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On the Lexico-Semantic Hypothesis for Learnability Theory

Keiko Murasugi

1. Introduction

The overgeneration issues, in particular, the issues related to retreatment from overgeneration, have received much attention in recent years in the study of language acquisition. One hypothesis is that the overgeneration patterns, traditionally taken as strong evidence for the application of linguistic rules, can be simulated by the network using a learning mechanism that does not resort to procedural rules. A pioneering work using the neural network modeling is found in Rumelhart and McClelland's (1986) simulation of the acquisition of English past tense forms.

Directly opposed to this is the generative approach to the subject, which crucially assumes the role of Universal Grammar. Randall (1987), for example, discusses an overgeneration phenomenon in argument alternation, and argues that "the Order Principle," which is proposed to the UG Principles in Randall (1987), plays a crucial role for the children to attain the proper argument alternations in the target grammar. Murasugi (1991, 1992) discusses an overgeneration phenomenon in Japanese, and argues that a particular syntactic principle, i.e., the Empty Category Principle (ECP), functions as the trigger for retreatment from the overgeneration.

Pinker (1989), who also crucially assumes Universal Grammar,

discusses a case of overgeneration from a lexico-semantic perspective. He investigates the semantic constraints on argument alternations in detail, and proposes a detailed lexico-semantic theory of argument structure. With this theory, he attempts to account for the actual acquisition process, and thereby support the learnability model based on semantic bootstrapping hypothesis.

The purpose of this paper is to review Pinker (1989) (henceforth P), and to clarify the issues addressed in this book. I will first discuss the major learnability problem associated with argument alternation, and P's basic approach to it. I will then discuss the main features of P's specific analysis and conclusions, pointing out some potential problems and alternative possibilities.

2. Pinker's (1989) Lexico-Semantic Hypothesis and Baker's Paradox

A serious learnability problem with argument alternation is discussed in detail in Baker (1979). One of P's main goals is to provide a solution to this 'learnability paradox.' P is concerned primarily with the four argument alternations illustrated below.

(1) Dative Alternation:

- a. Martha gave the book to Fred.
- b. Martha gave Fred the book.

(2) Locative Alternation:

- a. The farmers loaded the hay into the truck.
- b. The farmers loaded the truck with the hay.

(3) Causative Alternation:

- a. The ice melted.
- b. Fred melted the ice.

(4) Passive Alternation:

- a. The doctor examined the patient.
- b. The patient was examined (by the doctor).

Let us take the example in (1). This example indicates that the two internal arguments of the verb *give* can be realized syntactically in two different ways. The classical analysis for this alternation assumes that (1a) represents the base-generated structure, and that (1b) is derived by a movement operation called dative shift. However, as is well known, this analysis faces a problem, since dative shift lacks the generality expected of a transformational rule. More specifically, dative alternation seems quite idiosyncratic: it is observed with verbs like *give*, but not with other semantically similar verbs like *donate* as shown in (5).

(5) a. John donated his writings to the library.

- b. *John donated the library his writings.

Then, why is it that the *give* type verbs allow the dative alternation, whereas the *donate* type verbs do not? In the history of generative grammar, various hypotheses from many different perspectives have been proposed to answer this question. A 'strict lexical conservative' approach (the term due to P) is taken by Baker (1979), a syntactic approach by Randall (1987) and Larson (1988), among others, and a semantic approach by Langacker (1987), Jackendoff (1987), and also by P himself.

This question has received much attention from acquisitionists, as it poses interesting learnability problem: how and why do children attain the adult grammar with knowledge of such complex alternation properties on the basis of primary linguistic data, which seem clearly insufficient in quantity and quality? This learnability prob-

lated to semantic compositionality, in terms of his Linking Rule. This rule assigns grammatical relations to the particular semantic arguments.

P's lexico-semantic analysis for argument alternation is based on two kinds of rules: (a) broad-range rules, which provide the basic, necessary conditions for the alternations, and (b) narrow-range rules, which specify additional properties required of individual lexical items. I will discuss these rules in some detail in the following section.

3. Lexico-semantic Acquisition Model for Argument Alternation

Let us take the example of dative alternation in (1), repeated below in (8), to illustrate P's lexico-semantic acquisition model for argument alternations.

- (8) Dative Alternation:
 a. Martha gave the book to Fred.
 b. Martha gave Fred the book.

P proposes that the relation between (8a) and (8b) is to be directly captured by the following semantic relation:

- (9) $x \text{ causes } Y \text{ to go to } Z \longleftrightarrow X \text{ causes } Z \text{ to have } Y$

(9) is the broad-range rule specifying the necessary condition for dative alternation: a verb that shows this alternation must allow two semantic representations corresponding to the two forms in (9). The typical 'dative verbs' in (10) all satisfy this condition.

- (10) give, pass, hand, sell, pay, trade, lend, serve, feed

The Linking Rule applies to the two predicate-argument structures of the verb and yields two distinct semantic specifications. In the case of *give*, then, the following syntactic relation is indirectly established.

- (11) $[\text{_____NP1 [to NP2]}] \longleftrightarrow [\text{_____NP2 NP1}]$

The broad-range rule in (9) straightforwardly accounts for the absence of the alternation with *drive*.

- (12) a. David drove the car to Chicago
 b. *David drove Chicago the car

The double-object form is impossible since *drive* is incompatible with 'X causes Z to have Y,' which expresses causation of a possessor change. P argues that the account for alternations in terms of broad-range rules has further advantages. Note that according to this account, the two alternate forms need not have precisely the same meaning. And this is a desirable feature as shown clearly by the example of locative alternation in (2), repeated below.

- (13) a. The farmers loaded the hay into the truck
 b. The farmers loaded the truck with hay

The first sentence can be true even when the truck is partly empty, but the second implies that the truck is full with hay. The similarity in meaning can also be straightforwardly captured by the broad-range rule. In addition, since two predicate argument structures are assumed for the verbs showing alternation, the Linking Rule automatically accounts for the two distinct syntactic forms. For example, the affected entity of causation in (9) is mapped to the first object in (11).

A broad-range rule, as noted above, specifies only a necessary condition for alternations. Thus, there are verbs that satisfy (9), and yet, do not allow the double-object form. For example:

- (14) a. David pushed the suitcase to Diane.
b. *David pushed Diane the suitcase.

As the verb *push* is compatible with the 'change of possession,' it seems necessary to postulate more specific rules to predict which verbs actually can take double-objects. P calls those specific rules narrow-range rules. For instance, discussing examples such as (14), P proposes that verbs of 'instantaneous imparting of force' exhibit dative alternation, but those of 'continuous imparting of force' do not. Then, the broad-range rule specifies which verbs can undergo the alternation, but it is the narrow-range rules that specify which verbs actually do. P argues that this is the case not only for dative alternation, but also for locative and causative alternations as well.

Here, as the narrow-range rules actually predict the alternation possibilities, it may be questioned whether the broad-range rules are justified at all (or more precisely, whether it is necessary to postulate two kinds of rules, narrow-range and broad-range). P argues for the psychological reality of these two distinct types of rules on the basis of his acquisition studies.

He first argues that two types of 'overgeneralization errors' are observed in the course of the acquisition of argument alternations. He states his conclusion as follows (his (7. 3), p. 292):

- (15) Children's overgeneralization errors are due either to the application of broad-range lexical rules or to systematic misconceptions about the meanings of particular verbs.

Examples of the former type of errors are listed in P's Ch. 1 (1. 16)

and also in Ch. 7. Some of them are shown below.

- (16) Adam (4;1): I gon' put me all these rubber bands on.
Adam (4;11): You finished me lots of rings.
Adam (5;2): Mommy, fix me my tiger.

According to this type of errors is due to 'one-shot innovation,' and is observed in a wide range of ages in children's production. As this type of errors is observed only with verbs that satisfy the broad-range rules, P takes them as evidence for the psychological reality of those rules.

The second type of errors is due to 'childhood lexico-semantic malapropism,' the assignments of incorrect semantic representations to the stems in ways that cause incorrect argument structures to be paired with them. Evidence for this type of errors from children between the ages of three and seven is documented in Menyuk (1969):

- (17) a. They'll close him in jail.
b. I want to say in microphone.
c. He does instruments.
d. She has to make a lot of work.

P (p. 331) presents examples such as the following as the same kind of errors:

- (18) *put* for *give*
C (3;3): You put me just bread and butter.
E (2;2): I go put it to Christy.

- (19) *give* for *put*
E (2;7): Give some ice in here, Mommy.

In the first example in (18), C is clearly using *put* with the meaning of *give*. Given these two types of 'overgeneralization errors,' P formulates the learnability questions as follows: (a) how do children unlearn the overgeneralization errors that are due to the application of broad-range lexical rules, and (b) how do children attain the correct interpretations of verbs?

P's answer for the first question is both surprising and simple. He points out that the errors of the first type (the one-shot innovations due to the application of broad-range rules) are observed in adult production as well. P calls the innovative productions by adults 'Haigspeak,' after the former presidential Chief of Staff, who is 'credited for' expressions like "Let me caveat that," "That statement needs to be nuanced." The queer parallelism of the errors between the children and adults leads P to conclude that there is no specific unlearning mechanism in this case.

Addressing the second question, P goes into the discussion of a possible learning process for the semantics of verbs. In his view, the source of the syntactic errors disappears as an automatic consequence of the fine-tuning of the verbs' semantic representations. Children are equipped with all the apparatus for lexical rules, and the main developmental process is the acquisition of more and more accurate meanings for more and more verbs (P's 'Minimalist hypothesis').

4. Problems and Alternative Possibilities

In this section, I will discuss some issues related to P's lexico-semantic theory and pinpoint some problems for future research.

As discussed above, P's lexico-semantic theory is based on two kinds of rules, broad-range rules and narrow-range rules. Both of them are lexical rules referring to semantic properties. P summa-

rizes their relation as follows (p. 152):

..., the broad-range rules determine what all the narrow-range rules, for example, involve the double-object construction with the possessor as first object, not a family of different constructions with various combinations of prepositions or various assignments of roles to surface functions.

First, as these rules are semantic in nature, the familiar problem concerning semantic representations arises here: what are the primitives of semantic representations? This epistemological problem is of course shared by many (see for example, Jackendoff (1983, 1987), Hale and Keyser (1992)), but to the extent that P's analysis is quite detailed, it arises in a very sharp form.

Secondly, as pointed out in Baker (1992), a question can still be raised regarding the status of broad-range rules. The chief evidence for their existence, as noted above, is the overgeneralization phenomenon observed with both children and adults. However, it seems possible to interpret the phenomenon only in relation to the narrow-range rules. Here, it is quite plausible that what is overgeneralized is the application of narrow-range rules. Suppose, then, that those rules are acquired and formulated in such a way that overgeneralization cannot exceed the boundaries specified by the broad-range rules. This will be quite consistent with the data, and still, does not necessarily provide the wide-range rules with psychological reality. After all, as Baker (1992) notes, the acquisition of narrow-range rules, it seems, is based on generalization on primary data. Thus, more research seems to be needed to find out whether P's broad-range rules are truly motivated or not.

The final question that I would like to raise is concerned with the relation between P's theory and syntax. P of course proposes answers which are radically different from Baker's (1979) on the

fundamental source of the alternation, and also on the acquisition/learnability issues. However, he, like Baker, explains the syntactic aspect of the alternations in terms of subcategorization frames. Thus, *send/give* differ from *say/report* in their subcategorization properties as shown in (20).

- (20) a. *send/give* [____ NP to NP], [____ NP NP]
 b. *say/report* [____ NP to NP]

In this sense, what P proposes is a semantic explanation for the subcategorization properties of the relevant verbs, which Baker assumed to be basic in their own right.

Although P raises objections to Baker's 'lexical conservatism' and Larson's (1988) syntactic analysis in a parallel way, his relations to these two theories are quite different. P shares Baker's syntax, as noted above, but not Larson's, which derives the double-object construction syntactically.

As briefly discussed in Section 2, P objects to Larson's theory mainly on the grounds of learnability. According to Larson, *give* (but not *donate*, for example) can assign the appropriate theta-role to the goal argument without the preposition *to*. This distinction, P states, is simply unlearnable given the similarities between the two verbs. Here, let us briefly reexamine Larson's (1988) analysis of double object construction, and see if P's criticism is really convincing.

Larson's analysis can be considered the 'modern form of dative shift' in the sense that the prepositional dative construction and the double object construction are related transformationally. According to this analysis, prepositional dative examples such as *John gave the book to Martha* involve an underlying VP-shell as illustrated in (21a).

- (21) a. [_{IP} e [_{I'} I [_{VP} John [_{V'} e [_{VP} the book [_{V'} gave to Martha]]]]]]
 b. [_{IP} John_i [_{I'} I [_{VP} t_i [_{V'} gave_k [_{VP} the book [_{V'} t_k to Martha]]]]]]]

The subject *John* raises to the IP Spec position to receive Nominative Case, and the verb *give* moves to the higher V position and assigns Case to the NP *the book*, as shown in (21b).

Here, Larson hypothesizes that the preposition *to* is semantically redundant with dative-shifting verbs such as *give*. The dative-shifting verbs, according to him, are those that assign the theta-role Goal in a way that subsumes the theta-role assigned by *to*. This implies that the only role that *to* plays in (21b) is to assign Case to *Martha*. Thus, if this NP can be assigned Case in some other way, then *to* will be totally redundant. And Larson argues that there is in fact an alternative way for this NP to receive Case. More specifically, he argues that this alternative way is made possible by Argument Demotion, which he states as in (22).

(22) Argument Demotion

If alpha is a theta-role assigned by Xⁱ, then alpha may be assigned (up to optionality) to an adjunct of Xⁱ.

(22) allows *the book* in (21) to occur in an adjunct position as in (23).

- (23) [_{IP} John_i [_{I'} I [_{VP} t_i [_{V'} gave_k [_{VP} e [_{V'} [_{V'} t_k Martha] [_{NP} the book]]]]]]]

Then, *Martha* can move to the lower VP Spec and receive Case from *give*. Thus, the double object construction is derived. Dative shift, according to Larson, is exactly like Passive, but applies in the lower VP in a VP-shell structure.

Then why is it that dative shift does not apply with verbs such as *donate* and *push*? Larson's answer is that the preposition *to* is not semantically redundant with these verbs. Hence, *to* must appear in the structure and only the prepositional dative construction is possible.

As noted above, P argues against Larson's analysis on the basis of learnability: given the lack of negative evidence and the semantic similarity between two 'arbitrary' verbs such as *give* and *push*, it is not clear at all how children can find out their difference in the mechanism of theta-role assignment. However, it should be noted here that what P tried to achieve with his narrow-range rules is exactly to pinpoint the semantic difference between such pairs of verbs.

Recall P's analysis discussed in Section 3. According to P, the broad-range rule specifies the necessary condition for the verbs to undergo the alternation, and it is the narrow-range rules that specify which verbs actually do. (25) represents the case where the broad-range rule, but not the narrow-range rule, is satisfied.

(24) a. Martha gave the book to Fread.

b. Martha gave Fred the book.

(25) a. David pushed the suitcase to Diane.

b. *David pushed Diane the suitcase.

More specifically, *push* does not satisfy the narrow-range rule for dative alternation that requires that the verb express 'instantaneous imparting of force.'

P's analysis, then, implies that there is a crucial semantic difference between *give* and *push*, and this difference is learnable; otherwise, P's theory does not make sense. But if this is true, it is not at all clear that his criticism of Larson's analysis is convincing.

In fact, it seems possible to incorporate P's insight directly into Larson's analysis: a verb can assign the theta role Goal in a way that subsumes the theta-role assigned by *to* only if it expresses an 'instantaneous imparting of force.' And more generally, if narrow-range rules are learnable on the basis of primary linguistic data, then it is not obvious why Larson's distinction is not.

P's and Larson's syntactic analysis of course make a number of different theoretical/empirical claims. For example, they assume different versions of X-bar theory, and different ways to map the semantic predicate argument structures to syntactic structures. Thus, they clearly represent competing theories of argument alternations. But as argued above, it is not obvious that they can be distinguished straightforwardly on the basis of learnability considerations. The same, I believe, is true with respect to other proposed syntactic analysis of dative alternation, e.g., the theory proposed in Kayne (1981).

5. Concluding Remarks

In this paper, I reviewed the lexico-semantic learnability hypothesis proposed in Pinker (1989). Discussing the related issues, I pointed out some potential problems, and suggested possible alternative conclusions. In particular, I raised questions as to whether the broad-range/narrow-range distinction is well motivated. And more importantly, I argued that contrary to P, the alternative cannot be straightforwardly distinguished on the basis of learnability considerations. At present, there appears to be no strong reason to believe that P's insights cannot be incorporated into, for example, Larson's syntactic analysis. It seems then that the acquisition/learnability problem must be investigated further if it is to have any clear bearing on the actual analysis of argument alternation.

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