

THE INFLUENCE OF WORD ORDER AND CASE INFLECTION ON SENTENCE COMPREHENSION AT PRESCHOOL CHILDREN

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In 3 x 3 experimental design research the influence of word order and case inflection was investigated. The experimental materials were 36 three-word simple transitive sentences, which were presented to each subject. Each sentence was in one of the possible forms of word order (NVN, NNV, VNN), and case inflection (Nom.-Acc.; Acc.-Nom.; Without-Without). There were nine different forms of presented sentences. The subjects were 16 (6 years old) preschool children (8 boys and 8 girls) from kindergarden.

The results were analyzed with the analysis of variance and they showed that there is no significant influence of word order on sentence interpretation, except in the situation when we have a sentence without inflectional information. In that situation word order is an important information for the decision who/what is the actor in the sentence. The results concerning case inflection gave us the information that there is a dominant influence of case inflection in sentence processing. Our subjects made their decision about the actor in the sentence governed by case inflectional information whenever that kind of information was present.

INTRODUCTION

The comprehension ability of discourse from the listener's point of view has been for long in the focus of scientific interests. The breadth of possible explanations of this phenomena have ranged from nativistic ideas about innate abilities which are responsible for sentence processing, to empiristic ideas that this ability is one of the abilities which develop through the period of maturation. There is a large quantity of research in this area, but we concentrated our interest on the field of »strategies« which have been used by the subject during sentence interpretation. This problem was investigated in developmental psycholinguistic, but we have limited our interest to the research and analysis of the »interpretation strategies« which have been used during the sentence interpretation of six years old children. So, there was the question: which factors determine sentence interpretation? From this question comes another question: does the native speaker rely more on semantic or syntactic information during sentence comprehension? The answers to these questiones can not have a general importance, because

the role of semantics and syntax is not on the same level in the different languages. Different languages have different semantic/syntactic limitations. If some language have syntactic limitations which enact its interpretations, it is possible that this type of syntactic limitations are not important in other languages. For example, the importance and influence of the syntactic factor »case inflection« (case marking) is more important in Russian, Polish or Serbo-Croatian than it is in English or German. This means that »case inflection factor« is much more developed in Russian than in English (or any other language). The same situation holds, for example, if we look at the importance and influence of the factor »word order«, where we can notice the apparent and certain influence of »word order« in English which is significantly higher than in Russian or Serbo-Croatian. This is entirely logical if we know that Russian or Serbo-Croatian. This is entirely logical if we know that Russian or Serbo-Croatian are languages which do not depend on »word order« as much as English (word order in the sentence is relatively free). Conversely, in English the interpretation of the sentence is mostly assigned by »word order«, which means that the location of each word in the sentence is a more invariant »cue« than in some other languages. In cross-linguistic research by MacWhinney, Bates & Kliegl (1984), which was done on English, German and Italian, the results showed that there is a significant effect of the »word order« on the English and Italian language, but there wasn't a significant effect of »word order« on the sentence interpretation in German. These results in accordance with results found by Bates (1982) in English. Her conclusion related to the evidence that there is a strong tendency to choose a first noun as an »actor« in the sentence like NVN (noun-verb-noun). In the sentence like VNN (verb-noun-noun) or NNV (noun-noun-verb) there is a strong tendency to choose a second noun in the sentence as an »actor«. The evidence of research in Italian is very similar, although the effect of the »word order« (in sentence interpretation) is lower. The evidence of experiments in the German language gave us information that subjects had a general tendency to choose the first noun as an »actor« without regarding the »word order« (NVN, NNV, VNN). Because there was no difference between three situations of »word order« where the first noun in the sentence was chosen as the »actor«, it seems logical to assume that the German native speakers don't base their sentence interpretation on the »word order«. The »word order« was the first linguistic generalization which emerged in »language comprehension strategies«. Many authors pointed out the strategy of »word order« as the most important of all the strategies. Pinker (1981) proposed the acquisitional universal in this form: »For case inflected languages, children will utter sentences in the dominant word order, and will use the dominant word order as a in comprehending sentences, before they have mastered their language's morphology«. Similar conclusions were proposed by Brown (1973), Keeney & Wolfe (1973).

Nevertheless, there is a high number of experimental results which provide us with arguments that the »word order« strategy doesn't have an advantage over the other strategies during sentence comprehension (»case inflection strategy« or »strategy of decoding the semantic information«). The majority of these works are related to the developmental period. Hakuta (1982) reported that young Japanese children acquire »word order« and »inflectional cues« simultaneously and cannot use one in the absence of the other. In the Polish language, Weist (1983, 1984, 1985, and personal communication with the author) found that 2-years-olds can make highly reliable use of both, the »case marking« and the »word order« in sentence interpretation. Still the strongest evidence against the universalist arguments and perspectives comes from a study of sentence interpretation in different languages by Slobin & Bever in Turkish (1982) and an investigation of sentence interpretation in Hungarian by MacWhinney, Pleh & Bates (1985), and an investigation of sentence interpretation in Hungarian and Russian by Pleh, Jarovinskij & Balajan (1987). The results of these investigations show us that 2/5 years olds (in the Turkish and Hungarian language) had attained almost a perfect use of the suffixes marking the nominative/accusative distinction without regard to the word order. The results show us also that the Bever's »first noun as agent« strategy — as indicated by OVS and OSV errors — appears to be weaker in the bilinguals (Russian and Hungarian). The results of the investigation by MacWhinney, Bates & Kliegl (1984) which was realized with adults on the English, Italian and German language, give us a »hierarchy of strategies« which subjects used in sentence processing. It is entirely clear that there is a different hierarchy of using different strategies in sentence comprehension (depending on different languages).

In the first part of our current work we discuss the syntactic factors which can determine sentence comprehension, and some language universals which can emerge from them. As we know, each sentence is built from words and each word is related to meaning (semantic dimension). It is logical to assume that the semantic factor affects sentence interpretation. According to some authors, the semantic factor is the primary factor in the parsing system which determines sentence interpretation. In that case, the decoding process of syntactic informations has a secondary meaning, and becomes important in the situations when semantic information are on an equal level and none of them has an advantage. Some of the proposed assumptions about semantics can be included in the well known »Competition model« proposed by Bates & MacWhinney (1982a, 1982b), Bates et al. (1982), MacWhinney (1983). A large number of authors assume that in the early stage of the child's development there is a domination of the strategy which decodes semantic information, but after the early period there is an absolute domination of the strategies which decode syntactic information. There is another interesting approach to

this question, where the early emergence and importance of using the semantic strategy depends upon the relations of the words and their meaning to the child's early experience with them (and their meaning, or, we would like to call that: »pragmatic relation«). If the relations between the words (from sentences) are close to the subject's own experience they have a propensity to use the semantical strategy for sentence interpretation, but if it isn't they will have a propensity for using the syntactic strategy for sentence interpretation. Now we have the apparent assumption about the persistence of two »parallel strategies« which are based on the decoding of semantics and syntax and thereby preclude the dominance of semantics and syntax and thereby preclude the dominance of any other strategy (e.g. strategy based on decoding prosody). This assumption is put forward according to Bever (1970), Strohner & Nelson (1974), Chapman Konh (1978, Sinclair Broncart (1972) etc.

The next question concerns the influence of these syntactic/semantic factors in the sentence interpretation of the Serbo-Croatian language. Mimica (1986) reported about the absolute domination of the semantic factor over syntactic factor at age level 3—5 years olds. At the age level of 6 years there begins the giving of advantage to the strategies based on decoding syntactic information. It seems that we cannot give an advantage to any of the syntactic strategies (at age level of 6 years olds), because which strategy of decoding the syntactic information will dominate depends on the concrete, real situation. In the situation where one kind of syntactic information is absent the subject's interpretation is governed by the other syntactic information, and conversely. It seems that in the Serbo-Croatian language there is something like the »equality« of syntactic information which older children (older than 5 years) use in the sentence comprehension process. There is an investigation about the comparison of three factors which can determine the sentence interpretation by adults in Serbo-Croatian (Mimica, 1987). It is evident that there is the »domination« of the inflectional factor during sentence processing.

The goal of our investigation was to see the relation between factors- a) Case inflection and b) Word order during sentence interpretation process at age level of six (6) years old children.

METHOD

Subjects

Sixteen kindergarden children participated in the study (8 boys and 8 girls). The average ages were 6y (maximum deviation was one month more or less), and everyone was native Serbo-Croatian speaker. They were children with normal psycho-physiological development, and they were equalized by their intelligence and socio-cultural conditions at home.

Experimental materials

36 three word sentences were presented to each subject. Each sentence had two nouns and one verb. We varied two variables in each sentence: a) case inflection (with situations: Nominative-Accusative, Accusative-Nominative, Without-Without case endings), b) word order (with situations: Noun-Verb-Noun, Noun-Noun-Verb, Verb-Noun-Noun). All verbs were given in the third person singular. The nouns were taken from a set of 18 names for familiar animals (dog, chicken, cat, pig, lamb etc.). The verbs were selected from a group of nine verbs representing simple action (eat, bite, push, chase, etc.). Every sentence was constructed taking care that every factor (in one of given forms) participated in each sentence. There were 9 different types of sentences (each type of sentence was presented twice) in a 3×3 experimental design.

Procedure

All subjects were tested individually. The experimenter began the testing session by introducing the experimental toys to subjects, asking them to name each one. Then the experimenter explained that he will say one sentence and the subject has to show who/what is the actor in the sentence. That means that subjects were required to manipulate equal-sized toys in response to a spoken sentence, in order to demonstrate how they understood the activity denoted by the sentence. Before each stimulus, two associated objects for that item were placed on the table in front subject's eyes. The objects were small toys which presented noun used in the experiment. To minimize the bias introduced by place-directed responses: (e.g., picking the animal-toy on the left side), the toys were placed on the table in random position following a clockwise circular pattern across the trials. Each sentence was read aloud to the subject, and after hearing the sentence, the child had to show with the toys who/what was the actor in the sentence. The experimenter wrote in the protocol which noun in the sentence was chosen as the actor. The dependent variable (or criterion variable) was the number of choices of the first noun in the sentence as the actor. This procedure had been used in large number of similar experiments in this area (Bates et al., 1984; Smith & Mimica, 1984; Mimica & Taksic, 1985; Mimica, 1986) // This research was realized in March, 1987. Since March, 1987., we developed a new procedure which is very similar to the described procedure. The only difference is that our subjects don't manipulate with little toys placed in front of them. In accordance with the new method we put in front of each subject two small pictures representing the animals which were included in each particular sentence. The subject's task is to show with his/her finger the picture of animal which represents the actor in that sentence. (Mimica, 1988) //

DISCUSSION

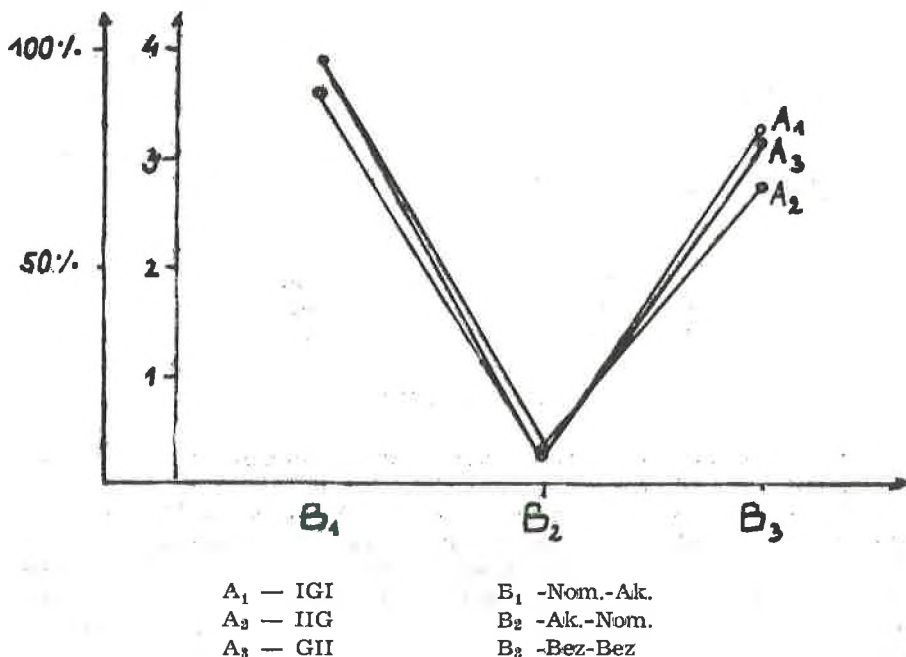
The results were analyzed with 2×2 Analysis of variance with repeated measures on two factors. As we can see from Table 1, there is no statistical significance to the main effect of factor »A« - word order ($F = 0.859$; $p > 0.10$).

IZVOR VARIJABILITETA	DF	F	P
A - RED RIJEČI	2	0.859	>0.05
B - PADEŽNI NASTAVAK	2	202.748	<0.001
A x B	4	1.625	>0.05

Table 1: Analysis of variance between factors: word order (A) and case inflection (B)

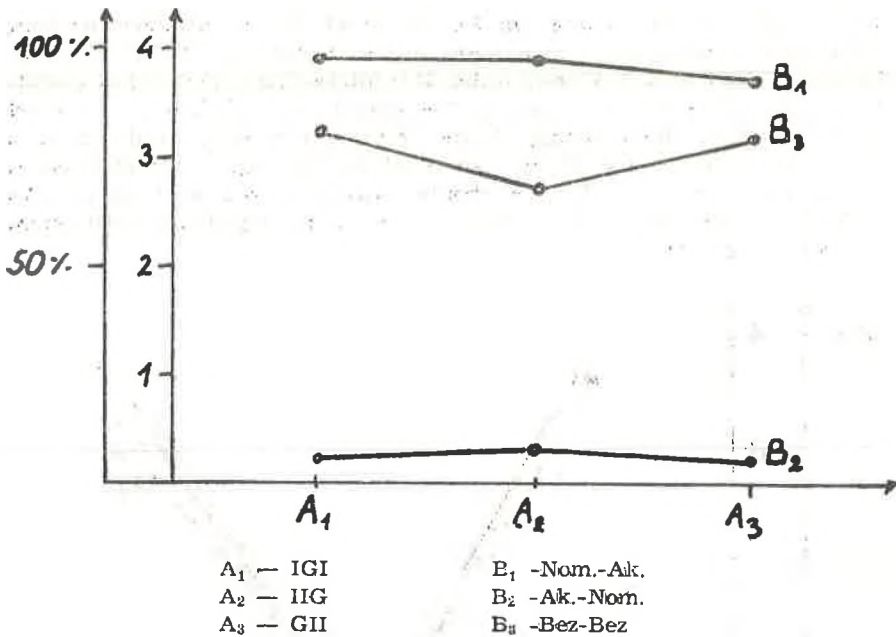
That means that word order doesn't have any important influence in choosing a first noun in the sentence as an actor. If we have the sentence Noun-Werb-Noun or Noun-Noun-Verb or Werb-Noun-Noun, the first or second noun in the sentence have the same chance to be chosen as an actor. This means that subjects make their decision about the actor in the sentence without paying attention to word order. From post hoc comparison it is possible to see that factor »A« has significance on the third level of factor »B« (the third level of factor »B« is from Without-Without inflectional endings). This is logical because in that situation we don't have any information about case inflection and information about the actor from case inflection, because that kind of information doesn't exist. We are discussing the situation when all the other semantical/syntactical information except word order don't exist (e.g.: The porky pushed the lamb — Prase je guralo janje; Prase je janje guralo; Guralo je prase janje. This sentence, in all three variations, is semantically logical, without case endings, with a verb which agrees with both nouns, without word stress etc. The only information which can be used for the decision who is an actor in this sentence is the word order. If we consider this sentence in English it is entirely clear who is the actor, because the grammatical rule is that the actor is in the first place in the sentence. In Serbo-Croatian it is not clear, because

each of the concrete nouns can be an actor). In the situation without inflectional information, our subjects preferred »typical« N-V-N word order over V-N-N or N-N-V word order. It is interesting to notice that a smaller number chose the first noun as the actor in N-N-V than V-N-N word order (although, the choosing of the first noun in both word orders is more over 70%, see Fig. 1). We can conclude that significant differences on the third level of »B« are mostly caused by second level of »A« (N-N-V). As we said at the beginning, there is no significant differences between categories of »A«.



Case inflection factor (B) is very interesting. As we can see from Table 1 there is a significant effect of the factor (B« ($F = 202.748$; $p < 0.001$). If we look at the effect of factor »B«, we can see that there are differences between levels of this factor (see fig. 2.) This significance is caused by the second level of »B«, Accusative-Nominative sentence form versus Nominative-Accusative and Without-Without sentence form. This means that the subject's choice of the first noun as an actor in the Acc.-Nom. sentences was about 5% versus 96% in Nom-Acc and 76% in Without-Without sentences.

The interaction between these two variables is not significant ($F = 1.625$; $p > 0.10$).



CONCLUSION

We think that our results sound logical, because there is a very strong influence of case inflection in Slavic languages which determines the relation between subject and object in the sentence. The influence and importance of that factor is higher and more important than the influence of word order. As we know, Serbo-Croatian is a language with relatively free word order. In situation where the other kind of semantic/syntactic information is absent, word order is important for decision about the actor in the sentence.

We think that it is possible to give general explanations for our results in terms of one »Competitional model« given by Bates & MacWhinney (1982; 1983), because some factor can change their position in the »hierachy« if »competitional conditions« are changed. Future investigations will give us clearer and more complete answers to these questions.

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Ivo Mimica: UTJECAJ REDOSLIJEDA RIJEČI I PADEŽNOG NASTAVKA
NA RAZUMIJEVANJE REČENICA KOD DJECE
PREDŠKOLSKE DOBI

S a ž e t a k

Istraživao se utjecaj faktora redoslijeda riječi u rečenici i faktora padežnog nastavka na interpretaciju rečenice. Eksperimentalni materijal je sadržavao 36 trosložnih jednostavnih tranzitivnih rečenica. Svaka rečenica je bila u jednom od oblika redoslijeda riječi (IGI, IIG, GII) i padežnog nastavka (Nom.Ak.; Ak.-Nom.; Bez-Bez). U istraživanju je sudjelovalo 16 ispitanika (šestogodišnjaka) iz dječjeg vrtića (8 dječaka i 8 djevojčica). Rezultati su analizirani uz pomoć 3 x 3 analize varijance s ponovljenim mjeranjima na oba faktora.

Iz rezultata vidimo da ne postoji značajan utjecaj redoslijeda riječi na interpretaciju rečenice, osim u situaciji kad imamo rečenicu bez infleksione informacije (npr.: »Janje gura tele«). S druge strane, utjecaj padežnog nastavka za donošenje odluke o subjektu u rečenici je dominantan. Naši ispitanici su odluku o subjektu u rečenici donosili ravnanjući se prema informaciji o padežu, kad je ta informacija bila prisutna.