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Distinctiveness effects in recall: Differential processing or privileged retrieval?

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Unusual information is generally recalled better than common information (the distinctiveness effect). Differential processing accounts propose that the effect occurs because unusual material elicits encoding processes that are different from those elicited by common material, and strong versions of these accounts predict distinctiveness effects in between-list as well as within-list designs. Experiment 1 employed a between-list design and manipulated presentation rate. Contrary to differential processing predictions, no distinctiveness effect emerged, nor did recall patterns for atypical versus common sentences differ as a function of presentation rate. Experiment 2 further tested differential processing accounts as well as representation accounts via a within-list manipulation and conditions that included experimenter-provided elaborations. Distinctiveness effects emerged in all conditions and, contrary to differential processing predictions, the pattern of recall in the elaborated conditions did not differ from that in the unelaborated conditions. Taken together, the results of this study lend more support to a representation view that suggests mechanisms related to the representation and subsequent retrievability of elements in the memory record play a major role in the distinctiveness effect.

One of the more robust findings reported in the memory literature is that stimuli that are in some way unusual are generally remembered better than stimuli that are not (Desrochers & Begg, 1987; Franks et al., 1982; Hunt & Elliot, 1980; Hunt & Marschark, 1987; Hunt & Mitchell, 1982; Jacoby & Craik, 1979; McDaniel, Dunay, Lyman, & Kerwin, 1988; Schmidt, 1985; Stein et al., 1982; Stein, Littlefield, Bransford, & Persampieri, 1984). Consider the target information, "The boy found a huge diamond." McDaniel et al. (1988) found that when subjects encoded targets like these in a sense that was unusual relative to common experience (e.g., "The boy found a huge diamond in the applesauce") the targets were better recalled than when they were encoded in a more typical sense (e.g., "The boy found a huge diamond in the jewelry store"). For ease of exposition, we will label this pattern of recall the distinctiveness effect. A mnemonic advantage of distinctiveness can be obtained when the unusualness of the target stimuli is varied in other ways as well. Semantic distinctiveness of individual words (Hunt & Mitchell, 1982; Schmidt, 1985), orthographic distinctiveness of verbal items (Hunt & Elliot, 1980), and visual distinctiveness of the components of faces (Light, Kayra-Stuart, & Hollander, 1979; Winograd, 1981) all lead to better memory.

Although the finding of distinctiveness effects is relatively common, theoretical understanding of the effect is not clearcut (see Schmidt, 1985, 1991). Various theoretical accounts of the distinctiveness effect can be formulated, and, unfortunately, these accounts are difficult to distinguish empirically. The difficulty is compounded by the observation that there are at least four different classes of manipulations that produce effects attributed to distinctiveness, and across these classes the pattern of distinctiveness effects varies (Schmidt, 1991). Schmidt suggests that one way to arrive at a theoretical understanding of distinctiveness effects is to restrict theoretical attention to a certain class of phenomena, a class he defines as "events that are ... incongruent with active conceptual frameworks" (Schmidt, 1991, p. 537). Within this class, Schmidt delineates a subset that he terms secondary distinctiveness to indicate that distinctive events are atypical relative to information stored in secondary (long-term) memory.

Our present research reflects the guidelines offered by Schmidt. We explicitly explored the mnemonic effects of secondary distinctiveness and, in so doing, evaluated all of the prominent accounts of these effects (including Schmidt's account). Before proceeding, it is important to note that Schmidt's view draws a conceptual distinction between secondary distinctiveness and what he terms primary distinctiveness. In primary distinctiveness, distinc-

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tive events are not atypical relative to information stored in secondary memory. Rather, these otherwise common events are atypical relative to other events in the immediate (primary) context. To foreshadow our later discussion, the present experiments would demonstrate that although secondary distinctiveness effects might require a list composition similar to that required for primary distinctiveness effects, the processes involved in the two types of distinctiveness might not completely dovetail with one another.

When it comes to legislating the theoretical explanations of distinctiveness effects, another weakness emerges in the literature. Few, if any, studies have contrasted the broad range of existing explanations. Moreover, the support that is marshaled for theories is sometimes based on post hoc reasoning and reanalysis of existing data (cf. Schmidt, 1991). The experiments we report here were specifically designed to evaluate competing predictions from the following accounts of the mnemonic effects of distinctiveness.

Differential Processing Views

One general class of explanations proposes that the distinctiveness effect occurs because the encoding processes elicited by unusual material are different from those elicited by common material. According to these differential processing accounts, unusual material receives more of whatever kind of processing the theorist presupposes aids memory. One model assumes that when people encounter to-be-learned material, they attempt to interpret and understand that material by connecting it to already existing knowledge. Unusual material requires the activation of a wider variety of background knowledge than does common material in order to create an adequate interpretation or understanding (Pressley, McDaniel, Turnure, Wood, & Ahmad, 1987). The activation of more background knowledge results in the unusual material's being encoded into a network of propositions that is richer than that of common material, thereby enabling better memory performance for the unusual material (Anderson & Reder, 1979). In short, unusual material prompts more spontaneous elaboration than does common material. We will label this variant of differential processing the *spontaneous elaboration hypothesis*.[1]

Another variant of differential processing holds that atypical items elicit more elaboration not as a result of trying to understand those items better but as a result of the atypical items' attracting more attention than the common items. The result is that more attention (and, potentially, more elaboration) is given to the atypical items at the expense of the common items. According to this *selective displaced rehearsal* account (Slamecka & Katsaiti, 1987), the reader increases the time given to processing atypical items by using time that would otherwise be allotted for processing common items. The result is that common items are less well processed (e.g., rehearsed, attended to, elaborated) because less time is spent on them.

Yet another member of the class of differential processing accounts is the *expectation violation hypothesis* (Hirshman, 1988). This hypothesis assumes that unusual stimuli elicit a surprise response that increases the association between the elements in the unusual stimulus and general contextual cues (Hirshman, Whelley, & Palij, 1989). Common stimuli do not elicit such a surprise response and, as a result, are not as strongly associated with general contextual information. A noteworthy point to which we will return is that in both this and the spontaneous elaboration view, a between-list manipulation should be sufficient to obtain the distinctiveness effect.

Representation Views

Representation explanations of distinctiveness effects are based on the idea that the properties of the nominal stimuli are reflected in the memory record. They assume that target stimuli produce a memory trace that is a more or less faithful record of the information conveyed by those stimuli. Accordingly, unusual stimuli produce a memory record that is relatively unusual (distinct) compared with other memory records, most of which are reflective of common experiences. In contrast, stimuli conveying more common events produce a memory record that is similar to other records in memory. Note that in this kind of account, the properties of the stimuli map straightforwardly onto properties presumably reflected in the memory record. In this sense, the representation account differs importantly from the spontaneous elaboration hypothesis (a differential processing view). The spontaneous elaboration account would also suggest that unusual stimuli produce a distinct record, which, however, would be distinct because of the more extensive processing afforded the unusual stimuli and not because of the stimuli's distinct properties per se.

According to one version of the representation view, distinct records are better remembered because they are clustered in their own subjective category, a category that is different from the one into which common records are clustered (Bruce & Gaines, 1976; Fabiani & Donchin, 1995). This category of unusual items is then given privileged status at the time of retrieval, a status that confers a mnemonic advantage to the distinct records (Schmidt, 1985).

Another representation version explicitly rejects the idea that the mnemonic benefits of secondary distinctiveness are due to organization. According to this view, distinctiveness is not a property of the encoding context as such and, therefore, influences neither encoding (at least in a functional sense) nor organization of the memory representation. Distinctiveness is directly associated with the retrieval context. The idea here is that the rememberer forms a set of plausible candidates when searching memory and that the items are distinct within the particular retrieval set formed. Thus, distinctiveness provides an advantage vis-à-vis the processes involved in retrieving items from the set (cf. McDaniel, Einstein, DeLosh, May, & Brady, 1995).

The precise retrieval processes through which distinct items in the retrieval set gain their advantage are unclear at this time (but see Hunt, 1995, Hunt & McDaniel, 1993,

and Schmidt, 1996, for initial ideas). For present purposes, the key point is illustrated by von Restorff's seminal experiments, which were replicated by Hunt (1995). In those studies, the distinct item always appeared very early in the list so that subjects had no reason to perceive it as unusual at the time of encoding. Despite its early appearance, the unusual item was recalled better than the other items, suggesting that distinctiveness emerged in regard to the retrieval set. Applied to the present materials, let us assume that the list items determine the retrieval set because they are delimited by the spatiotemporal context in which the list was presented. Then sentences expressing atypical relationships should become functionally distinctive only in within-list manipulations of sentence type. Better memory for sentences expressing atypical conceptual relationships (i.e., distinctiveness effects) should not obtain in between-list designs, because the search set does not provide a retrieval context against which these sentences are distinctive. In contrast, the differential processing views outlined above would generally anticipate that distinctiveness effects should be obtained in between-list designs.

EXPERIMENT 1

With the exception of the selective displaced rehearsal account, the strong versions of the differential processing views outlined in the introduction predict a distinctiveness effect in a between-list design. The present experiment therefore used a between-list manipulation to test the strong versions of those differential processing views. We employed sentence materials that had previously produced distinctiveness effects in a within-list design (McDaniel et al., 1988). The absence of distinctiveness effects with these materials in Experiment 1 would converge with Schmidt's (1991) observation that secondary distinctiveness is mnemonically effective in within-list designs but not in between-list designs.

In addition, differential processing views assume that distinctiveness effects occur because unusual material receives more processing or elaboration than common material. A prediction derived from this assumption is that if sufficient time did not exist for such extended processing, then the mnemonic advantage of unusual material might be attenuated or eliminated. To test this prediction, we also manipulated presentation rate. If no distinctiveness effects emerged in Experiment 1, then further examination would be directed at clarifying the mechanisms underlying the effect in a within-list manipulation.

Method

Subjects. The subjects were 40 undergraduate students who voluntarily participated in partial completion of an undergraduate psychology course requirement. Each subject was tested individually.

Design. The design was a 2 × 2 factorial with presentation condition (control vs. fast) and sentence type (atypical vs. common) as between-list factors. Ten subjects were assigned randomly to each combination of presentation condition and sentence type.

Materials. The stimulus materials were two sets of 16 sentences, one set for each of the two sentence conditions (taken from McDaniel et al., 1988). Each common sentence described an event that was not very unlikely, and each atypical sentence described an event that was highly unlikely. The atypical sentences were derived from the common sentences by changing one content word to make the described event unusual. For example, the common event described in "The boy found a huge diamond in the jewelry store" became the atypical event described in "The boy found a huge diamond in the applesauce."

Materials norming. A separate rating task was used to validate the level of typicality for the two sets of sentences used in this study. The subjects were 26 university students who did not participate in the main study. All subjects took part voluntarily in partial fulfillment of an undergraduate psychology course requirement. They were tested in groups of 2 to 4 persons each. Thirteen subjects were randomly assigned to rate the common sentences, and 13 were randomly assigned to rate the atypical sentences. The subjects read each sentence and used a Likert-type rating scale of 1 (*not at all unlikely*) to 5 (*highly unlikely*) to indicate how unlikely they thought the event in the sentence was. The average rating of the 16 sentences written to be atypical was 3.49 (SD = 0.54), and the average rating of the 16 sentences written to be common was 1.85 (SD = 0.62).

Procedure. All presentations were controlled by a Northgate XTURBO/8 personal computer. Each subject sat in front of a computer monitor on which the sentences appeared one at a time. The subjects were told that there would be a subsequent memory task, but the nature of the task was not specified and they were not told the particular information they would be asked to remember. The subjects read each sentence aloud when it appeared on the screen and then studied the sentence silently until the next one appeared. Four practice trials preceded the study phase; the sentences used in the practice trials were different from those used in the study phase. Target sentences appeared in a different random order for each subject. The presentation rate for the control presentation condition was 18 sec, the same as that used by McDaniel et al. (1988). Sentences in the fast presentation condition were presented for 5 sec each. An earlier pilot study verified that these presentation rates did not result in ceiling or floor effects for the stimulus set and that the fast presentation rate allowed sufficient time to complete reading the sentence aloud as long as the subject read it out quickly.

After all the sentences had been presented, the subjects completed a free-recall test in which they took as much time as they needed to write down as many of the studied sentences as they could remember. Next, they completed a cued-recall test in which each studied sentence had some of its words replaced by blanks. Subjects filled in the blanks with the words that had occurred in the studied sentences.

Results

The rejection level for all analyses was set at .05. All recall measures were initially analyzed with separate 2 × 2 (presentation condition × sentence type) between-list analyses of variance (ANOVAs). Analyses were performed both for recall of information from all the sentences presented and for recall adjusted to include information from all but the last sentence presented (to control for recency effects). Because the pattern of results was identical for both unadjusted and adjusted recall, we will report only the unadjusted results. The fact that the cued-recall test followed the free-recall test raised some serious concerns about possible contamination of the cued-recall results by the preceding free recall. Consequently, we do not report the cued-recall results in this section.[2]

Table 1 presents the average proportion of sentences accessed and the average proportion of target words (and close synonyms of target words) recalled in free recall as

a function of presentation condition and sentence type. A target word was defined as a content word that was shared by both the atypical and the common versions of a sentence. A sentence was defined as accessed if at least one content word (noun, verb, or adjective) was recalled from that sentence regardless of whether or not that content word was also a target word. The results for sentence access indicated no distinctiveness effect [$F(1,36) = 0.02$, $MS_e = 0.02$]. The only statistically significant result was a main effect for presentation condition [$F(1,36) = 14.04$, $MS_e = 0.02$]. Subjects in the fast condition accessed a smaller proportion of sentences overall ($M = .32$, $SD = .08$) than did subjects in the control condition ($M = .50$, $SD = .19$). Presentation condition did not interact with sentence type [$F(1,36) = 0.02$, $MS_e = 0.02$].

The same pattern occurred for proportion of target words recalled in free recall. Again, no distinctiveness effect emerged [$F(1,36) = 0.07$, $MS_e = 0.02$], although there was a significant main effect of presentation condition [$F(1,36) = 15.68$, $MS_e = 0.02$]. Subjects in the fast condition recalled a significantly smaller proportion of target words overall ($M = .24$, $SD = .09$) than did subjects in the control condition ($M = .42$, $SD = .18$). Presentation condition did not interact with sentence type [$F(1,36) = 0.26$, $MS_e = 0.02$].

Discussion

The results of Experiment 1 do not bear out the predictions of the strong versions of differential processing explanations of distinctiveness effects. Contrary to those predictions, no mnemonic advantage of atypical over common material emerged in a between-list manipulation. In addition, other than a lower level of overall recall for material presented at a fast rate, no difference emerged in the recall patterns for atypical versus common material as a function of presentation rate. The difference in level of recall for atypical versus common sentences was not less at a fast presentation rate than it was at a slower presentation rate, as differential processing explanations would have predicted. Finally, the absence of distinctiveness effects in the between-list design of Experiment 1 and the presence of distinctiveness effects for the same sentences in McDaniel et al.'s (1988) within-list design support the idea that secondary distinctiveness effects are observed primarily when atypical material is presented in conjunction with common material in the learning context.

Table 1
Mean Proportion of Sentences Accessed and Mean Proportion of Target Words Recalled in Free Recall in Experiment 1

Presentation Condition	Sentence Type: Atypical *M*	Atypical *SD*	Common *M*	Common *SD*
	Sentence Access			
Control	.51	.21	.49	.19
Fast	.32	.08	.32	.09
	Target Word Recall			
Control	.40	.19	.44	.13
Fast	.24	.07	.23	.11

EXPERIMENT 2

Experiment 1 established that unusual sentences (at least those used by McDaniel et al., 1988; see also McDaniel et al., 1995, for similar findings with different sets of atypical sentences) do not confer memory benefits under between-list manipulations. In Experiment 2, we sought to replicate the previously reported advantage of unusual sentences in within-list manipulations and, more importantly, to evaluate the various explanatory accounts for the anticipated mnemonic advantage of atypical over common sentences.

To test those various accounts, we implemented a number of conditions in the context of a within-list manipulation of distinctiveness. The control condition presented a list of common and atypical sentences at a generous presentation rate (the same sentences and the same rate used in the control condition of Experiment 1). There were three additional conditions. First, we manipulated presentation rate with a condition presenting the sentences at a fast rate (the same rate used in the fast condition in Experiment 1). We added another presentation condition (the *same-type* elaboration condition), in which each of the sentences was accompanied by an explanatory elaboration that described a cause for the event delineated in the base sentence. Furthermore, the typicality of the elaboration matched the typicality of the base condition. That is, base sentences describing common events were accompanied by explanations ascribing common causes to those events, and base sentences describing atypical events were accompanied by explanations ascribing unusual causes to those events. The final presentation condition (the *different-type* elaboration condition) included base sentences accompanied by causal elaborations whose typicality did not match that of the target event. That is, base sentences describing common events were accompanied by explanations ascribing unusual causes to those events and base sentences describing atypical events were accompanied by explanations providing common causes for those events. Table 2 contains examples of base sentences and elaborations for each of the presentation conditions.

All of the explanatory accounts of the distinctiveness effect outlined in the introduction predict an interaction between presentation condition and type of base sentence. Each account, however, predicts a different pattern for that interaction. Table 3 summarizes the pattern of distinctiveness effects predicted by each account addressed herein.

According to the spontaneous elaboration hypothesis (Bradshaw & Anderson, 1982), people spontaneously elaborate on atypical items more than on common items, which results in atypical items' being encoded into a richer network of propositions than common items. One prediction that follows from these assumptions is that if

Table 2
Examples of Target Sentences and Elaborations for the Targets "Boy," "Huge," and "Diamond"

Stimulus	Example
Atypical target sentence	The boy found a huge diamond in the applesauce.
Same-type elaboration (atypical–atypical)	The boy found a huge diamond in the applesauce. This is because some of the workers in the canning factory planned and executed a jewelry heist. After hiding the diamond, they were apprehended.
Different-type elaboration (atypical–common)	The boy found a huge diamond in the applesauce. This is because while his mother was making dessert, the setting on her engagement ring broke. The diamond fell into the food.
Common target sentence	The boy found a huge diamond in the jewelry store.
Same-type elaboration (common–common)	The boy found a huge diamond in the jewelry store. This is because his aunt was shopping for a necklace. He was busy looking at the diamond in the display case.
Different-type elaboration (common–atypical)	The boy found a huge diamond in the jewelry store. This is because he accidentally bumped into the gum machine and the diamond fell out. The manager examined it and found that it was real.

the distinctiveness effect is due to the stimulation of elaboration by atypical items and if insufficient time is available for that elaboration, atypical items should not exhibit a recall advantage. Our fast presentation rate was designed to test this prediction by providing a condition that reduced the available processing time. A further prediction of the account is that if common items are elaborated to the extent that atypical items are, the mnemonic advantage for atypical items should be attenuated or eliminated. In this experiment, our elaboration conditions used experimenter-provided elaborations that were equivalent in propositional complexity and that provided explanations for the events described in both the common and atypical base sentences.[3] Overall, then, the spontaneous elaboration hypothesis predicts a distinctiveness effect in the control condition and no effect (or an attenuated effect) in the other conditions.

The selective displaced rehearsal account (Slamecka & Katsaiti, 1987) predicts a distinctiveness effect with unelaborated base sentences provided that sufficient time was left over after processing the common items for displacing to additional processing of the atypical items. If only minimal time were available for processing, however, then the account would predict that little or no displacement could occur and the mnemonic advantage for atypical items ought to be reduced or eliminated. Our fast-presentation condition provided a test of this particular prediction of displaced rehearsal.

Furthermore, if rehearsal was displaced to atypical events, the displaced rehearsal account would predict that in the same-type elaboration condition, atypical base sentences (which were accompanied by atypical elaborations) would be remembered better than the common base sentences (which were accompanied by common elaborations). On the other hand, in the different-type elaboration condition, all the paragraphs have some element that is atypical (either the base sentence or the elaboration). With all the paragraphs having some atypical

Table 3
Patterns of Distinctiveness Effects in the Presentation Conditions of Experiment 2 as Predicted by Various Explanatory Accounts

	Presentation Condition			
Explanatory Account	Control	Fast	Same-Type Elaboration	Different-Type Elaboration
Spontaneous elaboration	Yes	No	No	No
Selective displaced rehearsal	Yes	No	Yes	No
Expectation violation	Yes	Yes	Yes	No
Representation (organizational)	Yes	Yes	No	No
Representation (retrieval set)	Yes	Yes	Yes	Yes or Reversed*

Note—"Yes" indicates that the account predicts a distinctiveness effect in that condition; "No" indicates that the account predicts no effect or an attenuated effect in that condition. *One variant predicts the standard distinctiveness effect; the other variant predicts a reversed distinctiveness effect (i.e., recall of common base sentences better than recall of atypical base sentences).

element, displacement should not occur. Thus, the displaced rehearsal account predicts a distinctiveness effect in the control and same-type elaboration conditions and no effect (or an attenuated effect) in the fast and different-type elaboration conditions.

The final differential processing account that we address, the expectation violation hypothesis, holds that atypical items show a mnemonic advantage because they elicit a surprise response that increases the association of contextual cues to that item. Assuming that the contextual associations elicited by a surprise response are not selectively tied to one part of the stimulus but become part of the entire event, then when a common base sentence is associated with an atypical cause (as in the different-type elaboration condition) that atypical cause should elicit a surprise response. This response should increase the association of contextual cues to the base sentence, enhancing memory of the common sentences and attenuating or eliminating any mnemonic advantage of atypical base sentences. The expectation violation hypothesis thus predicts distinctiveness effects in the fast, control, and same-type elaboration conditions and an attenuated effect (or no effect) in the different-type elaboration condition. The hypothesis would also predict that atypical elaborations would be recalled better than common elaborations.

In contrast to the patterns predicted by the differential processing views, the two representation views outlined in the introduction would each anticipate still different patterns of distinctiveness effects. Fabiani and Donchin (1995) proposed an account to explain primary distinctiveness effects (i.e., items that are atypical relative to their encoding context) but suggest that their account could apply to a larger class of distinctiveness effects, including the secondary distinctiveness effects addressed in the present study. Their version of a representational account assumes that the advantage of atypical items is due to a memory representation that is organized into distinct and nondistinct categories. In this kind of dichotomous organization, the distinct category enjoys a retrieval advantage over the nondistinct category of items. The account further assumes that elaborations may provide additional information that is included in the representation of both atypical and typical targets. This additional information may lead to a memory representation in which material is organized around the elaborative information or around item relationships established by the elaborations rather than by the typicality of the items themselves. In such cases, the addition of elaborations may lead to a memory representation of the items that is no longer organized into the dichotomous categories of typical and atypical, with the consequence that the memory advantage for atypical items is reduced or eliminated.

The predicted pattern of results in this account differs from that of the spontaneous elaboration account by predicting that the fast presentation rate will actually be associated with the most robust distinctiveness effect, because the limited time will lead to a memory representation that is not modified by added elaboration and so is organized primarily in terms of the dichotomous categories of typical and atypical items. Furthermore, this dichotomous organization should lead to clustering in free recall (also see Bruce & Gaines, 1976). The slower (control) rate should significantly attenuate the effect, because more time should be available for elaborative encoding of all the sentences, which should modify the dichotomous organization of the memory representation. Clustering in free recall should also be attenuated. In the two experimenter-provided elaboration conditions in which both the typical and atypical sentences are elaborated, the overall organization of the memory representation of those sentences should be even less categorical. The two elaboration conditions should therefore show little or no distinctiveness effect and no clustering in free recall.

In contrast to the foregoing organizational account, the idea that the mnemonic benefits of secondary distinctiveness are due to atypical items' being distinct vis-à-vis the retrieval set (thus giving them a retrieval advantage) does not necessarily predict clustering in recall. In addition, this variant of the representation view holds that elaborations may serve as a background against which a particular base sentence is encoded. This view thus predicts a distinctiveness effect in the same-type elaboration, control, and fast conditions. For the different-type elaboration condition, one of two possible patterns of effects is possible, depending on how the notion of elaboration-as-background is conceptualized. On the one hand, the presence of an elaboration may affect the representation of the entire event described in a paragraph. In this case, when the events in an atypical base sentence are accompanied by a common elaboration that "explains away" those unusual events, the overall event in the paragraph should be represented as common rather than atypical. On the other hand, when events conveyed in a common base sentence are rendered unusual via an accompanying atypical explanation, then the event described in the entire paragraph should be represented as unusual. If the elaboration affects the representation of the entire event in the paragraph, then a reversed distinctiveness effect should occur in the different-type elaboration condition: Common base sentences will be recalled better than atypical base sentences. If, however, elaborations simply serve as background information that is added after the processing of the base sentence, then atypical base sentences should be remembered better than common sentences regardless of the kind of elaboration (common or atypical) that accompanies those sentences.

Method

Subjects. The subjects were 80 undergraduate students. Of these, 48 participated for partial course credit in an undergraduate psychology course, and the remaining 32 each received $3 for their participation. The subjects were tested individually.

Design. The design was a 2 × 4 mixed factorial with type of base sentence (common vs. atypical) as the within-list factor and pre-

sentation condition (fast presentation, control presentation, same-type elaboration, different-type elaboration) as the between-list factor. Twenty subjects (12 unpaid and 8 paid in all groups) were randomly assigned to each of the four presentation conditions.

Materials. Stimulus materials were four sets of 16 items, one set for each of the four presentation conditions. Each item consisted of (in the control and fast conditions) a base sentence alone or (in the elaborated conditions) a base sentence plus an elaboration (adapted from McDaniel et al., 1988). The base sentences were the sentences from Experiment 1. For each condition, one half of the base sentences were common and one half were atypical. Type of base sentence (common or atypical) was counterbalanced across subjects in each condition. The stimulus set for the control and the fast conditions consisted of each base sentence presented alone. The stimulus set for the two elaboration conditions consisted of the base sentence accompanied by an explanatory elaboration consisting of two sentences that gave a reason for why the base sentence event had occurred. The relationship of the elaboration to the base sentence was made more explicit by beginning the first of the two sentences in the elaboration with the phrase, "This is because." Specifically, the same-type elaboration condition had paragraphs in which the elaborations did not change the relative likelihood of the event described in the atypical or common base sentences (termed *atypical–atypical* and *common–common* paragraphs, respectively). Atypical–atypical paragraphs consisted of an atypical base sentence followed by an atypical elaboration. Common–common paragraphs consisted of a common base sentence followed by a common elaboration. In the different-type elaboration condition, the paragraphs had elaborations that substantially altered the relative likelihood of the event described in the base sentence (termed *atypical–common* and *common–atypical* paragraphs, respectively). Atypical–common paragraphs consisted of an atypical base sentence followed by a common elaboration. Common–atypical paragraphs consisted of a common base sentence followed by an atypical elaboration.

Materials norming. A separate rating task was used to validate the level of typicality for all base sentences and elaborated paragraphs used in this study. Subjects were 34 undergraduate students who participated in partial fulfillment of an introductory psychology course requirement and who did not participate in any other part of the current study. They were asked to use a scale of 1 (*not at all unlikely*) to 5 (*highly unlikely*) to rate the likelihood of the events described in the base sentences and the elaborated paragraphs. All base sentences and paragraphs were presented in random order, and sentence type (atypical vs. common) and stimulus type (base sentence vs. elaborated paragraph) were counterbalanced across subjects. The mean ratings for the stimuli indicated that the events described in the 16 atypical base sentences were rated as being very unlikely ($M = 4.00$, $SD = 0.56$), as were the events in the atypical–atypical ($M = 4.39$, $SD = 0.47$) and common–atypical ($M = 4.14$, $SD = 0.49$) paragraphs. The events described in the common base sentences were rated as being not unlikely ($M = 1.20$, $SD = 0.16$), as were the events in the common–common ($M = 1.39$, $SD = 0.32$) and atypical–common ($M = 1.89$, $SD = 0.34$) paragraphs. The ratings results confirm that we succeeded in constructing two levels of stimuli. One level described relatively atypical relationships among the respective stimulus elements, and the other level described more typical relationships among those elements.

Procedure. All presentations were controlled by a Northgate XTURBO/8 personal computer. Each subject sat in front of a computer monitor on which the stimuli (unelaborated target sentences or elaborated paragraphs) were presented one at a time. The subjects read each item aloud when it appeared on the screen. They were told that there would be a subsequent memory task, but the nature of the task was not specified and nor were they told the particular information they would be asked to remember. Prior to beginning the study phase, the subjects completed four practice trials. The stimuli used in the practice trials were different from the target stimuli used in the study phase. Target stimuli were presented in a different random order for each subject. Following Bradshaw and Anderson (1982) and McDaniel et al. (1988), the presentation rates were 18 sec for each base sentence in the control condition, 5 sec for each base sentence in the fast condition, and 36 sec for each paragraph in the same-type elaboration and different-type elaboration conditions. An earlier pilot study had verified that these presentation rates did not result in ceiling or floor effects for the present stimulus set. Furthermore, the pilot study had verified that the 5-sec rate in the fast condition was long enough to allow subjects to complete reading the sentence aloud when they read it out quickly.

After all the stimuli were presented, the subjects received a free-recall test in which they wrote down as many of the studied items as they could remember, taking as much time as needed to complete the task. Next, they received a cued-recall test that consisted of the base sentences only, with some of the words in each sentence replaced by blanks. The subjects filled in the blanks with the words that had occurred in the studied sentences.

A subset of 40 subjects (9 in the control group, 11 in the fast group, and 10 each in the two elaboration groups) also completed a study-strategy questionnaire. On the computer monitor, they saw eight of the stimuli (base sentences or paragraphs) that they had previously studied (four atypical and four common, with sentence and sentence version counterbalanced across groups). They also received a list of 11 study strategies (adapted from McDaniel & Kearney, 1984). The stimuli appeared one at a time, and for each item, the subjects indicated which one of the 11 study strategies they had used to study and to try to remember that item when it had originally appeared.

Results and Discussion

The rejection level for all analyses was set at .05. All recall measures were initially analyzed with separate 2 × 4 (sentence type × presentation condition) mixed ANOVAs. Analyses were performed both for recall of information from all the sentences presented and for recall adjusted to include information from all but the last sentence presented (to control for recency effects). Because the pattern of results was identical for both unadjusted and adjusted recall, we will report only the unadjusted results. The specific predictions of each of the distinctiveness accounts were tested with planned comparisons that compared the size of the distinctiveness effect in a given experimental condition with the size of the effect in the control condition. The power for detecting an interaction (defined as a difference of at least .15 between two conditions) was .85. Confidence intervals (using Dunnett's distribution for comparing all treatments against a control) were also constructed for each planned comparison. As in Experiment 1, the cued-recall test in this experiment followed the free-recall test, a situation that raised concerns about possible contamination of the cued-recall results by the preceding free recall. Consequently, we do not report the cued-recall results in this section.[4]

Free recall. Table 4 presents the mean proportion of sentences accessed, the mean proportion of target words recalled, and the mean proportion of target words recalled per sentence accessed. For sentence access, a main effect emerged for sentence type [$F(1,76) = 30.15$, $MS_e = 0.03$]. In all four presentation conditions, the proportion

Table 4
Mean Proportion of Sentences Accessed, Mean Proportion of Target Words Recalled, and Mean Proportion of Target Words Recalled per Sentence in Free Recall in Experiment 2

Presentation Condition	Sentence Type: Atypical *M*	Atypical *SD*	Common *M*	Common *SD*
Sentence Access				
Control	.66	.11	.54	.22
Fast	.46	.18	.25	.16
Same-type elaboration	.59	.23	.44	.21
Different-type elaboration	.59	.18	.44	.25
Target-Word Recall				
Control	.54	.15	.45	.21
Fast	.35	.16	.18	.13
Same-type elaboration	.49	.22	.37	.20
Different-type elaboration	.45	.21	.34	.20
Target Words per Sentence				
Control	.81	.11	.86	.11
Fast	.78	.21	.81	.22
Same-type elaboration	.80	.12	.77	.19
Different-type elaboration	.78	.11	.82	.19

of sentences recalled was greater for atypical sentences than for common sentences (i.e., a distinctiveness effect). The main effect of presentation condition was also significant [$F(3,76) = 9.62$, $MS_e = 0.04$]. A Newman-Keuls analysis indicated that the effect of presentation condition was due to fast-condition subjects' accessing a lower proportion of sentences overall than did subjects in each of the other three conditions. Importantly, sentence type did not interact with presentation condition [$F(3,76) = 0.48$, $MS_e = 0.03$]. Planned comparisons tested the predictions of attenuated (or reversed) distinctiveness effects relative to those of the control group. The size of the distinctiveness effect was not attenuated in the fast condition relative to that of the control condition [$F(1,76) = 2.70$, $MS_e = .03$; confidence limits: -0.04 and 0.22]. The effect also was not attenuated in the same-type elaboration condition [$F(1,76) = 0.30$, $MS_e = .03$; confidence limits: -0.10 and 0.16]. Finally, the distinctiveness effect was neither attenuated nor reversed in the different-type elaboration condition [$F = 0.30$, $MS_e = .03$; confidence limits: -0.10 and 0.16].

The pattern of results for the proportion of target words recalled was identical to that for proportion of sentences recalled. A distinctiveness effect emerged [i.e., a main effect of sentence type; $F(1,76) = 26.20$, $MS_e = 0.03$]. A significant main effect was also found for presentation condition [$F(3,76) = 8.49$, $MS_e = 0.05$]. A Newman-Keuls analysis indicated that this effect was due to fast-condition subjects' recalling a lower proportion of target words overall than did subjects in each of the other three conditions. Again, presentation condition did not interact with sentence type [$F(3,76) = 0.50$, $MS_e = 0.03$]. Planned comparisons tested the predictions of attenuated (or reversed) effects relative to those of the control group. The distinctiveness effect was not attenuated in the fast condition [$F(1,76) = 2.13$, $MS_e = .03$; confidence limits: -0.05 and 0.21]. The effect was not attenuated in the same-type elaboration condition [$F(1,76) = 0.30$, $MS_e = .03$; confidence limits: -0.10 and 0.16]. Furthermore, the distinctiveness effect was neither attenuated nor reversed in the different-type elaboration condition [$F(1,76) = 0.13$, $MS_e = .03$; confidence limits: -0.11 and 0.15].

To investigate whether or not distinctiveness also affected the amount recalled given that a sentence had been accessed, the proportion of target words recalled per sentence (given that at least one word was recalled from that sentence) was calculated for each presentation group. Three subjects did not recall any sentences of at least one sentence type, and their data were eliminated from the analysis. No significant effects occurred for presentation condition [$F(3,73) = 0.07$, $MS_e = 0.03$], sentence type [$F(1,73) = 0.61$, $MS_e = 0.02$], or the interaction [$F(3,73) = 0.61$, $MS_e = 0.02$]. As we will discuss in detail in the General Discussion, the pattern of free-recall results does not support differential processing accounts of secondary distinctiveness. Instead, the data appear to provide better support for a representation view. To evaluate the two variants of that view, we next examined clustering in recall.

The degree to which subjects tended to recall typical or atypical sentences together was measured with Roenker, Thompson, and Brown's (1971) adjusted ratio of clustering (ARC) score. This score can range from -1 to 1, with 1 indicating perfect clustering and 0 indicating chance clustering. A one-way ANOVA of the ARC scores indicated that in none of the four presentation conditions did subjects tend to recall the same type of sentences together [$F(3,79) = .69$, $MS_e = .30$]. In fact, none of the ARC scores in any of the presentation conditions was significantly different from zero [largest $t(19) = 1.37$, $SE = .15$]. The absence of clustering is contrary to a representation view of secondary distinctiveness that assumes that atypical information is stored in clusters in memory (Bruce & Gaines, 1976; Fabiani & Donchin, 1995; Schmidt, 1985).

Recall of elaborations. For the two elaboration groups, free recall of the elaborated paragraphs was evaluated by conducting a 2 × 2 mixed factorial ANOVA with type of elaboration (atypical vs. common) as the within-list factor and elaboration group (same type vs. different type) as the between-list factor. All of the elaborations in the same-type elaboration and different-type elaboration conditions were broken into propositions according to the method described by Kintsch (1974). An elaboration was defined as recalled if at least one proposition from that elaboration was recalled. The frequency with which accompanying elaborations were recalled was very high. Out of the total number of base sentences recalled by the 40 subjects in the two elaboration groups, only 2% of those sentences were recalled without any accompanying elaborations. All of those omitted elaborations were accounted for by 5 of the subjects, each of whom also recalled base sentences with accompanying elaborations. The free-recall analysis revealed a significant interaction

between type of elaboration and elaboration group [$F(1,38) = 10.61$, $MS_e = 0.02$]. For the same-type condition, atypical elaborations ($M = .56$, $SD = .27$) were recalled better than common elaborations ($M = .43$, $SD = .21$). The opposite was true for the different-type elaboration condition. Common elaborations ($M = .58$, $SD = .19$) were recalled better than atypical elaborations ($M = .40$, $SD = .20$).

In addition, distinctiveness of the elaboration did not affect the amount recalled from that elaboration once it had been accessed. The proportion of propositions recalled was evaluated for those elaborations for which the subject had also recalled the accompanying target sentence (in only two instances did a subject recall an elaboration without recalling its target sentence). There was no main effect of elaboration group [$F(1,38) = 0.26$, $MS_e = .08$] or elaboration type [$F(1,38) = 1.76$, $MS_e = .02$], and elaboration group did not interact with elaboration type [$F(1,38) = 0.40$, $MS_e = .02$]. The analysis of the elaboration recall data indicates that elaborations accompanying atypical base sentences were recalled better regardless of whether or not those elaborations were also atypical. However, once an elaboration had been accessed, recall was equivalent from atypical and common elaborations in both elaboration groups.

Supplementary analyses. Additional self-report data on encoding strategies were collected from approximately half of the subjects after testing. To obtain an index of the degree to which subjects relied on the same encoding strategies for both atypical and common sentences, a repetition ratio (McDaniel & Kearney, 1984) was calculated for each subject. First, we identified the strategies that a subject indicated having used for encoding both common and atypical sentences. For example, if a subject indicated using imagery for both types of sentences, this strategy was counted as a repeated strategy. If imagery was used in encoding atypical sentences only or common sentences only, it was not counted as a repetition. A repetition count was obtained by summing the number of repeated strategies. The repetition ratio was then derived by dividing the repetition count by the total number of different strategies the subject reported having used (regardless of whether or not they were repeated strategies). The ratio ranges from 0 (using completely different strategies for atypical vs. common sentences) to 1.00 (using identical strategies for atypical and common sentences). The mean ratio scores for the control (.66, $SD = .37$), fast (.58, $SD = .21$), same-type elaboration (.64, $SD = .28$), and different-type elaboration (.67, $SD = .31$) groups did not differ significantly from each other [$F(3,36) = 0.22$, $MS_e = .08$]. In all four presentation conditions, the subjects tended to use the same encoding strategies (primarily imagery or repetition) for both atypical and common stimuli. The implications of these results for accounts of distinctiveness effects are presented in the next section.

GENERAL DISCUSSION

Paralleling previous research on distinctiveness effects, subjects in our studies remembered sentences that conveyed atypical events better than sentences that conveyed more common events. Contrary to the predictions generated by the strong versions of the differential processing views of spontaneous elaboration and expectation violation, the effect did not emerge in a between-list design (Experiment 1). Recall of atypical events was better than recall of common events only when a within-list manipulation was used (Experiment 2). Importantly, the particular pattern of distinctiveness effects across the various experimental conditions in Experiment 2 helps to constrain the theoretical interpretation of the effect. That experiment was designed so that the pattern of distinctiveness effects among the various encoding conditions would discriminate among the various accounts.

First, consider the differential processing accounts outlined in the introduction. For a within-list design, all of the accounts predict an interaction between sentence type and encoding condition, but each account predicts a different pattern for that interaction. According to a spontaneous elaboration view, elaboration increases recall of an item by providing information that makes the item more understandable and results in the item's being encoded into a richer network than is a less elaborated item. In that case, either reducing the possibility for spontaneous elaboration of atypical sentences (our fast condition) or providing explanatory elaborations of common as well as atypical sentences (our elaboration conditions) should reduce or eliminate the distinctiveness effect (relative to the control condition). The predicted reduction did not occur. In Experiment 2, the distinctiveness effect emerged in all conditions. Elaboration of atypical targets (at least elaboration directed at explanation of the target) does not appear to underlie the memory benefits observed for such targets. Furthermore, the strategy self-report data showed little evidence that enhanced memory of atypical sentences was tied to differential processing of atypical versus common sentences. Subjects in the two elaboration conditions reported using the same processing strategies equally often for both atypical and common sentences, but atypical sentences were still recalled better than common ones in both groups.

The argument might be made that, given the nominally (although not statistically significant) lower levels of recall in the elaboration conditions relative to the control condition, the experimenter-provided elaborations might have been less effective than self-generated elaborations would have been and might even have interfered with the processing of the base sentences. Although self-generated elaborations might have produced higher overall recall than experimenter-provided elaborations (cf. Hunt & Smith, 1996), it does not necessarily follow that the predicted pattern of effects failed to emerge because

the experimenter-provided elaborations were ineffective. Our elaboration conditions followed the design of previous studies of elaboration effects (e.g., Bradshaw & Anderson, 1982) in which target information was accompanied by experimenter-provided elaborative information. Furthermore, if our experimenter-provided elaborations had interfered with the processing of base sentences, then we would expect to see that interference reflected in decreased within-sentence processing (measured by words per sentence) relative to the control condition. We found no such decrease. A more likely explanation for the slightly lower overall levels of recall in the elaboration conditions stems from our free-recall instructions, which instructed subjects to recall as much of each paragraph as possible. For those in the elaboration conditions, that meant recalling not only the base sentences but the elaborations as well. The lower overall levels of recall may simply reflect some form of output interference resulting from subjects in the elaboration conditions having more to recall than subjects in the unelaborated conditions.

The data from Experiment 2 also did not conform to the pattern of results predicted by a selective displaced rehearsal account (Slamecka & Katsaiti, 1987). In the different-type elaboration condition, all paragraphs had some component that was unusual (either the base sentence or the elaboration). Thus, it is not clear on what dimension subjects would displace their rehearsal or why they would displace rehearsal to some paragraphs (i.e., those with base sentences that described an unusual event followed by a common elaboration) and not to others (i.e., those with base sentences that described a common event followed by an unusual elaboration).

Moreover, a distinctiveness effect occurred in the fast-presentation condition, a condition in which there is presumably little time for displacing rehearsal. One might argue that the fast condition was not fast enough to preclude displacement from the common to atypical items. Our observation of the subjects, however, argues against this point. Slamecka and Katsaiti (1987) found that having subjects repeat a stimulus aloud until the next one appeared eliminated effects of selective displaced rehearsal. In our study, the 5-sec time limit required the subjects to read the sentences aloud very quickly in order to finish speaking before the next sentence appeared. Even when reading quickly, the subjects seldom, if ever, had any time left before the next sentence appeared, and when they did have time, it was never more than about 1.5 sec. Given this situation, it seems implausible that the subjects routinely had enough time left after processing common sentences to displace rehearsal to atypical sentences. Moreover, if processing resources were indeed being reallocated to atypical items at the expense of common items, we would expect that within-sentence processing (measured by words recalled per sentence) should also be better for atypical sentences. We did not find such an advantage. Atypical base sentences showed no advantage over common sentences in words recalled per sentence.

Nor is the expectation violation version of a differential processing account (Hirshman, 1988) completely consistent with the present data. In the condition in which the elaborations created an unusual explanation for a common target (i.e., the different-type elaboration condition), expectations would presumably be violated. Accordingly, the events in paragraphs with common targets and atypical causes should be highly associated with contextual cues due to the startle or surprise produced by expectation violation, much as atypical base sentences alone should be more highly associated with contextual cues than common sentences. In this account, therefore, one would not anticipate superior recall for the atypical sentences relative to the common sentences in the different-type elaboration condition. We did, however, find such superior recall. One might argue that the distinctiveness effect was not attenuated in this condition because the atypical elaborations were not creating a surprise response. If the atypical elaborations were not creating a surprise response, they should not be well recalled in either elaboration condition. In the same-type elaboration condition, however, atypical elaborations were recalled better than common elaborations. A more parsimonious conclusion is that the typicality of the elaboration had no effect on recall of the elaboration itself. Rather, it was the typicality of base sentence that influenced recall of the accompanying elaboration.

A more sophisticated differential processing account like Schmidt's (1991) incongruity hypothesis might not be completely incompatible with the present patterns. This account appeals to differential processing at the level of automatic processes. By this account, when an item is presented, it is compared with active conceptual frameworks, and any item that is incongruent with those frameworks elicits more attention than an item that is congruent. This increased attention to unusual stimuli is assumed to be automatic, to occur within the first second or so of processing, and to result in the storage of more item-specific information for incongruent items than for congruent items.

A central assumption of this incongruity view is that the encoding of the item-specific information is stimulated in a context in which atypical information stands out against recently presented common information. In applying the incongruity account to secondary distinctiveness, the atypical and common information are atypical and common relative to previous experience. Placing atypical information against a background of common information in the mixed-list design makes the atypical information stand out in the list context. Thus, distinctiveness effects should emerge only in mixed-list designs, a prediction borne out by the present study. Furthermore, because the processing and increased storage of item-specific information for atypical sentences are assumed to be automatic and to occur quickly, presentation rate should have little effect on the distinctiveness effect. Thus, our fast presentation condition would not have been fast

enough to preclude increased storage of item-specific information for the atypical sentences, and accordingly the obtained distinctiveness effects would be expected. Also, the strategy self-reports would probably not reflect this differential processing across common and atypical sentences because of the automatic nature of that processing.

It is uncertain, however, how the incongruity hypothesis would account for the distinctiveness effects in the elaboration conditions. The elaborations added substantial information to each of the target sentences, information that might be expected to offset any advantage of automatically encoded item-specific information supposedly associated with the atypical sentences (cf. Robinson-Riegler & McDaniel, 1994). Yet, the common sentences were still more poorly recalled than the atypical sentences in both elaboration conditions.

The pattern of results obtained in this study seems to lend more support to a representation view of distinctiveness effects, although not all versions of this view can adequately account for our results. For example, an organizational interpretation (e.g., Bruce & Gaines, 1976; Fabiani & Donchin, 1995; Schmidt, 1985) assumes that, because atypical targets receive special status at the time of retrieval, those atypical targets should be recalled first and should be recalled together. Our data do not support either of those predictions. In Experiment 2, atypical targets were not more likely to be recalled first, nor were they recalled in clusters.

Nevertheless, a representation view generally suggests that distinctiveness is directly represented in the memory trace and that such a representation allows better trace access at the time of retrieval. The data from Experiments 1 and 2 are most consistent with a retrieval set version of the representational account. According to this version, the memory representations of items contain various kinds of potentially useful retrieval cues. Which cues will be functional at retrieval is determined by the retrieval context. Once the retrieval set is formed, items with discriminative cues (e.g., distinctiveness) will possess an advantage in the processes involved in retrieval from that set. This view predicts the pattern that occurred in Experiment 2: the atypical sentences in each presentation condition will be remembered better than the common sentences.

The question remains as to how an item is identified as distinctive within the retrieval set. In the case of the type of secondary distinctiveness effects investigated here, perhaps we compare the current information (i.e., target information presented during encoding) with our prior knowledge or experience to determine which information is atypical relative to that knowledge. That atypicality may then be represented in a form that serves as a discriminative cue during a later memory search (cf. Raaijmakers & Shiffrin, 1981). In such a model, encoding all items a little better (e.g., adding elaborations to all items) would not confer any overall benefit, because it is the ratio of available cues that is important during recall. Discriminative features are useful only when some, but not all, of the items have the features. All items may be encoded with information on how they relate to prior knowledge, but those that include information about a mismatch may have a recall advantage (relative to those with information about a match) because they have discriminative information that increases the probability that they will be sampled during the memory search.

The emergence of a distinctiveness effect in the different-type elaboration condition of Experiment 2 also helps to inform a notion of how discriminative features may come to be represented. In that condition, not only were atypical base sentences recalled better than common ones, but the common elaborations accompanying those atypical base sentences were better recalled than the atypical elaborations accompanying common bases. Let us assume that, for complex events, the initial theme (or sentence) of the event serves as the cue for recall of the remainder of the event. The challenge in free recall is first to gain access to the event. Once the event is accessed, the initial information is then used to recover the remainder of the event (or paragraph). Our data indicate that this initial access may be accomplished via accessing the base sentence. Gaining access to that base sentence may well depend on discriminative information associated with that sentence. It may be that, at encoding, the comparison of information in the base sentence to prior knowledge occurs very quickly (as Schmidt, 1991, surmises). That comparison may even result in some sort of surprise response for atypical items (as the expectation-violation hypothesis would suppose) that is incorporated into the representation of atypical items and later serves as a discriminative cue in the retrieval set. The subsequent (elaborative) information may or may not provide cues for retrieving the rest of the paragraph. Contrary to what the current formulation of the expectation-violation hypothesis would suppose (i.e., that atypical information in any part of the paragraph can serve as a retrieval cue for accessing the entire paragraph), the initial access to the paragraph appears to depend primarily on discriminative information in the base sentence serving as the functional retrieval cue.

The interpretation of base sentences as the source of functional retrieval cues is consistent with our findings that the different-type elaboration condition showed a standard distinctiveness effect (atypical base sentences recalled better than common base sentences) rather than a reversed effect (common base sentences recalled better than atypical base sentences). This view is also consistent with our findings that distinctiveness served to enhance access to base sentences, not to improve recall of words (or elaborations) once access was gained.

In summary, our research reinforces the position adopted herein that all distinctiveness effects may not be captured within one explanatory model in spite of a general similarity in the conditions that produce the effect (i.e.,within-list manipulation of the target items). Instead, the data across many studies seem to be captured best by distinguishing between primary and secondary distinc-

tiveness effects (cf. Schmidt, 1991). Furthermore, our data suggest that a number of variants of the differential encoding approach do not provide an adequate account of the observed secondary distinctiveness effects. When processing differences were reduced or eliminated, distinctiveness effects still occurred (see also Hunt, 1995). Furthermore, the mnemonic benefit of distinctiveness was due to increased accessibility of the atypical sentences relative to the common sentences and not to recovery of more elements (constituents) from the atypical sentences. At this point, it seems most likely that mechanisms related to the representation and subsequent retrievability of elements that are distinct in the memory record play a major role in these effects. This conclusion converges with recent theoretical interpretations of the von Restorff effect (Hunt, 1995) and with recent findings on the bizarre-imagery effect (Einstein & McDaniel, 1987; Einstein, McDaniel, & Lackey, 1989; McDaniel & Einstein, 1986; McDaniel et al., 1995), another instantiation of the secondary distinctiveness effect investigated here.

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NOTES

1. In Schmidt's (1991) terminology, this is called the depth of processing account.

2. For the sake of completeness, we present the cued-recall data for Experiment 1 here. No effect of distinctiveness emerged for proportion of target words recalled [$F(1,36) = 1.22$, $MS_e = 0.02$]. There was a sig-

nificant main effect of presentation condition [$F(1,36) = 15.68$, $MS_e = 0.02$], with subjects in the fast condition recalling a smaller proportion of target words overall than did subjects in the control condition. Presentation condition did not interact with sentence type [$F(1,36) = 0.01$, $MS_e = 0.02$].

3. Our elaboration conditions were not designed to mimic all the possible types of spontaneous elaborations that could be generated. Rather, we focused on one kind of elaboration that has been proposed to mediate distinctiveness effects. According to Bradshaw and Anderson (1982), people generate elaborations to help them make sense of the material. Atypical items may be more difficult to understand than common items, and so may elicit more elaboration. The result is that the atypical items are well understood and end up being better remembered than the common items because the atypical material is now accompanied by a richer propositional network than is the common material (which elicited less elaboration).

4. Our concerns were further supported by the lower levels of cued recall of target words than for the corresponding levels of free recall of those words. For the sake of completeness, however, we present the results of the analysis of the cued-recall data here. In proportion of target words recalled, there were significant main effects of presentation condition [$F(3,76) = 17.38$, $MS_e = 0.04$] and sentence type [$F(1,76) = 26.34$, $MS_e = 0.01$]. These effects were modified by a significant interaction between presentation condition and sentence type [$F(3,76) = 4.27$, $MS_e = 0.01$]. Distinctiveness effects were present in the fast, control, and same-type elaboration conditions. Recall for atypical sentences was nominally higher than recall for common sentences in the different-type elaboration condition, but the difference did not attain statistical significance.

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