

# Evaluating information for truthfulness: The effects of logical subordination

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Research has shown that many individuals do not routinely evaluate new information for consistency with respect to what they already know. One factor that may affect the likelihood of critical evaluation is whether or not the information is the central focus of the message. Two experiments tested this possibility by establishing differential emphasis of false information within complex sentences. Half of the target sentences contained a false fact in the main clause and half contained a false fact in the subordinate clause. In Experiment 1 subjects verified 64 sentences presented orally as either true or false. In Experiment 2 subjects read and evaluated 20 paragraphs for the presence of false information. As expected, subjects were less likely to report the false information when it was conveyed as logically subordinate rather than central. The results suggest one explanation for deficits in comprehension monitoring and have implications for understanding susceptibility to persuasive communications.

The failure of many individuals to evaluate information for its truthfulness, consistency, and completeness has long been recognized by educators concerned with critical reading skills (e.g., Goodman, 1976; Wolf, 1967). As early as 1917, Thorndike noted that reading may be wrong or inadequate "because of failure to treat the ideas produced by the reading as provisional, and so to inspect and welcome them or reject them as they appear" (p. 326). The extent to which people evaluate what they read has also become of concern to psychologists studying the processes underlying comprehension (see Baker & Brown, 1984). Several empirical studies have shown quite clearly that even mature readers do not routinely monitor their understanding of text according to the criteria necessary for critical reading (e.g., Baker, 1985a; Baker & Anderson, 1982; Epstein, Glenberg, & Bradley, 1984; Glenberg, Wilkinson, & Epstein, 1982; Tikhomirov & Klochko, 1981).

The practical value of critical evaluation is obvious when we consider the tremendous amount of information we encounter in our daily lives and the frequent use of rhetorical techniques designed to persuade us that what is said is true, valid, and reasonable (Campbell, 1972). Thanks to recent advances in psycholinguistics and cognitive psychology, advertisers and politicians, among others, have become quite sophisticated in their efforts to make audiences believe what they want them to believe. Although care is usually taken to avoid deliberate misstatement of fact, subtle linguistic devices may be used to encourage erroneous inferences. One such device is to present information in a syntactic structure that signals presupposition. Hutchinson (1971) suggested that listeners may not evaluate the presupposed information

as critically as they would focal information, and so may be more inclined to believe it. Consider the following sentence: "It was the president who authorized use of the debilitating chemical weapon during the war." The focal information in this sentence is that the president was the one who gave the authorization. Perhaps it had not been established with any certainty that the chemical weapon was debilitating or even that it was used. However, that a debilitating weapon was used is presupposed information in this sentence; the listener is not expected to question this "fact." The naive and unwary listener may therefore "learn" from this sentence that a debilitating chemical weapon was indeed used, and may store this information in memory as fact.

Empirical support for the potentially deceptive role of presupposition was provided by Hornby (1974). He gave subjects a sentence-picture verification task, using several different syntactic structures that signaled presupposition, including cleft, pseudocleft, and passive. Subjects were asked to verify whether each sentence was an accurate description of a picture that was presented for a fraction of a second. On some trials, subjects were shown a picture that was accurately described by the sentence; on other trials, there was a discrepancy in either the focal or the presupposed information. For example, for the cleft sentence, "It is the girl that is riding the bicycle," subjects could be shown a picture of a girl riding a bicycle (true), a picture of a boy riding a bicycle (false focal), or a picture of a girl riding a scooter (false presupposed). Hornby found that subjects were less likely to notice discrepancies when the picture conflicted with presupposed information than when it conflicted with focal information. Given the limited time available for processing the picture, subjects focused on what they thought would be the most important element (the focal noun), and therefore frequently failed to perceive the mismatch with the presupposed portion of the sentence.

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The distinction between presupposed and focal information is roughly equivalent to the more general distinction between given and new information. Halliday (1967) argued that every sentence consists of some given information (i.e., information that the speaker/writer assumes the listener/reader already knows) and some new information. Halliday suggested that under normal intonation patterns, people consider information presented earlier in a sentence to be given and information presented later to be new. However, the distinction between given and new information can be signaled by many other devices, including anaphora, stress patterns in speech, and punctuation in writing. These signaling devices also afford the possibility of deception. For example, a seemingly minor change in wording from an indefinite to a definite article can induce a listener to make an erroneous inference. This was demonstrated in an experiment by Loftus and Zanni (1975). Subjects were shown a film depicting an automobile accident and were later questioned about what they had seen. Some of the subjects were asked, "Did you see the broken headlight?" while others were asked, "Did you see a broken headlight?" (No broken headlight had in fact been shown.) Those subjects who heard the first question were more likely to respond affirmatively than were those who heard the second question. When a definite article is used, it signals that the referent is given information, whereas the indefinite article signals that the referent is new. Subjects in the experiment therefore assumed that there had indeed been a broken headlight on the car, and so were more likely to "remember" that they had seen one.

Although Hornby's (1974) study demonstrated an effect of presupposition on perceptual processing and Loftus and Zanni's (1975) study demonstrated an effect on episodic memory, neither of these experiments demonstrated that people are unlikely to critically evaluate given information with respect to their general knowledge about the world. In critical reading, it is necessary for the reader to decide whether the information conveyed in a sentence or text is truthful or consistent with what he/she already knows. Is it possible that linguistic devices can be used to affect the likelihood that such critical evaluation will occur? The present study was designed to test this possibility.

Two independent lines of research provided the direct impetus for this research question: one was concerned with comprehension monitoring (Baker, 1984, 1985a) and the other with an intriguing "semantic illusion" reported by Erickson and Mattson (1981). Each will be discussed briefly. The typical paradigm used in comprehension-monitoring research involves embedding some sort of problem or error into a passage and examining the likelihood that subjects will detect the error. Because the error disrupts the comprehensibility of the material, failure to notice the error may be taken as evidence of failure to monitor comprehension.<sup>1</sup> Baker's research on the comprehension-monitoring skills of children and adults has shown that readers frequently do not identify infor-

mation in the text that conflicts with their prior knowledge, even when they are explicitly instructed to try to do so. Consider the following portion of one of the expository passages Baker (1985a) presented to her college-student subjects:

Governors frequently go to great lengths to win legislators over to their side. They often spend many hours simply socializing with them. As governor of Montana, Ronald Reagan used to invite groups of legislators to his home. There, among other things, they would play with the model electric train network that he had set up in his basement.

A majority of the subjects did not notice anything inconsistent in the information that Ronald Reagan had been governor of Montana. When subjects were simply told to read a set of passages and underline anything they thought hard to understand, only 24% of the subjects noticed this particular problem. When subjects were informed that some of the passages would contain facts that were inconsistent with prior knowledge, 51% of the subjects noticed the problem—a substantial increase, but hardly an impressive figure. And it was not the case that the students did not have the necessary prior knowledge; when subsequently questioned, most indicated that they were well aware that Reagan had been governor of California.

A similar failure to consider prior knowledge was reported by Erickson and Mattson (1981), who used a task designed to reveal how people construct sentence meanings. College students, when asked to answer questions containing incorrect information, frequently failed to notice the errors. For example, when subjects were asked "How many animals of each kind did Moses take on the ark?" most immediately answered "Two," even though they knew it was Noah who sailed the ark and they had been told that some of the questions would contain incorrect names. Erickson and Mattson proposed several explanations for this finding and tested them in follow-up experiments. The explanation relevant to the present context was that the question was misleading because its focus was on something other than the inconsistent name (i.e., the number of animals). To test this possibility, Erickson and Mattson changed the task to one in which subjects were to respond "true" or "false" to assertions such as "Moses took two animals of each kind on the ark." Because the semantic illusion still occurred, Erickson and Mattson ruled out their focus explanation. What the authors did not consider, however, was that even in an assertion, some propositions are regarded as focal or new information and others as presupposed or given information. As noted by Halliday (1967), people often consider information presented at the beginning of a sentence to be given and information presented later to be new. Thus, subjects may have focused on the number of animals that were taken on the ark, deciding that this was the information that needed to be verified.

Based on the evidence reviewed earlier, there is reason to believe that structural characteristics of sentences

containing false information may have an important influence on whether or not people evaluate that information for truthfulness. This could help explain both Erickson and Mattson's (1981) results and those reported by Baker (1985a). Consider again the target sentence used in the previous example from Baker (1985a): "As governor of Montana, Ronald Reagan used to invite groups of legislators to his home." The syntactic structure of this sentence is such that the false information is embedded within an adjective clause whose sole function is to modify the subject of the sentence. Accordingly, subjects may have perceived this information as peripheral to the main point of the sentence and therefore may not have thoroughly evaluated it. One of the goals of the present study was to provide a more direct test of this possibility.

The linguistic device selected for establishing differential emphasis of false information in the present study was logical subordination. Guides to English composition specify that only those ideas that are fundamental should appear in the subject and predicate of an independent clause; lesser ideas should be placed in modifiers and other elective parts of a sentence. According to Vivian and Jackson (1961), "the significance of logical subordination is that it lends emphasis to the important ideas by preventing the unimportant ones from attracting undue attention" (p. 224). In the present study, logical subordination was accomplished through the use of complex sentences consisting of an independent clause and a nonrestrictive dependent clause (i.e., a clause that does not identify or limit the meaning of the word it modifies, but rather supplies extra details). The dependent clause always interrupted the main clause and was set off by commas, which also serve an important role in establishing emphasis: "The pair of commas usually functions as a signal to the reader that the element that appears between the commas is a nonessential interrupter which can be omitted without impairing the grammatical structure of the sentence" (Vivian & Jackson, 1961, p. 362).

Subjects in two experiments were presented with complex sentences containing false information located in either the main clause or the subordinate clause. In the first experiment, subjects listened as the sentences were read aloud and then verified them as true or false with respect to their own prior knowledge. In the second experiment, subjects read short paragraphs containing the target sentences and underlined whatever information they believed to be false. If, as expected, subjects evaluate information conveyed as central more thoroughly than they do information conveyed as peripheral, they should detect more false propositions in independent clauses than in dependent clauses. Although this prediction may appear intuitively obvious, it is nonetheless important to provide empirical documentation for the phenomenon. There exists ample evidence that linguistic structure influences many aspects of cognitive processing, but it remains to be shown that it affects critical evaluation with respect to world knowledge. It should be noted that the experiments were intentionally designed to be unlike naturalistic language experiences. That is, subjects were explicitly

informed that false information would be presented to them and that their task would be to detect it. If differential detection occurs as a function of logical subordination under these carefully controlled conditions, then almost certainly the magnitude of the effect would be greater during normal reading or listening.

## EXPERIMENT 1

### Method

**Materials.** The first step in developing the materials was to create 60 fact-based pairs of statements. All of the statements were designed to reflect common knowledge, such as information about historical events, elementary principles of science, and facts about famous people and places. Both members of a pair were based on the same topic, and all of the facts were expressed in simple, declarative sentences. The statements were constructed with the thought in mind that one member of the pair would later be falsified by changing a single word in the statement. For example, one such pair was "Whales are an endangered species" and "Whales are the largest mammals on earth." In this case the second member of the pair was falsified by changing the word *mammals* to *amphibians*: "Whales are the largest amphibians on earth."

A preliminary study was conducted to ascertain that the facts were indeed commonly known among college students. Twenty-eight undergraduates enrolled in an introductory psychology class participated to receive extra credit. The subjects were presented with a list of 132 statements; 120 of the statements were the individual members of the fact-based pairs, which had been separated and randomly distributed through the list, and the other 12 sentences were of various syntactic structures and would later serve as fillers. The subjects were instructed that some of the statements were true and some of the statements were false. They were to rate the truthfulness of each sentence on a 6-point confidence scale with 1 equal to *very sure it's false* and 6 equal to *very sure it's true*.

The 36 pairs of facts that were correctly evaluated with the most extreme confidence ratings were selected for use in the experiment. The false members of the pairs received confidence ratings of 1 and 2, whereas the true members of the pairs received ratings of 5 and 6. Each fact pair was combined to form two different complex sentences, one with the false fact in the subordinate clause and one with the false fact in the main clause. The subordinate clause always functioned as a nonrestrictive adjective clause modifying the subject noun. In addition, the clause always interrupted the main clause and was set off by a pair of commas. The relative pronoun *who* or *which* either explicitly or implicitly introduced the clause. Table 1 provides examples of the alternative versions of three target sentences derived from fact-based pairs.

**Table 1**  
**Examples of Sentences Used in Experiment 1**

Location of False Information	
Subordinate Clause	Main Clause
Bloodletting, generally accomplished with the aid of rats, was thought to remove "poisons" from the blood.	Bloodletting, thought to remove "poisons" from the blood, was generally accomplished with the aid of rats.
The liver, which is an organ found only in humans, is often damaged by heavy drinking.	The liver, which is often damaged by heavy drinking, is an organ found only in humans.
Emerald City, named after the precious red stone, was the home of the Wizard of Oz.	Emerald City, the home of the Wizard of Oz, was named after the precious red stone.

Two counterbalanced sets of sentences were constructed. Each set contained 18 sentences with the false fact in the subordinate clause and 18 sentences with the false fact in the main clause. Because it was necessary to have some sentences for which a response of "true" was appropriate, each set also included 16 true sentences that had the same structure as the target statements. Also included were 12 filler sentences that had varying sentence structures; some of these were simple sentences, some were compound, and some were complex. Half of these fillers were true and half were false. The fillers were intended to preclude biases in processing strategies that subjects might have developed if all sentences had identical structures. Both sets of 64 sentences were recorded on tape by a female experimenter who read each sentence aloud, leaving a 10-sec interval between sentences. The intonation pattern was such that it was clear the subordinate clauses were set off by commas.

**Subjects.** The subjects were 32 undergraduates, 21 females and 11 males, who participated in the experiment to receive extra credit in their introductory psychology course. The subjects were tested individually and were assigned to one of two groups on the counterbalancing factor of sentence set. The distribution of males and females in each group was roughly proportional.

**Procedure.** Subjects were told that the purpose of the study was to examine the ways people analyze verbal information. They were told that they would hear a set of 64 sentences containing various facts, some of which were true and some of which were false. They were instructed to evaluate the truthfulness of each sentence and to verbally respond "false" if any information in the sentence was false and "true" if all parts of the sentence were true. Subjects were told they would have 10 sec in which to respond and were encouraged to respond as quickly, but accurately, as possible. They were given several examples and an opportunity to ask questions.

As the sentences were being presented on tape, a second tape recorded the subjects' responses while the experimenter recorded them on paper. The tape provided a check on the accuracy of the experimenter's record keeping and it also permitted a gross assessment of subjects' response times.

## Results and Discussion

The dependent variable was the number of correct responses to the target sentences, that is, the number of times subjects responded "false" when the sentence contained a false fact. The mean number of correct responses when the false fact was in the main clause was 16.00 ( $SD = 1.75$ ), out of 18 possible, and the corresponding mean for the subordinate clauses was 14.59 ( $SD = 2.77$ ). This difference in accuracy was statistically reliable, as indicated by two separate 2 (sentence position)  $\times$  2 (sentence set) analyses of variance, one with subjects as the random variable and the other with items as the random variable [ $F_1(1,30) = 9.88, p < .01$ , and  $F_2(1,34) = 21.38, p < .001$ , respectively]. In both analyses, neither the main effect of sentence set (the counterbalancing factor) nor its interaction with sentence position was reliable (both  $F_s < 1$ ).

These results indicate that regardless of the specific content of false propositions, subjects were less likely to identify them as false when they were presented in subordinate clauses than when they were presented in main clauses. In other words, the data support the hypothesis that people are less likely to critically evaluate information for truthfulness when it is conveyed in such a way that it is perceived as less central.

It could be argued that the results reflect nothing more than a recency effect. That is, subjects may have made fewer errors when false facts were in main clauses simply because the main clauses were always placed at the end of the sentence. The false facts in subordinate clauses may have been forgotten or may have been less accessible because they always appeared in the middle of the sentence. This explanation rests on the assumption that information at the end of the sentence was still in short-term or working memory when the subjects responded, but that information in the middle of the sentence was not. However, this explanation is unlikely for two reasons. First, the total amount of time it took for the sentence to be read aloud and for the subject to make his/her response was rarely more than 7 sec. This is well within the temporal limitations of working memory. Second, we asked an independent group of subjects to listen to each sentence and repeat it verbatim. None of the subjects had the slightest difficulty in doing so, indicating that the entire sentence was within the capacity limitations of working memory.

Thus, the present experiment provides support for one of the alternative explanations of the semantic illusion that Erickson and Mattson (1981) believed they ruled out, namely, that structural characteristics of a sentence may induce people to focus on certain information at the expense of other information. The present experiment also extends the work of Hornby (1974) by showing that variations in syntactic structure affect detection of discrepancies with prior knowledge as well as discrepancies with visual information. Finally, the experiment suggests one possible interpretation for the frequent failures to detect false or inconsistent information observed in studies of comprehension monitoring (e.g., Baker, 1985a). The usual interpretation has been that subjects were not evaluating their own understanding carefully and so failed to consider whether what they were reading made sense with respect to what they already knew (Baker, 1985b). It may be, however, that subjects were indeed evaluating their understanding of information they perceived to be central, but were allocating less attention to the more peripheral information. Some support for this alternative comes from a study of comprehension monitoring by Baker and Anderson (1982) that examined subjects' detection of internal inconsistencies within paragraphs (i.e., propositions within the text itself that conflict with one another). Subjects were more likely to identify the inconsistencies when they involved main ideas rather than details. In Baker and Anderson's study, importance was determined by the semantic content of the paragraph, rather than by structural characteristics of the sentences, as in the present experiment, but the underlying mechanisms may be similar.

The differences between the task used in the present experiment and those used in typical comprehension-monitoring studies are too extreme to permit anything but the most tentative of inferences. Therefore, we conducted Experiment 2 to determine whether manipulation of sentence structure would affect subjects' evaluation of writ-

ten expository passages as it had affected subjects' verification of orally presented individual sentences. A second purpose of Experiment 2 was to provide further evidence against the recency interpretation of the data discussed above. One group of subjects was asked to read paragraphs that had embedded within them target sentences like those used in Experiment 1 and to underline any information they thought was false. The subjects were free to read the paragraphs at their own pace and to reread them if they chose. Despite the elimination of memory demands on subjects' responding, one could still argue that subjects differentially allocate attention to information within individual sentences as a function of serial position. Thus, as an added control against the possibility that subjects more frequently fail to report false information in the subordinate clause simply because the subordinate clause is in the middle of the sentence, Experiment 2 used compound as well as complex sentences. A second group of subjects read paragraphs containing target sentences rewritten as compound sentences, again with the false proposition appearing in the first position or the second position. If serial position is the relevant factor, then subjects should be less likely to notice the false information in the middle of the sentence, regardless of sentence type. On the other hand, if logical subordination plays a role, as hypothesized, then subjects receiving complex sentences should be less likely to notice the false information in the first position of the sentence, where the information is conveyed as less central than at the end. However, subjects receiving compound sentences should be equally likely to report false information in both positions, because the two propositions are logically coordinated and therefore equally important (Vivian & Jackson, 1961). (It could be argued that order of mention in a compound sentence signals differential importance, with the first proposition more important than the second, in which case false propositions would be reported *more* frequently in the first position than in the second. Such a pattern would be opposite to that predicted by the serial position hypothesis.)

Two additional procedural refinements were also incorporated into Experiment 2. One was the inclusion of a within-subjects test for relevant prior knowledge. Recall that the materials developed for Experiment 1 were pre-tested for prior knowledge with a different group of subjects. A within-subjects test allows for correction of detection scores based on whether the individual actually possesses the background knowledge necessary to detect a false fact. Experiment 2 also included a test for memory of the false information that had actually been presented in the text. If subjects were as capable of recognizing the false facts presented in subordinate clauses as they were the false facts presented in main clauses, this would suggest that any difference in the initial identification of false information was not simply due to a failure to process the subordinate clauses.

## EXPERIMENT 2

### Method

**Materials.** The materials consisted of 20 short expository paragraphs, five to seven sentences in length, with a mean of 95.29 words ( $SD = 14.79$ ). Fourteen of the paragraphs contained target sentences used in Experiment 1. Selection of the target sentences was based on the feasibility of constructing a paragraph in which the false information could appear as either the first or the second proposition in the sentence without disrupting the referential continuity or coherence of the paragraph. The paragraphs were constructed so that both propositions of the target sentence were relevant to the topic and the sentence fit equally well in context regardless of which proposition was presented first. Initially, 14 sentences were randomly selected from the set of 60 used in Experiment 1. Whenever one of these sentences proved unworkable, a new sentence was randomly selected from the pool. The position of the target sentence was intentionally varied across paragraphs to preclude subjects from adopting a strategy of focusing on specific sentences; however, the target sentence was never in the first or last position.

There were four different versions of each experimental paragraph. Two versions used complex target sentences identical to those of Experiment 1: in one version the false fact was embedded in the subordinate clause (first position), and in the other the false fact was embedded in the main clause (second position). The two other versions used compound sentence structures consisting of two independent clauses joined by the conjunction *and*: in one version the false fact appeared in the first clause, and in the other version it appeared in the second clause. Table 2 provides an example of a paragraph generated for the experiment, showing the target sentence in each of its four possible versions.

An additional six paragraphs served as filler paragraphs, and there was only one version of each. Three of the fillers contained no false facts, although they did contain sentences similar in structure to the target sentences. The other three paragraphs contained two false facts each, embedded within sentences of various structures. The purpose of the fillers was to prevent the subjects from ascertaining that there was one and only one false fact per paragraph and that it always appeared in a sentence of a particular structure.

The materials were divided into two counterbalanced sets, A and B, so that half of the target sentences in each set had the false fact appearing in the first position and half had the false fact appearing in the second position. The materials were also separated on the basis of sentence structure, with matching sets of compound and complex target sentences. The paragraphs were typed on individual sheets of paper and were assembled into booklets. The order of the paragraphs in each booklet was random, with the constraint that the first and last paragraphs be fillers.

Supplementary materials for the experiment consisted of a set of 24 multiple-choice questions. All of the items took the form of sentence completions with three alternatives. Fourteen of the questions were based on the targeted false facts. For each of these, one alternative was the false fact that actually appeared in the paragraph; another alternative was the correct fact, based on world knowledge; and the third was an incorrect distractor. The ordering of the three types of alternatives was random across items but was fixed for all subjects. Table 2 includes the multiple-choice question for the sample paragraph. The remaining 10 questions were based on the filler paragraphs. The questions were typed one after another on standard paper. A separate answer sheet was also prepared. It was numbered 1 through 24 in the left margin and contained two columns of blank lines, headed "Correct" and "Text-Based." Instructions for completing the multiple-choice task were typed at the top of the question sheet.

**Table 2**  
**Example of Materials Used in Experiment 2**

Paragraph:

Many different writing systems have been developed in many different parts of the world. Some of the earliest systems were created thousands of years ago. [Target sentence embedded here.] A descendent of the picture-writing system is still used by the Chinese. Some writing systems, notably one used by the Japanese, are based on syllables. But most modern cultures use alphabetic systems, which are based on speech sounds.

Alternative versions of target sentence:

False Information Presented	Complex	Compound
First	Hieroglyphics, which is usually associated with the Russians, is a kind of picture writing.	Hieroglyphics is usually associated with the Russians and is a kind of picture writing.
Second	Hieroglyphics, which is a kind of picture writing, is usually associated with the Russians.	Hieroglyphics is a kind of picture writing and is usually associated with the Russians.

Multiple-Choice Question:

Hieroglyphics were used by the:  
a. Russians      b. Egyptians      c. American colonists

**Subjects.** The subjects were 63 undergraduates, 40 females and 23 males, who participated in the experiment to receive extra credit in their introductory psychology course. Subjects were tested in small groups ranging in size from 3 to 9. All subjects within a group received either complex or compound sentence structures and were randomly assigned to receive either the Set A or Set B materials. A total of 33 subjects received complex sentences and 30 received compound sentences.

**Procedure.** Subjects were informed that the purpose of the experiment was to study the extent to which people think about the relation between what they read and what they already know. They were further instructed as follows:

You will be given a set of 20 short paragraphs dealing with a variety of different topics. Each paragraph will contain several facts, most of which should be familiar to you. However, some of the facts will be false; they will be inconsistent with your prior knowledge. Your task is to identify the false facts and to explain what it is about them that makes them false. Not every passage will contain false information and some passages will contain more than one false fact. When you encounter something you believe is false, underline the word or phrase. Then, in the space at the bottom of the page, explain why you underlined it.

Subjects were given a sample paragraph with a false fact embedded within the main clause (second position) of a complex sentence. The false fact was underlined and an explanation given.

After the subjects had read and evaluated the 20 paragraphs, their booklets were collected and the multiple-choice questions and answer sheets were distributed. Subjects were informed that the questions were based on information in the passages they had just read. They were asked to make two decisions for each question. First they were to select the correct answer, based on their own knowledge and experience; the appropriate letter (a, b, or c) was to be entered in the "Correct" column. Next they were to select the answer that had actually been presented in the passage, regardless of whether or not it was correct. These responses were to be entered in the "Text-Based" column.

Subjects worked through the two tasks at their own pace. Average completion time was 25 min.

**Results and Discussion**

The subjects' response booklets were first scored for correct identification of false information. For the purposes of this analysis, a correct identification was defined as an underscore of the false fact. Recall that subjects had been asked to supply the correct factual information at

the bottom of the page, but in several instances this information was missing or incorrect. It was decided to use the liberal criterion of detection as an indication that subjects had evaluated the information for truthfulness. However, scores on the detection task alone were not sufficient to allow firm conclusions as to whether subjects had evaluated the information for truthfulness. Failure to underline a false fact may have reflected either failure to evaluate or lack of relevant knowledge (i.e., the subject did not know the information was false). It was because of this second possibility that subjects were given the multiple-choice questions assessing their knowledge of the facts. Their response protocols were scored for the number of target facts for which they knew the correct information. Their detection scores were then converted to conditional probabilities based on whether or not they correctly answered the multiple-choice question. For example, if a subject underlined five of the seven false facts appearing in second position, but demonstrated by his responses to the multiple-choice questions that he had the relevant prior knowledge for only one of the two false facts he failed to underline, his score was 5/6, or .83, rather than 5/7, or .71.

The corrected probabilities of identifying false information are shown in Table 3. Notice that detection scores on compound sentences did not differ as a function of the location of the false information. On complex sentences, however, subjects identified fewer false facts in the first position than in the second. This pattern was confirmed by a 2 (sentence type: compound or complex)  $\times$  2 (passage set: A or B)  $\times$  2 (location of false proposition: first or second) mixed analysis of variance. The first two factors were between-subjects factors; the third was a within-subjects factor. The interaction of sentence type  $\times$  position of false information was reliable [ $F(1,59) = 4.4, p < .05$ ]. None of the main effects or remaining interactions were statistically reliable.

These results are entirely consistent with the hypothesis that subjects are less likely to accept false information as true if it is conveyed as central than if it is conveyed

Table 3  
Corrected Probabilities of Identifying False Information  
in Experiment 2

Location of False Information*	Complex Sentence		Compound Sentence	
	Probability	SD	Probability	SD
First Position	.69	.25	.78	.16
Second Position	.80	.20	.79	.16

\*The first position in complex sentences was the subordinate clause; the second position was the main clause.

as peripheral. Information in the first position in the complex sentences was embedded within subordinate clauses, and hence was less central than information in the three independent clauses. Moreover, given the similarity in detection rates for the two propositions in compound sentences, it is clear that the central/peripheral effect first observed in Experiment 1 and replicated with the complex sentences in Experiment 2 was not simply a function of more thorough processing of information at the end of a sentence.

One could still question the present interpretation of the data, however, by arguing that because subjects perceived information in the subordinate clauses to be less important than information in the independent clauses, they paid no attention to it. According to this view, detection failures resulted not from a tendency to accept subordinate information as true, but rather from a failure to process the information at all. Evidence against this argument is provided by the recognition memory task, in which subjects were asked to indicate what information had actually been presented in the text. Recognition rates were exceedingly high and did not differ across the four conditions (complex-first = .92; complex-second = .89; compound-first = .92; compound-second = .91). The fact that information in subordinate clauses was as well recognized as information in main clauses indicates that subjects did process the information at some level during reading, yet they still failed to recognize the information as false. We are not claiming that the information in subordinate clauses was processed as thoroughly as information in main clauses. Thorough processing, in this task at least, entails critical evaluation, and this is precisely what did not occur. Had we used a more stringent recall measure rather than our recognition test, we may well have found differences between the conditions. However, our goal here was simply to ascertain whether the false information had been encoded at all, and the recognition test confirmed that it had.

Finally, it should be noted that even under optimal conditions, when the false information was presented in a sentence constituent that signaled importance, the detection rate was only .80. Thus, even when subjects were explicitly set to look for false information, and their scores were corrected for lack of relevant prior knowledge, they missed an average of 20% of the problems. This finding is consistent with results obtained in studies of comprehension monitoring that indicate that mature readers often do not think about how newly encountered information

relates to what they already know (e.g., Baker, 1985a).<sup>2</sup> Nevertheless, the fact that detection rates were higher when the false information was given emphasis in the sentence suggests that some of the reported deficits in comprehension monitoring may be attributable to perceived nonimportance of the target information.

We do not wish to imply, however, that sentence structure is the only factor responsible for subjects' failure to notice false information. Several studies have shown that when the salience of false information is increased, subjects are more likely to notice it. For example, Pace (1980) found that children are more likely to report something wrong with a story about peanut butter and shoe polish sandwiches than with a story about peanut butter and ice cream sandwiches. Erickson and Mattson (1981) found that subjects were never misled when the name *Moses* was replaced by *Nixon* in the question "How many animals of each kind did Nixon take on the ark?" Thus, the semantic relatedness of the incorrect proposition to the correct proposition is also a crucial factor, one that this study did not address.

## GENERAL DISCUSSION

The present study shows that structural characteristics of sentences do have an influence on whether or not people evaluate information for truthfulness. Subjects were less likely to notice false information when the sentence structure signaled that the information was logically subordinate, rather than of central importance. Experiment 1 revealed this phenomenon in a simple sentence-verification paradigm and Experiment 2 showed that the effect generalizes to a paragraph-evaluation task. The fact that subjects in Experiment 2 were free to read and reread the paragraphs at their own pace further attests to the practical significance of the effect. Recall that Hornby's (1974) demonstration of a similar pattern with presupposition was based on data collected under impoverished viewing conditions, when subjects did not have sufficient time to process all information thoroughly. Just as subjects are less likely to evaluate presupposed or given information, so too are they less critical of information that is conveyed as peripheral or parenthetical. Quite clearly, the linguistic device of logical subordination should be regarded as another means by which language can be manipulated for deceptive purposes.

One seemingly discrepant finding concerning the effects of sentence structure on text evaluation warrants discussion. Glenberg et al. (1982) presented subjects with passages containing contradictory information within adjacent sentences. Half of the time the contradiction was presented as given information, and half of the time it was presented as new. On the basis of the argument developed in this paper, one might predict that subjects would evaluate given information less thoroughly than new information, and therefore that they would be less likely to report the contradiction in given information. However, Glenberg et al. predicted and obtained the opposite pattern of



results: Subjects were less likely to report the contradiction when it was conveyed as new information than when it was conveyed as given. To understand this apparent inconsistency, it is necessary to consider the nature of the materials used and the processing demands of the task. Information was conveyed as given by linking the contradictory information in the two sentences through anaphoric reference. For example, one contradiction entailed discussion of fluctuations of political opinion in one sentence, followed by mention of stability in the subsequent sentence. The given version of the second sentence referred to "this" stability, whereas the new version of the sentence used an entirely different syntactic structure, with no anaphoric links to the prior mention of fluctuation. Discourse-processing models postulate that readers attempt to integrate each incoming sentence with their memory representations for previously presented sentences. The anaphoric referent in Glenberg et al.'s passage serves as a cue that there is an explicit link to a prior sentence. The reader searches memory to establish the link and discovers the contradiction. When the sentence does not contain a cue signaling that the information is given, the reader does not attempt to integrate the new information with the old, and so "new information that contradicts the previous text will be accepted without scrutiny" (Glenberg et al., 1982, p. 601). Thus, Glenberg et al.'s explanation of this finding does not contradict our hypothesis by maintaining that subjects perceived the given information as *more important* than the new; instead, it maintains that the given information was *processed differently*, by virtue of prior relevant context. Unlike Glenberg et al.'s task, our task required subjects to consider not how two ideas expressed in the text were related to one another, but rather how one idea expressed in the text was related to prior knowledge. In other words, structural characteristics of sentences appear to have differential effects on critical evaluation depending on the nature of the processing demands.

The present findings are also relevant to the more general issue of prior knowledge activation during reading. There is ample evidence that prior knowledge plays a crucial role in comprehension (see Anderson & Pearson, 1984), yet the evidence reported here and elsewhere (e.g., Baker, 1985a; Bransford et al., 1982; Erickson & Mattson, 1981) suggests that knowledge activation is far from automatic for many individuals. In fact, Potts, Keller, and Rooley (1981), using a linear ordering paradigm, found large individual differences in the extent to which college students used relevant world knowledge, even when task demands required its use and subjects were so informed. Moreover, Potts and Peterson (1985) recently determined that there is consistency among individuals in their propensity to use world knowledge. The main focus of the latter study was on the degree to which new information acquired through reading a text was incorporated into existing world knowledge, as opposed to being "compartmentalized." The authors

found that subjects who did not draw on world knowledge in one reading task also failed to do so in a different task.

The evidence that compartmentalization occurs for the same individuals who do not draw on prior knowledge in other situations has one encouraging implication for the interpretation of the present study. Recall that one of our initial concerns was with the use of language for deceptive purposes. We argued that individuals who do not critically evaluate information for truthfulness should be more susceptible to propaganda techniques. However, if Potts and Peterson's (1985) results can be generalized, it appears that these individuals will compartmentalize newly acquired information: Thus, although they may store distorted or erroneous information in memory, they may not access that information in other contexts. In other words, their subsequent behavior may not be influenced by their exposure to the misleading communication.

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## NOTES

1. Strictly speaking, a more appropriate interpretation is that subjects failed to use the specific standard of evaluation necessary for the detection of that particular type of problem; they may well have evaluated their understanding with respect to alternative standards (Baker, 1985b).
2. The detection rate in the present study was actually considerably higher than the rate reported by Baker (1985a). Recall that the "governor" problem from Baker's study, which was presented in the introduction, had a maximum detection rate of .51. There are many differences between the two studies, however, that account for this apparent discrepancy. For example, Baker (1985a) used 250-word expository passages adapted from college-level textbooks. Thus, the individual passages were both longer and more difficult than those used in the present study. In addition, there were two other types of problems embedded in the passages, and subjects who were told that the passages contained problems were instructed to evaluate for all three problems simultaneously. Thus, the processing demands of the task were also more complex.

(Manuscript received June 17, 1986;

revision accepted for publication October 21, 1986.)