

THE ROLE OF TWO COGNITIVE CONSTRAINTS IN THE
MANAGEMENT OF ORAL NARRATIVES

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ABSTRACT

The nature and supporting evidence for two well-known and frequently discussed cognitive processing principles, the CLOSURE and the GIVEN-NEW constraints, are reviewed. The two constraints are then evaluated against data from experiments dealing with the production of oral narratives under controlled conditions. It is concluded that the two constraints, for which the majority of supporting evidence has come from comprehension studies, are also operative in language production. CLOSURE is found to be highly salient and central in the production of such narratives, while the GIVEN-NEW constraint is shown to function in a somewhat more complex manner, depending on the type of narrative being produced. Possible reasons for the differences in salience are suggested.

1. Introduction

In much of the psycholinguistic research over the past two decades, considerable effort has been directed toward an understanding of those particular cognitive principles which are intimately involved in language processing. Much of the work in this vein first found voice in Bever's (1970) pioneering proposals dealing with what he called 'perceptual strategies,' a research program which has been extended in a variety of directions. Although the specific formulations for individual perceptual strategies has evolved considerably, certain features of the research paradigm have remained surprisingly constant. One of the most important features of this particular approach is the assumption that certain cognitive principles are intimately involved in information processing in a variety of domains, including that of language. Moreover, such principles are assumed to be innately given, deriving as they do from our cognitive architecture, but at the same time interacting with the grammatical structures in each specific language in order to facilitate or hinder the processing of

particular structures. Thus, while the structures of a given language may evolve over time, the processing principles remain constant, based as they are on such cognitive factors as working memory, attention, search procedures, and the like.

In this paper, two of the best-known factors of this sort, the CLOSURE and GIVEN-NEW constraints, are examined in detail. A formulation of each is offered, and the supporting empirical evidence for each briefly discussed. It will be shown that most of the supporting evidence comes from the area of language comprehension, with relatively little attention having been given to what roles, if any, the constraints might play in language production. Accordingly, attention is directed to the roles of the two constraints in language production. In particular, the production of oral narratives is examined from an experimental perspective, where it is shown that the two constraints are in fact operative.

2. Two Processing Constraints

One of the earliest and best-known processing factors to be proposed in the psycholinguistics literature is that of CLOSURE. This factor loomed large in Bever's (1970) discussions of perceptual strategies, was incorporated in Slobin's (1973) major contribution on language acquisition, and has been further developed by Kimball (1973) and Frazier and Fodor (1978), in their work on parsing. Moreover, Clark and Clark (1977) discussed CLOSURE when addressing the nature of semantic aspects of clauses, and Prideaux and Baker (1986) assessed its role in the processing of relative clause structures in English.

While the specific details of the constraint's formulation differ considerably across researchers (as, for example, in the difference between early and late closure), the principle can be understood as suggesting that in the processing of a particular unit (clause, phrase, etc.), that unit is closed (completed) as early as possible. For parsing, CLOSURE predicts that the syntactic parse for a clause is completed once such conditions are met as having the argument structure or theta-roles for the verb satisfied. Once closure takes place, the syntactic register can be emptied in anticipation of the next incoming string, and a semantic assignment can be made to the unit.

In the spirit of this interpretation, CLOSURE suggests that a unit which is interrupted by another unit of the same kind should be relatively more difficult to process than a parallel case in which no interruption has taken place (Bever 1970, Slobin 1973). Thus, a sentence like (1a) should be harder to process than its analogue (1b) since the former contains a double embedding which is absent in the latter.

1. a. That for John to win the race is easy is obvious.
- b. It is obvious that it is easy for John to win the race.

At this point, two important factors about CLOSURE need to be recognized. First, the constraint is 'local' in the sense that it is restricted by and large to operating within a clause or sentence. It does not appear to have access to any information from the surrounding discourse or context. Second, CLOSURE is a derivative notion, based in part on the limited capacity of our working memory and on our attention limitations. It is important to recognize that CLOSURE arises from the nature of our information processing system(s).

A vast amount of empirical evidence is available in support of the operation of CLOSURE in language comprehension. An early instance is found in the click migration study of Ladefoged and Broadbent (1960), where it was argued that the perception of click locations away from their actually occurring positions and toward constituent boundaries was due to CLOSURE, coupled with the hearers' knowledge of surface constituent structure. Later click studies (e.g., Ladefoged 1967, Holmes & Forster 1970) provided further support for the claim that hearers tend to perceive clicks at major constituent boundaries, thereby supporting the perceptual integrity of the major constituents and hence of CLOSURE.

Bever (1970) alludes to CLOSURE often. For example, his processing Strategy A (290) states:

Segment together any sequence X...Y, in which the members could be related by primary internal structural relations 'actor action object...modifier.'

Strategy A claims that constituents (in English) will be grouped together on the basis of membership in the same clause, which in turn requires that the hearer knows what constitutes the minimal clause components. Similarly, the familiar garden path sentences such as 'The horse raced past the barn fell' are argued to be

difficult simply because the hearer is tempted to close the main clause after barn.

Abstracting away from language-specific factors and toward the formulation of language independent 'operating principles,' Slobin (1973) proposed (Operating Principle D) that structures which contain interruptions or which deviate from the normal word order are relatively more difficult to comprehend than those which do not meet these objections. Here then is a formulation of CLOSURE associated with predictions about language acquisition.

Townsend, Ottaviano, and Bever (1979), using a probe-latency task, found that participants processed non-interrupted clauses significantly faster than interrupted clauses, again supporting CLOSURE. In a series of acceptability studies dealing with relative clauses, Prideaux and Baker (1986) also found that structures containing interrupting relative clauses were in general more difficult to process than those in which the relative clause was attached to the final NP. This finding was further supported by a series of text studies (e.g., Prideaux 1985, Prideaux & Baker 1986) in which it was found that in written texts from a variety of genres, relative clauses tended to be attached to final NPs significantly more often than to medial NPs.

In summary, a considerable amount of attention has been directed toward the specifics of the CLOSURE constraint, and it is widely held that some version of this principle is operative in comprehension.

A second processing principle and one which has received considerable attention over the past decade or so because of the increasing interest in discourse analysis is the GIVEN-NEW constraint (see Clark & Haviland 1974, Clark & Clark 1977, Smyth, Prideaux & Hogan 1979, Prideaux & Baker 1986, Smyth 1988). Unlike CLOSURE, the GIVEN-NEW constraint is not local, but rather more global in nature, taking as its domain of application a broader stretch of language than a single clause or sentence. Moreover, Given information can be established as such by virtue of a variety of factors, including prior mention, shared world knowledge, or even inference (see Prince 1981, Brown & Yule 1983).

In its simplest and perhaps most intuitively plausible form, the GIVEN-NEW constraint can be understood as a bridging device, linking shared ('given') information to information imparted by the speaker to the hearer ('new'). In short, the constraint suggests

that to be informative and to advance a discourse or narrative in accord with the Gricean maxims which facilitate communication, the speaker starts with some information considered to be shared by all participants. Once the Given information is established as a point of reference or departure, the New information is then delivered in a context in which it can be readily integrated.

The GIVEN-NEW constraint simply states that Given information is systematically separated from New, and that within a particular clause, Given information typically precedes New. Again, it would appear that this constraint results from factors such as limited working memory, attention, and the relative ease of access of activated versus non-activated information. To illustrate, the GIVEN-NEW constraint predicts that in answer to a question like (2a), the response (2b) is appropriate, while (2c) is not (where the sentence stress falls on the last word of the answers).

2.
 - a. What did John give Mary?
 - b. John gave Mary a ring.
 - c. *John gave a ring to Mary.

However, just the opposite appropriateness is assigned to the pair of responses when the question is (3a).

3.
 - a. Who did John give a ring (to)?
 - b. *John gave Mary a ring.
 - c. John gave a ring to Mary.

As these examples clearly indicate, it is not the form of the responses which is called into question, since both of the structures are well-formed when assessed in isolation. Rather, it is the information distribution which causes one or another of the responses to be appropriate or inappropriate. In (2), the information that John gave something to Mary is shared, and in the response, the 'something' is New. In (3), however, the shared information is that John gave someone a ring, and the New information is that the recipient is Mary. In both cases, the Given information precedes the New, which is the typical, unmarked case for English. Of course, New information can precede Given, but only if certain specific coding devices are used, such as contrastive stress or various types of clefting. For example, in response to (2a), both (4a) and (4b) are appropriate:

4.
 - a. John gave a ring to Mary.
 - b. It was a ring that John gave to Mary.

Considerable empirical evidence is available in support of the operation of the GIVEN-NEW constraint, and again most of it deals with comprehension. The work of Clark and Haviland (1974) provides early evidence in support of the constraint, research which is reiterated for example in Clark and Clark (1977). Smyth, Prideaux and Hogan (1979) found that when listening to passages in which some information was Given and some was New, participants were able to determine which sentence forms were used in the passages if the forms themselves differentiated Given from New information. For example, sentences such as (2a) and (2b) were readily differentiated when there was an information difference in the two post-verbal NPs. However, in the absence of a difference in the information status of the two NPs, participants could not reliably recall which had been heard. In an extension on this study, Smyth (1988) found that the bridging effect of the GIVEN-NEW constraint decays relatively rapidly in discourse, a result which makes obvious sense when it is recognized that the function of the constraint is to link proximate material. In several text analysis studies, it was found that the linking function associated with the GIVEN-NEW constraint tended to be strongly operative within a variety of genres in both English (Prideaux 1989) and Japanese (Prideaux & Yoshida 1988).

As well as being relevant to constituents within a clause, the GIVEN-NEW constraint has also been applied to entire clauses. Bever (1970), for example, suggested that main clauses tend to contain New information while subordinate clauses, often being presupposed, should contain Given information. Of course, such a bald assertion tends to lump together all types of subordinate clauses, a move which seems dubious at best. For example, it might be expected that modifying clauses, such as certain relative clauses, might tend to contain Given information more often than, say, conditional or complement clauses. Yet the hypothesis that subordinate clauses should more often contain Given information, and main clauses New, is one which can be subjected to empirical test, and it is this version which is evaluated below.

From this brief review, it is apparent that virtually all the supporting evidence for the two constraints comes from either comprehension studies or text count data. Relatively little evidence is available from oral language production studies for either of the constraints (but for one relevant study, see Bock & Irwin 1980). It is for this reason that we now turn to a discussion of two production studies which directly address the involvement of the two constraints.

3. Two Production Studies

One method which has been used to assess language production involves having participants watch a video or movie segment and provide a narrative of the events, either 'on-line' as the scenes unfold (see Tomlin 1984) or upon completion of the viewing (see Chafe 1980, Prideaux & Baker 1986). The two studies to be discussed here fall into the latter category. In each, participants were asked to watch a short video and then to provide a narration of the events they had seen. Data from the first study, which was designed for an entirely different purpose, was recently reanalyzed to assess the roles, if any, of the two constraints. The second study, however, was designed to acquire oral narrative production data under controlled conditions with the goal of evaluating the roles of various constraints in production.

Study 1. In the first study, modelled on an experiment reported in Prideaux and Baker (1986:105-110), sixteen participants individually watched a short (eight minute) silent video clip in the absence of the experimenter. The video consisted of a series of loosely connected events taking place in a bar. There was no 'plot' as such, but instead a series of scenes in which people are seen talking and interacting. A silent version was selected in order to elicit narratives with as much descriptive language as possible. When the experimenter returned to the room, each participant produced an individual oral description of what had been seen, with the goal of providing enough information so that the experimenter would have a good understanding of what had taken place. All descriptions were taped and later transcribed in conventional orthography, but including pauses, false starts, hesitations, and the like. No syntactic editing was done. The purpose of this study was to examine the uses and distributions of relative clauses.

Once the transcriptions were assembled, each was analyzed in detail. Since attention here was focused solely on the use and distribution of relative clauses, information was collected on the location (medial or final) of each relative clause and on whether each such relative clause contained Given or New information. Given information was operationally defined as that which is known at that point in the narrative because of prior mention, anaphoric relationship, world knowledge, or via inference. The pooled data, containing 114 instances of restrictive relatives, are shown in Table 1.

Table 1. Study 1 Relative Clause Frequency Data

Final				Medial			
Indef		Definite		Indef		Definite	
Given	New	Given	New	Given	New	Given	New
4	14	35	8	4	4	45	0

The tabulated data were then analyzed to determine if the CLOSURE and GIVEN-NEW constraints were operative in the results. CLOSURE was assessed by a X^2 -test. In order to determine the expected medial and final values, it was crucial to recognize that any English sentence will have at least one NP (the subject) which can in principle host an interrupting relative clause, but there is no corresponding requirement for a final NP. Therefore, there are in general more possibilities for an medial (interrupting) relative clause than for a final (non-interrupting) one, and this difference must be taken into account when assessing the data (see Prideaux & Baker 1986:106-109 for a discussion of, and a solution to, this methodological problem). An analysis of the data in Table 1 yields a highly significant position effect ($X^2(1) = 44.6$, $p < .001$), with far more relative clauses attached to final than to medial NPs. It is therefore clear that CLOSURE is a significant factor in these oral data.

Turning to a test of the GIVEN-NEW constraint, we find from the data in Table 1 that, when we sum over the definite and indefinite categories, significantly more relative clauses represent Given than New information ($X^2(1) = 29.5$, $p < .001$), thereby supporting the GIVEN-NEW constraint. More important, however, is the fact that a strong correlation exists between the information status of a relative clause and the definiteness of its host NP ($X^2(3) = 41.7$, $p < .001$). In particular, Given relative clauses tended to be attached to definite NPs while New relative clauses tend to be attached to indefinite NPs. This result supports the often-noticed fact that definite NPs tend to be Given and indefinite NPs New (see Givon 1979).

From this study it is clear that both CLOSURE and the GIVEN-NEW constraint are operative in the production of oral narratives, at least of this particular sort. In order to examine these issues in more detail, and with an eye toward a treatment of narratives based on a story rather than a series of loosely related events such as were found in the bar scene, a further study was undertaken.

Study 2. In the second study, 24 participants individually watched a short (four-minute) scene (with sound) from the film 'Adam's Rib,' after which they individually provided an oral narration of what had transpired. The famous 'massage scene' was selected for this study. In this scene, only two individuals are present, Spencer Tracey and Katherine Hepburn, who play husband and wife in the movie. They are discussing a court case in which each is involved, while at the same time giving one another a back rub. No other characters are involved and the scene has an integrity of its own. After each narration, participants were asked a few questions about the scene. The taped narrations were then transcribed in much the same fashion as in the earlier study.

In this study, relative, adverbial, and complement subordinate clauses were analyzed in terms of their positions within the main clause (medial or final), as well as in terms of their information status (Given or New). The pooled data for the three types of subordinate clauses are found in Table 2.

Table 2. Study 2 Frequency Data

Clause Type	Position		Information Status	
	Final	Medial	Given	New
Adverbial	66	22	26	62
Complements	307	5	56	256
Relative	49	2	15	36

As in the earlier study, X^2 -tests were carried out to determine the relevance of both CLOSURE and GIVEN-NEW for each of the three subordinate clause types. The CLOSURE results were highly significant for each clause type. The resulting values are (a) for adverbials, $X^2(1) = 22.0$, $p < .001$, (b) for complements, $X^2(1) = 292.3$, $p < .0001$, and (c) for relatives, $X^2(1) = 57.8$, $p < .001$.

In all cases, there is a strong tendency for subordinate clauses to be final rather than medial, with the consequence that CLOSURE is strongly supported for all three types of subordinate clauses.

The status of the GIVEN-NEW constraint, however, is quite different. A cursory examination of the data in Table 2 indicates that none of the three subordinate clause types tends to encode Given information more often than New. In fact, for all types, the subordinate clauses tend to represent New information, contrary to both the general expectation and the results of the first study. An explanation is therefore required for these results.

Fortunately, an explanation is not difficult to find, once two major factors are taken into consideration: the functions of the different types of subordinate clause and a fuller understanding of the scene being described. Starting with the second issue first, we recall that only two individuals, a husband and wife, participate in the scene, thereby reducing the need for descriptive language to differentiate the two persons. Once the characters are introduced in the narrative, they can be readily referred to by pronouns, and this is precisely what is found in the data. Moreover, adverbial subordinate clauses tended to be used as scene setting devices, and as such these tend to represent New, although not highly salient, information, as in:

5. After she delivered the second drink, the waitress turned away and cursed the woman under her breath.

The second class of subordinates, the complement structures, naturally tend to introduce New information, as can be seen in such sentences as:

6. She got real mad... and...it upset him that she stormed out of the room.

In this example, the complement clause introduces New information, placing it within the main clause in just the position where New information normally resides. An important function of complements is that they permit the introduction of New information in the unmarked New position.

The only perplexing result then, is that of the information distribution found for the relative clauses. However, it will be recalled that the video in the first study consisted of several

scenes with a variety of characters in a bar, thereby inviting the use of descriptive language for the identification of individuals. Over and over again in the narratives of the bar scene are found sentences like the following:

7. a. One couple was sitting at a corner table waiting for their drinks to arrive. ...
- b. The girl who was sitting at the corner table seemed to know the drunk...

In pairs like this, descriptive information is introduced and then is used later, within relative clauses, to redirect attention to a particular individual. In the 'Adam's Rib' scene, with only two participants, this reintroduction function for relative clauses is not required at all. Rather, in this scene, relative clauses tend to be used much like adverbials, to introduce New, although relatively unimportant, information. It is almost as if these structures were used to flesh out the narrative, providing detail but adding little to the main stream of the story. The functions of relative clauses differ in the two experiments. In the first study, relative clauses serve an identifying function, thereby typically encoding Given information to direct the hearer to a particular individual from among a competing set. In the second study, however, there is no requirement for the individuals to be identified in any other way than by pronouns, since there are only two participants.

However, that version of the GIVEN-NEW constraint which states that subordinate clauses should contain Given information more often than New is refuted by the second study. Instead, it has been shown that different functions of relative clauses reflect different information distributions.

4. Conclusions

In this paper, we have examined the roles played by two well-established language processing constraints in the management of oral narratives. It has been demonstrated that the local CLOSURE constraint, being highly significant in both studies, is of great importance in the way speakers organize their sentences. They tend to produce structures in which subordinate clauses are typically final. While exceptions of course exist, the vast majority of

subordinate clauses are placed in a position which makes the hearer's task easier, namely at the end of the main clause. One might even speculate that a kind of processing-based Gricean principle is at work here: the speaker tends not to disrupt his or her own main clauses with intervening subordinate structures, and this in turn facilitates the hearer's job. Violations of this situation are especially apparent in pedantic speech, laced as it often is with baroque embeddings and nested conditionals.

However, the bridging function associated with the GIVEN-NEW constraint, while apparently operative for constituents within main clauses, tends not to be universally operative in oral narratives. Rather, it seems that the varied functions of subordinate clauses, coupled with the specifics of the events being described in a given narrative, govern the extent to which the GIVEN-NEW constraint is exploited. In situations such as the bar scene study, where a number of individuals compete for attention, the constraint proves very useful for keeping tabs on who is doing what. In these instances, once an individual is introduced, he or she can be recalled to center stage by using a relative clause containing Given information. Here, the bridging function is quite relevant and useful in organizing a narrative. However, in those narratives with a small number of participants, using relative clauses for identification is not required, and to exploit it would be to violate the maxim of quantity, since the individual is already properly identified. Since the GIVEN-NEW constraint is not required here, the relative clause structures are available for other functions, such as the provision of additional (New) information.

The general conclusions are two-fold. First, the local (sentence-level) CLOSURE constraint emerges as extremely important in both comprehension and production. Second, just because that version of the (discourse) GIVEN-NEW constraint which associates Given information with subordination as been shown to be operative in one situation, its universality is not thereby assured. Rather, when such a constraint functions in one condition but not in another, explanations for the differences must be determined. It is only through such a thorough examination of potentially conflicting evidence that we can avoid overly simple conclusions and achieve a fuller understanding of language processing.

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