctly recognized or rejected approximately 70% of the items on the questionnaire; small-unit perceivers correctly responded to an average of 18.50 items (77%), and large-unit perceivers averaged 17.75 correct responses (74%), \( t(22) = 1.03, ns \) (see Table 5). Confidence ratings did not differ between small- and large-unit perceivers, \( F(1, 22) = 0.79, MSe = 0.40, ns \) (see Table 5), and both groups were more confident about true items than about foils, \( F(1, 22) = 80.83, MSe = 0.32, p < .001 \).

Hit and false alarm rates were also similar across the two groups. The average percentage of hits made by subjects in the small-unit group was 85, whereas subjects in the large-unit group averaged a hit rate of 80%, \( t(22) = 1.15, ns \). Similarly, the average false alarm rate by small-unit perceivers was 31%, whereas large-unit perceivers averaged a false alarm rate of 33%, \( t(22) = -0.26, ns \). Thus recognition performance was neither at ceiling nor at floor levels. The results support the conclusion drawn in the first two experiments that orienting instructions do not differentially affect recognition performance. Moreover, it appears that whether subjects first recall the game tape or not makes little difference in recognition scores (see Tables 1, 3, and 4 for a comparison with the results of Experiments 1 and 2).

Discussion

The results of Experiment 3 replicate those obtained in the first two experiments. Specifically, subjects who organize an episodic sequence into small events demonstrate recognition performance equivalent to that of those who segment the sequence into large units. This is true regardless of whether subjects are forewarned that their memory will be tested (Experiments 1 and 2) or are told only to segment the sequence (Experiments 2 and 3). It is also true regardless of whether subjects are intentionally oriented toward small and large events (Experiments 1 and 3) or spontaneously use different levels of analysis (Experiment 2). Last, this result occurs regardless of whether subjects recall the sequence before performing the recognition task (Experiments 1 and 2) or whether recognition only is tested (Experiment 3).

Experiment 4

The recall test administered in Experiments 1 and 2 was open-ended; that is, subjects could write as little or as much as they thought was appropriate. Consequently, it is possible that subjects were merely writing as much as they thought the experimenter wanted. If they received instructions to segment
the game episode into small events, they may have thought that they should similarly "remember" small events by including all the details that they could recall. Also, despite the fact that subjects were instructed to "recall as much as possible," if they were told to segment the game episode into large events, they may have believed that the experimenter was expecting them to recall only large events. The results of Experiment 2 argue against this possibility insofar as the effects of orientation were obtained even when subjects were not explicitly oriented toward large and small events. Nevertheless, we decided to address this issue in another context.

In this experiment, a visual cued-recall task was used to probe subjects' memory for the game tape. Specifically, subjects were shown sections of the game tape in which a part of the tape was blanked out. The task for subjects was to describe what occurred during the blank part of the tape. In each case the blanked section of tape depicted small events as indicated by subjects in Experiment 1. We hoped that requiring subjects to recall specific events, rather than allowing subjects to choose which events to report, would reduce any effects on recall that might be attributed to a response bias of the nature described earlier.

**Method**

Experiment 4 consisted of two parts. The first part provided a guessing baseline and descriptions for the test items that were used in the scoring of the cued-recall task in the second part of the experiment. The second part of Experiment 4 was the experiment proper. In this part of the experiment, subjects were oriented toward small or large events while viewing the game tape, and then their memory was tested with a cued-recall task.

**Subjects.** Thirty-six Princeton undergraduates were paid $3 each for their participation. Subjects were tested in groups of 1-5. Twelve subjects provided baseline data, and 24 subjects participated in the experiment proper. Of the 24 subjects, half were oriented toward small events when viewing the game tape and half were oriented toward large events.

**Stimuli.** The practice tape, the game tape, and the distractor tape were presented to subjects as in the last three experiments. In addition, a Panasonic visual editor was used to construct the cued-recall task of 18 trials. Each trial consisted of 3 s of tape taken from the game tape, 3 s during which the television screen was black, and another 3 s of tape taken from the game tape. Thus the duration of each trial was 9 s.

The 18 trials of the cued-recall task were constructed on the basis of the segmentation data obtained from subjects oriented toward small events in Experiment 1. Each test event (i.e., the blanked section of each trial) represented a section of the game tape bounded by two consecutive points that had met the significance criterion for agreement in Experiment 1. Although each trial of the cued-recall task contained 3 s of blank tape, the true length of the test event could be more or less than 3 s. The actual duration of the test events ranged from 2 to 10 s with a mean duration of 4.67 s.

The taped sections preceding and following each test event in the cued-recall task were the 3 s that immediately preceded and followed the event in the game tape. There was no overlap between the 3 s of tape shown before and after a test event on one trial and test events on other trials. The presentation of trials reflected the order of occurrence of the test events in the game tape. Each trial was numbered, and subjects heard the trial number before presentation of the trial.

**Procedure.** The 12 subjects providing guessing data were told that their responses would be used for comparison with experimental subjects. First, they were shown the cued-recall trials and were asked to guess what had occurred between the two taped sections of each trial. They were told,

You are about to see 18 short taped sequences. In each sequence a part of the tape is missing. For each sequence you will see three seconds of tape in which something is happening, three seconds of blank tape, and then three seconds of tape in which something is happening. I would like you to guess what happened during the missing part of the tape. The blank part of the tape is always three seconds long and does not reflect the actual amount of time that has elapsed. After you have seen both parts of a sequence, I will stop the machine to give you time to write.

Subjects were provided with response booklets. Two blank lines were provided for each trial. Each set of two lines was numbered, and space for nine trials per page was allocated.

When subjects had completed the 18 trials of the cued-recall task, they were then shown the 18 events that had been missing in the cued-recall task and asked to describe what they saw. They were told,

Now I will show you 18 short taped sequences. For each sequence I would like you to describe what occurred in the sequence. Be as explicit as possible. I will stop the machine after each sequence to give you time to write.

Subjects wrote their responses in booklets. Two lines were provided for each trial. Space for nine trials per page was provided, and each set of two lines was numbered.

For the experiment proper, subjects were told that the purpose of the experiment was to see "how people perceived events in everyday situations." They were given the general instructions about events and then shown the practice tape. After the practice tape and before the game tape, half of the subjects were given instructions to press for small events, and the other half were told to press for large events. After viewing the game tape, subjects who had pressed for small events were told to press for large events and vice versa before viewing the distractor tape.

After presentation of the distractor tape, subjects were told that their memory for the game tape would be tested. They were told,

I am now going to see how well you remember the tape in which the two people were playing a game. You will see three seconds of the tape, then three seconds of blank tape, and then three more seconds of the tape. What I would like you to do is describe what happened during the blank part. You might think of this as a visual fill-in-the-blank test. The blank part will always be three seconds long and does not reflect the actual amount of time that passed between the two sections of tape that you will see. Following the second taped section, I will stop the machine to give you time to write.

Subjects were given response booklets to record their answers. Two blank lines were allotted for each of the 18 trials, and each pair of lines was numbered.

**Results**

**Baseline data.** Individual differences in the descriptions of the eighteen test events by the 12 baseline subjects tended to be stylistic rather than substantive. No description for any
single event was completely at odds with others collected for that event. For each of the eighteen events, the descriptions written by subjects were collapsed into sets that comprised one to four actions.

These sets of actions provided the scoring criteria for the cued-recall task. For example, the correct answer to Trial 1 involved two actions: "He opened the box" and "He took the money out." A total of 49 correct responses were possible over the eighteen trials.

The guesses by the 12 baseline subjects were compared with the action sets just described. For each trial, one point was assigned for each action matching one in the action set for that trial. The 12 baseline subjects averaged 9.42 correct responses (19%); see Table 6. The scoring of this guessing data was significantly correlated with that of an independent scorer who was blind to both the purpose and design of the experiment (r = .98, p < .001).

Segmentation. Subjects in Part 2 of the experiment (i.e., the experiment proper) who had been instructed to press for small events pressed an average of 122.8 times, whereas those instructed to press for large events pressed an average of 19.8 times, t(22) = 4.89, p < .001.

As in the first three experiments, a criterion for significant agreement on event boundaries was determined. Subjects in the small-event group responded an average of 3.39 times per 1-s bin (SD = 1.98). Subjects in the large-event group responded an average of 0.56 times per bin (SD = 0.91). We chose seven or more presses at a point in the tape as the significance criterion for the small-unit perceivers and two or more presses for the large-unit perceivers. Thirty event boundaries (7%) met the criterion for consensus for the small-event group, χ²(1, N = 419) = 4.11, p < .05. Fifty-seven points (14%) met the criterion for the large-event group, χ²(1, N = 419) = 65.29, p < .001. Eleven points in the tape met the criterion for an event boundary by both groups, χ²(1, N = 87) = 12.12, p < .001.

Cued recall. The responses to the cued-recall trials were scored with the action sets described earlier. The scoring was similar to that used for the guessing data; each action that was correctly recalled received one point. An independent judge who was blind to both the purpose and the design of the experiment also scored the cued-recall data. Scores assigned by this judge and the experimenter were significantly correlated (r = .99, p < .001). The mean number of correct actions recalled by subjects in the small-event group was 19.33 (39%); see Table 6. Subjects in the large-event group recalled an average of 14.50 actions (30%). This difference in mean recall by small- and large-unit perceivers was significant, t(22) = 2.18, p < .05. Both groups had significantly better recall than the baseline subjects, F(2, 33) = 9.69, MSₑ = 295.08, p < .001.

Because the number of possible correct responses varied across trials, some trials could contribute more to the overall recall score than could other trials. To compensate for this unequal weighting across trials, we rescored the data so that each trial could be worth a maximum of one point. Fractional scores were given for partial answers; that is, if one correct action was described on a trial in which three actions could be described, that trial was given a score of .33. For example, on Trial 4 the correct response was "She came into the room, set the basket on the table, and sat down." The response "She came into the room" would receive one point in the initial scoring and .33 in the second scoring. The response "She ate a pretzel" would receive zero points in either case.

Under the new scoring method, subjects in the small-event condition received an average of 7.39 points (41%), and subjects in the large-event condition averaged 5.58 points (31%); see Table 6. Baseline subjects received an average of 3.56 points (20%). The difference in mean recall scores for small- and large-unit perceivers was significant, t(22) = 2.10, p < .05. Small- and large-unit perceivers also demonstrated significantly better recall performance than did the baseline subjects, F(2, 33) = 10.18, MSₑ = 43.97, p < .001.

Given that most of the test events had been described by baseline subjects in terms of multiple actions, we decided to adopt a third and final measure of cued recall. We rescored the data so that if a subject recalled any one action for a test event, that subject would be given credit for having recalled the event. Thus evidence that any piece of the event had been remembered was treated as sufficient indication that the event was recallable. The new scoring procedure yielded a mean of 13.75 events (76%) recalled by small-unit perceivers and a mean of 11.33 events (63%) recalled by large-unit perceivers, t(22) = 1.83, p < .04, one-tailed (see Table 6). The mean number of events recalled by baseline subjects under this scoring was 7.08 (39%) and reflected performance that was significantly poorer than that exhibited by either small- or large-unit perceivers, F(2, 33) = 13.12, MSₑ = 10.42, p < .001.

Last, a qualitative analysis of subjects' responses revealed that they were not trying to mimic their encoding instructions. If they were, large-unit perceivers might be expected to use superordinate labels such as setting up the game rather than subevents such as opening box, putting tokens on board, and so on. Yet, large-unit perceivers did not respond with superordinate labels. The omissions made by large-unit perceivers reflected an inability to respond, not an inappropriate level of response.

Discussion

Experiment 4 confirmed that the orientation toward small and large events can influence recall of an episodic sequence. Specifically, subjects who were oriented toward small events were better able to recall brief sections of the game sequence than were subjects oriented toward large events. The results
of this experiment replicated those obtained with a free-recall
task in Experiments 1 and 2.

Moreover, the results of Experiment 4, in conjunction with
those of Experiment 2, made it unlikely that differences in
recall between small- and large-unit perceivers can be ex-
plained as a deliberate attempt by subjects to maintain con-
sistency between their organization of events during encoding
and their subsequent recall of those events. In Experiment 2,
subjects were not specifically oriented toward either small or
large events, and yet differences in recall were found to be
related to the level of analysis that had been used to segment
the game tape. In Experiment 4 the cued-recall task reduced
the possible effects of a response bias by demanding specific
responses. Even when the data were rescored under more
liberal criteria, subjects who had been oriented toward small
events recalled more than did those who had been oriented
toward larger events.

General Discussion

Our results, like those of other researchers who have ex-
amined the perception of event boundaries in episodic se-
quences (e.g., Barker, 1963; Dickman, 1963; Lyons, 1956;
Newton, 1973), affirmed the ability of observers to segment
an action sequence into meaningful units. Our subjects had
little difficulty following our instructions or shifting from one
level of orientation to another. Moreover, the degree of con-
sensus among subjects concerning event boundaries was siz-
able, no matter what orientation was adopted.

We also found that memory for episodes was not affected
by intention to memorize in our study. Performance on recall
and recognition tests, when subjects were surprised by these
memory tasks, was equal to that when subjects were fore-
warned that their memory would be tested. Apparently, mem-
ory for events is influenced more strongly by orientation
strategies than by those involved in trying to memorize an
episode. It is worth noting that this conclusion not only applies
to memory for events but also appears to be a general principle
of memory (see Hirst, 1988, for a discussion).

Most important, our findings indicate that orientation and
organization affect how information in an episode is encoded,
not necessarily what is encoded. People presumably build a
hierarchical representation of the episode as they perceive it.
The depth—that is, the number of levels—of this hierarchy
might differ as a function of organization. Thus when an
observer attends to large events, only a few levels are built,
whereas orienting toward small events will increase the num-
ber of levels that are represented. Of importance is that the
depth of the hierarchy determines the recallability but not the
number of events that are represented. Events may be encoded
without being organized into a coherent framework, although
events that are linked to the overall structure of an episode
will be more readily recalled than those that are not so
connected. Whether events become part of the organization
of an episode will depend on the orientation toward events
during encoding. Events receiving attention will be linked to
the hierarchy at an appropriate level, whereas events that do
not receive attention will be encoded without being incorpo-
rated into the structure of the episode. Our results follow
naturally from this model. Events that fell outside the level of
analysis adopted for orientation, although not readily recalled,
were nevertheless recognized.

One might argue that our results are a function of the
paradigm with which we measured event perception. The
button-pressing task may have evoked, rather than reflected,
the structural effect that we observed; that is, subjects may
have been induced to attend more to points in the episode at
which they pressed than to points at which they did not press.
However, given the large number of button presses and the
intervening segmentation task, it is unlikely that subjects
remembered the presses themselves or even that they kept a
catalog of what occurred at the time of a press. Moreover,
memory for the episode was not limited to information im-
mEDIATELY surrounding the button press. Subjects recalled,
not the specific actions defining an event at its boundaries (i.e.,
man lifted arm or man replaced arm), but rather the gist of
the event (i.e., man rolled the dice or man took his turn)
occuring between those boundaries. Thus we believe that it
is more reasonable to attribute subjects’ recall of events to
how they perceived the episode than to how they pressed a
response button.

The model that we sketched assumes that people encode
the details of any episode. However, we might legitimately
wonder exactly how much detail about an episode is encoded.
The absence of a ceiling effect in our subjects’ performance
in the recognition test suggests that not everything is encoded,
at least not well enough to be recognized. However, it is
possible that had we examined even smaller events, we might
have found that recognition of minutiae is affected by orien-
tation and organization. Thus our conclusions must be tem-
pered by the need for a more detailed examination of how
events are represented. For example, we might study how
recognition performance varies as a function of different types
of cue and retention interval, and we might probe observers’
abilities to recognize more fine-grained information.

Last, issues similar to those addressed in this article have
arisen in the literature on memory for prose. Initially, in
research on memory for prose, investigators argued that peo-
ple abstracted from, but quickly lost, the details of a story
unless they specifically attended to those details (e.g., Bartlett,
1932; Bransford, Barclay, & Franks, 1972; Bransford &
Franks, 1971; Sachs, 1967). Subsequent work has shown that
recognition performance may remain unchanged by factors
that degrade recall performance (Alba, Alexander, Hasher,
& Camiglia, 1981), which suggests that more may be encoded
than is apparent from recall measures alone (see Johnson &
Raye, 1981, for an alternative to abstraction models and Alba
& Hasher, 1983, for a review of this issue). Of course, reading
is a much more constructive process than is the perception of
an event; writers do not describe every action, nor do readers
necessarily fill in all the gaps. Nevertheless, the similarity
between our results and those involving memory for prose is
intriguing and deserves further investigation.

Our paradigm has proved useful to explore issues about the
effect of perception of events on memory for events. As further
research is conducted, investigators should better understand
how memory representations are built up as the complex
activity of perception takes place.
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