LANGUAGE AND COGNITIVE PROCESSES, 1990, 5 (4) 257–280

Comprehension of Deep and Surface Verbphrase Anaphors

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Linguistic research on anaphora (Hankamer & Sag, 1976; Sag & Hankamer, 1984) suggests that anaphors can be divided into two classes: *Surface* anaphors that find their antecedents in some level of linguistic representation, and *deep* anaphors that find their antecedents in a discourse model or a corresponding mental representation. In three experiments, we tested the hypothesis that the syntactic form of the antecedent for a subsequent anaphor would affect the difficulty with which surface anaphors but not

syntactic and semantic relations that definite pronouns can or must bear to their antecedents, and most psycholinguistic studies of anaphora have likewise focused on the comprehension of definite pronouns with antece-

apartment is not sufficient to license the use of such cases of surface [redacted] it is sufficient to support the use of a deep anaphor.

A second difference between deep and surface anaphors is that the surface anaphors require that their linguistic antecedent be presented in a suitable form (being sensitive to aspects of linguistic form), whereas deep anaphors are not sensitive to the syntactic form of the expression introducing the antecedent, when the antecedent is introduced linguistically. This difference is one of "syntactic parallelism". Consider the phenomenon of VP ellipsis in English, where (roughly) a repeated verbphrase may be

expect that a deep anaphor could take this concept as its antecedent. As

The claim that anaphors divide into deep and surface categories is particularly striking in light of the fact that, in many cases, a sentence with a deep anaphor appears to have the same interpretation as the correspond-

and type of anaphor. Moreover, the effects of length were markedly

containing the anaphor were separated by an intervening sentence. Murphy concluded that when the verbatim form of the antecedent was available in memory, both deep and surface anaphors are interpreted by a "copying" process, whereas when the form of the antecedent is not available, "plausible reasoning" is used to construct an interpretation for the anaphor.

However, the manipulation of antecedent length also introduced potential scope and attachment ambiguities which could have complicated comprehension of both types of anaphors. Thus, the length effect alone does not provide convincing evidence for a copying process. The fact that

nouns and definite nounphrase anaphora, the distance between an antecedent and its anaphor has little effect on comprehension times for the sentence containing the anaphor as long as the antecedent remains in focus (Anderson, Garrod, & Sanford, 1983; Garnham, 1987; Lesgold, Roth, & Curtis, 1979). Thus, the fact that distance effects obtained with the deep anaphors in Murphy's experiments raises the possibility that the intervening material introduced topic shifts. Tanenhaus, Carlson, and Seidenberg (1985) report an experiment in which an intervening sentence increased comprehension times to surface—but not deep—anaphors. The interven-

comprehension time and reading tasks are in fact variants of signal detec-

surface anaphors when the material following the infinitive marker ("to") is deleted. The contrast between null complement anaphora (a deep anaphor) and VP-ellipsis (a surface anaphor) was used in Experiment 3 in order to examine the effects of syntactic parallelism on deep and surface anaphors when both types of anaphors involve null elements.

EXPERIMENT 1

Parallel antecedents were introduced in active sentences and non-parallel

8a. After the exam Bill decided to have a beer or two. Sam didn't either.
8b. Yesterday, the sports star announced his retirement. Sam denied it, too.

Procedure. The sentences were presented using an Apple 2E microcomputer that was interfaced to a Digitry CTS card. Each trial began with

TABLE 1

presented in (9):

9a. It always annoys Sally when anyone mentions her sister's name.
9b. The mention of her sister's name always annoys Sally.
9c. However, Tom did it anyway out of spite.
9d. However, Tom did anyway out of spite.

The parallel and non-parallel antecedents are presented in the sample [illegible] sentences (9a) and (9b), respectively, and the deep and surface anaphors in the sample target sentences (9c) and (9d).

Method

Subjects. Twenty-eight undergraduates recruited from introductory psychology courses participated in the experiment.

Materials and Procedure. We used the same lists as in Experiment 1 with the test sentences replaced by sentence-pairs generated from 20 sets of [illegible] similar to the set presented in (9). All of the test materials are

when they were syntactically parallel. However, syntactic parallelism had negligible effects on judgements to deep anaphors. The effect of type of

first two experiments. Only 12 sets of materials were used because of the limited number of verbs that can be used with null complement anaphora. One of the material sets was later discarded because of a mistake in

The results of Experiment 3 are similar to those obtained in the first two experiments. The surface anaphors were judged to make sense significantly more often when their antecedent was syntactically parallel, but parallelism did not significantly affect judgements to deep anaphors. Parallelism

between parallelism and type of anaphor that obtained in all three of the

mately [The garage$_x$ (Need (someone paint x))]. This corresponds to a situation in which the *state of the garage* itself motivates the need for the painting (e.g. the paint is old and peeling), whereas the semantics for (12a) is more neutral, specifying only that a certain situation needs to come about, though no element is scoped out to target the source of the need.[2] Thus the passive sentence tends to structure the information in such a way as to give special prominence to the subject nounphrase, whereas the active sentence tends not to. If these focus differences are reflected in the discourse model—as they appear to be intuitively—sentence (12b) is more likely to bring to mind an image of a garage with peeling paint than (12a), and if anaphoric processing searches for the most prominent elements of the discourse representation, then the antecedent for a deep verbphrase anaphor which is an event in the discourse model would be less accessible

are not. This conclusion differs from that reached by Murphy (1985a; 1985b). However, like Murphy, we did find that parallelism affects the speed with which deep anaphors are interpreted. We have suggested that this is because non-parallel antecedents are typically associated with discourse structures which make the event that serves as the conceptual antecedent for the anaphor less accessible than the discourse structures

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4a. Someone broke our basement window last night.
b. Our basement window was broken last night.
c. Sam thinks he knows who did it.
d. Sam thinks he knows who.

5a. An architect designed the elaborate conference room.
b. The elaborate conference room was designed by an architect.

16a. Bill was supposed to feed the cat last night.
b. The cat was supposed to have been fed last night.
c. He fell asleep and forgot to do it.
d. He fell asleep and forgot to.

17a. My brother Sam wrote a best-selling novel.
b. A best-selling novel was written by my brother Sam.
c. Our family was proud he did it.
d. Our family was proud he did.

18a. Somebody had to paint the garage.
b. The garage had to be painted.
c. Finally my younger sister Carol agreed to do it.
d. Finally my younger sister Carol agreed to.

19a. The police are curious about who robbed the jewelry store.
b. The jewelry store robbery is a puzzle to the police.
c. They still don't know who did it.
d. They still don't know who did.

20a. At the sports event the opera star sang the national anthem.

7a. It could take three hours to swim to the island.
b. A swim to the island could take three hours.
c. That is why we decided not to do it.
d. That is why we decided not to.

19a. In this state it is illegal for politicians to accept gifts.
b. In this state the acceptance of gifts by politicians is illegal.
c. Many small town politicians still continue to do it.
d. Many small town politicians still continue to.

20a. The troops were in dismay when the general surrendered.
b. The general's surrender was dismaying to the troops.

[redacted]

He had promised them that he never would do it.

[redacted]

Materials used in Experiment 3

[redacted]