

## Children use canonical sentence schemas: A crosslinguistic study of word order and inflections

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"We speak ... by certain well-practiced schemes,—sentence-skeletons that require but the variation of a few words from utterance to utterance."

Leonard Bloomfield  
*The Study of Language*  
(New York: Henry Holt,  
1914, p. 190)

### Abstract

We propose that children construct a canonical sentence schema as a preliminary organizing structure for language behavior. The canonical sentence embodies the typical features of complete clauses in the input language, and serves as a framework for the application of productive and perceptual strategies. The canonical sentence schema offers a functional explanation of word-order and inflectional strategies based on the child's attempts to quickly master basic communication skills in his or her language. The present research explores sensitivity to the canonical sentence form and to word-order and inflectional perceptual strategies for comprehending simple transitive sentences in monolingual children aged 2;0 to 4;4 in four languages: English (ordered, uninflectional), Italian (weakly ordered, weakly inflectional), Serbo-Croatian (weakly ordered, inflectional), Turkish (minimally ordered, inflectional). The results show that children fail to respond systematically to sequences that violate the canonical sentence form of their particular language. They develop distinct word-order and inflectional strategies appropriate to the regularities of their language. The early behavioral emergence

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*of linguistically appropriate canonical sentences and processing strategies suggests a behavioral foundation for linguistic constraints on the surface form of sentences.*

Languages make use of devices of word order, inflection, and prosody to identify and relate entities in sentences and to orient sentences to the flow of discourse. Particular languages rely more heavily on one or another device to perform various syntactic and pragmatic functions. It is the task of the learner to identify formal linguistic devices and the range of form-function mappings in the input language. For example, a child acquiring English must eventually take note of the fact that the position of a noun in relation to a verb is often crucial for determining the semantic role of that noun in a sentence, but that simple order relations between nouns and verbs are not a guide to figuring out the communicative 'point' of an utterance. Issues of topic, focus, surprise, and the like, are signalled in other ways, requiring attention to the interaction of word order with factors such as syntactic variation, characteristics of the verb phrase, and prosody. A child acquiring Turkish, by contrast, must come to quite different conclusions, since suffixes on nominal inflections indicate semantic roles of nouns, while simple variations in word order perform pragmatic functions without altering the roles of the nouns in relation to the verb.

How do children determine the semantic and pragmatic functions of basic linguistic devices? In the course of everyday communication, word order, inflection, and prosody are presented in complex interaction; furthermore, much of comprehension is guided by nonlinguistic factors of context and world knowledge. Yet, sooner or later, we expect the English-speaking child and the Turkish-speaking child—for example—to have come to opposite conclusions about the role of word order in their respective languages. Such linguistic inductions could be facilitated by two types of factors: (1) attention to 'privileged' sentence forms, and (2) extraction of 'privileged' features from those forms.

The child may be sensitive to particular sentence types as diagnostic, or critical for the typological characterization of the language. In ascribing such inductive capacity to the child, we assume an ability to identify *canonical* forms in the language. Such forms are lowest in terms of what Givón has called 'discourse presuppositionality' (1979, p. 49). In uttering such canonical sentences, the speaker makes minimal assumptions about the background knowledge of the listener. The neutral sentence type which transmits new information is the simple active affirmative declarative. In regard to transitive sentences—the focus of our study—such forms tend to have

definite, human agents which function as discourse topics; finite active verbs; and item arrangements exhibiting the basic word order of the language—for example, SVO in English and SOV in Turkish. To the extent that children receive and orient to such sentences, they are provided with linguistic models which most clearly reveal basic schemas of syntactic organization in the language. Canonical forms are not the most frequent, since input contains a high proportion of questions, imperatives, fragments, and focused forms. And even among declaratives, canonical forms are not always in the majority—for example, although SVO sentences predominate in English, in Turkish only 48% of simple sentences are in canonical SOV order in our sample of adult speech to preschool children. What is important is that they require the least processing of implicit discourse presuppositions in addition to the basic semantic content of the sentence. We do not have data on children's processing of canonical sentence forms in natural discourse, but our experimental results suggest that children extract schemas of canonical sentences and use such schemas to guide comprehension.

In developing a schema for the canonical sentence type, the child may be predisposed to orient to particular linguistic features. For example, earlier work on English development focused on sensitivity to word-order regularities, especially the agent-first and SVO order of English. The simplest canonical sentence schema for an English-speaking child to arrive at would be one based on word order. And, indeed, in an extensive series of studies of sentence comprehension in English (beginning with Fraser, Bellugi, and Brown in 1963; summarized recently in Bridges, 1980) it has been repeatedly demonstrated that children extract the basic SVO order of that language. Clear evidence comes from a common developmental phase, sometime in the fourth year, in which the noun-verb-noun sequence of passive sentences is interpreted as SVO rather than the appropriate OVS (e.g., Bever, 1970a, b; Maratsos, 1974). On the basis of such work, Bever (1970a, b) proposed a basic inductive capacity to form perceptual strategies which assign syntactic functions according to sequential arrangements of words. Applied to English, such a capacity would result in a language-specific processing strategy: "Any *Noun-Verb-Noun* (NVN) sequence within a potential internal unit in the surface structure corresponds to '*actor-action-object*'" (Bever, 1970a, p. 298).

However, an acquisitional model based on a predisposition for canonical word-order strategies encounters two basic difficulties: (1) How does the child determine the functions of other devices, besides word order, in languages like English? (2) How does the child acquire languages which use variable word order?

The first question can be generalized to the problem of discovering means

for *contravening* canonical strategies. In order for English-speaking children to come to understand passive sentences, they must eventually note that the SVO schema can be contravened by a participial form of the verb and a *by*-phrase on the following noun. Other linguistic devices, however, such as contrastive stress, need not contravene the SVO schema. Orientation to canonical forms alone cannot lead the child to discover the range of functions performed by the particular constellation of word order, inflection, and prosody expressed in the neutral form. Such facts can only be discovered by noting what is constant and what is variable in comparisons of canonical and non-canonical forms. That is to say, the child must record what linguistic features remain constant in sentences across the range of presuppositional variants. In our research we seek to clarify the role played by attention to features of canonical sentence forms, asking whether children may be initially more predisposed to attend to some features (e.g., word order) than others, and, further, attempting to reveal developmental patterns of attention to factors which can contravene strategies based on canonical sentence forms in several languages. Our conclusion is that a schema formed on the basis of the canonical sentence form is the point of departure for the construction of a series of related schemas for sentence types which are non-canonical.

As regards the second problem noted above—that of crosslinguistic differences—an SVO schema is useful to the child learning English, where this order is so prevalent. But what of languages with greater freedom of word order? For example, the inductive process proposed above when applied to Turkish input would result in an early strategy to interpret any NNV sequence as SOV (provided that strategies are induced only on the basis of neutral sentence forms). If word-order strategies are basic, all languages should initially be approached as fixed word-order languages. Indeed, Slobin (1966) made such a suggestion on the basis of an early phase in one child's acquisition of Russian (Gvozdev, 1949), in which fixed word order was used although the input language exhibits a range of word orders. Along with many psycholinguists in the late sixties and early seventies, it seemed to us that the use of word order as a basic syntactic device had a special primacy. Observation of various kinds of inflectional and variable word-order languages, however (including Turkish and Serbo-Croatian, studied here), has shown that two-year-olds can also orient to case inflections in organizing beginning grammars (e.g., Slobin, 1973, 1982). The primacy assigned to word order as a language acquisition principle was unduly influenced by the study of languages like English.

Our research aim is to identify characteristics of simple sentences which children orient to in developing sentence processing strategies in different

types of languages. Specifically, we compare the roles of word order and inflection in the comprehension of transitive sentences with animate agents and patients. Accordingly, we selected four languages which vary in regard to the use of word order and inflections to signal agent-patient relations. Two of the languages, Serbo-Croatian and Turkish, are inflectional and therefore allow all six word orders of subject, verb, and object (SVO, OVS, SOV, OSV, VSO, VOS). These languages differ in that the inflections in Turkish are always regular and explicit, while in Serbo-Croatian there are several declensions, as well as forms that do not differentiate phonetically between subject and object. The other two languages, English and Italian, are non-inflectional, and therefore do not have formal marking systems that allow variation in word order. However, Italian shows considerably more flexible word order in usage than English, relying on prosodic and contextual cues to disambiguate re-ordered sentences. In the process of our work we come to the conclusion that children in the third and fourth year of life arrive at a basic understanding of the major means used in their language for signaling syntactic relations —at least in the transitive sentence types we have investigated—along with some grasp that deviations from canonical patterns can be interpreted in consistent ways. We also conclude that some types of sentence interpretation strategies are more accessible to the very young child than others—but that is getting ahead of our story. To begin with, we examine statistics of conversational data in the four languages, and then move on to our experimental findings.

### **1. Speech patterns**

Reliance on word order should be shaped by the roles played by word order in the particular language. Accordingly, we present a very general survey of speech production patterns of children and adults in the four languages under study. Little systematic statistical information is available about the relative frequency of subject-first and object-first constructions in English-speaking children and their caregivers. We assume that subject-first forms predominate. One reason is that object-first constructions are relatively rare for adults and involve complex constructions. In addition, the role of word order in guiding comprehension in English (and other languages) must be considered in the light of the structure of early adult-child discourse. The sentences exchanged between preschool children and their caretakers hardly allow for ambiguity as regards the roles of agent and patient in transitive clauses, suggesting that children's sensitivity to word order must be based more on propensities for syntactic analysis than on discourse pressures for semantic interpretation of utterances in context. For example, in an exten-

sive corpus of adult-child discourse, we discovered that almost every utterance involving two nouns and a verb was semantically nonreversible, in that the agent was animate and the patient inanimate. That is, word order is not crucial to the interpretation of such sentences, since only one of the nouns could have been the agent. Furthermore, in most of the examples of reversible sentences (involving two animates), at least one of the participants was pronominalized. Since English maintains case inflections on person pronouns (with the exception of the second person), these structures would not have been indeterminate. In order to determine children's sensitivity to word order *per se*, therefore, it is necessary to present them with controlled stimuli, as we have done in the experiment described below.

Our interest in English, however, was purely for background information. There is little doubt that the vast majority of sentences in adult-child interaction follow SVO order in that language. English is marginally inflectional and therefore does not serve to discriminate among the different theories of the basis for word-order strategies. Italian, as noted above, is more flexible. Bates (1976) presents data on the speech of two children, collected between the ages of 1;5 and 3;9, along with a small sample of adult speech to these two children, as shown in Table 1. It is evident that even though Italian allows for deviations from SVO order, this is still the most frequent in both child and adult speech. (Here we consider only object nouns, since object pronouns precede the verb. Given the pattern of results reported below, we propose that different sentence schemas may be developed for sentences with nominal *versus* pronominal subjects and objects.) Furthermore, ignoring verb position, 82% of child utterances and 95% of adult utterances follow subject-object order.

In order to gain more discriminative data on the basis of word-order strategies, we collected conversation samples from children and their caretakers in Serbo-Croatian and Turkish, recorded in their native country as part of a larger study. Table 2 presents summary data from this sample, categorizing child and adult utterances according to order of subject, verb, and object. Consider first the Serbo-Croatian data. As in Italian (and English), the children's and adults' patterns are very similar: the NVN pattern is most frequent, and the first noun is almost always the subject. At first this result might seem to support the notion of a developmental priority of word order: Serbo-Croatian is highly inflectional and allows all possible word orders, yet children place the subject in initial position, even more often than adults do. This would seem to show that even in a language that does not require word order for communication clarity, children tend to impose order in their speech.

Serbo-Croatian, however, is only imperfectly inflectional, which leaves

**Table 1.** *Percentages of occurrence of orders of subject, verb, and object in Italian speech<sup>a</sup>*

Word order	Claudia (1;5–2;9)	Francesco (1;9–3;9)	Adult input
SVO	74	70	82
OVS	7	9	5
SOV	1	1	2
OSV	1	1	0
VSO	12	10	11
VOS	5	13	0

<sup>a</sup>Figures from Bates (1976, Tables 7–9, pp. 188–190), rounded to nearest whole percentage.

**Table 2.** *Percentages of occurrence of word-order types in Serbo-Croatian and Turkish speech*

	Serbo-Croatian <sup>a</sup>		Turkish <sup>b</sup>	
	Children	Adults	Children	Adults
NVN	73	57	37	38
(percentage of NVNs that are SVO)	(99)	(97)	(46)	(66)
NNV	12	24	53	56
(percentage of NNVs that are SOV)	(83)	(67)	(87)	(86)
VNN	14	19	10	6
(percentage of VNNs that are VSO)	(79)	(84)	(100)	(100)
Total N <sub>1</sub> = Subject	94	87	73	78

<sup>a</sup>Based on a sample of 48 children between the ages of 2;0 and 4;8.

<sup>b</sup>Based on a sample of 14 children between the ages of 2;3 and 3;8.

such an interpretation ambiguous. There are three major noun declensions: masculine, feminine, and neuter. In some instances the subject and object case are differentiated phonetically, but in others the inflectional suffixes are identical. This means that some sentences in Serbo-Croatian do not indicate by phonetic inflection which noun is the subject and which the object. Speakers must make use of some convention to deal with those cases, and the convention is to follow SVO order in inflectionally ambiguous sentences. Since at least some of our data were uniquely phonetically inflected, it is striking that the tendency for the first noun to be the subject is so strong, even when it is often not required. This suggests that if required at all, an order schema is overgeneralized in speech.

What if an order schema is never required by a grammatical sentence in a particular language? Will it be used anyway? Turkish approaches being such a language: the object noun is uniformly marked by the addition of a unique suffix. The only exception is an indefinite object noun, which is uninflected. This exception, however, is marginally relevant to the language-learning child. The only situation in which it would lead to ambiguity would be a clause with a reversible verb and an indefinite subject and object (e.g., 'a boy kissed a girl'). In one sample of 500 adult utterances to a child of 3;2 we found no such clauses, and it is unlikely that they would be very frequent in everyday discourse.

Table 2 presents summary data for adult and child conversations in Turkish, collected and categorized in the same way as in the case of Serbo-Croatian. Several features are striking. First, the relative frequencies of NNV (most frequent), NVN (intermediate), and VNN are nearly identical for adults and children. Second, in one sentence order, NVN, the children show a smaller tendency to place the subject before the object than do the adults: While adults place the first noun as subject in 2/3 of the NVN constructions, this is true of less than half of the corresponding utterances by children. Clearly the presence of reliable inflections goes with greater flexibility of word order. Nevertheless, even in Turkish we did find overall the usually reported tendency for the subject to precede the object. However, given the fact that our speech statistics come from conversations, it is not possible to pull apart the various factors which may contribute to this tendency. Subjects may precede objects because they are cognitively salient human actors (an argument based on conceptual 'naturalness' such as that proposed by Osgood [Osgood and Bock, 1977; Osgood and Tanz, 1977]). On the other hand, subjects may precede objects because subjects are most likely to be topics, an argument based on discourse function such as that proposed by Givón [1979]). Further, these two tendencies interact in that agents tend to be topics. Issues of the priority of subjects in our speech data can only be resolved by detailed textual analysis. This we have not done. Rather, having established a range in word-order variability across our four languages, we go on to compare children across languages in an experimental task.

The situation is one in which we control the speech input and observe the subject's response to nouns in different positions. The goal is to distinguish the languages in which a child relies on word order to identify agent and patient from those in which s/he does not—if such there be. The following experiment on sequence comprehension in children in four different languages addresses this question directly. The task required children to act out simple transitive sentences with no contextual support, thus forcing them to rely only on linguistic cues to agent-patient differentiation. Such tasks have

been criticized for ignoring children's real-life capacities to make use of many types of information in understanding speech (e.g., Bridges, 1980; Chapman, 1978). Clearly, such tasks do not establish the normal age at which particular sentence types can be understood in natural settings, nor do they presume to model natural speech comprehension in its everyday richness. Rather, by putting a child in a stringent task, one hopes to reveal the linguistic capacity when pushed to its limit. Some researchers have questioned whether it is indeed linguistic capacity which we are tapping in such settings (e.g., Karmiloff-Smith, 1979). However, in the present study we have an additional independent variable of crucial significance: the differences between English, Italian, Serbo-Croatian, and Turkish. All of our children have been put in the same communicatively unnatural setting. To the extent that their performance varies systematically on the basis of definable characteristics of the particular language that they are acquiring, we can be satisfied that the experimental task is not merely a device to elicit *ad hoc* strategies from confused children. With this anticipation of the questions of some methodologically concerned readers, we turn to the crosslinguistic sentence comprehension experiment and its results.

## 2. Method of experiment

### 2.1. Subjects

Subjects were all monolingual children of professional parents, residing in Berkeley, Rome, Dubrovnik, Istanbul, or Ankara. For each language, the design provided for the testing of 48 children (three boys and three girls in each of eight age groups: 2;0, 2;4, 2;8, 3;0, 3;4, 3;8, 4;0, 4;4). Due to various vicissitudes of field research, the actual numbers of children tested were: English, 48; Italian, 44; Serbo-Croatian, 38; and Turkish, 37.

### 2.2. Task

The child was presented with a pair of toy animals or dolls (identical in all field settings) and was asked to demonstrate an action of one object upon the other. (See Bever, 1970a, b, for the study on which our technique was modelled.) Each instruction contained two animate nouns and a reversible verb (a verb which could take either noun as agent or patient, e.g., 'The squirrel scratches the dog'). The verb-noun combinations are given in Table A1 in the Appendix. There were 18 verbs and 18 forms of the test, allowing for permutations of word order and case inflections, as described below. Each child received three different forms of the test, administered on differ-

ent days within a ten-day period: the six children of each age group thus received all 18 forms of the test.

In pretraining, the experimenter ascertained the child's ability to name the animals and to demonstrate intransitive verb instructions (e.g., "Here's a camel. Let's think of a little story about him. How about, 'The camel is sleeping.' Can you show me what that would be like?"). In the main task, each sentence was offered three times, in a medium flat intonation at normal speaking rate, with slight emphasis on the verb and equal stress on both nouns (with some exceptions for English and Italian, as described below). The English and Italian sentences were given in the present tense (e.g. *the dog scratches the cat/il cane graffia il gatto*); the Serbo-Croatian sentences were given in the present imperfective tense (e.g., *štene grebe mače* 'dog scratches cat'); and the Turkish sentences were given in the optative mood (e.g., *köpek kedi kaşısın* 'dog cat scratch-let'). Response was scored in terms of the noun chosen as agent. If the child's response, after three presentations, remained unclear, s/he was probed in two ways: (1) the experimenter would act out both possible events, asking the child to choose the appropriate one; (2) the child would be questioned directly (e.g., "Who is touching?"). The data presented here are based only on clearly interpretable responses.

### 2.3. Design

The three possible orders of two nouns and one verb occurred equally often (NVN, NNV, and VNN). The nouns were chosen so as to be either neuter or feminine in Serbo-Croatian, allowing for ambiguous and unambiguous utterances in that language. Nominative and accusative cases are not distinguished morphologically for neuter nouns (zero ending -e in both cases), while the accusative is marked for feminine nouns (nominative -a versus accusative -u). This allowed for: (1) fully ambiguous utterances with two neuter nouns, (2) utterances with clear marking of subject only, using feminine nominative and neuter unmarked forms, and (3) utterances with clear marking of object only, using feminine accusative and neuter unmarked forms. Consistent responses to ambiguous utterances would require use of a word-order strategy (e.g., first noun = agent), whereas consistent responses to utterances with inflectional marking could rely on either word-order rules (resulting in errors on sentences with marked object first or subject second) or inflectional rules (resulting in uniformly correct performance). There were 15 possible sentence types in Serbo-Croatian (N = unmarked neuter -e, S = feminine nominative -a, O = feminine accusative -u, V = verb): NVN, SVN, NVO, NVS, OVN/NNV, SNV, NOV, NSV, ONV/VNN, VSN, VNO, VNS, VON. Each of

the unmarked types occurred twice (NVN, NNV, VNN), resulting in 18 sentence types for each test. Each type was represented by a different constellation of verb and nouns.

Turkish has a uniformly regular and obligatory definite direct object suffix<sup>1</sup>, thus allowing for six unambiguous and grammatical orders: SVO, OVS, SOV, OSV, VSO, VOS. In order to probe for the application of a word-order strategy in the absence of inflectional cues, some sentences were presented with two uninflected nouns, corresponding to the Serbo-Croatian NVN, NNV, and VNN sentences. It should be noted that these sentences are ungrammatical in Turkish (lacking the obligatory case suffix) but grammatical in Serbo-Croatian (since both nouns are neuter).

The paradigms in English and Italian were simpler than the other languages, since there are no inflections. However, in order to keep the overall design constant across the four languages, we introduced the variable of stress in English and Italian, paralleling the position of inflected cases in the Turkish and Serbo-Croatian paradigms. Italian has more flexible word order than English, perhaps because person and number inflections on the verb make it possible to identify subject independent of order information. The ordinary role of stress in Italian is to indicate either new information or a reversal of normal agent-patient order (Bates, 1976; Bates *et al.*, 1982), and therefore it may play some role in children's sentence processing. The noun that was stressed in a given sentence corresponded to the noun which had either subject or object inflection in Serbo-Croatian.

In all four languages, each form of the test consisted of a pseudo-random series containing two examples of each of the nine sentence types: NVN, NNV, VNN, SVO, OVS, SOV, OSV, VSO, and VOS. Each sentence had a different verb, and the order of the 18 verbs was held constant across all forms of the test. The constellations of nouns occurring with each verb were also held constant, while sentence type was systematically varied for each noun-verb-noun combination across test forms. Left-right placement of animals was systematically randomized to prevent position biases of individual children in choice of animal from affecting the overall pattern of results.

### 3. General results

In a small percentage of cases children did not respond to the task with interpretable two-animal interaction. These non-scorable responses included

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<sup>1</sup>The inflectional morpheme is a high vowel which agrees with the preceding stem vowel in fronting and rounding (-i/-ı/-ü/-u). Turkish children master the inflectional system, including vowel harmony, before the age of two (Aksu and Slobin, forthcoming; Ekmekci, 1979; Slobin, 1982).

complete absence of any action performed by an animal, simultaneous action performed by both, or an action performed by only one animal without involving the other animal<sup>2</sup>. Since our primary concern is to compare the effects of sensitivity to word order and inflections, where relevant, these non-scoreable responses were dropped from the data pool. A further justification for not including these non-responses is that they may reflect differences in the extent to which the experimenter insisted on a response from the child, or, even more subtly, the possibility that cultural conventions may require children to do what adults say to a differing extent in our four language communities<sup>3</sup>.

The most striking property of the data overall is that Turkish children perform extremely accurately on all of the grammatical sentences, even at the youngest age. Our first form of analysis was to calculate for each four-month age grouping the percentage correct on all the grammatical forms in each language. This procedure reflected different forms in the different languages; for example *all* the constructions were grammatical in Serbo-Croatian, while only three of the constructions were grammatical in English. The results of this analysis are summarized in Table 3. They clearly demonstrate that at all ages Turkish children understand these simple constructions well, and that the youngest Turks perform better than children learning the other languages. The English and Italian children in the younger ages perform at an intermediate level and the Serbo-Croatian children have the greatest difficulty. The relatively low score of the younger Serbo-Croatian children may be due to the fact that our materials included constructions in which neither of the two nouns is recognizably marked for its grammatical relation. Furthermore, all the grammatical constructions in English and Italian are of the form S...O (subject precedes object). If this construction is universally easy it could artificially inflate those scores compared with those grammatical Serbo-Croatian forms which are in O...S order (OVS, OSV, VOS). To check this possibility we calculated the percentage correct in Serbo-

<sup>2</sup>We had very few instances of the 'child-as-agent' strategy reported by Sinclair and Bronckart (1972), de Villiers and de Villiers (1973b), and others. Perhaps this was because our stimulus items were simple, normal, active sentences, not embedded in a matrix command (as the deVilliers' 'Make the boy hit the girl' and 'Make the boy be hit by the girl'), and not shorn of normal grammatical markers (as the ungrammatical *garçon pousser fille* 'boy push girl' of Sinclair and Bronckart, along with the confusing homophony of the infinitive *pousser* and the polite or plural imperative *poussez*).

<sup>3</sup>It has often been suggested that language development is more rapid in girls than boys. To test for this everyday expectation we performed two ANOVAs on the percentage correct for each child on the standard grammatical forms. In one case, the subject variables were sex, language, and age; in the other analysis the subject variables were sex, language, and mean length of utterance (MLU). In both cases language and age-or-MLU was significant and sex was not. (This is consistent with findings summarized by Macaulay, 1978.)

**Table 3.** *Percentage correct performance on all grammatical sentences<sup>a</sup>*

Age (months)	Language			
	English	Italian	Serbo-Croatian	Turkish
24–28	58	66	61	79
32–36	75	78	58	80
40–44	88	85	69	82
48–52	92	90	79	87

<sup>a</sup>We consider responses of 67% or greater to represent a consistent response tendency in this and the following tables.

Croatian and Turkish only on those constructions that parallel the grammatical forms in English and Italian—namely, SVO in Turkish and SVN, NVO, and NVN in Serbo-Croatian. The results, in Table 4, suggest that the relatively low scores on all Serbo-Croatian forms considered together were due in part to non-comparability across languages. When only these constructions are considered, initial performance in Serbo-Croatian is on a par with English and Italian (though with a subsequent slower growth rate, as discussed below).

The most difficult constructions for the Serbo-Croatian children are those which are inflectionally marked for O...S order. As shown in Table 5, these sentences are responded to at chance levels until the last age group. A comparison with the uniformly good Turkish comprehension of such sentences shows that the problem is not a general one for inflectional languages, but must reside in some special feature of Serbo-Croatian.

Before turning to more detailed analysis, we can offer a preliminary generalization: Turkish presents the child with a unique and morphologically simple inflectional marker which always indicates the object; English and Italian depend entirely on word order for the assignment of semantic

**Table 4.** *Percentage correct performance on SVO sentences*

Age (months)	Language			
	English	Italian	Serbo-Croatian	Turkish
24–28	58	66	67	82
32–36	75	78	64	84
40–44	88	85	79	84
48–52	92	90	82	91

**Table 5.** *Percentage correct performance on OS sentences*

Age (months)	I language	
	Serbo-Croatian	Turkish
24-28	58	77
32-36	54	77
40-44	65	82
48-52	75	88

relations (in the constructions we were using); Serbo-Croatian, however, utilizes both kinds of syntactic cues. To make matters more complex in Serbo-Croatian, sometimes it is the subject that is phonetically marked and sometimes the object; sometimes neither, necessitating the use of an order strategy. These linguistic differences provide an interpretation of the observed comprehension differences. Turkish children need learn only the object morpheme in order to understand the sentences correctly. This morpheme is productive before age two (Aksu and Slobin, forthcoming). English and Italian children have to develop sensitivity to word-order patterns, rather than acquire a single case morpheme. Finally, the Serbo-Croatian children are faced with the double problem of learning both inflectional systems and word-order rules, as well as learning when to rely on each cue, since the two cues lead to opposite interpretations in sentences in which the first noun is the object. Accordingly, the increase in complexity of the linguistic markers for semantic relations is reflected in the ease of their acquisition in the different languages.

We now turn to a more detailed analysis of the results within each language. To facilitate this, we reorganized the data according to each child's mean length of utterance (MLU) rather than chronological age. The reason for doing so was twofold, although, in this study, it turned out that similar results were revealed by both types of grouping. First, previous reports on language acquisition have shown that comparisons across children within the same language are considerably more stable if MLU is used as the parameter rather than age (e.g., Brown, 1973; de Villiers and de Villiers, 1973a). Second, we must factor out the possibility that the different cultural groups stimulate linguistic development at different rates for the age span we were examining (even though our subjects were all being raised in urban, professional homes). Such cross-cultural, rather than cross-linguistic differences could artificially make the development of the speech processing systems appear to be different across the four languages.

Accordingly, to reduce the within-language variability and enhance the meaningfulness of the crosslinguistic comparisons, we set up eight groups of children in each language, in order of increasing MLU. The MLU was calculated on the basis of 100 tape-recorded utterances in free speech interaction with the experimenter<sup>4</sup>. Previous research on MLU has counted the length of each utterance in terms of morphemes. However, this is justifiable only if one has available a general picture of each child's productive capacity. We were not able to carry out such an extensive analysis of each child's competence. In addition, crosslinguistic comparisons of MLU run into unresolvable difficulties as to what should count as a 'morpheme', especially in a language relying heavily on fusional inflectional morphemes, such as Serbo-Croatian. Our decision, therefore, was to count utterance length in terms of words, on the assumption that within each language considered separately, increase in number of words per utterance should bear a more direct relationship to growth in linguistic capacity than simple increase in age. Table 6 presents the summary of MLU for each language and each MLU rank group in each language. Groups were constructed by rank-ordering children by MLU and combining them into groups of roughly equal size. While the languages differ in their mean MLU, the pattern of development in rank and age is similar. This gives further justification for using this measure as the basis for crosslinguistic comparison<sup>5</sup>. (Note that MLU cannot be compared in absolute terms across the four languages because of the differences in morphological complexity *within* each word. The inflectional languages tend to have more morphemes per word.)

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<sup>4</sup>We excluded utterances which were imitations of the experimenter, exact repetitions of any previous utterance, and utterances which were unfinished or partially unintelligible. Such a discourse sample was segmented into surface utterance units roughly representing either simple or complex clauses. The following conventions were followed in segmenting discourse into utterance units: Initial segmentation into utterances was carried out on the basis of intonation contours. Any utterance containing two or more clauses linked by *and*, *or*, *but*, *so*, was counted as having one surface utterance unit per linked clause; utterances containing clauses linked by other conjunctions were not split. In the case of successive utterances conveying the same meaning, only the most complete version was counted. MLU calculation, in words (see text), was carried out on 100 such surface utterance units for each child.

<sup>5</sup>Bates and MacWhinney have recently performed an analysis of variance of our data, grouped into four age groups (summarized in the Appendix). The main findings presented in Section 4, below, are confirmed in that analysis—suggesting that our pattern of results is quite stable across different types of analysis. While our analysis in terms of eight MLU groups allows for a more fine-grained picture, it is encouraging that the main outlines also appear in an ANOVA based on four age groups.

Table 6. *Characteristics of MLU groups in the four languages*

MLU Group	English			Italian			Serbo-Croatian			Turkish		
	N	MLU	Age	N	MLU	Age	N	MLU	Age	N	MLU	Age
1	6	2.1	27	6	2.5	25	5	2.1	25	5	1.9	28
2	6	3.1	27	6	3.8	32	5	2.9	31	5	2.3	30
3	6	4.0	38	6	4.6	41	6	3.1	39	5	2.5	31
4	6	4.5	41	6	4.8	38	5	3.3	45	5	2.7	44
5	7	4.7	37	6	5.1	42	5	3.5	40	5	3.0	42
6	6	5.0	45	5	5.4	43	5	3.8	38	5	3.1	46
7	6	5.2	42	5	5.7	45	4	4.2	44	4	3.3	43
8	5	5.7	49	4	6.2	46	3	4.9	47	3	3.7	48
Total N	48			44			38			37		

#### 4. Specific results

We first consider the two non-inflectional languages as a group—English and Italian, and then the two inflectional languages—Turkish and Serbo-Croatian.

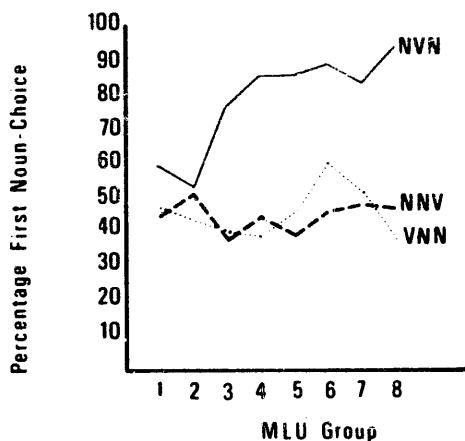
##### 4.1. English

The only striking result in English is an increase in the tendency to take the first noun as the agent averaged over all the NVN sequences. This tendency reaches its peak in the third MLU group, as shown in Figure 1 and Table A2 in the Appendix. Thus the linguistically least mature English-speaking children do not demonstrate a consistent word-order schema under the stringent conditions of our experiment.

Since we did not include passive constructions in our materials we were not able to test for the overgeneralization of the initial-noun-as-agent strategy with grammatical sentences. However, the responses to ungrammatical word orders brought out an interesting property of the sentence processing schema. Children performed randomly<sup>6</sup> at all ages on VNN and NNV sequences. We had expected that the initial-noun strategy would dominate in

<sup>6</sup> 'Random' performance is based on scores averaged across scores of individual children in each MLU group. As Bridges (1980) has recently pointed out, group-based scores may conceal individually consistent patterns. We plan a follow-up analysis of individual response patterns. However, on the basis of partial analysis of individual patterns, we believe that the overall crosslinguistic and developmental patterns revealed in our present analysis will not be disconfirmed by future subject-based analyses.

**Figure 1.** *Percentage of first-noun choices in English in three different word-order types (averaging across stress)*



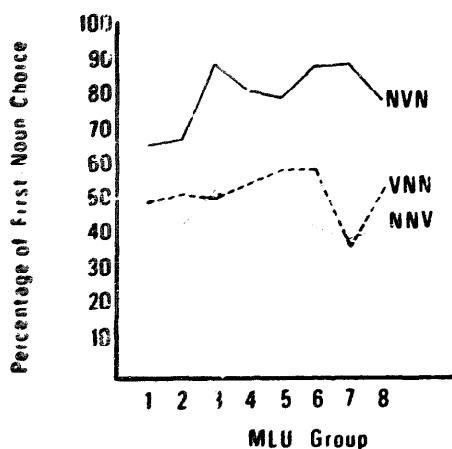
these cases. However, the failure of any pattern to emerge in response to these sequences suggests that they were not susceptible to processing because they do not have the basic configuration of English sentences containing subjects, verbs, and objects. Following our introductory discussion, we suggest that the basic sentence schema for English is verb-medial and that our children were sensitive to this requirement. Utterances apparently have to conform to the basic schema in order for children to attempt to process them systematically (at least at levels of linguistic development studied here). We consider this possibility in our analysis of the other languages below.

#### 4.2. Italian

Consider the grammatical forms first (Nvn). Overall correct performance on these constructions is little better than chance until Group 3, as in English. At this point, the overall mean is better than 90%. This suggests that the sensitivity to word order, the only available cue to semantic relations in these forms, does not emerge clearly until the third MLU level is reached. (See Figure 2 and Table A3 in the Appendix.)

The non-standard forms, Nnv and Vnn, do not show a strong effect of word order at any age. In the Nnv sequences there is a slight sensitivity to word order, taking the first noun as the agent in Group 3 and then a steady decrease to a low point in Group 7. There is a similar pattern in Vnn sequences with one first-noun strategy peak in Group 5 and another in Group 7. These latter phenomena are numerically weak, but worth pointing out in the light of the results in the other languages.

**Figure 2.** *Percentage of first-noun choices in Italian in three different word order types (averaging across stress)*



The other major variable in the Italian materials was the position of nominal stress. This had a consistent effect overall as a cue to the agent (see Table A3 in the Appendix). Even at the youngest age, when the other grammatical sentence forms are near chance, the NVN form with initial noun stress is performed better than chance. The developmental pattern of the stress effect is roughly the same in both the standard and non-standard forms. An interesting and consistent feature is that for every word-order form, stress as a signal to the agent is at its greatest in Group 2 and is at its weakest in Group 7. (That is, in comparing stressed with unstressed versions of the same order type, the overall effect of stress to relatively favor choice of stressed noun as agent is greatest in Group 2 and lowest in Group 7. In fact, the role of stress appears to be reversed in the older group—consistently for NVN, NNV, and VNN—suggesting the effect of stress in the more advanced child becomes a cue to the object, rather than the subject.) Bates *et al.* (1982) have noted that in adult speech in Italian, abnormal noun stress is often a cue to object fronting. Our older children may be demonstrating a sensitivity to stress as an element in sentence schemas that can contravene interpretation based on the basic or canonical schema.

#### *4.3. Comparison of English and Italian*

English and Italian are most directly comparable since they share the property of having only the NVN constructions as standard. Developments in the two languages are similar in regard to word order: both show a strong tendency to take the first noun as the agent by Group 3. The languages differ in their response to stress. In Italian there is a tendency to take the

stressed noun overall as the agent, and a general shift with increasing MLU towards the opposite strategy. In contrast, English shows no regular sensitivity to stress, or even a slight reversal of the Italian pattern. A possible reason for this difference between Italian and English is that the role of stress in Italian in carrying syntactical functions is broader than in English. That is, in English the import of stress is almost always only to disambiguate contrastively, with no change in word order, while in Italian stress can be used to mark non-standard orders. Compare, for example, the English SVO with contrastive stress on the object, *Franco recommended the LASAGNA* (and not the spaghetti), with the Italian colloquially normal VOS, *Ha consigliato la LASAGNA Franco* (Bates *et al.*, 1982). In Italian stress is also a regular concomitant of such changes as the affirmative into a question form. Thus, the Italian child can functionally attribute syntactic roles to stress, as noted above.

The languages also differ in the availability of non-standard orders. In English the NNV and VNN constructions do not exist on normal declarative sentences of any kind, and would appear to be marginal colloquial variants in the California English of our sample. Where non-standard orders do occur, they are syntactically marked. VNN occurs in imperatives (*Give the dog a bone*) and question (*Is Harry a dog? Has Harry a bone?*) and NNV constructions do not exist at all. In Italian, NNV and VNN constructions *can* occur with agent and object nouns, but require contrastive stress as well (Bates, 1976, pp. 182–183). VNN appears to have greater applicability than NNV as a non-standard pattern (excluding sentences with object clitic pronouns, which are fixed in pre-verbal position). That is, Italian has the following ordering of possible declarative sentence forms with an agent and an object noun: NVN > VNN > NNV; while English has only NVN. This is reflected in the fact that word-order strategies appear only in NVN forms in English, whereas in Italian, both the stress and order strategies appear most strongly in NVN, then VNN, then NNV (see Table 7). Thus children not only identify the canonical sentence pattern in forming schemas for speech processing, but they also come to categorize sentence patterns in terms of degree of deviation from the basic schema. Italian-speaking children include in their basic transitive sentence schema the possibility that VNN and, to a lesser extent, NNV orders are susceptible to interpretation, and that nominal stress may be significant in guiding interpretation.

Our findings have suggestive parallels with a recent study of English and Italian sentence processing by adults. Bates *et al.* (1982), in similar tasks, found greater reliance on word order in English speakers, as compared with Italians, and greater reliance on stress information by Italians. Adult English speakers showed some tendency to apply word-order strategies to those non-

**Table 7.** *Percentages of noun choice in English and Italian on the basis of word order and stress*

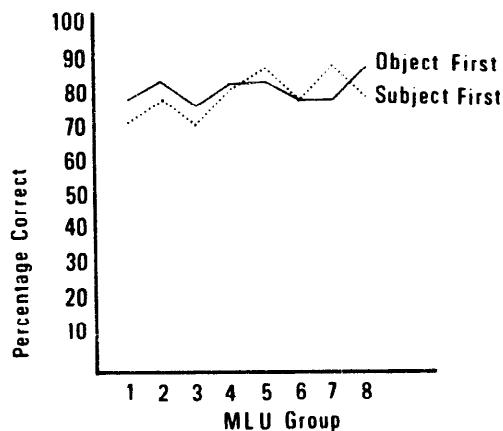
Sequence type	Italian		English	
	Choice of first noun	Choice of stressed noun	Choice of first noun	Choice of stressed noun
NVN	82	58	79	48
VNN	53	57	46	47
NNV	47	54	45	52

standard orders which have limited currency in colloquial English, interpreting VNN as VOS (right-dislocation) and NNV as OSV (left-dislocation), whereas Italians entertained the possibility of a greater variety of word orders, and required stress cues to come to consistent interpretations of non-standard orders. Bates *et al.* propose that their study "suggests that Italian is 'less' of an SVO language than English". This difference in language patterning is already evident at our preschool level, but it is clear that sentence schemas have a considerable developmental history beyond the early levels we have studied. Italian and English seem far more similar from our perspective than from the perspective of the adult study. What must be added is an account of how features signaling pragmatically motivated variants are incorporated into sentence schemas.

#### 4.4. Turkish

The most obvious generalization about the Turkish data is that children are consistently sensitive to inflection, regardless of word order. Every single child in our sample correctly acted out the inflected forms with an average of more than 50%. This sensitivity does increase with MLU for some sentence types, as shown in Table A4 in the Appendix, but it is significantly better than our cutoff criterion of 67% even in the earliest two MLU groups. Figure 3 compares subject-first (SOV, SVO, VSO) and object-first (OSV, OVS, VOS) orders in terms of average percentage correct. Correct response to object-first orders requires an inflectional strategy, since the second noun must be chosen as agent. Such a strategy apparently develops in Turkish children before age 2;0. There is no marked difference between the types of grammatical sentence forms (NVN, NNV, VNN) in their sensitivity to inflections.

Figure 3. Percentage correct in Turkish by order type and MLU (Subject first = SOV, SVO, VSO; Object first = OSV, OVS, VOS)



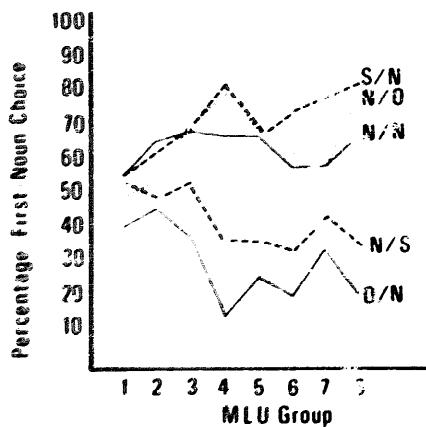
There is, however, considerable difference in the sensitivity of the three ungrammatical (uninflected) sequences to word order. Uninflected NNV forms show a significant tendency for interpretation of the first noun as agent; uninflected NVN shows a strong trend in this direction; while uninflected VNN shows no word order effect. This order mirrors the order of frequency of occurrence of the three order types in Turkish, as shown in Table 2, above.

The ordering of the three sequence types is also weakly revealed in patterns of younger children's choice of first noun as agent in inflected sentences. We calculated the tendency to pick first noun in inflected forms by averaging the percentage of first noun choices for each version of a sequence type (e.g., NOV + ONV). If there were no effect of word order, independent of inflections, this sum would be 50%; if there is a tendency to take the first noun as agent, this sum would be greater than 50%. For the first four MLU groups the average of this sum for the NNV sequences is 53%, for the NVN sequences 52%, and for the VNN sequences 49%. In brief, there is a very weak ordering of word order strategy in the inflected forms, which has the same relative strength as in the uninflected forms. Again, while the effect in the inflected forms is only a trend, the fact that it can be detected at all, and that it shows the same relative ordering as in the uninflected forms, is important in the light of considerations of canonical sentence schemas which we raise in more detail below.

#### 4.5. Serbo-Croatian

We calculated means of the tendency to pick the first noun as the actor, separating inflected and uninflected forms, and subject-marked *versus* object-

**Figure 4.** Percentage first-noun choice in Serbo-Croatian by order type and MLU (S/N = SVN, SNV, VSN; N/O = NVO, NOV, VON; N/N = NVN, NNV, VNN; N/S = NVS, NSV, VNS; O/N = OVN, ONV, VON)



marked forms within the inflected constructions. Figure 4 displays the changes in the percentage correct according to increasing MLU group. Note that there are three groups of sentences according to inflection: inflected subject only (S/N, N/S), inflected object only (N/O, O/N), and neither noun inflected for subject or object (N/N). The figure highlights the different effects of subject as opposed to object inflectional marking, displaying the fact that sensitivity to object-marked forms develops sooner than to subject-marked forms in situations in which the correct performance is to interpret the first noun as the object and second noun as subject.

We can see why this might be so by considering the effect of word order in Serbo-Croatian. The developmental pattern of the tendency to take the first noun as the agent in inflected and uninflected forms is displayed in Figure 4. This shows that by the third MLU group there is a strong tendency to respect that strategy, *even in the inflected forms*. The increase in this tendency with MLU in the uninflected forms is paralleled by an increase in the same tendency in inflected forms in which the first noun is the agent. That is, the tendency to take the first noun as agent increases at the same rate in the forms where that is the correct response; this rate is constant regardless of whether there is an inflected noun in the sentence or not, and regardless of whether the inflection is in the form of a subject marking on the first noun or an object marking on the second noun.

The location of the inflection does affect performance on sentences in which the correct response is to interpret the first noun as the object. In these cases sentences with initial object inflection are not affected by the development of the word-order strategy. On the contrary, as the word-order

strategy emerges, correct performance on object-initial sentences also *increases*, while in subject-final sentences it decreases at first, and is worse than performance on object-initial sentences until the last MLU group.

Similar findings have been reported for German (Mills, 1977) and Hebrew (Frankel and Arbel, 1979; Frankel *et al.*, 1980). In sentence interpretation experiments with children in those languages, it was found that the tendency to pick first noun as agent was more readily blocked by an initial object inflection (masculine accusative article in German and direct object particle in Hebrew) than by subject marking on the second noun (masculine nominative article in German and subject-verb gender agreement in Hebrew) where the first noun was neutral in regard to subject or object marking.

We can offer the following observation as a way of summarizing this result. The word-order strategy and inflectional sensitivity lead to the same result except in sentences without inflections, and sentences with object-initial or subject-final constructions. The children's performance on constructions with no inflections shows that there is a word-order strategy available in Serbo-Croatian. However, their performance on subject-final *versus* object-initial inflected sentences suggests that the location of the inflection can influence whether the word-order strategy applies or not. The initial object inflection apparently blocks the application of the word-order strategy much more strongly than the final subject inflection does (as in German and Hebrew also). We have here the kernel of development of strategies for contravening processing based on the canonical sentence schema. Early strategies of this sort seem bound to on-line processing, as evidenced by their sensitivity to a sentence-initial local cue on an object noun. More mature strategies will require deferral of interpretation until an entire clause has been received.

All of this is not to say that subject has no effect at the preschool level. First, even the subject-final inflected forms are performed correctly by the fourth MLU group significantly more often than not. Furthermore, the presence of initial subject inflection consistently is reflected in a greater tendency to take the first noun as agent, in comparison with the corresponding uninflected N...N forms, even in the earliest MLU groups.

The standard word order (NVN) of Serbo-Croatian shows all of the effects we have discussed to a greater degree than the non-standard word orders (NNV, VNN). (See Table A5 in the Appendix) First, the effect of word order on uninflected forms is stronger in NVN sequences than in the others. Second, performance on object-initial sentences is better in NVN sequences. Finally, performance on initial subject inflected sentence forms is *worse* in the third MLU group in NVN sequences. Recall that this is the overall pattern—that is, whatever pattern is typical of the sentences overall, is even

stronger in the standard sequence orders than in the non-standard orders. Again, we find a general sensitivity to the canonical word order of the language in performance on our task.

#### *4.6. Comparison of Turkish and Serbo-Croatian*

These two languages can be compared in terms of the effects of word-order and inflectional comprehension strategies. The languages are directly comparable only in regard to the object-inflected sentences, since the object is always marked in Turkish sentences and all the uninflected forms are ungrammatical in Turkish. In the object-inflected forms, the Turkish sentences are always comprehended better than the corresponding Serbo-Croatian forms, particularly in the first three MLU groups. This difference is surprising, since the Serbo-Croatian object-inflected sentences are as uniquely recognizable as the corresponding Turkish forms. There are several facts which may explain this phenomenon. First, unlike Turkish, Serbo-Croatian presents children with several declension systems to learn, each with numerous exceptions and irregularities. As a consequence, even the youngest Turkish children have mastered the entire case-inflectional system of their language, simply by learning the structure of one underlying phonetic form for each case. The Serbo-Croatian children must not only learn several possible phonetic forms for each case, but must also learn which nouns go with each phonetic form (Radulović, 1975; Slobin, 1982). Consequently, the Serbo-Croatian children take a longer time to reach the same level of performance as the Turkish children—in fact, in our sample this does not occur until the last MLU group, when the Serbo-Croatian children correctly act out all sentence types (except NVS), as shown in Table A5 in the Appendix.

The second factor affecting the development of comprehension in Serbo-Croatian sentences is the fact that many sentences have no unique inflectional marking on either noun, and are conventionally interpreted as having the first noun as the agent when the verb is semantically reversible. Serbo-Croatian children develop a corresponding strategy, as demonstrated by their performance on such sentences, by the third MLU group. Thus, unlike Turkish children, they must not only learn an inflectional system, but must also learn that it is not always phonetically recognizable; in addition they have to learn how to apply an order strategy when it is needed. Turkish children show a slight tendency to develop a similar word-order strategy even though it is not required by any actual sentence forms. But this strategy in Turkish never overrides the inflection; in Serbo-Croatian this *does* occur strongly in the subject-inflected forms.

## 5. The role of canonical sentence schemas

Many aspects of our data can be interpreted on the view that the child is building up a representation of a 'typical' or 'canonical' sentence in his or her language. We have used the term 'schema' at a number of points in the preceding presentation. What we have in mind is a summary representation of the characteristics of a linguistic entity—in this case, a simple active affirmative declarative sentence involving a transitive verb and the related subject and object nouns. (For a theoretical discussion of 'schemas' in another area of language development, see Bybee and Slobin, 1982, on English past-tense forms. For related theoretical discussion, see Bever, 1970a, 1970b, 1981; Bever and Langendoen, 1971.) Schemas are formed on the basis of linguistic experience and are used for recognizing utterances as interpretable (e.g., accessible to comprehension strategies in our experiment). We propose, further, that sentence schemas have their origin in orientation to canonical or presuppositionally most neutral sentence forms in adult speech. The data of our study fill in only part of the picture. (Slobin, 1981, discusses relations between canonical sentence forms and prototypical event perception, but we need to know much more about the contextual settings of such form-event pairings as well as the application of linguistic schemas outside of the laboratory.) Our findings in this study point to language-specific schema development, drawing on features of word order, inflection, and prosody occurring in the canonical sentence forms of each of the four languages.

The English and Italian children, overall, responded consistently only to NVN sentences, and the Turkish children only responded consistently to forms with an object inflection. The failure of a strong pattern to emerge in response to the non-standard forms (NNV and VNN in English and Italian, uninflected forms in Turkish) suggests that the child does not apply systematic analysis to a string which does not correspond to the canonical sentence schema.

Further evidence of sensitivity to canonical forms is shown in those cases where consistent responses are made to deviant sequences. A tendency to show *any* consistent response is related to the frequency of occurrence of the order type of the deviant construction in the language. Turkish children are consistent most frequently in response to NNV strings, corresponding to the dominant SOV order of their language, and least frequently to verb-initial strings, which are the most infrequent in normal Turkish discourse. In Italian the relative frequency of application of stress and order strategies corresponds to the relative frequencies of the order types in the language from NVN to VNN to NNV.

The emergence of sentence processing strategies in response to grammatical sentences is also sensitive to the relative typicality of the form. Both inflectional and word-order strategies in Serbo-Croatian emerge first in response to NVN, which is the standard order. Thus the schemas we are proposing have some characteristics of 'prototypes', in that they define not only a single form, but extend to a collection of less-related forms in terms of typicality.

It is difficult to determine if verb-final forms play a similar role in Turkish as early central members of a developing prototypical schema, since the inflections are so well mastered by our earliest MLU group. However, the emergence of the ability of children to imitate grammatical sentences in Turkish does allow us to explore the possibility that processing grammatical forms is sensitive to standard NNV order. The 18 sentences of one form of the comprehension test were offered as stimuli for imitation to 30 of the Turkish children, with an average age of 3;9. The findings are summarized in Table 8. Overall, 73% of the sentences were imitated correctly (again indicating easy acceptance of all possible orders). Re-orderings were rare, but when they occurred, they reflected a sensitivity to the frequency of occurrence of sentence forms in the language: (1) verb-final strings were almost never re-ordered; (2) NVN strings were re-ordered less frequently than VNN, and always into NNV order; (3) VNN strings were re-ordered most frequently—generally into NNV order, but also into NVN. Younger children re-ordered more frequently (from 46% at 3;0 to 11% by 3;8), and younger children made more attempts to move less frequent orders (NVN and VNN) to verb-final order, suggesting a greater early role for canonical order on this task, declining sharply after 3;4. Thus, in some circumstances, younger children may show a tendency to assimilate non-canonical to canonical forms even in Turkish.

The notion of canonical sentence schema can also be used to clarify results of previous studies of sentence comprehension. Children's early inconsistent response to English passive sentences suggests that these forms are not perceived as possible sentences—in which case the strategy would be to consistently pick the first noun as agent—but rather as strings to which no strategy applies. In the case of the English passive, which follows standard NVN order, it must be the unusual form of the verb which excludes it from the canonical schema at early ages. Apparently schemas include not only word-order characteristics, but also basic morphological characteristics. At the point in the fourth year at which English-speaking children begin to apply the canonical schema to passives they have probably enlarged their sentence schemas to include verbal auxiliaries, thus bringing passives within the realm of potentially processible sentences.

Table 8. *Percentages of Turkish sentence imitations by word-order type.* (N = 30; Mean age = 45 months)

Stimulus Sentence	Response Type						Other
	SVO	OVS	SOV	OSV	VSO	VOS	
SVO	76		14	2			9
OVS	2	73	4	15			7
SOV			98				2
OSV			6	81			13
VSO	2		20	2	67	2	7
VOS		3	8	2	2	69	18

The French findings of Sinclair and Bronckart (1972) further support the suggestion that the child's notion of canonical sentence form includes both word-order and inflectional information (nominal inflections, as shown in Turkish, and verbal inflections, as shown in English and French). Sinclair and Bronckart, in a task similar to ours, did not find consistent acting out of NVN sequences until later than age five. Their stimuli were all ungrammatical in French, consisting of two nouns and a verb in the infinitive. We suggest that their younger children, applying a canonical sentence schema which requires an inflected verb in such structures, did not consider such strings to be interpretable sentences of French. In Japanese, similar to our Turkish findings, Hakuta (1976) found random response to NNV strings without case inflections.

The interpretation of our results in terms of the early development of a prototype-like canonical sentence schema also offers an interesting interpretation of the behavior of our Serbo-Croatian subjects. We noted that the children respond non-systematically to object-first sentences, even at ages when they interpret NVN or object-final NVO sentences systematically. Apparently the children construct an initial canonical sentence schema which includes *both* the SVO order convention *and* the separate information that the object should be explicitly marked. This canonical schema is redundant for certain sentence types (e.g., SVO, NVO...), but it is independently motivated by other frequent forms (e.g., NVN). On our view the child is sensitive to the fact that such sentences are most frequent in what s/he hears, and (in the first MLU group) constructs an SVO canonical schema as an intitial hypothesis about all such sentences in the language. At a later stage, when the order strategy emerges as a separate phenomenon, an initial object-

marked noun blocks the order strategy while a final subject-marked noun does not.

We noted above that this asymmetry between object- and subject-markers also occurs in German and Hebrew. This raises the possibility that object inflections are more salient than subject inflections generally. There is an alternate interpretation, however, that explains the specific phenomena in terms of how the transitive sentences are processed. An initial noun that is not marked as subject or object can be interpreted as subject by application of the order strategy. If the subsequent noun is unambiguously inflected as subject, then the listener has to recall the first noun and the intervening material and re-assign the semantic relation between them. However, if the initial noun is unambiguously marked as an object, then the order strategy is immediately blocked, and the intermediate mis-assignment of semantic relations is avoided. Thus processing constraints may play a role in guiding the formation and extensions of sentence schemas.

In sum, our crosslinguistic results, and those in the literature, support the notion that the child is not only acquiring a schema of the 'typical' sentence in his/her language, but is also *using* that schema as a guide for the application of processing strategies. The fact that the notion of the 'canonical' sentence emerges so early in language development indicates that it may serve as a strong constraint on the possible variations in sentence forms which will be processed and learned during the later stages of acquisition. This may offer an explanation from acquisition—as an interactive counterpart to explanations from discourse functions—as to why languages have canonical forms at all. In addition, to the extent that the child may be sensitive to typological consistencies in language, the acquisition of canonical forms may facilitate construction of related linguistic schemas. For example, if the canonical form is verb-final, the child might find it easy to acquire such features as suffixed inflections, postpositions, and prenominal modifiers—features which tend to co-occur with canonical verb-final order in languages.

## 6. Conclusion

The most general result of this investigation is that children seem prepared to learn both inflectional and word-order languages. Contrary to earlier expectations based on the alleged naturalness of fixed word order, the acquisition of Turkish is not at all impaired by the fact that word order is not a cue for semantic relations. Nor is there evidence from Turkish for a natural subject-first, agent-first, or SVO schema. At most, our Turkish data weakly

confirm a more general hypothesis that word order may play some role in comprehension and imitation even if it is not strongly modelled in the input language.

Serbo-Croatian children, however, show a strong dependence on word-order comprehension strategies, even in inflected sentence forms where such strategies would be unnecessary. Apparently the fact that the word-order strategy is required for the comprehension of some forms that are not recognizably inflected stimulates the child to overgeneralize the use of the strategy to all forms. Ultimately the child learns when to attend to the inflections as contravening the word-order strategy.

It is striking that in all four languages the strongest evidence for the word-order strategy occurs in MLU groups 3-4. The average age for these groups is around 3;6, which is the usual age at which overgeneralizations of word-order strategies have been previously reported for English. It is not clear whether this seeming universality is due to linguistic development or to some general maturational factors. Chapman and Kohn (1978) have found a general increase in systematic responding to comprehension tests at this age, including word-order and nonlinguistic task-specific strategies. Bever (1970a) has made similar arguments in regard to other aspects of cognitive development at this age. (Also see Mehler and Bever, 1967.) A linguistic hypothesis might be that it is only at this stage that the child can process utterances with three major phrases, the minimum number needed to express the relation between a predicate, an agent and a patient. This is consistent with the fact that the MLU that corresponds to our MLU groups 3-4 is about five words for English and Italian and about three words for Turkish and Serbo-Croatian. English and Italian SVO sentences require two additional words for the determiners, as compared with Turkish and Serbo-Croatian which lack determiners. A more general explanation might lie in the development of immediate memory, which would account *both* for the MLU development and the emergence of the order strategy.

We hope to have shown that children are attuned to canonical sentence forms, and that, early on, they develop schemas embodying the most typical features of such forms; and, further, that canonical sentence schemas play a central role in processes of perception and interpretation of utterances.

## Appendix

**Table A1.** *Verb-noun combinations in four languages<sup>a</sup>*

VERB	NOUN A	NOUN B	NOUN C
pats	the cat	the chick	the bird
carezza	il gatto	la gallina	l'uccello
mazi	mač	pile	ptica
okşasın	kedi	civciv	kuş
eats	the lamb	the horse	the camel
mangia	l'agnellino	il cavallo	il cammello
jede	janje	ždrijebe	deva
yesin	kuzu	at	deve
rubs	the calf	the goat	the giraffe
gratta	il vitellino	la cappa	la girafa
gladi	tele	kozle	žirafa
sevsin	dana	keçi	zürafa
grabs	the boy	the dog	the fox
prende	il bambino	il cane	la volpe
zgrabi	djete	štene	lija
yakalasin	oğlan	köpek	kurt
spanks	the pig	the duck	the goose
picchia	il maialino	la papera	l'occhetta
udara	prase	pače	guska
dövşün	domuz	ördek	kaz
smells	the baby	the deer	the cow
annusa	il pupo	il cerbiatto	la mucca
mırıze	bebe	lane	krava
koklasın	bebek	geyik	inek
pushes	the duck	the boy	the girl
spinge	la papera	il bambino	la bambina
gura	pače	djete	djevojčica
itsin	ördek	oğlan	kız
pinches	the goat	the horse	the zebra
pizzica	la capra	il cavallo	la zebra
štipa	kozle	ždrijebe	zebra
çimdiklesin	keçi	at	zebra
licks	the baby	the lamb	the camel
lecca	il pupo	l'agnellino	il cammello
liže	bebe	janje	deva
yalasın	bebek	kuzu	deve

(continued overleaf)

Table A1. (continued)

<i>VERB</i>	<i>NOUN A</i>	<i>NOUN B</i>	<i>NOUN C</i>
touches	the calf	the chick	the bird
tocca	il vitellino	la gallina	l'uccello
dira	tele	pile	ptica
ellesin	dana	civciv	kuş
hits	the cat	the deer	the llama
colpisca	il gatto	il cerbiatto	il lama
tuče	mače	lane	lama
tekmelesin	kedi	geyik	lama
picks up	the pig	the dog	the fox
solleva	il maialino	il cane	la volpe
dizē	prase	štene	lija
kaldırsın	domuz	köpek	kurt
bumps	the boy	the calf	the donkey
urta	il bambino	il vitellino	l'asinello
lupa	djete	tele	mazga
düşürsün	oğlan	dana	eşek
shakes	the pig	the goat	the sheep
scuote	il maialino	la capra	la pecora
trese	prase	kozle	ovca
sallasin	domuz	keçi	koyun
kisses	the duck	the baby	the cow
bacia	la papera	il pupo	la mucca
ljubi	pače	bebe	krava
öpsün	ördek	bebek	inek
slaps	the lamb	the horse	the zebra
schiaffeggia	l'agnellino	il cavallo	la zebra
pljuska	janje	ždrijebe	zebra
tokatlasın	kuzu	at	zebra
scratches	the dog	the cat	the squirrel
graffia	il cane	il gatto	lo scoiattolo
grebe	štene	mače	ververica
kaşısın	köpek	kedi	sincap
bites	the chick	the deer	the llama
morde	la gallina	il cerbiatto	il lama
grize	pile	lane	lama
isırsın	civciv	geyik	lama

<sup>a</sup>Each stimulus sentence contained the verb and the noun from column A, paired with either the noun from column B or column C. Columns A and B are neuter nouns in Serbo-Croatian; Column C feminine. The languages are listed in the order: English, Italian, Serbo-Croatian, Turkish.

**Table A2.** *Percentage of choices of first noun as agent in English*

MLU Group	N	Sentence type <sup>a</sup>								
		NVN	<u>NVN</u>	N <u>VN</u>	NNV	<u>NNV</u>	N <u>NNV</u>	VNN	V <u>NN</u>	V <u>NN</u>
1	6	50	72	58	58	50	28	46	38	56
2	6	60	47	55	56	49	48	33	45	53
3	6	81	65	84	32	51	32	40	48	31
4	6	90	88	81	40	53	39	43	28	47
5	7	80	80	89	44	26	47	40	43	54
6	6	92	86	88	46	42	51	61	58	67
7	6	80	83	90	51	45	43	42	53	62
8	5	92	90	100	56	49	35	56	33	24

<sup>a</sup>Underlined noun received stress.**Table A3.** *Percentage of choices of first noun as agent in Italian*

MLU Group	N	Sentence type <sup>a</sup>								
		NVN	<u>NVN</u>	N <u>VN</u>	NNV	<u>NNV</u>	N <u>NNV</u>	VNN	V <u>NN</u>	V <u>NN</u>
1	6	64	81	60	61	50	43	43	46	66
2	6	61	89	56	49	57	29	50	71	37
3	6	95	95	83	56	57	50	53	67	37
4	6	90	94	64	47	49	55	70	56	43
5	6	81	87	75	43	57	49	71	65	44
6	5	93	87	90	43	57	30	56	67	57
7	5	90	93	90	29	30	61	20	43	51
8	4	79	91	69	52	56	26	58	67	40

<sup>a</sup>Underlined noun received stress.**Table A4.** *Percentage of choices of first noun as agent in Turkish*

MLU Group	N	Sentence type <sup>a</sup>								
		NVN	NVO	OVN	NNV	NOV	ONV	VNN	VNO	VON
1	5	54	79	23	17	78	30	35	84	29
2	5	64	81	27	74	83	12	65	81	24
3	5	58	73	28	62	72	30	51	90	24

*(continued on facing page)*

Table A4. (continued)

MLU Group	N	Sentence type <sup>a</sup>								
		NVN	NVO	NNO	NNV	NOV	ONV	VNN	VNO	VON
4	5	53	86	23	42	90	23	52	7	77
5	5	67	83	10	73	90	13	53	83	10
6	5	65	83	16	70	77	20	50	80	87
7	4	53	100	13	82	88	23	60	83	82
8	3	52	94	0	67	67	26	44	83	6

<sup>a</sup>N = unmarked nouns (subject case), O = noun with definite direct object inflection.

Table A5. Percentage of choices of first noun as agent in Serbo-Croatian

MLU Group	N	Sentence type								
		NVN	SVN	NOV	NVS	OVN	NNV	SNV	NOV	NSV
1	5	53	53	70	73	47	50	53	53	40
2	5	80	47	73	80	47	57	60	50	27
3	6	75	78	61	61	33	67	61	84	61
4	5	73	7	93	27	13	67	80	73	40
5	5	80	67	60	20	40	55	60	80	47
6	5	77	60	73	26	20	47	80	53	47
7	4	58	100	84	42	33	67	70	50	50
8	3	72	78	89	56	11	67	66	67	33

MLU Group	N	Sentence type					
		ONV	VNN	VSN	VNO	VNS	VON
1	5	33	68	47	47	53	47
2	5	47	63	60	60	67	47
3	6	50	67	78	67	44	33
4	5	27	57	80	87	47	7
5	5	27	72	80	73	47	13
6	5	27	57	87	67	33	20
7	4	27	58	67	50	42	17
8	3	33	72	89	89	22	22

<sup>a</sup>N = neuter noun (unmarked for subject-object), S = feminine nominative noun (subject), O = feminine accusative noun (object).

## Appendix: ANOVA

Elizabeth Bates and Brian MacWhinney have performed analyses of variance on our data, confirming the patterns of results presented in Section 4. We are grateful to them for this independent analysis, and present a partial summary below for the interested reader. The dependent variable in all analyses was selection of first noun as subject: choice of first noun was scored as 1, second noun as 2, and no response or uninterpretable response was scored as 1.5. To correct for missing data, the number of subjects across language  $\times$  age analyses was equalized. Subjects were grouped into four age levels. The smallest number of subjects for whom complete data were available in such a group was 10; accordingly, subjects were randomly eliminated from groups of 11 or 12, resulting in 16 groups of 10 subjects at each of 4 age levels in each language. Here we summarize only the results of these 16 individual analyses of variance (examining Word Order, Case/Stress, and Word Order  $\times$  Case/Stress at 4 age levels), along with a brief summary of age effects within languages. (Full details are available on request.) The findings of these analyses are fully consistent with our more fine-grained analysis on the basis of 8 MLU groups, as presented in Section 4, above.

In English, none of the effects reached significance in the youngest of the four age groups (although the word-order main effect was marginal,  $p < 0.08$ ). By the second age level, word order had reached significance, and remained strong at the next two ages. The effect of stress never reached significance at any of the ages, nor were there interactions between order and stress. Thus the only cue used by English children at any age level is word order (resulting from a first-noun strategy on NVN items and close to chance performance on the other two word-order types).

In Italian, the word-order effect at the youngest age level was also marginal ( $p < 0.09$ ), but there was a significant effect of stress, with choice of the stressed noun as agent. By the second age level, both word-order and stress effects were significant, but there was no interaction. In the third and fourth age groups only word order was significant. As with the English group, the word-order pattern involves selection of first noun on NVN, with random performance on the other two word-order types.

In Serbo-Croatian, the only effect to reach significance at any level was case inflection. This effect was already significant among the youngest children, increasing in magnitude through the fourth age level. However, in this analysis children tended to choose the first noun more often than the second on all three word-order types (averaging 62%).

In Turkish, there was a large effect of case at every age level, with a significant effect of word order only at the fourth level. The word-order

pattern reflected a bias toward first noun in NNV as compared with the other two orders.

There were no significant interactions of word order and case/stress in any of the languages.

Age effects within languages can be summarized very briefly as follows: *English*: an age X word order X stress ANOVA (age as a between-subjects variable, order and stress as repeated measures) yielded a main effect of age, a main effect of word order, and an age X word order interaction. None of the other effects reached significance. In short, English children rely entirely on word order, and the difference between NVN and the other two word-order types increases with age. *Italian*: there were significant main effects of word order and stress, with none of the other effects reaching significance. *Serbo-Croatian*: the only significant effects were a main effect of case inflection and an age X case interaction. That is, processing of case inflections increases reliably across the four age levels, while word order does not reach significance and does not interact with age. *Turkish*: there was a main effect of word order, along with a very much larger main effect of case inflection.

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### **Résumé**

Les enfants construisent un schéma de phrase canonique comme structure préliminaire pour organiser le comportement langagier. La phrase canonique inclut les traits typiques des clauses dans la langue maternelle et sert de trame aux stratégies de production et de perception. Le schéma de phrase canonique fournit une explication fonctionnelle des stratégies selon l'ordre des mots ou selon les flexions qui s'appuient sur les essais de l'enfant pour acquérir la maîtrise rapide des techniques de communication fondamentales.

On étudie, dans la recherche présentée, la sensibilité aux phrases de forme canonique et aux stratégies fondées sur l'ordre des mots ou sur les flexions dans la compréhension de phrases transitives simples. Les sujets sont des enfants monolingues de 2;0 à 4;4 ans. L'étude porte sur 4 langues: l'Anglais (langue à contraintes d'ordre non fléchi), l'Italien (contraintes d'ordre faible, peu de flexions); le Serbo-Croate (contraintes d'ordre faible et flexions); le Turque (contraintes d'ordre minimale et flexions).

Les résultats indiquent que les enfants ne répondent pas systématiquement aux séquences qui violent la forme canonique de leur langue. Ils développent des stratégies distinctes et appropriées aux régularités de leur langue (ordre des mots ou flexions). L'émergence d'un comportement précoce pour les phrases canoniques pertinentes de la langue et l'émergence de stratégies de traitement suggèrent que des bases comportementales existent pour les contraintes linguistiques sur la forme de surface des phrases.