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DISCOURSE CONSTRAINTS ON THE SYNTAX OF
TEMPORALLY ORDERED EVENTS

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1. INTRODUCTION. Languages often provide a variety of structures for representing the same proposition or propositions. When examined in isolation, all such "paraphrases" generally appear to convey the same basic information, but within a context one specific structure is usually preferred. This paper examines one such set of alternatives: those English structures used to represent two temporally ordered events. We first examine a class of these structures and the explanations proposed for their use. These proposals are then assessed against data taken from an extensive set of written texts. It is argued that both syntactic and discourse factors are involved in the distribution of the forms.

2. ORDER OF EVENTS. If we have two temporally ordered events E1 and E2 represented by the two clauses S1 and S2 respectively, English allows various ways of representing this information. Let us first consider the example of the two temporally ordered events in (1):

- 1 a. E1: Fred opened the door.
- b. E2: Fred turned on the light.

These two events can be expressed by conjoined clauses linked by such conjunctions as and, and then, then, or but. Here, the order of the clauses reflects the order of events. Examples are found in (2):

- 2 a. Type 1: S1 and S2
Fred opened the door and he turned on the light.
- b. Type 2: S1 and then S2
Fred opened the door and then he turned on the light.
- c. Type 3: S1 then S2
Fred opened the door, then he turned on the light.
- d. Type 4: S1 but S2
Fred opened the door, but he turned on the light.

The two events can also be represented in terms of complex structures involving the subordinate conjunctions before and after. Here, the order of the clauses does not always mirror the order of events and moreover the main clause may either precede or follow the subordinate clause. Examples are found in (3):

- 3 a. Type 5: S1 before S2
Fred opened the door before he turned on the light.
- b. Type 6: after S1, S2
After Fred opened the door, he turned on the light.
- c. Type 7: S2 after S1
Fred turned on the light after he opened the door.
- d. Type 8: before S2, S1
Before Fred turned on the light, he opened the door.

Since all eight sentences in (2) and (3) represent the same two ordered events, the question arises as to what factors govern the selection of a particular form. Clearly, an understanding of the speaker's (or hearer's) activities involves more than just the structures themselves. In particular, it involves the various cognitively based constraints and strategies which the speaker or hearer actually uses (see Prideaux & Baker, 1986 for a discussion of such strategies). An examination of the structures in (2) and (3) suggests that two distinct types of constraints might be relevant to the processing of such sentences: those based on purely syntactic properties and those deriving from discourse or contextual factors.

3. SYNTACTIC FACTORS. Among the possible syntactic factors governing the selection of a particular structure, two are immediately obvious. First, we might expect some measure of syntactic complexity to be operative, such that a relatively more complex structure would be harder to process than a less complex one. Let us call this the SYNTACTIC COMPLEXITY constraint. On the plausible assumption that conjoined structures are syntactically less complex than those involving embeddings, the SYNTACTIC COMPLEXITY constraint predicts that the compound structures of (2) should be easier to process than those in (3). This constraint is both intuitively plausible and supported by considerable independent empirical evidence from language processing studies (see, for example, Bever, 1970, and the results reported in Prideaux & Baker, 1986).

A second syntactic factor, discussed by Clark and Clark (1977), is that in English the unmarked case for a complex sentence has the main clause first. This MAIN-SUBORDINATE constraint predicts that sentence Types 5 and 7 would be easier to process than Types 6 and 8. These two syntactic factors are organized in a hierarchical relation since the MAIN-SUBORDINATE constraint is relevant only if the sentence is complex. Furthermore, both constraints appear to relate solely to the forms of sentences, isolated from context. It will later be suggested that contextual factors also play an important role here.

4. DISCOURSE FACTORS. Among those proposals found in the literature relating to the effect of context on sentence form, the two most relevant for the present study are the ORDER OF MENTION and the GIVEN-NEW constraints. The ORDER OF MENTION constraint states that a sentence whose clauses are in the same order as the events they represent is easier to process than one in which the order of clauses differs from the order of events. All the sentences in (2) mirror the order of events, but of those in (3), only (3a) and (3b) do. Thus, the ORDER OF MENTION constraint predicts that (3a) and (3b) should be easier to process than (3c) or (3d).

The second relevant discourse factor, and one relating to numerous other structures as well, is the GIVEN-NEW constraint. This constraint states that the speaker (or writer) partitions his message into two general types of information, that which is known to both the speaker and hearer ("Given" information), and that

which is known to the speaker but not to the hearer, ("New" information). Given and New information are typically separated and represented by distinctive syntactic means. There is considerable empirical support for this constraint from a variety of sources (see, for example, Clark & Haviland, 1974; Clark & Clark, 1977; Smyth, Prideaux, & Hogan, 1979).

Bever (1969) has suggested that in complex sentences, Given information is typically found in the subordinate clause, while the main clause carries the New information. This suggestion follows from the observation that the assertion in a (declarative) sentence is basic and represented by the main clause, while any presuppositions are found in subordinate clauses. Independent empirical support for this proposal is found in Silva (1981), who notes that old information is typically found in after clauses. Of course, it is not necessary that a subordinate clause contain any Given information, since all the content may be New.

When we try to apply the GIVEN-NEW constraint to sentences such as those in (2) and (3), however, it is clear that we must have access to the preceding context since syntactic factors alone cannot tell us if one or another event is Given or New. In the absence of a knowledge of the relevant discourse information, the GIVEN-NEW constraint can make no predictions, although once the information is available, the predictions follow immediately. Nevertheless, if Bever (1969) is right, both clauses in compound sentences should be New, while in complex sentences with a Given-New distinction, the subordinate clause should be Given and the main clause New. The GIVEN-NEW constraint can only be tested by establishing whether each clause in a complex sentence is Given or New, as assessed in terms of the preceding context.

It is apparent from these observations that the constraints can either buttress or work against one another, depending on the relevant contextual facts. Moreover, discourse factors are also expected to interact with syntactic ones. It is therefore plausible to expect that the convergence of syntactic and discourse factors will determine the relative processing ease of a set of particular sentences.

How, then, is each of these factors to be evaluated? To approach this problem we turn to text counts to assess the viability of the various constraints. We operationally define the relative frequency of structures as a measure of their relative complexity. Accordingly, we assume that, everything else being equal, if one structure is more frequent than another, it is easier to process than the other. Such an assumption provides the necessary link between our text data and the relevant psychological processes involved in their production and comprehension.

5. TEXT COUNTS. In order to determine whether the constraints discussed above are operative, several text counts were carried out, using two fiction and two non-fiction sources. The fiction texts examined were Murphy's (1979) The Vicar of Christ and Salinger's (1951) The Catcher in the Rye. These sources were selected since both are attempts to represent the spoken language.

Two selections were taken from Murphy (1979). The first, labelled VC(a), encompasses pages 5-55 and represents the speech of a retired U.S. Marine sergeant, while the second, VC(b) (pages 98-170), is supposed to represent the speech of a retired U.S. supreme court justice. The selection from Salinger (1951), labelled CR, was taken from pages 5-104. The two non-fiction sources were Newman's (1979) The Canadian Establishment (CE, pages 3-75) and Evans' (1979) The Micro Millenium (MM, pages 3-100). In total, some 390 pages of text were sampled. The text counts involved tabulating each instance of the eight structures mentioned above in (1) and (2). The raw data from the text counts are found in Table 1. Some 350 instances were found of compound structures representing two temporal events and some 66 instances of complex (before and after) structures.

In order to determine which predictions are borne out in the text counts, a series of X^2 -tests was carried out, the results of which are found in Table 2. Since the GIVEN-NEW constraint cannot be tested directly until the Given or New status of each clause is known, we postpone discussion of this constraint for the moment. From Table 2, it can be seen that there is a strong tendency in all the texts for compound sentences to be preferred over complex ones. Such evidence provides considerable support for the SYNTACTIC COMPLEXITY constraint.

The MAIN-SUBORDINATE constraint, however, does not appear to be supported by these data, at least to the extent that there is no general preference for one order of clauses over the other. It might appear that VC(a) constitutes an exception to this general result, since the Marine sergeant appears to prefer the main clause first. However, even when the complex clause data from VC(a) are excluded from the analysis, there is still no significant difference between the two clause orders ($X^2 = 2.2$, $p > 0.1$). It is possible, of course that the roughly equal frequencies of the two distinct word orders reflects a discourse distinction, especially if each part of the distinction occurs at roughly the same frequency. This possibility is discussed below.

From Table 2 it is obvious that the ORDER OF MENTION constraint is very important. For compound sentences, this result is of course trivial, since in such structures the clauses necessarily reflect the order of events they represent. Thus, when all eight of the structures are evaluated, the importance of the order of events is to some extent "swamped" by the compound structures. It is therefore more useful to examine the complex structures. Here too, the ORDER OF MENTION constraint is found to be highly significant, with those sentences mirroring the order of events preferred over those which do not. Again, given the possibility that VC(a) is introducing a frequency bias, a X^2 -test was carried out in which the data from VC(a) were excluded, and again the ORDER OF MENTION constraint was still found to be statistically significant ($X^2 = 5.6$, $p < 0.025$).

At this point, two important questions arise. First, if ORDER OF MENTION is so important, why are there any exceptions to it? Is it possible that there is another discourse factor at work

TABLE 1. TEXT FREQUENCY DATA

<u>Text</u>	<u>STRUCTURES</u>							
	<u>COMPOUND</u>					<u>COMPLEX</u>		
	<u>T1</u>	<u>T2</u>	<u>T3</u>	<u>T4</u>	<u>T5</u>	<u>T6</u>	<u>T7</u>	<u>T8</u>
VC(a)	32	2	3	0	16	1	0	3
VC(b)	36	1	0	2	4	3	0	3
CR	114	5	1	6	5	9	5	1
CE	62	4	2	0	1	4	1	4
MM	77	2	0	1	1	4	1	0
TOTALS	321	14	6	9	27	21	7	11
T1: S1 and S2				T5: S1 before S2				
T2: S1 and then S2				T6: after S1, S2				
T3: S1 then S2				T7: S2 after S1				
T4: S1 but S2				T8: before S2, S1				

TABLE 2. X²-TESTS FOR CONSTRAINTS

<u>CONSTRAINT</u>	<u>STRUCTURES COMPARED</u>	<u>X²</u>
SYNTACTIC COMPLEXITY	Compound vs. Complex	193.9***
MAIN-SUBORDINATE	T5, T7 vs. T6, T8	.02
ORDER OF MENTION (for all types)	T1-T6 vs. T7, T8	173.6***
ORDER OF MENTION (complex only)	T5, T6 vs. T7, T8	13.6***

*** p < .001

which can explain the exceptions? Second, if the order of main clause first is in fact the unmarked case, why do we find so many instances of the other order? Can there possibly be discourse factors which account for the "violation" of this constraint, or do we in fact have a real instance of syntactic "free variation"? It is to the first of these problems which we now turn.

In attempting to account for the few "violations" of the ORDER OF MENTION constraint, we will appeal to the GIVEN-NEW constraint, analyzing instances of ORDER OF MENTION violations by examining data taken from *The Catcher in the Rye*. It is instructive first to examine some examples of the suspected violations. Thus, in (4) we find an example of Type 7 (S2 after S1) and in (5) and example of Type 8 (before S2, S1).

4. "It was pretty nice to get back to my room, after I had left old Spencer..." (p. 21).
5. "Anyway, before I got back to the hotel, I started to go in this dumpy looking bar, but two guys came out, drunk as hell, and wanted to know where the subway was" (p. 95).

An examination of the context for (4) reveals that the visit to Spencer had been discussed in the an earlier paragraph, while no discussion had taken place about Holden Caulfield's return to his room. That is, the subordinate clause in (4) represents Given information, while the main clause is New. Similarly, in the paragraph preceding (5), Caulfield had been discussing his return trip to the hotel, although at that point no mention had been made of the bar or the drunks. Again, the subordinate clause is Given information and the main clause is New.

The GIVEN-NEW constraint, which predicts the association of the subordinate clause with Given information and the main clause with New, appears to be operative here even when the ORDER OF MENTION constraint is not. Support for the independence of the two factors can be found in cases in which the ORDER OF MENTION is also preserved, as in (6), an example of Type 6 (after S1, S2):

6. "After I got all packed, I sort of counted my dough" (p. 55).

In this case, the preceding context contains a discussion of the packing, making the subordinate clause Given, while the main clause is again New. Here, however, the clauses reflect the order in which the events take place. Thus, the ORDER OF MENTION and GIVEN-NEW constraints can function independently.

Even when the ORDER OF EVENTS constraint is violated, the GIVEN-NEW constraint can be maintained, suggesting that the GIVEN-NEW constraint is important for sustaining discourse coherence. At this point, however, a further problem arises: why is it possible to adhere to the GIVEN-NEW constraint while at the same time violating ORDER OF MENTION, especially since an alternative structure to Type 7, exists, namely Type 6, in which both constraints are maintained. Similarly, an alternative to Type 8 also exists which maintains both constraints, namely Type 5. What governs the choices here?

Once again, the particular contexts for each of these sentences were examined, and all ten of the complex sentences were analyzed in which the subordinate clause preceded the main clause. We now approach the second puzzle: is there some additional factor determining the order of the two clauses? The relevant structures here are Types 6 and 8, since it is these which represent the putative marked cases of subordinate clause first. It so happens that five of the nine Type 6 structures in The Catcher in the Rye and the single instance of Type 8 all serve to initiate paragraphs. Moreover, the remaining four instances of Type 6 also signal a change in topic. That is, the word order of subordinate clause before main clause appears to be used when a change of topic is announced. Accordingly, if the writer wishes to signal a topic change with a complex sentence, he places the subordinate clause first. If there is a Given-New distinction in the two clauses, the subordinate clause should be Given and the main clause New, thereby extending the tendency found within clauses for Given information to precede New.

The need to satisfy these two constraints may lead the speaker (or writer) to violate the ORDER OF MENTION constraint,

however. It appears that the discourse device relating to topic change is rather global, marking major breaks in the flow of the narrative, while the ORDER OF MENTION and GIVEN-NEW constraints tend to be somewhat more local, even though the latter can readily bridge a change in topic. Moreover, it seems reasonable to associate a marked structure with the topic change function since the presence of a marked structure would be unexpected, indicating a disruption of the discourse. And, at least to a certain extent, a topic change constitutes a disruption in a narrative or discourse. It appears that the ORDER OF MENTION constraint is satisfied at a relatively more local level than is the GIVEN-NEW constraint, since the former is relevant within a particular sentence, while the latter takes as its domain more than one sentence. Similarly, the topic change is even more global, serving to package the narrative into relatively large units. Even though the MAIN-SUBORDINATE constraint did not yield a statistically significant difference in the data when examined in isolation and independent of context, it nevertheless serves the important function of signalling a topic change. A cautionary note is in order, however, since these conclusions are based on a very small sample, namely some 20 complex sentences from The Catcher in the Rye. Accordingly, a larger sample is called for before firmer conclusions can be established.

6. CONCLUSIONS. Each of the proposed constraints appears to play an important role in the organization of discourse. Syntactic complexity is obviously important since compound sentences are less difficult to process and are therefore more frequent than complex ones. However, compound sentences have associated problems of their own: they typically represent only New information, and they always reflect the order of events.

One way around these "shortcomings" is by the use of complex structures, including those which may reflect a Given-New distinction in terms of information content and which may also be varied to permit the clauses to mirror the order of events or not. The ORDER OF MENTION constraint is of importance since it permits the hearer (or reader) to follow the general maxim of "first things first," in which events are assumed to transpire in the order in which they are expressed. Also important is the GIVEN-NEW constraint, serving as it does a bridging function. Once information is separated into two classes, the repetition of Given information serves as a kind of linkage from that which has gone before to that which is New. Finally, the MAIN-SUBORDINATE constraint, which we initially treated as a purely syntactic phenomenon, appears to be grounded in an important discourse property, the requirement that a change of topic be highly marked syntactically. The most highly marked structure in complex sentences is one in which the subordinate clause (or phrase) comes first and in which the ORDER OF MENTION constraint is violated. These structures are frequently found to initiate major topic changes, often at the beginning of paragraphs.

We conclude that the structures used to represent temporally ordered events are not randomly chosen, but rather are governed by distinct and often quite subtle factors. We have identified some

local syntactic and some broader discourse factors which bear on the distribution of the various structures. SYNTACTIC COMPLEXITY is quite a local constraint, and ORDER OF MENTION is also limited to a particular sentence. The GIVEN-NEW constraint is broader, operating across sentences. Finally, the topic changing function serves to bracket large chunks of information into thematic packages.

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