ELSEVIER

Brief article

"Long before short" preference in the production of a head-final language

Hiroko Yamashita*, Franklin Chang

University of Illinois at Urbana-Champaign, Urbana, IL, USA

Abstract

A tendency for speakers to produce short phrases before long phrases has been attributed to the accessibility of short phrases, and thought to reflect universal mechanisms of production. However, recent corpus analyses in Japanese suggest that long phrases tend to be shifted ahead of short ones (Hawkins, J. (1994). *A performance theory of order and constituency*. Cambridge: Cambridge University Press; Yamashita, in press). Two on-line experiments confirmed that speakers shifted long arguments to earlier positions more than short arguments, exhibiting a "long before short" preference. We reconcile these contradictory data from English and Japanese by a competition between different factors in an incremental production system. © 2001 Elsevier Science B.V. All rights reserved.

Keywords: Language production; Phrasal ordering; Scrambling; Japanese

1. "Short before long" preference in English

When people speak, a series of words must be produced in rapid succession. The speaker must access and sequence words within a phrase (i.e. put "the" before "dog"), and furthermore sequence those phrases within a sentence (i.e. put "the dog" before "on the street"). Given the incredible fluency with which people produce sentences, it has been hypothesized that the language production system plans a sentence in an incremental manner, and that decisions about the sequencing of words and phrases depend on the accessibility of these units during the incre-

* Corresponding author. 2090A FLB, 707 South Mathews, Urbana, IL 61801, USA. Fax: +1-217-244-4010.

E-mail address: hyamash@uiuc.edu (H. Yamashita).

mental planning of the sentence (Bock, 1982; Ferreira, 1996). Studies demonstrate that a phrase that is more accessible due to conceptual or lexical factors tends to be produced earlier in the sentence (Bock, 1986; McDonald, Bock, & Kelly, 1993). In this article, we present a phenomenon that contradicts this traditional view of accessibility in word/phrasal ordering and reevaluate the universal character of production mechanisms.

One phenomenon that is consistent with the accessibility-based account of word/phrasal ordering is the "short before long" preference in English (e.g. Arnold, Wasow, Losongco, & Grinstrom, 2000; Stallings, MacDonald, & O'Seaghdha, 1998). This preference manifests itself in constructions such as the heavy noun phrase (NP) shift shown in (1). The canonical order in (1a) becomes highly awkward when the NP "a song" is shifted after the prepositional phrase (PP) "with friends" as in (1b). However, if the NP includes more modification, increasing its length as in (1c), the shifted order becomes more acceptable or even preferred over its canonical counterpart. Experimental studies on the construction, both with and without listeners (Arnold et al., 2000; Stallings et al., 1998), suggest that the shift is due to the workings of the production system, rather than a stylistic adaptation for listeners.

(1a) Bill sang a song with friends.
(1b) # Bill sang with friends a song.
(1c) Bill sang with friends a song that was written by a famous guitar player from Texas.

While the length in number of words has not been directly linked to accessibility, it seems natural to suggest that short phrases are easier to access than long phrases (Arnold et al., 2000). Short phrases have fewer words to access, and fewer alternative orderings that need to be selected among. Because this account is grounded in the nature of the human sentence processor, the short before long preference might be a universal property of production.

2. "Long before short" preference in Japanese

Recent corpus analyses in Japanese pose a potential challenge to the universality of an accessibility-based account of phrasal ordering. Japanese is a SOV (subject, object, verb), head-final language that allows the fronting of arguments (commonly called "scrambling"). Because of case markers, speakers are allowed to change the order among arguments while keeping semantic content and grammatical relations identical to canonical counterparts. Corpus analyses on written texts (Dryer, 1980; Hawkins, 1994; Yamashita, in press) found that in Japanese, long phrases, such as an argument with a long modifier, tend to shift in front of shorter phrases. These findings are exactly opposite of what would be predicted if short phrases were more accessible.

It is possible that these corpus findings merely reflect a stylistic bias in written language. We therefore experimentally investigated whether phrase length directly

affects phrasal ordering in Japanese, using a variant of the task that Stallings et al. (1998, Experiment 3) used to study the shift in English. The experiment, which was disguised as a sentence recognition task, asked participants to construct a sentence using sentence components presented on a screen, in any order, and then say the sentence aloud after a cue.

3. Experiment 1

3.1. Method

3.1.1. Participants

Fifty-three Nara University undergraduates were paid for their participation. All were native speakers of Japanese.

3.1.2. Stimuli

Twenty-four sets of sentences were constructed with transitive verbs, a subject NP, and a direct object NP. Three versions of each sentence were created by attaching a modifier to the subject, the object, or leaving the modifier out, yielding long-SUB, long-DO, and all-short conditions. The modifiers consisted of 5–7 words on average and 10–15 morae. The experimental sentences were combined with 58 filler sentences and 30 stimuli from Experiment 2. Table 1 gives examples of experimental sentences. In addition, when the target sentence was presented, the position of the arguments on the screen was manipulated to avoid screen position effects. In one condition the subject was in a box in the upper corner of the screen and the object was in the lower-left corner; in the other condition their positions were reversed. The verb remained in the upper-left corner throughout. Six lists were created to counterbalance the three versions based on phrase length and two levels of screen positioning.

3.1.3. Procedure

Each participant was tested individually. The participants were told that they were in a memory experiment that measured how quickly they could later recog-

Table 1
Example set of experimental items in Experiment 1

Phrase length condition	Example
All-Short	Keezi-ga hannin-o oikaketa.
	detective-nom suspect-acc chased
	"The detective chased the suspect."
Long-SUB	Se-ga takakute gassiri sita keezi-ga hannin-o oikaketa.
	height-nom tall and big-boned detective-nom suspect-acc chased
	"The detective who is tall and big-boned chased the suspect."
Long-DO	Keezi-ga se-ga takakute gassiri sita hannin-o oikaketa.
	detective-nom height-nom tall and big-boned suspect-acc chased
	"The detective chased the suspect who is tall and big-boned."

nize the sentences that they uttered. Each trial consisted of three kinds of screens as shown in Fig. 1.

Participants first pressed a return key to initiate a trial, which showed the first screen containing four boxes with sentence components. Participants prepared a sentence using the sentence components and pressed the return key when they were ready. The screen then went blank for 1500 ms, and then a simple math problem followed. The delay and math problem were designed to encourage subjects to produce their sentences from the meaning, rather than by covert rehearsal or reading from their visual buffer. Immediately afterwards, the third screen presented the verb in the lower-right box as a cue. Participants then produced their sentence aloud using the verb. Because only the verb was given as a cue, the participants had the freedom to order arguments either in a canonical or shifted order.

Filler sentences were used to disguise the intent of the study. Forty percent of the filler sentences were presented twice for the recognition task. Participants pressed the spacebar whenever they saw a repeated sentence. To give the impression that phrases were randomly placed on the screen, the location of the arguments and verbs in the fillers was randomized. To ensure that the targets were not obvious, however, 50% of the fillers had the verb in the upper-left position like the targets.

Prior to the main experiment, participants practiced with 10 sentences. All of the sentences that participants uttered were recorded with a Sony Walkman tape recorder (Model WM GX322) using the built-in microphone for later transcription.

3.2. Scoring

The data were scored using a coding scheme that marked the order of the subject, object, and verb. Changes of subject to topic were ignored and treated as if they were subjects. The coding also denoted the position of the long phrase and several types of deviations from the original stimuli, as well as various types of errors.

3.3. Results

The dependent measure was the percentage of sentences whose object shifted to the sentence-initial position out of all the error-free sentences within each cell. An ANOVA was performed crossing phrase length and location on the screen. As shown in Fig. 2, there was a clear effect of phrase length ($F1(2, 104) = 38.5$; $F2(2, 46) = 25.4$). Although the canonical order was always preferred over shifted order, participants were more likely to front objects when they were long than when they were short (post-hoc comparison of long-object and all-short, $F1(1, 104) = 58.3$; $F2(1, 46) = 37.3$).

We confirmed that Japanese speakers tend to shift long arguments ahead of short ones in an on-line task. This tendency was observed in an environment without prior discourse context or an explicit listener, in a similar situation to a previous study in English (Stallings et al., 1998).

Note that Japanese allows arguments to shift not only to the sentence-initial position but also to the sentence-internal position when the sentence involves

both indirect and direct objects. The canonical order in (2a) may change by shifting either the indirect or direct object to the sentence-initial position, as in (2b) and (2c).
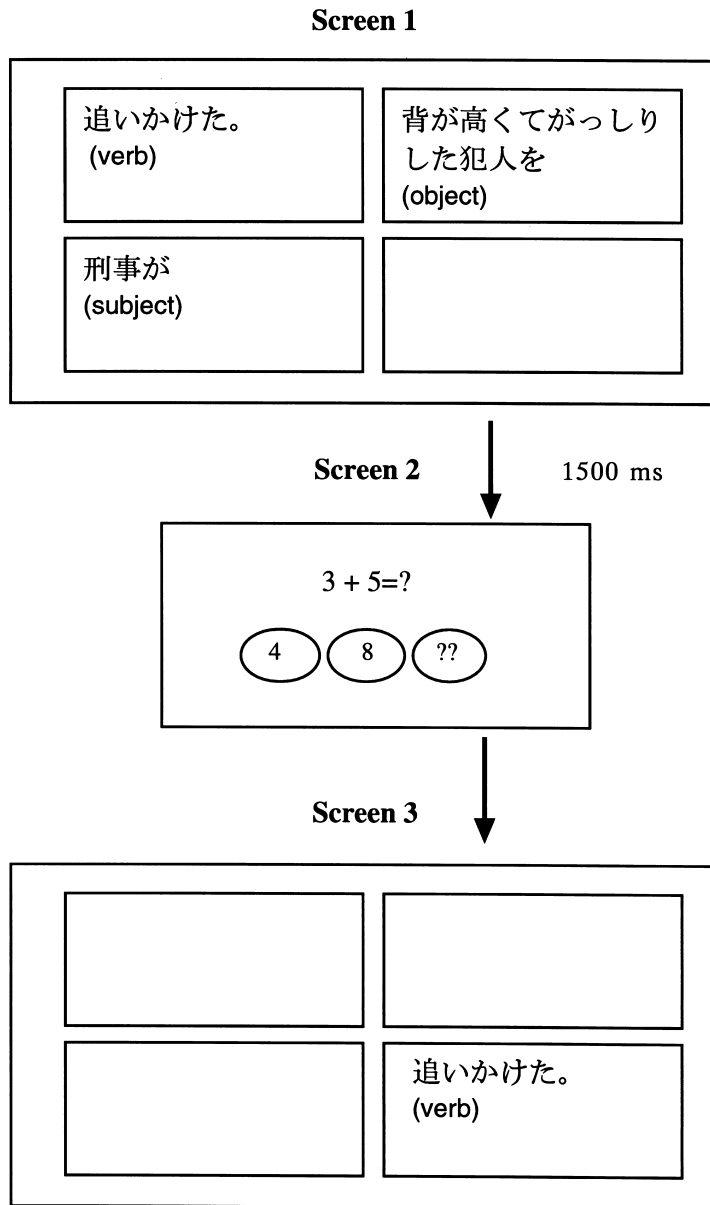
Screen 1

追いかけた。 (verb)	背が高くてがっしり した犯人を (object)
刑事が (subject)	

Screen 2   1500 ms

3 + 5=?

(4) (8) (??)

Screen 3

	追いかけた。 (verb)

Fig. 1. Sequence of events on each trial of Experiments 1 and 2. All four boxes were filled in presenting the stimuli in Experiment 2.
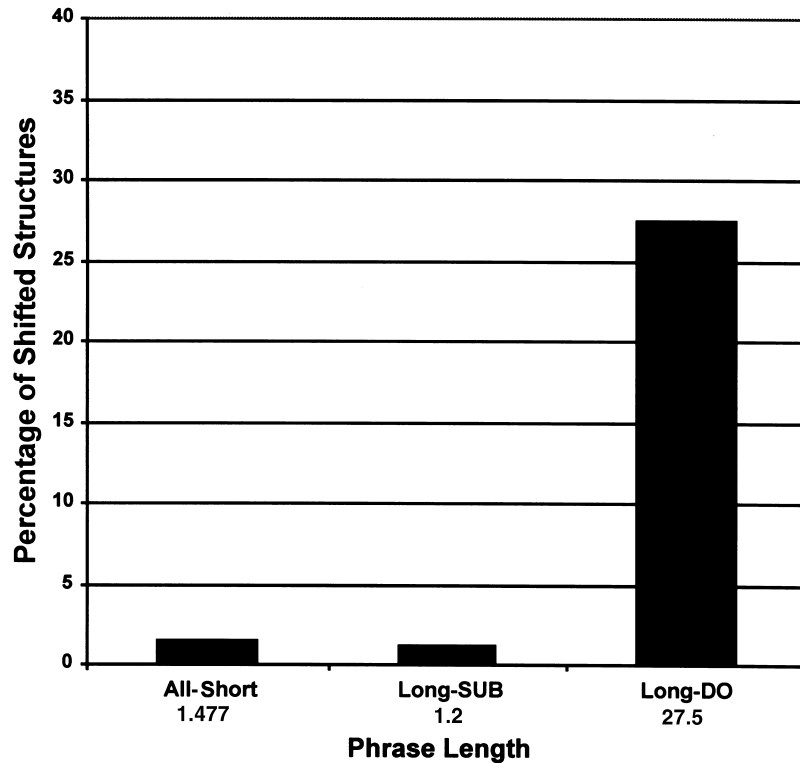
Fig. 2. Shifting in transitive sentences as a function of phrase length.

In addition, as in (2d), the direct object may shift VP internally to the position before the indirect object but after the subject/topic phrase.

(2a) Taro-ga/wa　Miki-ni　ringo-o　　ageta.
　　　Taro-nom/top Miki-dat apple-acc gave
(2b) Miki-ni Taro-ga/wa ringo-o ageta.
(2c) Ringo-o Taro-ga/wa Miki-ni ageta.
(2d) Taro-ga/wa ringo-o Miki-ni ageta.
　　　"Taro gave Miki an apple."

In one of the corpus analyses mentioned earlier (Yamashita, in press), 37% of the shifts were of the internal type, showing that this order does occur. We therefore investigated how participants in an on-line task would position long verb please (VP) internal arguments in Experiment 2.

4. Experiment 2

4.1. Participants and procedure

Experiment 2 took place interleaved with Experiment 1, so the participants and procedure were identical.

4.2. Stimuli

Phrasal length was varied for indirect and direct objects in ditransitive sentences. The all-short condition was the base structure, with a ditransitive verb and two unmodified bare NP arguments. In the long indirect object (long-IO) condition, the indirect object was modified by a relative clause, whereas in the long direct object (long-DO) condition, the direct object was modified by the same relative clause. The relative clause was normed to insure that it was equally felicitous with each phrase. Furthermore, in order to reduce possible priming effects between this experiment and Experiment 1, the subject phrases in these sentences were marked with the topic marker "wa" instead of the subject marker "ga". Table 2 provides samples of sentences.

In presenting the stimulus sentences, the positions of the topic and verb remained the same as in Experiment 1: in lower-right and upper-left boxes, respectively. The positions of the indirect and direct objects were manipulated between upper-right and lower-left. Thirty sets of sentences were constructed varying phrase length and two different presentation positions.

4.3. Scoring

The data were scored using a coding scheme that marked the order of the subject, indirect object, object, and verb. Changes of topic to subject were ignored. The coding also denoted the position of the long phrase and the same kind of deviations as in Experiment 1.

4.4. Results

The dependent measure was again the percentage of sentences produced with shifted order within each cell, but now there were three kinds of shifted sentences, IO-shift (IO-topic-DO), DO-shift (DO-topic-IO), and internal-shift (topic-DO-IO), out of all error-free sentences. An ANOVA was performed crossing the phrase length and box location on the screen. Except where mentioned, box location was not significant.

For the occurrences of IO-shift (Fig. 3), there was a clear effect of phrase length ($F1(2, 104) = 23.5$; $F2(2, 58) = 18.4$). Participants were more likely to shift indirect objects to the sentence-initial position when they were long than when they were short (post-hoc comparison of long-IO and all-short, $F1(1, 104) = 30$; $F2(1, 58) = 23.3$). For the occurrences of DO-shift, a clear effect of phrase length was also found ($F1(2, 104) = 12.9$; $F2(2, 58) = 11.4$). Participants were more likely

to front direct objects to the beginning of the sentence when they were long than when they were short (post-hoc comparison of long-DO and all-short, $F1(1, 104) = 20.2$; $F2(1, 58) = 16.2$). There was an interaction of box location and phrase length ($F1(2, 104) = 15.7$; $F2(2, 29) = 10$), such that long elements were more likely to be shifted when they were in the upper-right box, but short elements did not differ as much between the two box locations.

For the internal-shift, a robust effect of phrase length was found ($F1(2, 104) = 109$; $F2(2, 58) = 64.5$). Participants were more likely to shift direct objects in front of indirect objects but not all the way to the beginning of the sentence when they were long than when they were short (post-hoc comparison of long-IO and all-short, $F1(1, 104) = 147.7$; $F2(1, 58) = 84.7$).

In Experiment 2, we once again confirmed the effects of phrase length on ordering. At the same time, we found that length had somewhat different effects on indirect and direct objects. While the shift to the sentence-initial position increased in both conditions when the length was added, long direct objects shifted to the sentence-internal position more frequently than to the sentence-initial position.

5. General discussion: reconciling the directions of the shift in English and Japanese

The two experiments confirmed that length directly affected phrasal ordering in production of Japanese: people tended to place long phrases before short ones, consistent with the corpus analyses. Because the short before long preference in English has been argued to be a manifestation of accessibility in an incremental production system, these results in Japanese raise questions about the universality of such processes. We now attempt to account for the difference in the preference direction by situating the shift in the theory of grammatical encoding (Bock & Levelt, 1994; Garrett, 1980).

In the theory of grammatical encoding, decisions about word order depend on the properties of different levels in the production system. Some decisions are more

Table 2
Example set of experimental items in Experiment 2

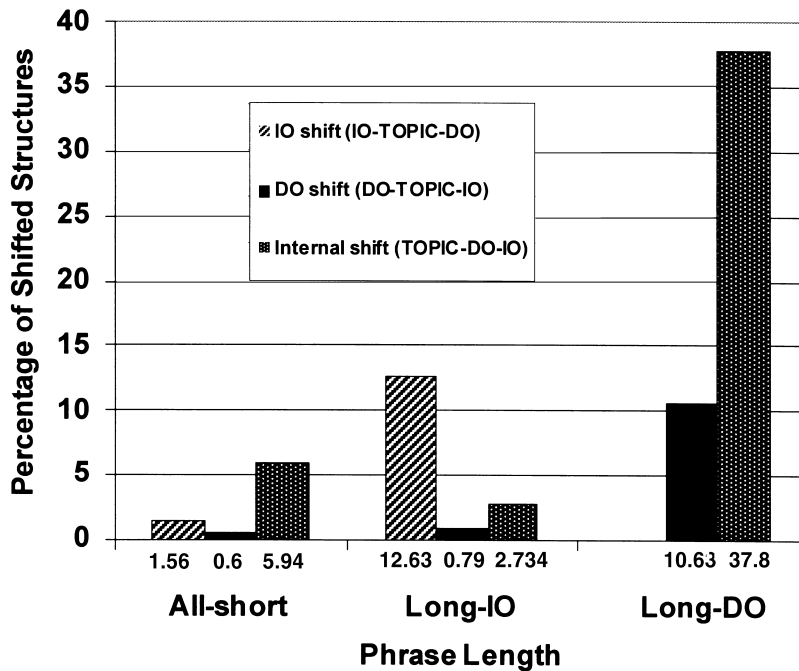| Phrase length condition	Example
All-Short	Masako-wa otoko-ni okasi-o　todoketa.
	Masako-top man-dat cake-acc delivered
	"Masako delivered the cake to the man."
Long-IO	Masako-wa sinbun-de　syookai-sarete-ita otoko-ni okasi-o　todoketa.
	Masako-top newspaper-in introduced　　man-dat cake-acc delivered
	"Masako delivered the cake to the man [who was] introduced in the newspaper."
Long-DO	Masako-wa otoko-ni sinbun-de　syookai-sarete-ita okasi-o　todoketa.
	Masako-top man-dat newspaper-in introduced　　cake-acc delivered
	"Masako delivered the cake [which was] introduced in the newspaper to the man."

Fig. 3. Shifting in dative sentences as a function of phrase length and shift type. (Note there were no IO shifts in the Long-DO condition.)

conceptually driven and others depend more on form (Bock, 1982). In the conceptual arena, there is a tendency to place salience elements earlier in sentences (Osgood & Bock, 1977), while in the form arena, the system is trying select individual lexical items in an incremental manner (Ferreira, 1996).

In this theory, long phrases have competing characteristics. They are semantically richer than short phrases, because the extra lexical items enhance the meaning of the head noun, which makes them more salient. This semantic richness increases the overall accessibility of the phrase in the conceptual arena. At the same time, in the form arena, they are longer in terms of lexical content, which increases the number of possible sequences. This might increase the likelihood of simpler phrases being ready before complex phrases, and an overall preference for putting short phrases before long phrases in the form arena. These two contrary biases are delicately balanced against each other, and differences in grammatical constraints in the two languages may upset the balance in favor of one over the other.

In Japanese, unlike English, the shifting of phrases all precedes the verb. Early on, the speakers have the most freedom in how they construct their sentence; they are only constrained by their message they are about to convey. In addition, because of the fairly free word order and null pronouns, NPs in Japanese are subject to few

syntactic constraints. For these reasons, the language allows speakers to use word order to mark the saliency of different arguments.

In contrast, English has a fairly strict word order that requires all arguments to be overtly present. In such a language, syntactic structure is a crucial constraint in creating grammatical sentences. Furthermore, weight-based shifts including heavy NP shift in English take place after the verb, and there is evidence that verbs exert strong influence over the phrases that follow them, including their order (Stallings et al., 1998). These syntactic constraints presumably reduce the influence of conceptual factors, allowing form-related factors to play a larger role in phrasal ordering.

This approach explains shifts in both languages as a competition among a variety of factors during incremental production. In Japanese, the extra saliency of long NPs leads to their earlier placement. At the same time, the saliency of long NPs must compete with the accessibility of subjects/topics, or the grammatical tendency to put these first. If the subject/topic wins at the first position in the sentence, then the long NP competes with the other object for the next position, where they are more evenly matched in saliency. In English, weight-based shifts seem to be less sensitive to conceptual factors. Stallings et al. (1998) found that animacy did not influence the shift, but lexical information (verb bias) did. If the shifts in human languages are motivated by both conceptual and lexical factors, then the language-specific differences in sensitivity to these two factors can provide a uniform account for both "short before long" and "long before short" preferences.

Confirmation of this view will require more research, but already there is some cross-linguistic validation. In languages that permit phrases to appear pre- and post-verbally, conceptual and form-related factors should differentially influence these regions. Interestingly, this seems to be the case in Hungarian, which allows all permutations of the major constituents within a simplex sentence (cf. Kiss, 1981). In Hungarian, pre-verbal phrases seem to be subject to semantic-pragmatic forces (where a long before short preference is evident), but post-verbal phrases exhibit a short before long preference (Hawkins, 1994, p. 131). This is exactly what our bi-level theory would predict, and it further supports our view that within and across languages, variation in word/phrasal ordering is a product of multiple competing biases in the system of sentence production.

Acknowledgements

References

Arnold, J., Wasow, T., Losongco, A., & Grinstrom, R. (2000). Heaviness vs. newness: the effects of structural complexity and discourse status on constituent ordering. *Language*, *76*, 28–55.

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

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

Bock, K., & Levelt, W. (1994). Language production: grammatical encoding. In M. Gernsbacher (Ed.), *Handbook of psycholinguistics* (pp. 945–984). New York: Academic Press.

Dryer, M. (1980). The positional tendencies of sentential noun phrases in Universal Grammar. *The Canadian Journal of Linguistics*, *25*, 123–195.

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

Garrett, M. (1980). Levels of processing in sentence production. In B. Butterworth (Ed.), *Language production* (Vol. 1, pp. 177–220). New York: Academic Press.

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

Kiss, K. (1981). Structural relations in Hungarian, a 'free' word order language. *Linguistic Inquiry*, *12*, 185–213.

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

Osgood, C., & Bock, K. (1977). Salience and sentencing: some production principles. In S. Rosenberg (Ed.), *Sentence production: developments in research and theory* (pp. 89–140). Hillsdale, NJ: Lawrence Erlbaum.

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

Yamashita, H. (in press). Scrambled sentences in Japanese: linguistic properties and motivations for production. *TEXT*.