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Given-New Ordering Effects on the Production of Scrambled Sentences in Japanese

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Across many languages, speakers tend to produce sentences so that given (previously referred to) arguments are mentioned before new arguments; this is termed given-new ordering. *We explored the nature of such given-new effects in Japanese using a procedure following Bock and Irwin (1980). Speakers encoded and then recalled canonical (e.g.,* okusan-ga otetsudaisan-ni purezento-o okutta, *"the housewife gave the housekeeper a present") or scrambled (*okusan-ga purezento-o otetsudaisan-ni okutta*) dative targets when prompted by a statement-question sequence. The prompting statement established one nonsubject argument of the dative target as given, leaving the other nonsubject argument as new. Previous mention was either with lexically identical content (e.g.,* otetsudaisan *or* purezento*) or with lexically distinct but nearly synonymous content (*meidosan, *"housemaid" or* okurimono, *"gift"). Results showed that speakers produced canonical or scrambled word orders so that given arguments were mentioned before new, but especially when the previous mention of the given argument occurred with lexically identical content (replicating Bock and Irwin's English effect). These results show that the production of Japanese scrambled and canonical word orders is sensitive to given versus new status (as in English), implying that given-new ordering arises at the stage of sentence production where scrambling effects are realized.*

KEY WORDS: Language production; grammatical encoding; information structure; given-new ordering; Japanese scrambling.

INTRODUCTION

Speakers can use more than one linguistic expression to express a particular proposition. For example, an English speaker can describe the same event

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either with a *double-object dative* sentence like (1) or a *prepositional dative* sentence like (2):

(1) The rancher sold the cowboy the horse.
(2) The rancher sold the horse to the cowboy.

What is less clear is why the grammars of natural languages allow such *syntactic flexibility*. That is, under what circumstances would a speaker produce (1) versus (2), and why?

One important factor that can affect speakers' choices between alternatives like (1) and (2) is *givenness* (e.g., Bock, 1977; Chafe, 1970; Halliday, 1967; MacWhinney & Bates, 1978). That is, speakers typically produce sentences as parts of *discourses*, and most sentences in discourses refer both to already mentioned or *given* information and to not yet mentioned or *new* information. Importantly, speakers tend to produce sentences so that given information is mentioned early and new information later, termed *given-new ordering* (e.g., Bock & Irwin, 1980). For example, a (quite short) discourse might begin with "A rancher had a *horse* who kept running away. What did the rancher do?" Under this circumstance, *horse* is given information, so that if a speaker were to follow up with (1) or (2), (2) is more likely, in which *horse* precedes *cowboy*, rather than (1), in which *cowboy* precedes *horse*.

Although givenness is known to affect speakers' word-order choices the processing basis of given-new ordering effects is less clear. That is, what kinds of information are speakers sensitive to when they produce a sentence with given-new order, and how is that information accessed and used in a processing account of sentence production? To frame this question, we next outline a general theoretical architecture for sentence production, describing alternative conceptions of how givenness effects might arise in such an architecture. We then present an experiment that determines in these theoretical terms how given information affects sentence production.

Two-Stage Sentence Production

Most theories of sentence production (e.g., Bock, 1995; Bock & Levelt, 1994; Garrett, 1975; Levelt, 1989) claim that speakers formulate and produce sentences through a sequence of two processing stages, represented in Fig. 1. The first stage is termed *function assignment*. At this stage, speakers take a developing conceptual representation or *message*, and (1) retrieve the lexical-syntactic forms (sometimes termed *lemmas*) that can represent the conceptual content that corresponds to the entities, states, and actions that are to be expressed (e.g., a rancher, the act of selling, a horse, a cowboy); (2) determine the grammatical functions such as *subject, verb, direct object*, and so forth that

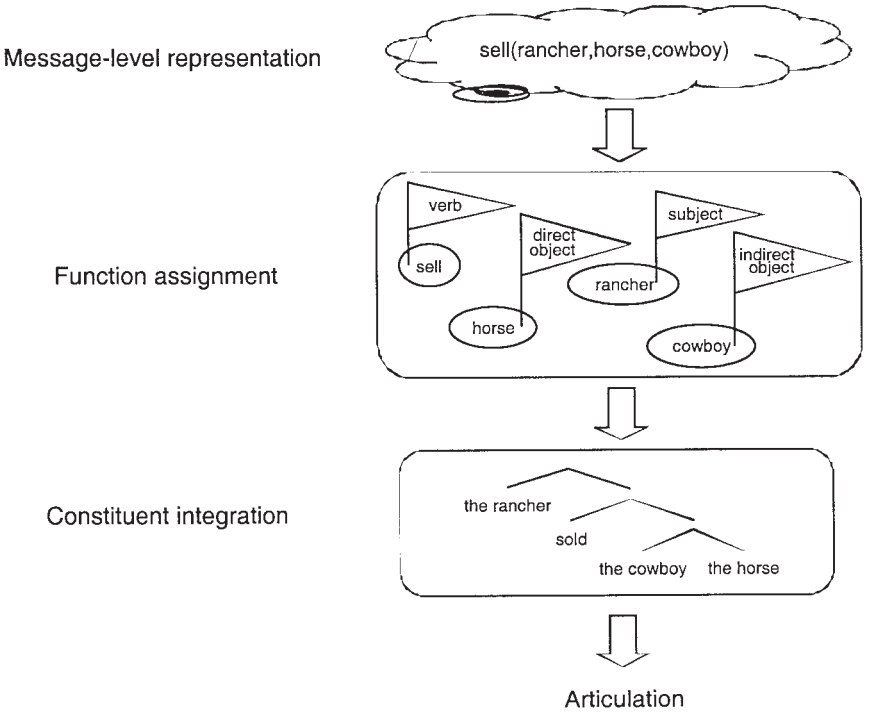

Fig. 1. Standard two-stage model of sentence production.

are necessary to represent the relational content in the message; and (3) appropriately assign or *bind* the lemma representations to the grammatical functions. The second stage is termed *constituent integration*. Here, sentence-production processes take the to-be-expressed grammatical functions and the lemma representations associated with them and assign the lexical forms that correspond to those lemmas to sequentially specified phraselike representations that correspond to the grammatical functions retrieved and bound at function assignment.

This distinction between the stages of function assignment and constituent integration is important for a number of reasons, beginning with the fact that it straightforwardly explains certain patterns in the speech error record (e.g., Garrett, 1975). For present purposes, the most important difference between the stages of function assignment and constituent integration is that function assignment represents the point where message-level factors determine how the arguments of a sentence will be grammatically expressed. Thus, if a sentence-production effect arises at function assignment, that effect can be

characterized as a meaning-based, grammatically realized effect. Furthermore, to the extent that a meaning feature exerts a grammatical effect, the expression of that feature can be argued to be communicatively motivated—that the mapping from the feature of meaning to the grammatical form that represents it is meant to allow that feature of meaning to be expressed (just like the meaning feature "agent," or "do-er of an action" maps onto the grammatical form "subject of an active sentence" to allow agency to be expressed). On the other hand, because constituent integration is where the sequential order of arguments in a sentence is determined in a manner that is one step removed from conceptual-level message information, if a sentence-production effect arises at constituent integration, that effect can be characterized as a relatively meaning-independent, sequential order effect. Thus, if given-new ordering specifically arises at the level of function assignment, it would imply that given-new ordering is a meaning-based, grammatically realized effect—that the grammar of speakers' languages specifically encode the fact that word-order information can communicate givenness. In turn, this would be consistent with the possibility that speakers use given-new ordering to communicate givenness per se. On the other hand, if given-new ordering is a constituent-integration effect, it would imply that given-new ordering is not directly encoded into speakers' grammars and thus is not used to communicate givenness per se, but rather is a more meaning-independent, sequential order effect—that given-new ordering emerges from the way that constituent integration processes operate.

How might the nature of constituent-integration processes cause a given-new ordering effect to emerge in a more communicatively independent manner? Most accounts of sentence production assume that speakers produce sentences piecemeal or *incrementally* from start to finish (e.g., Ferreira, 1996; Levelt, 1989). Furthermore, the information that a speaker must access to produce a sentence is likely to become available with a variable or unpredictable time course; some information that a speaker needs will come to mind quickly, whereas other information will come to mind more slowly (i.e., information can be highly or less available). If so, then sentence production should proceed especially efficiently if highly available arguments are mentioned earlier (so that that availability need not be maintained as or re-established after other sentence material is processed) while less available arguments are mentioned later (so that other more available material can be produced, buying time for the less available material to be fully retrieved). This information-processing strategy, which has been termed the *principle of immediate mention* (Ferreira & Dell, 2000), would thus claim that the recent mention of given information should cause it to be especially available, implying that it should be mentioned earlier. New information, on the other hand, has not been recently mentioned and thus should be less available, implying that it should be mentioned relatively later. Thus, given-new ordering effects might arise at constituent integration as an

emergent property of how availability affects an incremental sentence-production mechanism. Of course, such an availability-based tendency may be sufficiently systematic that it can be exploited by language users (perhaps most especially in the process of sentence comprehension). Importantly however, from the perspective of the processing system of the speaker, givenness per se may have no special status apart from the effect of previous mention upon availability.

One of the first experiments that explored whether givenness effects are availability based and thus might arise during constituent integration was presented by Bock and Irwin (1980). They had participants produce written target sentences that were like (1) or (2) above when prompted with eliciting sequences like (3) and (4):

(3) A rancher had a *horse* who kept running away. What did the rancher do?
(4) A rancher had a *stallion* who kept running away. What did the rancher do?

Note that both (3) and (4) establish one argument in (1) or (2) as given (i.e., *horse*), leaving the other argument *(cowboy)* as new. However, (3) and (4) establish that givenness differently. Relative to how the given argument is referred to in the target (e.g., *horse*), (3) establishes the given argument with the same lexical content (hereafter, a *same-form* reference), whereas (4) establishes the given argument with distinct but nearly synonymous lexical content (e.g., *stallion;* hereafter, a *different-form* reference). The idea is that while both a same-form and different-form reference may mark an argument as given, each should affect the availability of the information necessary for production differently. Specifically, a same-form reference [as in (3)] should make a given argument highly available both conceptually (because the given argument refers to the same entity in the eliciting sequence as in the target) and lexically (because the given argument is referred to with the same words in the eliciting sequence as in the target), whereas a different-form reference [as in (4)] should make a given argument available conceptually (because the given argument refers to the same entity in the eliciting sequence as in the target) but *not* lexically (because the given argument is referred to with different words in the eliciting sequence compared to the target). This implies that if given-new ordering is an availability-based effect, the fact that same-form references are available at more levels of representation than different-form references predicts that a same-form reference should lead to a stronger availability effect than a different-form reference. Bock and Irwin's results showed that while eliciting sequences like (3) and (4), both affected word-order such that given arguments were mentioned before new [i.e., participants produced (2) especially often after (3) or (4)], the effect was stronger with same-form references [as after (3)], versus with different-form references [as after (4)]. These results suggest that at least part of the given-new ordering

effect is due to availability and thus arises at constituent integration. This implies in turn that given-new ordering is not entirely a meaning-based communicative effect, but rather that at least part of the effect emerges from the way that incremental constituent-integration level processing operations are affected by availability.

However, the fact that degree of availability influences given-new ordering does not necessarily imply that given-new ordering comes entirely from availability. That is, it may be that given-new ordering arises at least partially as a function-assignment level, meaning-based effect, and that that function-assignment effect can then be influenced by availability at the level of constituent integration. Indeed, Bock and Irwin (1980) found that different-form references (e.g., when speakers previously referred to *horse* with the word *stallion*) did cause a significant given-new ordering effect. Thus, part of the given-new ordering effect—at least that part reflected by the different-form references—might reflect a genuine function-assignment effect, consistent with the possibility that speakers produce given arguments before new in order to communicate givenness information per se. Furthermore, because Bock and Irwin assessed written production, it is possible that at least some aspects of their results reflected processes specific to writing (e.g., writing is likely to involve more production monitoring, because it is a slower and less ephemeral process). Below, rather than focus only on availability differences, we explore how a distinction between different kinds of word-order alternations in spoken production may provide another way to determine whether given-new ordering arises at the level of function assignment or at the level of constituent integration.

Fixed and Free Word-Order Languages

The fact that sentence production can be characterized as proceeding through the two different processing stages described above implies that there are two ways that different word-order alternatives can be distinct from one another (see also McDonald, Bock, & Kelly, 1993). One is that different word-order alternatives can be *functionally* distinct (i.e., initially distinct at the level of function assignment). Two word orders are functionally distinct if they involve different assignments of arguments to grammatical functions. An example of functionally distinct word orders are the active and passive word orders in English: "the dog chased the cat" differs from "the cat was chased by the dog" in that in the active, "dog" is assigned to the grammatical subject and "cat" to the direct object, whereas in the passive, "dog" is assigned to the by-object and "cat" to the grammatical subject.

A different way that word-order alternatives can be distinct from one another is *sequentially* (i.e., initially distinct at the level of constituent integration). Two

word orders are sequentially distinct if they involve the same assignment of arguments to grammatical functions, but the sequential order of those arguments differs. An example of sequentially distinct word orders arises in Japanese with a phenomenon termed *scrambling*. This refers to the fact that a (Japanese) speaker can produce either "okusan-ga purezento-o katta," in which the grammatical subject (*okusan-ga*, "housewife") is positioned before the direct object (*purezento-o*, "present"), or "purezento-o okusan-ga katta," in which the direct object is positioned before the grammatical subject (in both cases, the verb, *katta*, "bought," is grammatically constrained to occur at the end of the sentence). Importantly, such scrambled word orders do not involve a grammatical distinction, because other features of the sentence (e.g., verb morphology) do not change with the different word orders. The only way such word orders differ from one another is sequentially, and according to standard models of production, that difference in sequential order arises from differences at the level of constituent integration.

Thus, given this distinction between functionally and sequentially distinct word orders, one way to determine whether given-new ordering arises at the level of function assignment or at the level of constituent integration is to determine whether given arguments cause given-new ordering even with word orders that are sequentially distinct but not functionally distinct. In English, however, this is difficult to test. This is because English is a *fixed word-order* language, entailing that English inherently communicates grammatical function information with word-order distinctions. For example, in an English active sentence, the grammatical subject precedes the verb and the direct object follows the verb, and critically, the order of each argument with respect to the verb is the only cue that English language users have to determine which argument serves which grammatical function. For this reason, it may be that any word-order distinction in English involves a grammatical function distinction. For example, the distinction between the prepositional dative and double-object dative—(1) and (2) above—may be a functional distinction, such that the grammatical function assigned to *horse* differs in one word order versus the other. Thus, to assess whether given-new ordering arises with word-order alternations that are sequentially distinct, it is necessary to look at a language other than English.[3]

In the experiment below, we investigated the production of Japanese, which is a (more) *free word-order* language. Free word-order languages do not rely on order information to communicate grammatical function information, but rather they typically use suffixes or *case markers* to indicate grammatical-subject,

[3] It may be that in English, the order of arguments in conjunctions or disjunctions purely reflects constituent integration processes and, revealingly, results from Bock and Irwin (1980) suggest that conjunct ordering is sensitive to givenness.

indirect-object, and direct-object functions. For example, in Japanese, a dative sentence such as (1) above would be expressed as in (5):

(5) okusan-ga otetsudaisan-ni purezento-o okutta
housewife-NOM housekeeper-DAT present-ACC gave
"The housewife gave the housekeeper a present."

Here, the case markers *-ga*, *-ni*, and *-o* indicate the grammatical-subject, indirect-object, and direct-object functions of the corresponding arguments ("okusan," "otetsudaisan," and "purezento"), respectively. A consequence of using case markers rather than word order to indicate grammatical function information is that free word-order languages allow for the scrambling effects noted above, where the arguments in a sentence can be arbitrarily ordered [i.e., the *-ga*, *-ni*, and *-o* marked arguments in (5) can in principle be produced in any order, though some orderings are much more frequently observed and are more acceptable than others, e.g., Shibatani, 1990; Yamashita, 2002]. Thus a dative like (5) can be produced in a scrambled form like (6), where the order of the two nonsubject arguments has been reversed, but otherwise the sentence is identical:

(6) okusan-ga purezento-o otetsudaisan-ni okutta
housewife-NOM present-ACC housekeeper-DAT gave

Most importantly, because scrambling in Japanese is a constituent-integration phenomenon, it provides an opportunity to assess whether given-new ordering effects arise at the level of function assignment or at the level of constituent integration.

To explore this question, we used the design of Bock and Irwin (1980) to determine how givenness affects the production of Japanese scrambled sentences. Specifically, speakers produced target dative utterances like (5) or (6) when prompted with the Japanese analogue of eliciting sequences like (3) and (4) above. As in Bock and Irwin's experiment, the eliciting sequences established one nonsubject argument of the target as given, either with a same-form reference or with a different-form reference. To the extent that given-new ordering arises at the level of function assignment, we should *not* observe given-new ordering effects here, because the scrambled word orders represented by (5) and (6) are distinct from one another only at the level of constituent integration. On the other hand, to the extent that given-new ordering is a constituent-integration level effect—an effect of the availability of an argument on its position in a sentence—we should indeed observe given-new ordering effects even with the production of word-orders that are only sequentially distinct, including Japanese scrambled word orders.

A wholly different possibility is that given-new ordering may affect Japanese production differently than it affects English production. For example, another word-order phenomenon—*heavy-NP shift*—behaves in opposite fashion

in Japanese (where heavy arguments tend to be mentioned sooner) as it does in English (where heavy arguments tend to be mentioned later; Yamashita & Chang, 2001; see also Hawkins, 1994). Other evidence (e.g., Prat-Sala & Branigan, 2000; Sridhar, 1988; Yamashita, 2002), on the other hand, suggests that many languages (including Japanese) exhibit given-new ordering as in English. The experiment below will provide evidence on this point. Of course, if it is shown that in Japanese, given-new ordering manifests opposite to how it does in English, that would constitute strong evidence that such ordering cannot be the result of an availability based ordering effect, but rather, must be represented at the level of function assignment.

Above it was noted that in Japanese, some word orders are used more commonly than others. Indeed, for dative sentences, behavioral and linguistic analyses suggest that the order represented by (5)—the subject-indirect object-direct object word-order—is a *canonical* word order (but see Miyagawa, 1997). Most importantly for our purposes is that this canonical order is used far more frequently than any of the other *scrambled* word orders (e.g., Yamashita, 2002), implying that one pressure that sentence-production mechanisms may be sensitive to is a pressure to produce canonical word orders. The procedure below allows us to evaluate this pressure, and furthermore, to compare the strength of that pressure to the strength of a given-new ordering pressure.

To elicit sentences, we adapted the long-term sentence-recall task used by Bock and Irwin (1980). Each experimental session began by familiarizing speakers with a set of 24 eliciting sequences [i.e., Japanese analogues of (3) or (4) above]. Then they memorized a set of 24 dative target sentences, which were in either canonical word-order [as in (5) above] or in scrambled word-order [as in (6)]. Here, speakers not only had to try to encode each target sentence into memory, but they also had to identify which dative target corresponded to which eliciting sequence (because the two kinds of stimuli were presented in different random orders). Finally, speakers were given the 24 eliciting sequences again, after each of which they were to recall (with a spoken response) the corresponding dative target (note that approximately 15 minutes passed from when a speaker was originally presented with a dative target and when they later produced it in response to the eliciting-sequence prompt). Generally, it is well known that speakers have relatively weak memory for the surface characteristics of sentences at the same time as they have stronger memory for the gist of those sentences (e.g., Bates, Masling, & Kintsch, 1978; Sachs, 1967). Thus, although speakers may be able to retain the gist of the sentences they originally remembered enough so they can produce them in response to the eliciting sequences, their memory for the surface characteristics of those sentences should be sufficiently weak that they occasionally recall canonical sentences when they were originally presented with scrambled sentences and vice versa. If so, then such *shifts* may reflect the

influence of sentence-production factors on sentence production. One such sentence-production factor is given-new ordering, so that speakers may shift a canonical to a scrambled word order or vice versa so as to respect given-new ordering. Thus the experiment below will specifically ascertain whether speakers are likely to mis-recall (i.e., shift) the order of arguments in a sentence when that shift results in an utterance that respects given-new ordering, and how any such tendency varies depending on whether the given argument was previously mentioned with a same-form reference or with a different-form reference.

EXPERIMENT

Method

Speakers

Sixteen speakers of Japanese from the UCSD community participated. All learned Japanese as their first language. All speakers but 4 rated themselves as having native-speaker–like proficiency in Japanese reading, writing, speaking, and comprehension (with the remaining 4 rating themselves at least as "good" on each factor). Two of 16 speakers began learning English at birth (simultaneously with Japanese), most learned English beginning at ages 8–12, and one learned English beginning at 20 years. Only 3 participants rated their English proficiency as Native-speaker–like. Many speakers also learned other languages at later ages, including Mandarin Chinese, French, German, and Spanish.

Speakers received monetary compensation at a rate of $5 per hour or class credit (or both) for participation. All speakers participated in four 1-hour sessions, each separated by between 7 and 10 days. One additional speaker stopped participating after one session due to limited Japanese proficiency.

Materials

Twenty-four dative target sentences were created based on the materials of Yamashita (1995).[4] Targets consisted of three unmodified noun phrases marked with nominative ("-ga"), dative ("-ni"), and accusative ("-o") case markers that acted as subject, indirect-object, and direct-object arguments respectively, followed by a ditransitive verb. For each target, a canonical and a scrambled word-order sentence was created, as in (5) and (6) above, repeated here as (7) and (8):

[4] We are very grateful to H. Yamashita for providing us with her stimulus materials.

(7) okusan-ga otetsudaisan-ni purezento-o okutta
housewife-NOM housekeeper-DAT present-ACC gave
'The housewife gave the housekeeper a present.'

(8) okusan-ga purezento-o otetsudaisan-ni okutta
housewife-NOM present-ACC housekeeper-DAT gave
"The housewife gave a present to the housekeeper."

Dative targets were assigned to two target lists for presentation. Each target list contained 12 canonical dative targets and 12 scrambled dative targets. Every target appeared once in one of its versions in each target list, and across the two target lists each target appeared once as a canonical sentence and once as a scrambled sentence. The same fixed randomly generated order of sentences was imposed on both target lists.

For each target, four eliciting sentence-question sequences were created, as follows (the given argument is indicated with *italics*):

(9) okusan-ga *otetsudaisan-ni* kanshashiteita.
housewife-NOM *housekeeper-DAT* was grateful.
sorekara doushita?
What happened next?
'The housewife was grateful to the *housekeeper*. What happened next?'

(10) okusan-ga *meidosan-ni* kanshashiteita.
housewife-NOM *housemaid-DAT* was grateful.
sorekara doushita?
What happened next?
'The housewife was grateful to the *housemaid*. What happened next?'

(11) okusan-ga *purezento-o* katta. sorekara doushita?
housewife-NOM *present-ACC* bought. What happened next?
'The housewife bought a *present*. What happened next?'

(12) okusan-ga *okurimono-o* katta. sorekara doushita?
housewife-NOM *gift-ACC* bought. What happened next?
"The housewife bought a *gift*. What happened next?"

Each eliciting sequence consisted of a declarative sentence that named the subject argument and then either the indirect-object or the direct-object argument of its corresponding target, followed by an eliciting question. Together, the eliciting sequence and the target formed a meaningful three-sentence discourse. Eliciting sequences mentioned either the indirect-object argument [as in (9) and (10)] or the direct-object argument [as in (11) or (12)] with a term that was either lexically identical [as in (9) and (11)] or (nearly) synonymous [as in (10) and (12)] to the corresponding argument in the target.

The eliciting sequences were assigned to four question lists for presentation. Each question list contained six of each kind of eliciting sequence. Each target's eliciting sequence appeared in one of its versions once per question list, and across the four question lists, each version of the eliciting sequence for a particular target appeared once. One fixed randomly generated order (that was different from the order of the target lists) was imposed on all four question lists.

All eliciting sequences and targets were recorded by the second author (a native Japanese speaker) onto a computer at a moderate speech rate and with the same unmarked intonation across all readings of the sentences. Stimuli were then transferred to standard audio cassettes to form the question and target lists. Five seconds of silence separated each stimulus within a list. A brief tone was inserted to mark the end of each list.

Eight presentation conditions were defined by factorially combining the four question lists with the two target lists. Thus, across the eight presentation conditions, each eliciting sequence appeared in each of its versions twice, once with a canonical target and once with a scrambled target. A Latin-square procedure was used to assign four of the eight presentation conditions to each speaker's four sessions such that each was presented with each question list once and each target list twice. Across all 16 speakers' four sessions, each presentation condition appeared 8 times.

Procedure

The critical part of each experimental session consisted of three phases: (1) Speakers were presented with all 24 eliciting sequences from the assigned question list. They were instructed to listen to each eliciting sequence. (2) Speakers were presented with all 24 targets from the assigned target list. They were instructed to try to remember the targets and to determine which eliciting sequence each belonged to, so that they could provide each target as an answer for the corresponding eliciting sequence in the third phase. (3) Speakers were again presented with the same 24 eliciting sequences they heard in the first phase. This time, after each eliciting sequence, speakers were instructed to provide the appropriate target from the target list as an answer. The wording of the answer was to be as close as possible to that of the originally presented target. The experimenter paused the cassette player after each stimulus to allow sufficient time for the speaker to complete their recall attempt. Speakers' responses were recorded by a head-worn microphone onto a separate cassette recorder for later transcription and analysis.

Each session began with instructions and a practice phase that included four eliciting sequences and target sentences that were similar to those in the experiment proper, except that stimuli were presented orally rather than from audio tape.

Design and analyses

The design is illustrated in Table I. Following Bock and Irwin (1980), four experimental conditions were generated by factorially manipulating two factors. The first was *reference form*, referring to whether the given argument in the target was referred to with the same lexical content as in the eliciting sequence. This determined whether the given argument in the target was the *same-form* or a *different-form* as the corresponding argument in the eliciting sequence. The second factor was *given-new appropriateness*, referring to the position of the given argument in the originally presented target. If the given argument preceded the new argument in the originally presented target, then that target was *given-new appropriate*, whereas if the new argument preceded the given argument, the target was *given-new inappropriate*. Both factors were manipulated completely within speakers and within items, counterbalanced across experimental sessions and whether the direct- or indirect-object argument served as the given argument. Across all four of each speaker's experimental sessions, she or he saw (all) 24 sentences in each experimental condition, and each target was presented to (all) 16 speakers in each experimental condition.

Recalled productions were transcribed and coded by the second author. Analyses were restricted to target productions that began with the grammatical subject, followed by a direct and indirect object in either order, followed by a verb. All three nominal arguments had to include the same lexical content as in the originally presented target. A recalled target was not excluded from analysis if speakers (1) used a different case-marking for the subject argument (i.e., if "-wa" was substituted for "-ga"), (2) used a different verb that did not affect the syntactic properties of the target sentence, or (3) inserted sentence material that did not affect the basic structure of the sentence (e.g., the insertion of an adjunct phrase).

All analyzed targets were then coded into the complementary categories of *accurate* and *shift*. An accurate production used the same indirect- and direct-object word order as the originally presented sentence, whereas a shifted production used the opposite indirect- and direct-object word order as the originally presented sentences. Because these categories are complementary, we report only the *percentage of shifts*, reflecting the percentages of all analyzable targets that were produced with a shifted phrase ordering. The percentages of shifts in each condition for each speaker (across items) and for each item (across speakers) were calculated and entered into two-way repeated-measures ANOVAs to yield analyses by speakers (F_1) and items (F_2), respectively. We report variability for each analysis with 95% confidence-interval halfwidths. All reported mean percentages are calculations across speaker means. All effects reported as significant reached the .05 level or better, unless otherwise indicated. We also explored the consistency of all important effects by counting the number of speakers who exhibited those effects and assessing significance with sign tests.

Table I. Experimental Design and Condition Examples

Reference form	Given-new appropriateness	Eliciting sequence	Target dative that speakers were presented with
Same-form	Appropriate	a. okusan-ga *otetsudaisan-ni* kanshashiteita. housewife-NOM housekeeper-DAT was grateful b. okusan-ga *purezento-o* katta. housewife-NOM present-ACC bought	okusan-ga *otetsudaisan-ni* purezento-o okutta (canonical) housewife-NOM *housekeeper-DAT* present-ACC gave okusan-ga *purezento-o* otetsudaisan-ni okutta (scrambled) housewife-NOM *present-ACC* housekeeper-DAT gave
Same-form	Inappropriate	a. okusan-ga *otetsudaisan-ni* kanshashiteita. housewife-NOM housekeeper-DAT was grateful b. okusan-ga *purezento-o* katta. housewife-NOM present-ACC bought	okusan-ga purezento-o *otetsudaisan-ni* okutta (scrambled) housewife-NOM present-ACC *housekeeper-DAT* gave okusan-ga otetsudaisan-ni *purezento-o* okutta (canonical) housewife-NOM housekeeper-DAT *present-ACC* gave
Different-form	Appropriate	a. okusan-ga *meidosan-ni* kanshashiteita. housewife-NOM housemaid-DAT was grateful b. okusan-ga *okurimono-o* katta. housewife-NOM gift-ACC bought	okusan-ga *otetsudaisan-ni* purezento-o okutta (canonical) housewife-NOM *housekeeper-DAT* present-ACC gave okusan-ga *purezento-o* otetsudaisan-ni okutta (scrambled) housewife-NOM *present-ACC* housekeeper-DAT gave
Different-form	Inappropriate	a. okusan-ga *meidosan-ni* kanshashiteita. housewife-NOM housemaid-DAT was grateful b. okusan-ga *okurimono-o* katta. housewife-NOM gift-ACC bought	okusan-ga purezento-o *otetsudaisan-ni* okutta (scrambled) housewife-NOM present-ACC *housekeeper-DAT* gave okusan-ga otetsudaisan-ni *purezento-o* okutta (canonical) housewife-NOM housekeeper-DAT *present-ACC* gave

Note: Given arguments indicated with *italics*. In sequences marked with (a), the indirect object is given, whereas in those marked with (b), the direct object is given. All eliciting sequences ended with the generic question, "sorekara doushita?"

RESULTS AND DISCUSSION

The percentages of analyzable utterances produced in each presentation and experimental condition are shown in Table II. The table shows that speakers produced more analyzable utterances in the same-form than in the different-form conditions. As is evident from the table, this occurs because in the different-form condition, speakers are relatively likely to substitute the given argument from the eliciting sequence into the recalled target in place of the originally presented argument (e.g., if "gift" was in the eliciting sequence, it was relatively likely to be produced in the target instead of the correct "present"; note that such substitutions cannot occur in the same-form condition). Other erroneous recalls that led an utterance to be unanalyzable (inaccurate subject or new argument) occurred about equally often in the two reference-form conditions. Across the entire experiment, all targets coded as unanalyzable were excluded because at least one nominal argument was inaccurately recalled, except for one sentence provided by one speaker, in which all arguments were accurately recalled but a direct object-subject-indirect object word order was produced. The uneven percentages of scored utterances among the experimental conditions motivated the fact that in the analyses below, percentages of analyzable utterances rather than raw numbers of utterances was the dependent variable.

Figure 2 shows the percentages of analyzable targets where speakers shifted the argument order of the target sentence that they were originally presented with. One point that is immediately evident is that speakers' memory for the form of the originally presented sentences was weak, as shifts were commonly observed. Indeed, collapsing across all other factors, speakers shifted the order of arguments in their recalled sentences on 50.2% of trials, showing that speakers were as likely to recall a shifted word order as the original word order. Two important implications follow from the high rate of shifts observed here. First, episodic memory was not a strong determinant of the form of speakers' sentences in this experiment, which should allow production effects to be observed. Second, the fact that speakers remembered word order poorly, combined with the fact that sentence-memory typically reflects memory for meaning, implies that the different word orders differ from one another in meaning only minimally. Indeed, Bock and Irwin (1980) found a lower rate of shifting (approximately 30%) in their English experiment, consistent with the possibility that the English word-order alternatives that they tested were more meaning-distinct (i.e., functionally distinct) than the scrambled word orders tested here. Thus this reinforces the claim that the word order of Japanese scrambled sentences is determined less at the level of function assignment than the word order of English variants.

Given that speakers tended to commonly shift word orders in their recalled utterances, the question of interest is whether the propensity to shift word order was affected by the givenness manipulations. Three important effects are evident

Table II. Percentage Of Analyzable Dative Targets Produced and Percentages of Inaccurately Recalled Arguments as a Function of Reference Form and Appropriateness Condition for Sentences Presented in Canonical and Scrambled Orders

	Analyzable		Inaccurate subject		Inaccurate given argument		Substituted eliciting given argument		Inaccurate new argument	
	Canon	Scram	Canon	Scram	Canon	Scram	Canon	Scram	Canon	Scram
Same-form										
Appropriate	66.1	59.3	10.4	7.8	16.1	14.6	–	–	31.8	34.9
Inappropriate	59.9	66.7	5.2	8.9	13.0	17.2	–	–	37.0	31.8
Different-form										
Appropriate	33.3	44.3	11.5	8.3	62.5	41.1	37.5	19.3	37.5	38.0
Inappropriate	44.3	35.4	13.5	15.6	45.3	60.4	20.3	34.4	41.1	39.1

Note: "Canon" indicates trials in which the speakers were presented with a canonical word order and "scram" indicates trials in which speakers were given a scrambled word order. Percentages add to more than 100 because a particular utterance could be inaccurate in more than one of the indicated ways.

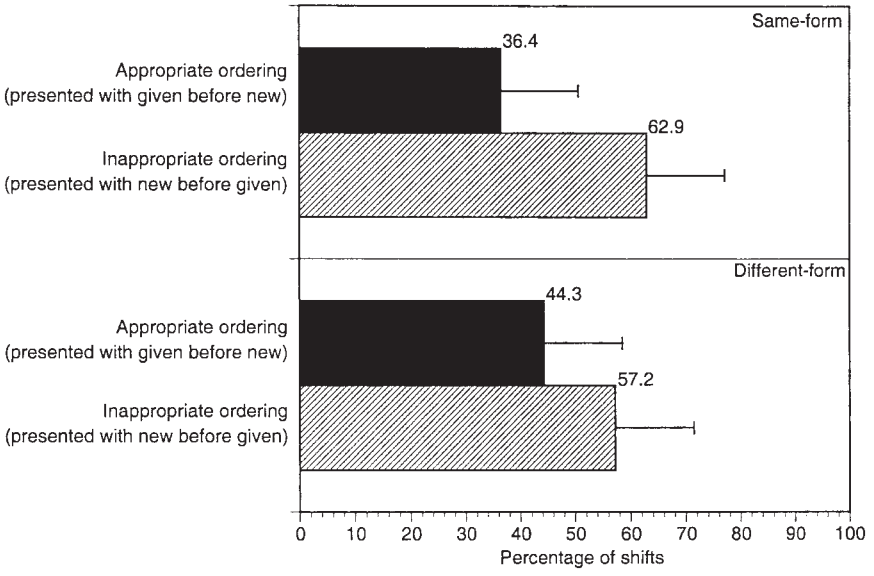

Fig. 2. Percentages of shifts in recalled productions when presented with same-form and different-form references with appropriate and inappropriate given-new structures.

in Fig. 2. First, targets were recalled with shifted word orders more often when the given-new structure of the originally presented sentence was inappropriate (striped bars, a mean of 60.1%) compared to when it was appropriate (dark bars, a mean of 40.3%). ANOVAs show that this 19.8% difference led to a significant main effect of given-new appropriateness [$F_1(1,15) = 11.0$, $CI = \pm 12.7\%$, $F_2(1,23) = 13.2$, $CI = \pm 11.0\%$]. Furthermore, 13 out of 16 speakers shifted the word order of their recalled utterance more when the target had an inappropriate rather than an appropriate given-new structure, which is significant by a sign test ($p < .05$). Thus, Japanese speakers, like English speakers, produce word orders such that given arguments are mentioned before new arguments. These results thus provide experimental evidence that Japanese speakers use scrambling in accordance with the given-new ordering hypothesis.

The second result evident in Fig. 2 is that targets presented with an inappropriate given-new structure were produced with shifted word orders more often not only when the given argument was previously mentioned with a same-form reference (the difference in the top panel of Fig. 2), but also when it was previously mentioned with a different-form reference (the difference in the bottom panel of Fig. 2). This is supported by the fact that within the same-form condition, the simple main-effect of appropriateness was significant [$F_1(1,15) = 15.8$, $F_2(1,23) = 19.5$], whereas within the different-form condition, it was marginally

significant [$F_1(1,15) = 3.7$, $p < .08$; $F_2(1,23) = 2.9$, $p < .10$]. Furthermore, in the same-form condition, 14 out of 16 speakers recalled shifted word orders more with targets that had inappropriate rather than appropriate given-new structure ($p < .01$), whereas in the different-form condition 11 out of 14 speakers recalled shifted word orders more with targets that had inappropriate rather than appropriate given-new structure (with two ties; $p < .05$). Importantly, the effect in the different-form condition reveals that a different-form reference can cause a given-new ordering effect even with Japanese scrambled sentences. Because scrambling is a constituent-integration phenomenon, this suggests that the effect from different-form references cannot be taken to reflect a meaning-based effect that arises at the level of function assignment.

Third, although speakers tended to shift word order more with inappropriate given-new structure both in the same-form and in the different-form conditions, the effect appears to be larger in the same-form condition (top panel, a 26.5% difference) than in the different-form condition (bottom panel, a 12.9% difference). This effect is hinted at by the fact that the interaction between given-new appropriateness and reference form is marginally significant by items [even though it is not significant by speakers; $F_1(1,15) = 2.1$, $CI = \pm 14.2\%$; $F_2(1,23) = 3.7$, $p < .07$, $CI = \pm 13.1\%$]. It is further reinforced by the fact that 12 out of 16 speakers showed a bigger inappropriate-appropriate difference in the same-form condition than in the different-form condition ($p < .05$). This interaction, which corresponds to that reported by Bock and Irwin (1980), shows that scrambling in Japanese is sensitive to the degree of availability of a given argument, such that an argument that is available at more levels of representation (i.e., a same-form given argument, which is available conceptually and lexically) exhibits a larger given-new ordering effect than an argument that is available at fewer levels of representation (i.e., a different-form given argument, which is available only conceptually).

The effect of producing canonical versus scrambled word order on given-new ordering is illustrated in Fig. 3. Here, we analyzed performance in the given-new appropriate and inappropriate conditions as a function of whether speakers were originally presented with a canonical word order (top panel) or a scrambled word order (bottom panel). (To avoid missing values, it was necessary to collapse across the reference-form factor in these analyses.) The results reveal two prominent effects on speakers' recalls: First, speakers were much more likely to shift the order of arguments in a produced sentence if the original sentence was presented in scrambled word-order (67.2%) than in canonical word-order (29.2%), an effect that was significant [$F_1(1,15) = 27.1$, $CI = \pm 15.5\%$; $F_2(1,23) = 31.4$, $CI = \pm 12.6\%$]. This reflects the expected preference for producing the more common canonical word order rather than the less common scrambled word order. Interestingly, the tendency to shift word order to produce given arguments before

new is evident for both kinds of word orders [overall, a 20.3% effect, which was significant, $F_1(1,15) = 13.8$, $CI = \pm 11.6\%$, $F_2(1,23) = 24.3$, $CI = \pm 9.0\%$]. Furthermore, the tendency to produce given arguments early is about equal with either word order (20.2% when speakers were presented with canonical word orders vs. 20.3% when speakers were presented with scrambled word orders), as the interaction between presented word order and given-new appropriateness was not significant [$F_1(1,15) < 1$, $CI = \pm 14.2\%$; $F_2(1,23) = 1.2$, $CI = \pm 8.6\%$]. These results are consistent with the possibility that speakers' preference to produce canonical word order and to produce given arguments before new affect sentence-production behavior independently.

The pattern of results can thus be summarized in three points: First, speakers readily recalled sentences with word orders that differed from those that they were originally presented with. This shows that the well-known observation of weak memory for the surface features of sentences (e.g., Sachs, 1967) holds for Japanese. Importantly here, this implies that the use of a long-term recall task to investigate questions of language production is reasonable, as the partial independence of speakers' productions from episodic memory leaves room for production factors to influence sentence-recall performance (supporting the use generally of memory-based production tasks, including those used by Bock, 1977; Bock & Irwin, 1980; Bock

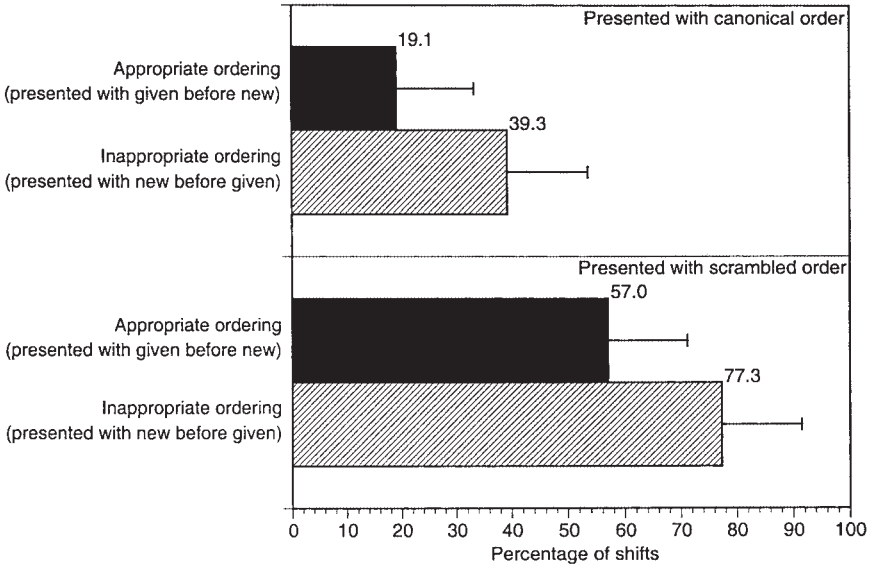

Fig. 3. Percentages of shifts in recalled productions when presented with canonical or scrambled word orders with appropriate and inappropriate given-new structures.

& Warren, 1985; Brown & Dell, 1987; Fox Tree & Meijer, 1999; Kelly, Bock, & Keil, 1986; Lombardi & Potter, 1992; McDonald *et al.*, 1993; Potter & Lombardi, 1998; Stallings, McDonald, & O'Seaghdha 1998; see Bock, 1982, for a review of earlier studies). Furthermore, the fact that shifts were so readily observed here suggests that the difference between word orders in Japanese is only very weakly meaning based, especially in contrast to the difference between English word orders. This supports the idea that Japanese scrambled word order (more than the English word order) is determined at the level of constituent integration.

Second, though speakers' memory for the surface forms of the originally encoded sentences was weak, they did not produce word orders in their productions haphazardly. Rather, recalled productions were influenced by two factors. First, speakers preferred to produce word orders that allowed given arguments to be mentioned before new arguments. Second, speakers produced canonical word orders (subject-indirect object-direct object) more than scrambled word orders (subject-direct object-indirect object). Furthermore, even though the canonical difference was bigger than the given-before-new difference, the given-new effect manifested about equally with canonical or scrambled word-orders. This shows that while Japanese speakers (unsurprisingly) prefer to produce the more common canonical word order rather than the less common scrambled word order, one factor that causes speakers to produce a canonical or scrambled word order is givenness (agreeing with the corpus-based evidence presented by Yamashita, 2002). Notably, the givenness effect in Japanese appears as it does in English—as a tendency to mention given arguments before new arguments.

Third, though the given-before-new preference was especially strong when the previous mention of the given argument involved the same lexical content, the effect was still evident even when the previous mention of the given argument involved distinct lexical content. This interaction replicates that observed by Bock and Irwin (1980), and thereby extends their results in three ways. First, because the present results came from spoken production rather than written (as in Bock and Irwin's experiment), these results show that differences between spoken and written production (e.g., the relative speed of each output modality, or the greater monitoring that is likely to occur with writing) is not relevant to the kinds of given-new ordering effects revealed in these experiments. Second, the implication taken from Bock and Irwin's study can be applied to Japanese scrambling. The tendency to produce Japanese scrambled sentences so that given arguments are mentioned before new evidently arises from the differential availability imparted to an argument by virtue of its previous mention. Specifically, given arguments are mentioned especially early in sentences because their previous mention renders them more available, and the more information made available by that previous mention (e.g., if a reference is same-form rather than different-form), the greater the given-new ordering

effect. Third and most profoundly, the fact that Japanese scrambling arises at the level of constituent integration implies that the given-new ordering effect observed here (and, by extension, in Bock & Irwin, 1980) is a constituent-integration effect. Because constituent-integration processes are one step removed from message-level influences, this suggests that given-new ordering is not directly a message-level effect—it does not come from the assignment of an argument marked with a message- or discourse-based "given" feature to a grammatical function that can express that given feature. These results are thus incompatible with the claim that speakers' (tacit) motivations for using given-new ordering is to communicate givenness per se. Rather, given-new ordering seems to emerge as a consequence of availability-sensitive processing at the level of constituent integration (e.g., Bock, 1982).

How might the pattern of same- and different-form givenness effects be explained within such an availability-sensitive framework? The fact that same-form references caused an availability-based given-new ordering effect can be explained straightforwardly, because a same-form reference should make (at least) lexical and phonological information about a previously mentioned argument available directly at the level of constituent integration. This implies that during constituent integration, a mentioned argument should tend to be assigned to its constituent representation sooner, resulting in its earlier positioning. The way that different-form references cause an availability-based given-new ordering effect is more complex, but still follows from an incremental, availability-sensitive sentence-production strategy. As described above, different-form references should cause the conceptual information about the mentioned argument to become highly available (e.g., previous mention of *gift* should cause conceptual information about *present* to become highly accessible). Then a conceptually available argument should be processed more rapidly at the level of function assignment, which should allow that argument to complete function assignment and commence constituent integration sooner. If a mentioned argument commences constituent integration sooner, it should complete constituent integration sooner, and thereby be mentioned earlier. Thus, in some sense, the different-form given-new effect arises at the level of function assignment, but only *quantitatively*—different-form references cause *faster* function-assignment processing. What is important is that the present evidence suggests that different-form references do not cause given-new effects because they lead to *qualitatively* different processing at the level of function assignment. That is, a different-form reference evidently does not exert its effect by causing an argument to be assigned to a special given-communicating grammatical function, because different-form references affected the functionally nondistinct scrambled word orders in this experiment. Finally, the greater effect of the same-form references can be explained by the fact that a same-form reference makes a mentioned argument lexically *and* conceptually available, and that mentioned argument

should thereby not only commence constituent integration sooner (because its conceptual availability causes more rapid function assignment), but it should proceed through constituent integration more quickly (because of the effect of lexical accessibility directly upon constituent integration). Different-form references, on the other hand, make mentioned arguments only conceptually available, and thus give rise only to the faster function-assignment effect.

It is important to note that because speakers evidently produce given before new without direct reference to a grammatically represented or communicatively motivated notion of givenness does not mean that language users generally do not take such given-new ordering effects to have communicative value. Rather, as noted above, the availability-based framework suggests that the tendency to produce given before new should be systematic. Thus, if the identification of given information is useful, word order can be reliably used for such identification. Indeed, it is worth noting that often, communicatively motivated and processing-motivated claims about production effects predict the same linguistic behavior. The present analysis suggests that this confluence may not be a coincidence. Note that from a communicative perspective, given-before-new is an arbitrary signal (i.e., "new-before-given" could have worked just as well, provided that all language users in a community shared that convention). From an information-processing perspective, however, given-before-new is not arbitrary, but rather, follows from the more efficient production that should result from producing more available (given) arguments before less available (new) arguments. Because the communication of meaning-based features could in principle work just as well with any word-order signal to givenness, it makes sense that the particular signal chosen is one that also makes sentence production (and thus communication as a whole) more efficient. Overall then, certain communicative effects may work such that speakers' production patterns are determined by factors that lead to more efficient production, and then language users come to be sensitive to the communicatively useful information encoded in those production-centered biases. Such an account is not only communicatively effective, but promises more efficient production as well. (An analogous argument also can be made for an influence of comprehension preferences.)

Overall, these results and analyses suggest that speakers can produce utterances in more than one way because the existence of multiple ways of saying the same thing allows production processes to choose an utterance that allows for more efficient production. Not only does this permit the communication process to proceed with less difficulty and in a more timely fashion, but it allows communicative distinctions to still be conveyed (to the extent that those communicative distinctions are correlated with information-processing distinctions). This portrays a communicative process by which generally, speakers and listeners work together to achieve communication, both in terms of how their linguistic knowledge is organized and in terms of their moment-to-moment communicative behavior.

REFERENCES

Bates, E., Masling, M., & Kintsch, W. (1978). Recognition memory for aspects of dialogue. *Journal of Experimental Psychology: Human Learning & Memory, 4*(3), 187–197.

Bock, J. K. (1977). The effect of a pragmatic presupposition on syntactic structure in question answering. *Journal of Verbal Learning and Verbal Behavior, 16,* 723–734.

Bock, J. K. (1982). Toward a cognitive psychology of syntax: Information processing contributions to sentence formulation. *Psychological Review, 89,* 1–47.

Bock, J. K. (1986). Meaning, sound, and syntax: Lexical priming in sentence production. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 12,* 575–586.

Bock, J. K. (1987). An effect of the accessibility of word forms on sentence structures. *Journal of Memory and Language, 26,* 119–137.

Bock, K. (1995). Sentence production: From mind to mouth. In J. L. Miller, P. D. Eimas (Eds.), *Speech, language, and communication: Handbook of perception and cognition* (2nd ed., Vol. 11. pp. 181–216). San Diego, CA: Academic Press.

Bock, J. K., & Irwin, D. E. (1980). Syntactic effects of information availability in sentence production. *Journal of Verbal Learning and Verbal Behavior, 19,* 467–484.

Bock, J. K., & Levelt, W. J. M. (1994). Language production: Grammatical encoding. In M. A. Gernsbacher (Ed.), *Handbook of psycholinguistics* (pp. 945–984). San Diego, CA: Academic Press.

Bock, J. K., & Warren, R. K. (1985). Conceptual accessibility and syntactic structure in sentence formulation. *Cognition, 21,* 47–67.

Brown, P. M., & Dell, G. S. (1987). Adapting production to comprehension: The explicit mention of instruments. *Cognitive Psychology, 19,* 441–472.

Chafe, W. L. (1970). *Meaning and the structure of language*. Chicago: University of Chicago Press.

Ferreira, V. S. (1996). Is it better to give than to donate? Syntactic flexibility in language production. *Journal of Memory and Language, 35*(5), 724–755.

Ferreira, V. S., & Dell, G. S. (2000). Effect of ambiguity and lexical availability on syntactic and lexical production. *Cognitive Psychology, 40*(4), 296–340.

Ferreira, V. S., & Firato, C. E. (2002). Proactive interference effects on sentence production. *Psychonomic Bulletin & Review*, *9,* 795–800.

Fox Tree, J. E., & Meijer, P. J. A. (1999). Building syntactic structure in speaking. *Journal of Psycholinguistic Research, 28*(1), 71–92.

Garrett, M. F. (1975). The analysis of sentence production. In G. H. Bower (Ed.), *The psychology of learning and motivation* (pp. 133–177). New York: Academic Press.

Halliday, M. A. K. (1967). Notes on transitivity and theme in English. Part 2. *Journal of Linguistics, 3,* 199–244.

Hawkins, J. A. (1994). *A performance theory of order and constituency*. Cambridge, UK: Cambridge University Press.

Kelly, M. H., Bock, J. K., & Keil, F. C. (1986). Prototypicality in a linguistic context: Effects on sentence structure. *Journal of Memory and Language, 25,* 59–74.

Levelt, W. J. M. (1989). *Speaking: From intention to articulation*. Cambridge, MA: MIT Press.

Lombardi, L., & Potter, M. C. (1992). The regeneration of syntax in short term memory. *Journal of Memory and Language, 31,* 713–733.

MacWhinney, B., & Bates, E. (1978). Sentential devices for conveying givenness and newness: A cross-cultural developmental study. *Journal of Verbal Learning and Verbal Behavior, 17,* 539–558.

McDonald, J. L., Bock, K., & Kelly, M. H. (1993). Word and world order: Semantic, phonological, and metrical determinants of serial position. *Cognitive Psychology, 25(2),* 188–230.

Miyagawa, S. (1997). Against optional scrambling. *Linguistic Inquiry, 28,* 1–25.

Potter, M. C., & Lombardi, L. (1998). Syntactic priming in immediate recall of sentences. *Journal of Memory & Language, 38*(3), 265–282.

Prat-Sala, M., & Branigan, H. P. (2000). Discourse constraints on syntactic processing in language production: A cross-linguistic study in English and Spanish. *Journal of Memory & Language, 42*(2)*,* 168–182.

Sachs, J. S. (1967). Recognition memory for syntactic and semantic aspects of connected discourse. *Perception & Psychophysics, 2,* 437–442.

Shibatani, M. (1990). *The languages of Japan*. Cambridge, UK: Cambridge University Press.

Stallings, L. M., MacDonald, M. C., & O'Seaghdha, P. G. (1998). Phrasal ordering constraints in sentence production: Phrase length and verb disposition in heavy-NP shift. *Journal of Memory & Language, 39*(3), 392–417.

Sridhar, S. N. (1988). *Cognition and sentence production: A cross-linguistic study*. New York: Springer-Verlag.

Yamashita, H. (in press). Scrambled sentences in Japanese: Linguistic properties and motivations for production. *TEXT, 22,* 597–633.

Yamashita, H. (1995). Verb argument information used in a prodrop language: An experimental study in Japanese. *Journal of Psycholinguistic Research, 24*(5)*,* 333–347.

Yamashita, H., & Chang, F. (2001). "Long before short" preference in the production of a head-final language. *Cognition, 81*(2), B45–B55.