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Word Order and Inflectional Strategies in Syntactic Processing

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Three lexical decision experiments are reported that test the use of inflectional and word-order strategies by adult readers of Serbo-Croatian to assign syntactic roles of subject and object. No word-order effects are observed when both syntactic roles are specified unambiguously by inflection (Experiment 1) or when the object's inflection only is unambiguous (Experiment 3). Word-order influences on lexical decision are obtained when neither syntactic role is specified (Experiment 3) and when the subject's inflection only is unambiguous (Experiment 2). Results are discussed in terms of word-by-word *vs* clausal processing and, more generally, in terms of Forster's model of the language processor.

INTRODUCTION

The syntactic function of entities in a sentence can be identified by means of three devices—word order, inflection, and prosody—which are more or less important depending on the language of interest. English, for example, is not inflectional and relies heavily on word order to identify syntactic

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roles such as subject (S), verb (V), and object (O). In contrast, Turkish is ordered minimally, relying instead on regular and explicit inflections that identify objects unambiguously. The Serbo-Croatian language is somewhat of a hybrid. Because it is inflectional, all six permutations of subject, verb, and object are grammatically acceptable (Belić, 1933) and one must be sensitive to inflections in order to interpret them correctly. But it is imperfectly inflectional in that certain forms do not distinguish between subject and object (e.g. *čamac* is both the nominative and accusative form for the masculine noun "boat") and, presumably, a convention pertaining to word order is required to interpret them. These competing demands of the Serbo-Croatian language will provide the focus for our investigation. (We will limit the discussion to simple declarative sentences where prosody is relatively unimportant.)

A word-order convention can be thought of as a perceptual strategy that a speaker/hearer can use in order to comprehend a sentence (cf. Bever, 1970a; 1970b; Slobin & Bever, 1982). It assumes sensitivity to a particular sentence type—the canonical form (Givon, 1979; Greenberg, 1966)—that provides a linguistic model of basic syntactic organisation in the language. If, say, SVO is canonical (a likely candidate given that SO orders predominate among the world's languages whereas OS orders are quite rare—Greenberg, 1966), then the strategy would be to interpret any noun–verb–noun sequence as SVO. Such a strategy would be useful for English where the SVO order is, in fact, prevalent. Is such a strategy—an implicit assumption of fixed word order—apparent also in a language that demands inflectional sensitivity and that allows any word order?

In their study of language use and comprehension by children, Slobin and Bever (1982) found that young Yugoslavs (1) used the SO order in 94% of their utterances (collected in conversation samples), and (2) had the most difficulty understanding OS constructions (as indexed by their success in acting out simple transitive sentences). Developmentally (grouped by mean length of utterance rather than by age), the tendency to take the first noun as the subject increased at a similar rate for SN, NO, and NN orders (where N indicates a noun whose inflection does not distinguish S—i.e. nominative—from O—i.e. accusative). The similarity in the pattern of increase for inflected and uninflected forms was taken to indicate the development of a word-order strategy (Slobin & Bever, 1982). For ON and NS sentences, however, the tendency to take the first noun as the subject decreased and did so more quickly for ON than NS sentences. This last finding indicates that, although the youngest children tend to overgeneralise word-order strategy, ultimately it can be blocked by attention to inflections. The greater success of initial object inflection in blocking the word-order strategy reveals what Slobin and Bever (1982, p. 251) consider "early strategies . . . bound to on-line processing. More

mature strategies will require deferral of interpretation until an entire clause has been received."

In so far as word-order effects in children derive from the misassignment of syntactic roles engendered by word-by-word processing, such effects should be mitigated if adult speakers/readers delay syntactic assignment until the end of clauses. In particular, an initial unmarked noun would not be assigned any syntactic role until the entire clause was received. If the subsequent noun was inflected, then the first noun's role would be determined. If the subsequent noun was also unmarked, then the word-order strategy would be invoked. Alternatively, if the word-order strategy in adults involves word-by-word processing, then the "maturing" of the strategy may simply mean that unambiguous inflections contravene the word-order strategy effectively and are handled, instead, by an inflectional strategy. When syntactic roles are not indicated, the word-order strategy must come into play—an unmarked initial noun will be assigned the role of the subject. Depending on whether or not the next noun is marked and for what role, this initial assignment could be right or wrong.

If misapplication of a word-order strategy engenders additional processing in order to reconcile syntactic roles with inflectional markings or with sentence meaning, then we might expect a task such as lexical decision to be sensitive to this increased processing load. But in previous lexical decision experiments, we found that lexical decision to verbs was unaffected by whether the context was SO or OS, and that lexical decision to objects was unaffected by whether the context was SV or VS (Urošević et al., 1986). In those experiments, nouns were chosen to have unambiguous inflections. Because a word-order strategy was not necessary, we might suppose that it was not used or, at least, that it did not override an inflectional strategy. This would be expected from either word-by-word or clausal processing. Experiment 1 is a replication of the SO–OS contrast with verb targets.

Experiment 2 will examine lexical decision to verb targets in sentences that include words with (1) either noun marked (NN) for syntactic role, or (2) subject marked (NS or SN). Word-by-word implementation of a word-order strategy would predict an SO advantage for type (1) sentences. The first N is assigned the role of S, the second N is assigned the role of O. If the semantic content is consistent with that assignment, processing will be fast relative to when the semantic content is inconsistent with that assignment (we will take up the particulars of this processing in the discussion). An SO advantage would also be predicted for sentences of type (2). If the first noun is marked S, then the word-order strategy and the inflectional strategy coincide; the second noun will be assigned O because that role is still available. If the first noun is unmarked, word-order strategy dictates that it be S; when the second noun is encountered and found to be

marked S, the clause is reanalysed or otherwise slowed. Unlike the fully marked nouns of Experiment 1, therefore, we would expect word-order effects for both sentence types in Experiment 2.

Clausal processing gives rise to the same predictions save one. For SN or NS sentences, whichever noun is marked dictates what the other noun in the clause should be. Because assignment of syntactic roles occurs at the clausal level, no misassignment can occur regardless of which noun is marked. If adult clausal processing truly "defers interpretation until an entire clause has been received", then, unlike the outcome predicted by word-by-word processing, there should be no word-order effects when subject is marked (Experiment 2); nor, of course, should there be when both nouns are marked (Experiment 1). For NN sentences, the prediction is the same as from word-by-word processing, although the logic is different. The processor waits for the full clause but ultimately must use the word-order strategy (S then O) to assign syntactic roles: Semantic evaluation will show that to be wrong for unmarked initial objects, thereby slowing N_ON_S sentences (where the subscript indicates the semantically determined role) relative to N_SN_O sentences. Predictions from clausal and word-by-word processing disagree, therefore, only with respect to the SN–NS contrast.

EXPERIMENT 1

Method

Subjects. A total of 60 undergraduate students in the Department of Psychology at the University of Belgrade participated as one way of fulfilling a course requirement. They were assigned to one of four counterbalancing groups according to their appearance at the laboratory.

Materials. Target words were 22 third-person singular verbs in the present tense. The length of target words varied from four to seven letters. Pseudoverbs were generated from the real verbs by changing one letter but maintaining the verb affix. Vowels were substituted for vowels and consonants were substituted for consonants. A total of 22 SO/OS contexts were constructed with singular subjects marked in the nominative case and singular objects marked in the accusative case.

Design. Each subject saw 11 (SO)V and 11 (OS)V situations with verbs as targets and the same number with pseudoverbs as foils. Whether a given target was seen with an OS or SO context was counterbalanced over subjects. Each subject saw the same sentences as every other subject but not necessarily in the same word order; no subject ever experienced the

same sentence more than once, although pseudoword foils were repeated with different contexts; every target appeared with SO and OS contexts. The type of context was randomised over trials.

Procedure. A subject was seated before the CRT of an Apple IIe computer in a dimly lit room. A fixation cross was centred on the screen. On each trial, the fixation point disappeared and a centred context (SO or OS) appeared for 900 msec followed by an interstimulus interval of 100 msec before the target was presented, also in the centre of the screen, for a maximum of 1500 msec. All letter strings appeared in upper-case Roman. Subjects were instructed to read the sentences and decide as rapidly as possible whether or not the target was a word. In order to ensure that subjects were reading the contexts, they were asked periodically (on average, every 10 trials) to say the sentences aloud after the target decision had been made. Decisions were indicated by pressing a telegraph key with both thumbs for a "no" response and a further key with both forefingers for a "yes" response. Latencies were measured from the onset of the target. In the event of an error, a message appeared on the screen, and that trial was repeated (but its decision time was discounted). The experimental sequence was preceded by a practice session in which subjects had to achieve an error rate of less than 10% over 40 trials.

Results and Discussion

Minimum and maximum acceptable latencies were set at 400 and 1500 msec, respectively. Average lexical decision latencies to verb targets preceded by SO contexts and OS contexts were identical (700.5 msec). Pseudoword rejections took 825 and 822 msec with SO and OS contexts, respectively. Errors, which were under 2%, showed no significant differences. As expected, varying the order of subject and object did not affect lexical decision time to a following verb when the inflections on the nouns were marked.

EXPERIMENT 2

When both nouns are marked unambiguously, word order does not influence lexical decision time for verb targets. If a word-order strategy is available, then explicit inflections may have forestalled its use or otherwise lessened its impact. In Experiment 2, situations will be created that invite a word-order strategy to different degrees for clausal and word-by-word processing: (1) NS situations allow a word-order strategy for word-by-word processing only; (2) NN situations allow a word-order strategy for both; and (3) SN situations do not distinguish a word-order strategy from an inflectional strategy for either type of processing.

In order to ensure that the three types of situations were comparable, care was taken to match the stimuli along several dimensions. Unmarked subjects and marked subjects were selected to be synonyms or, at least, close in meaning, while verb targets were the same for both types of contexts. For example, **TALAS ČAMAC PREVERČE** is an N_SN_OV sentence meaning "the wave capsizes the boat"; **BURA ČAMAC PREVERČE** is an SN_OV sentence meaning "the sea storm capsizes the boat". This was done to ensure that the difference between subject-marked and completely unmarked situations was not confounded by a difference in meaning. (These restrictions could not be met on 3 of the 40 situations. The complete set with English translations is provided in the Appendix.)

Method

Subjects. A total of 60 undergraduate students in the Department of Psychology at the University of Belgrade participated as one way of fulfilling a course requirement. They were assigned to one of four counterbalancing groups according to their appearance at the laboratory. None had participated in Experiment 1.

Materials. Target words were 40 singular verbs in the present tense. The length of the target words varied from four to eight letters. Pseudoverbs were generated as in Experiment 1. A total of 20 NN contexts were constructed with singular masculine nouns that are not marked for nominative (S) or accusative (O) cases, and 20 SN contexts were constructed by replacing the unmarked subjects with singular feminine nouns that are marked in the nominative case and that were close in meaning to the nouns they were replacing. All nouns were of four to nine letters, bi- or tri-syllabic, and sampled from the entire frequency range (necessitated the constraint on meaning).

Design. Each subject saw 10 SN, 10 NS, 10 N_SN_O, and 10 N_ON_S situations with verbs as targets and the same number with pseudoverbs as foils. The context with which a given target was seen was counterbalanced over subjects such that each subject saw the same sentences as every other subject but not necessarily in the same word order; no subject ever experienced the same sentence more than once, although pseudoword foils were repeated with different contexts; every target appeared with SN, NS, N_SN_O, and N_ON_S contexts. The type of context was randomised over trials.

Procedure. Same as Experiment 1.

Results and Discussion

Minimum and maximum acceptable latencies were set at 400 and 1500 msec, respectively. Average lexical decision latencies and errors (which included slow and wrong decisions) are presented in Table 1. Because the pseudowords were filler items and not counterbalanced across groups, the analysis of variance was limited to the word data. Further, selection restrictions on the stimuli (with respect to inflections and meaning) make a stimulus analysis inappropriate. A 2 (word order) × 2 (marking of inflection) ANOVA on the latencies revealed a main effect of word order—$F(1,59) = 9.92$, MSe = 3486.51, $P < 0.003$—with subject–object orders being faster overall (764 msec) than object–subject orders (788.5 msec). The main effect of inflection was not significant—$F < 1$ (marked averaged 778 msec, unmarked averaged 774.5 msec). The word order × inflection interaction was significant—$F(1,59) = 9.98$, MSe = 1418.08, $P < 0.002$. Table 1 shows the word-order effect to be larger for situations in which subject has a marked inflection. *Post hoc* tests revealed that the difference was significant for marked inflections only—$F(1,59) = 7.84$, $P < 0.007$. The 9-msec difference for situations with unmarked inflections was not significant—$F(1,59) = 1.58$, $P > 0.20$. There were no differences in the error analysis.

As expected from a word-by-word implementation of word-order strategy, and contrary to what seems to be predicted from clausal processing, a word-order effect was found in the SN–NS contrast with an advantage for subject–object situations. Contrary to both hypotheses, however, the word-order effect was not found in the N_SN_O–N_ON_S contrast. It should be noted that the non-significant 9-msec difference was in the appropriate direction. Before dismissing it out of hand, therefore, we will attempt a replication in Experiment 3 using exactly the same NN

TABLE 1
Average Lexical Decision Latencies (RT) in msec and Percentage Error (PE) to Verb Targets as a Function of Context Word Order and Inflection Marking in Experiment 2

	Inflection marking			
	Marked		*Unmarked*	
Word order of context	*RT*	*PE*	*RT*	*PE*
SO	758	1.3	770	1.0
OS	798	2.0	779	1.3

contexts. Word-order effects will again be examined in comparison with situations where one noun is marked, but this time it will be the object, not the subject, that has the ambiguous inflection.

EXPERIMENT 3

Where word-by-word processing should lead to a word-order effect in the SN–NS contrast, it should produce no such effect in the NO–ON contrast. If the first noun is unmarked, word-order strategy dictates that it be S; when the second noun is encountered with an O inflection, that is consistent and processing proceeds without incident. If the first noun is marked O, then the word-order strategy is contravened or overridden for it; the second noun will be assigned S because that role is still available. Again, syntactic roles are consistent and processing can proceed without incident. Lexical decision latencies to verb targets following NO contexts should be the same as latencies to verb targets following ON contexts. Again, we should expect a word-order difference in the N_SN_O–N_ON_S contrast.

Method

Subjects. A total of 56 undergraduate students in the Department of Psychology at the University of Belgrade participated as one way of fulfilling a course requirement. They were assigned to one of four counterbalancing groups according to their appearance at the laboratory.

Materials. Verb and pseudoverb targets were the same as Experiment 2. The same set of NN contexts was used. ON/NO contexts were created in the same way that SN/NS contexts had been, with the exception that this time the unmarked objects of the NN set were replaced. Again, care was taken that the objects (feminine nouns marked for the accusative case) were similar in meaning to the words that they were replacing.

Design and Procedure. Same as Experiment 2.

Results and Discussion

Minimum and maximum acceptable latencies were set at 400 and 1500 msec, respectively. Average lexical decision latencies and errors (again including slow and wrong decisions) are presented in Table 2. A 2 (word order) × 2 (marking of inflection) ANOVA on the latencies (again limited to subjects as the error term) revealed a main effect of word order—$F(1,55) = 6.17$, MSe = 1342.78, $P < 0.016$—with subject–object orders being faster overall (703.5 msec) than object–subject orders (715.5 msec),

TABLE 2
Average Lexical Decision Latencies (RT) in msec and Percentage Error (PE) to Verb Targets as a Function of Context Word Order and Inflection Marking in Experiment 3

	Inflection marking			
	Marked		*Unmarked*	
Word order of context	*RT*	*PE*	*RT*	*PE*
SO	715	1.6	692	1.6
OS	716	2.7	714	1.1

and a main effect of inflection—$F(1,55) = 7.07$, MSe = 1401.76, $P < 0.01$—with unmarked situations producing faster overall latencies (703 msec) than object-marked situations (716 msec). The significant word order × inflection interaction—$F(1,55) = 4.25$, MSe = 1464.71, $P < 0.044$—indicates that the word-order effect was limited to the unmarked situations. *Post hoc* tests revealed that the 22-msec difference between N_SN_O and N_ON_S was significant—$F(1,55) = 9.86$, $P < 0.003$—but the 2-msec difference between NO and ON was not—$F < 1$. There were no significant effects in the error analysis.

GENERAL DISCUSSION

The Serbo-Croatian language is comparatively free of word order constraints and imperfectly inflectional. This means that for some sentences, with nouns that are marked explicitly for nominative and accusative case, the inflections indicate the noun's syntactic roles. For nouns that are not marked explicitly, all six permutations of subject, verb, and object are grammatically legal.

The present series of experiments demonstrated that both word-order and inflectional strategies are available to adult speakers/readers of Serbo-Croat. They do not appear to be applied indiscriminately or inexorably, however. The word-order strategy does not override unambiguous inflections if both subject and object are so marked. Experiment 1 showed no word-order effect in those situations. The presence of a single unambiguous inflection can contravene or override the word-order strategy only *if it is located appropriately relative to the logic of applying a canonical word order* (Experiments 2 and 3). When the initial noun is marked S (Experiment 2), both the inflectional strategy and the word-order strategy ought to assign it S, and assign O, the remaining syntactic role, to the second noun. An unmarked initial noun will be assigned the role S by the word-order

strategy. If the second noun is marked S inflectionally—that is, for NS situations—then processing is slowed relative to SN situations. In contrast, when the initial noun is marked O (Experiment 3), the inexorable application of the word-order strategy would assign S to that noun despite the inflection. This would lead to a difference relative to NO situations for which the word-order assignment of S to the initial noun would not be contradicted by subsequent inflections. The lack of such an effect suggests either that the initial inflection contravenes the word-order strategy or, alternatively, that the inflectional strategy (when it can be used) is weighted more heavily.

In the absence of inflections, only the word-order strategy is available. But the N_SN_O–N_ON_S difference in Experiment 2 was not significant and the 22-msec difference in Experiment 3, though significant, is none the less smaller than the 40-msec difference between SN and NS. In order to understand how this might have come about, we have to consider the nature of the language processor that is being speeded or slowed by word-order relationships.

Forster's (1979; 1981; 1985) model provides a framework for understanding these results. He argues that the language processor comprises three relatively independent, hierarchically arranged subsystems. At the lowest level, the lexical subsystem accesses the representations of (read or heard) words in the lexicon. This information is passed along to the syntactic subsystem which assigns grammatical roles to the sequence of words. This information is then passed along to the message subsystem which assigns meaning to the arrangement of words. A general problem solver (GPS) integrates information from all three levels. Because this processor is organised for normal language comprehension, it is supposed that linguistic input is processed automatically through all three levels even if an experimental question (e.g. lexical decision) is contrived to be answerable after, say, only the first level. The automaticity is used to account for how syntactic relationships, which are determined post-lexically, can have an influence on lexical decision times: After a word is accessed in the lexicon, a post-lexical coherence check biases the GPS positively (if assigned grammatical roles of context and target are consistent) or negatively (if assigned grammatical roles of context and target are inconsistent). This results in a grammatical congruency effect in which lexical decision is speeded for targets that agree with their contexts (e.g. with respect to gender, number, and person) relative to targets that disagree with their contexts [e.g. demonstrated with the Serbo-Croatian language by Gurjanov et al., 1985a; 1985b; Katz, Boyce, Goldstein, & Lukatela, 1987 (using auditory word recognition); Lukatela et al., 1982; Lukatela, Kostić, Feldman, & Turvey, 1983; and, using English language materials, Stanovich & West, 1983; Wright & Garrett, 1984].

Similar biases can result from semantic coherence checks. Lexical decision to a target word is hastened by semantically plausible contexts relative to semantically implausible contexts (e.g. Carello, Lukatela, Kostić, & Turvey, 1988; Fischler & Bloom, 1979; Schuberth & Eimas, 1977; Stanovich & West, 1983). If bias from both the syntactic and semantic levels is different for N_SN_O/N_ON_S relative to NS/SN, then the different sized word-order effects for the two comparisons would be rationalised. We will work through an example to illustrate the logic. Interpreting N_SN_OV as SOV (**TALAS ČAMAC PREVERČE** as "wave capsizes boat") would produce positive bias from the syntactic level and positive bias from the semantic level. Interpreting N_ON_SV as SOV ("boat capsizes wave") would provide positive bias from the syntactic level (the S and O assignments are consistent with each other and with the lack of inflections) but negative bias from the semantic level. Interpreting the second noun of SNV as O (**BURA ČAMAC PREVERČE** as "sea storm capsizes boat") would produce positive bias from both processors. Interpreting the initial noun of NSV as S ("boat, sea storm capsizes") would produce negative bias from the syntactic level (there is no object for the transitive verb) and negative bias from the semantic level (the message does not make sense). Where NS produces two negative biases, N_ON_S produces one positive and one negative. Whether biases are simply noted by the GPS or summed algebraically, the size of the word-order effect would be larger for the SN–NS comparisón than for N_SN_O–N_ON_S.

Just as Slobin and Bever (1982) noted in their examination of the acquisition of word-order and inflectional strategies, we too have found that the relative use of these strategies is appropriate to the regularities of the language of the speaker/reader. In the Serbo-Croatian language, there are situations that are suited to one or the other strategy and our subjects appear to be sensitive to these differences, at least in so far as they are revealed by influences on lexical decision. While such a task is somewhat removed from normal language use, it may, as Slobin and Bever (1982, p. 237) argue for their acting-out task, "reveal the linguistic capacity when pushed to its limit".

We have shown elsewhere word-order effects in Serbo-Croat with sentence verification time and latency to initiate a three-word utterance (Urošević et al., 1986). The sentences were like the ones that did not show a word-order effect on lexical decision in Experiment 1—explicit inflections on both nouns. Word-order effects in these other tasks were apparent despite uniformly positive biases from the syntactic and semantic processors and despite the fact that the referential meanings of SO and OS orders are the same. This suggests that (1) word order is relevant to more than simply the assignment of syntactic roles, and (2) lexical decision does not tap into this other aspect. We have speculated previously that because OS

orders are non-canonical, they may signal something that is relevant to contextual (rather than referential) meaning, e.g. intended points of emphasis (Urošević et al., 1986).

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APPENDIX

Word Order and Inflection	Serbo-Croatian			English		
N_SN_O	LJUBAV	RADOST	DONOSI	LOVE	JOY	BRINGS
SN	NAGRADA	RADOST	DONOSI	PRIZE	JOY	BRINGS
NO	LJUBAV	SREĆU	DONOSI	LOVE	LUCK	BRINGS
N_ON_S	RADOST	LJUBAV	DONOSI	JOY	LOVE	BRINGS
NS	RADOST	NAGRADA	DONOSI	JOY	PRIZE	BRINGS
ON	SREĆU	LJUBAV	DONOSI	LUCK	LOVE	BRINGS
N_SN_O	MOTOR	TOČAK	VRTI	MOTOR	WHEEL	TURNS
SN	PARA	TOČAK	VRTI	STEAM	WHEEL	TURNS
NO	MOTOR	PLOČU	VRTI	MOTOR	BOARD	TURNS
N_ON_S	TOČAK	MOTOR	VRTI	WHEEL	MOTOR	TURNS
NS	TOČAK	PARA	VRTI	WHEEL	STEAM	TURNS
ON	PLOČU	MOTOR	VRTI	BOARD	MOTOR	TURNS
N_SN_O	KLJUČ	KOVČEG	ZATVARA	KEY	CHEST	LOCKS
SN	BRAVA	KOVČEG	ZATVARA	LOCK	CHEST	LOCKS
NO	KLJUČ	BRAVU	ZATVARA	KEY	LOCK	LOCKS
N_ON_S	KOVČEG	KLJUČ	ZATVARA	CHEST	KEY	LOCKS
NS	KOVČEG	BRAVA	ZATVARA	CHEST	LOCK	LOCKS
ON	BRAVU	KLJUČ	ZATVARA	LOCK	KEY	LOCKS
N_SN_O	PLAMEN	VOSAK	TOPI	FLAME	WAX	MELTS
SN	VATRA	VOSAK	TOPI	FIRE	WAX	MELTS
NO	PLAMEN	SVEĆU	TOPI	FLAME	CANDLE	MELTS
N_ON_S	VOSAK	PLAMEN	TOPI	WAX	FLAME	MELTS
NS	VOSAK	VATRA	TOPI	WAX	FIRE	MELTS
ON	SVEĆU	PLAMEN	TOPI	CANDLE	FLAME	MELTS

N_SN_O	PRAŠAK	TALOG	SKIDA	CLEANSER	GROUNDS	REMOVES
SN	VODA	TALOG	SKIDA	WATER	GROUNDS	REMOVES
NO	PRAŠAK	MRLJU	SKIDA	CLEANSER	SPOT	REMOVES
N_ON_S	TALOG	PRAŠAK	SKIDA	GROUNDS	CLEANSER	REMOVES
NS	TALOG	VODA	SKIDA	GROUNDS	WATER	REMOVES
ON	MRLJU	PRAŠAK	SKIDA	SPOT	CLEANSER	REMOVES
N_SN_O	PLJUSAK	PASULJ	ZALIVA	SHOWER	BEANS	IRRIGATES
SN	KIŠA	PASULJ	ZALIVA	RAIN	BEANS	IRRIGATES
NO	PLJUSAK	BAŠTU	ZALIVA	SHOWER	GARDEN	IRRIGATES
N_ON_S	PASULJ	PLJUSAK	ZALIVA	BEANS	SHOWER	IRRIGATES
NS	PASULJ	KIŠA	ZALIVA	BEANS	RAIN	IRRIGATES
ON	BAŠTU	PLJUSAK	ZALIVA	GARDEN	SHOWER	IRRIGATES
N_SN_O	VETAR	PROZOR	OTVARA	WIND	WINDOW	OPENS
SN	KOŠAVA	PROZOR	OTVARA	GUST	WINDOW	OPENS
NO	VETAR	KAPIJU	OTVARA	WIND	DOOR	OPENS
N_ON_S	PROZOR	VETAR	OTVARA	WINDOW	WIND	OPENS
NS	PROZOR	KOŠAVA	OTVARA	WINDOW	GUST	OPENS
ON	KAPIJU	VETAR	OTVARA	DOOR	WIND	OPENS
N_SN_O	CREP	KROV	POKRIVA	TILE	ROOF	COVERS
SN	TRSKA	KROV	POKRIVA	REED	ROOF	COVERS
NO	CREP	KUĆU	POKRIVA	TILE	HOUSE	COVERS
N_ON_S	KROV	CREP	POKRIVA	ROOF	TILE	COVERS
NS	KROV	TRSKA	POKRIVA	ROOF	REED	COVERS
ON	KUĆU	CREP	POKRIVA	HOUSE	TILE	COVERS
N_SN_O	RAZDOR	POSAO	KVARI	DISCORD	JOB	SPOILS
SN	SVAĐA	POSAO	KVARI	QUARREL	JOB	SPOILS
NO	RAZDOR	SLOGU	KVARI	DISCORD	HARMONY	SPOILS
N_ON_S	POSAO	RAZDOR	KVARI	JOB	DISCORD	SPOILS
NS	POSAO	SVAĐA	KVARI	JOB	QUARREL	SPOILS
ON	SLOGU	RAZDOR	KVARI	HARMONY	DISCORD	SPOILS

Word Order and Inflection	Serbo-Croatian			English		
N_SN_O	BROD	TOVAR	NOSI	BOAT	CARGO	CARRIES
SN	LAĐA	TOVAR	NOSI	SHIP	CARGO	CARRIES
NO	BROD	ROBU	NOSI	BOAT	GOODS	CARRIES
N_ON_S	TOVAR	BROD	NOSI	CARGO	BOAT	CARRIES
NS	TOVAR	LAĐA	NOSI	CARGO	SHIP	CARRIES
ON	ROBU	BROD	NOSI	GOODS	BOAT	CARRIES
N_SN_O	METAK	CILJ	POGAĐA	BULLET	MARK	HITS
SN	BOMBA	CILJ	POGAĐA	BOMB	MARK	HITS
NO	METAK	METU	POGAĐA	BULLET	TARGET	HITS
N_ON_S	CILJ	METAK	POGAĐA	MARK	BULLET	HITS
NS	CILJ	BOMBA	POGAĐA	MARK	BOMB	HITS
ON	METU	METAK	POGAĐA	TARGET	BULLET	HITS
N_SN_O	POREZ	DOBIT	SMANJUJE	TAX	INTEREST	REDUCES
SN	KAZNA	DOBIT	SMANJUJE	PENALTY	INTEREST	REDUCES
NO	POREZ	ZARADU	SMANJUJE	TAX	PROFIT	REDUCES
N_ON_S	DOBIT	POREZ	SMANJUJE	INTEREST	TAX	REDUCES
NS	DOBIT	KAZNA	SMANJUJE	INTEREST	PENALTY	REDUCES
ON	ZARADU	POREZ	SMANJUJE	PROFIT	TAX	REDUCES
N_SN_O	ČEKIĆ	EKSER	UKIVA	HAMMER	NAIL	HAMMERS
SN	ŠIPKA	EKSER	UKIVA	ROD	NAIL	HAMMERS
NO	ČEKIĆ	ŠIPKU	UKIVA	HAMMER	ROD	HAMMERS
N_ON_S	EKSER	ČEKIĆ	UKIVA	NAIL	HAMMER	HAMMERS
NS	EKSER	ŠIPKA	UKIVA	NAIL	ROD	HAMMERS
ON	ŠIPKU	EKSER	UKIVA	ROD	HAMMER	HAMMERS

N_SN_O	ODBOR	PROGRAM	IZLAŽE	COMMITTEE	PROGRAM	EXPOSES
SN	STRANKA	PROGRAM	IZLAŽE	PARTY	PROGRAM	EXPOSES
NO	ODBOR	IDEJU	IZLAŽE	COMMITTEE	IDEA	EXPOSES
N_ON_S	PROGRAM	ODBOR	IZLAŽE	PROGRAM	COMMITTEE	EXPOSES
NS	PROGRAM	STRANKA	IZLAŽE	PROGRAM	PARTY	EXPOSES
ON	IDEJU	ODBOR	IZLAŽE	IDEA	COMMITTEE	EXPOSES
N_SN_O	ŠIPRAG	TRAG	SKRIVA	UNDERBRUSH	TRAIL	HIDES
SN	ZVERKA	TRAG	SKRIVA	ANIMAL	TRAIL	HIDES
NO	ŠIPRAG	ZVERKU	SKRIVA	UNDERBRUSH	ANIMAL	HIDES
N_ON_S	TRAG	ŠIPRAG	SKRIVA	TRAIL	UNDERBRUSH	HIDES
NS	TRAG	ZVERKA	SKRIVA	TRAIL	ANIMAL	HIDES
ON	ZVERKU	ŠIPRAG	SKRIVA	ANIMAL	UNDERBRUSH	HIDES
N_SN_O	PRIZNANJE	MORAL	PODIŽE	PRAISE	MORALE	RAISES
SN	POBEDA	MORAL	PODIŽE	VICTORY	MORALE	RAISES
NO	PRIZNANJE	SNAGU	PODIŽE	PRAISE	ENERGY	RAISES
N_ON_S	MORAL	PRIZNANJE	PODIŽE	MORALE	PRAISE	RAISES
NS	MORAL	POBEDA	PODIŽE	MORALE	VICTORY	RAISES
ON	SNAGU	PRIZNANJE	PODIŽE	ENERGY	PRAISE	RAISES
N_SN_O	MELEM	BOLEST	LEČI	BALM	ILLNESS	CURES
SN	TRAVA	BOLEST	LEČI	HERB	ILLNESS	CURES
NO	MELEM	BOLJKU	LEČI	BALM	DISEASE	CURES
N_ON_S	BOLEST	MELEM	LEČI	ILLNESS	BALM	CURES
NS	BOLEST	TRAVA	LEČI	ILLNESS	HERB	CURES
ON	BOLJKU	MELEM	LEČI	DISEASE	BALM	CURES
N_SN_O	PIJUK	KAMEN	LOMI	PICK-AXE	STONE	CRACKS
SN	MINA	KAMEN	LOMI	MINE	STONE	CRACKS
NO	PIJUK	STENU	LOMI	PICK-AXE	ROCK	CRACKS
N_ON_S	KAMEN	PIJUK	LOMI	STONE	PICK-AXE	CRACKS
NS	KAMEN	MINA	LOMI	STONE	MINE	CRACKS
ON	STENU	PIJUK	LOMI	ROCK	PICK-AXE	CRACKS

Word Order and Inflection	Serbo-Croatian			English		
N_SN_O	TALAS	ČAMAC	PREVERĆE	WAVE	BOAT	CAPSIZES
SN	BURA	ČAMAC	PREVERĆE	STORM	BOAT	CAPSIZES
NO	TALAS	BARKU	PREVERĆE	WAVE	BARGE	CAPSIZES
N_ON_S	ČAMAC	TALAS	PREVERĆE	BOAT	WAVE	CAPSIZES
NS	ČAMAC	BURA	PREVERĆE	BOAT	STORM	CAPSIZES
ON	BARKU	TALAS	PREVERĆE	BARGE	WAVE	CAPSIZES
N_SN_O	NOŽ	HLEB	REŽE	KNIFE	BREAD	CUTS
SN	OŠTRICA	HLEB	REŽE	BLADE	BREAD	CUTS
NO	NOŽ	VEKNU	REŽE	KNIFE	LOAF	CUTS
N_ON_S	HLEB	NOŽ	REŽE	BREAD	KNIFE	CUTS
NS	HLEB	OŠTRICA	REŽE	BREAD	BLADE	CUTS
ON	VEKNU	NOŽ	REŽE	LOAF	KNIFE	CUTS
N_SN_O	RAZRED	IZVEŠTAJ	SLUŠA	CLASS	REPORT	LISTENS TO
SN	VLADA	IZVEŠTAJ	SLUŠA	GOVERNMENT	REPORT	LISTENS TO
NO	RAZRED	IZJAVU	SLUŠA	CLASS	STATEMENT	LISTENS TO
N_ON_S	IZVEŠTAJ	RAZRED	SLUŠA	REPORT	CLASS	LISTENS TO
NS	IZVEŠTAJ	VLADA	SLUŠA	REPORT	GOVERNMENT	LISTENS TO
ON	IZJAVU	RAZRED	SLUŠA	STATEMENT	CLASS	LISTENS TO
N_SN_O	AVION	MOST	RUŠI	AEROPLANE	BRIDGE	DESTROYS
SN	GRANATA	MOST	RUŠI	GRENADE	BRIDGE	DESTROYS
NO	AVION	BRANU	RUŠI	AEROPLANE	DAM	DESTROYS
N_ON_S	MOST	AVION	RUŠI	BRIDGE	AEROPLANE	DESTROYS
NS	MOST	GRANATA	RUŠI	BRIDGE	GRENADE	DESTROYS
ON	BRANU	AVION	RUŠI	DAM	AEROPLANE	DESTROYS

N_SN_O	DRVO	HLAD	PRAVI	TREE	SHADE	MAKES
SN	BREZA	HLAD	PRAVI	BIRCH	SHADE	MAKES
NO	DRVO	SENKU	PRAVI	TREE	SHADOW	MAKES
N_ON_S	HLAD	DRVO	PRAVI	SHADE	TREE	MAKES
NS	HLAD	BREZA	PRAVI	SHADE	BIRCH	MAKES
ON	SENKU	DRVO	PRAVI	SHADOW	TREE	MAKES
N_SN_O	KOROV	KUKURUZ	NAPADA	WEEDS	CORN	ATTACKS
SN	SUŠA	KUKURUZ	NAPADA	DROUGHT	CORN	ATTACKS
NO	KOROV	PŠENICU	NAPADA	WEEDS	WHEAT	ATTACKS
N_ON_S	KUKURUZ	KOROV	NAPADA	CORN	WEEDS	ATTACKS
NS	KUKURUZ	SUŠA	NAPADA	CORN	DROUGHT	ATTACKS
ON	PŠENICU	KOROV	NAPADA	WHEAT	WEEDS	ATTACKS
N_SN_O	SELO	PUT	GRADI	VILLAGE	ROAD	BUILDS
SN	ZEMLJA	PUT	GRADI	COUNTRY	ROAD	BUILDS
NO	SELO	ŠKOLU	GRADI	VILLAGE	SCHOOL	BUILDS
N_ON_S	PUT	SELO	GRADI	ROAD	VILLAGE	BUILDS
NS	PUT	ZEMLJA	GRADI	ROAD	COUNTRY	BUILDS
ON	ŠKOLU	SELO	GRADI	SCHOOL	VILLAGE	BUILDS
N_SN_O	UCENJE	ZNANJE	POVEĆAVA	STUDYING	KNOWLEDGE	INCREASES
SN	ŠKOLA	ZNANJE	POVEĆAVA	SCHOOL	KNOWLEDGE	INCREASES
NO	UČENJE	OCENU	POVEĆAVA	STUDYING	GRADE	INCREASES
N_ON_S	ZNANJE	UČENJE	POVEĆAVA	KNOWLEDGE	STUDYING	INCREASES
NS	ZNANJE	ŠKOLA	POVEĆAVA	KNOWLEDGE	SCHOOL	INCREASES
ON	OCENU	UČENJE	POVEĆAVA	GRADE	STUDYING	INCREASES
N_SN_O	SNEG	PLOČNIK	KVASI	SNOW	SIDEWALK	MOISTENS
SN	ROSA	PLOČNIK	KVASI	DEW	SIDEWALK	MOISTENS
NO	SNEG	ULICU	KVASI	SNOW	STREET	MOISTENS
N_ON_S	PLOČNIK	SNEG	KVASI	SIDEWALK	SNOW	MOISTENS
NS	PLOČNIK	ROSA	KVASI	SIDEWALK	DEW	MOISTENS
ON	ULICU	SNEG	KVASI	STREET	SNOW	MOISTENS

Word Order and Inflection	Serbo-Croatian			English		
N_SN_O	NOKAT	ZID	GREBE	FINGERNAIL	WALL	SCRAPES
SN	KANDŽA	ZID	GREBE	CLAW	WALL	SCRAPES
NO	NOKAT	KOŽU	GREBE	FINGERNAIL	SKIN	SCRAPES
N_ON_S	ZID	NOKAT	GREBE	WALL	FINGERNAIL	SCRAPES
NS	ZID	KANDŽA	GREBE	WALL	CLAW	SCRAPES
ON	KOŽU	NOKAT	GREBE	SKIN	FINGERNAIL	SCRAPES
N_SN_O	BRDO	ZAKLON	PRUŽA	HILL	SHELTER	OFFERS
SN	ŠUMA	ZAKLON	PRUŽA	FOREST	SHELTER	OFFERS
NO	BRDO	ZAŠTITU	PRUŽA	HILL	PROTECTION	OFFERS
N_ON_S	ZAKLON	BRDO	PRUŽA	SHELTER	HILL	OFFERS
NS	ZAKLON	ŠUMA	PRUŽA	SHELTER	FOREST	OFFERS
ON	ZAŠTITU	BRDO	PRUŽA	PROTECTION	HILL	OFFERS
N_SN_O	KAMION	UGALJ	VOZI	TRUCK	COAL	TRANSPORTS
SN	ZAPREGA	UGALJ	VOZI	TEAM OF ANIMALS	COAL	TRANSPORTS
NO	KAMION	CIGLU	VOZI	TRUCK	BRICKS	TRANSPORTS
N_ON_S	UGALJ	KAMION	VOZI	COAL	TRUCK	TRANSPORTS
NS	UGALJ	ZAPREGA	VOZI	COAL	TEAM OF ANIMALS	TRANSPORTS
ON	CIGLU	KAMION	VOZI	BRICKS	TRUCK	TRANSPORTS
N_SN_O	JARBOL	BARJAK	DRŽI	MAST	BANNER	HOLDS
SN	MOTKA	BARJAK	DRŽI	POLE	BANNER	HOLDS
NO	JARBOL	ZASTAVU	DRŽI	MAST	FLAG	HOLDS
N_ON_S	BARJAK	JARBOL	DRŽI	BANNER	MAST	HOLDS
NS	BARJAK	MOTKA	DRŽI	BANNER	POLE	HOLDS
ON	ZASTAVU	JARBOL	DRŽI	FLAG	MAST	HOLDS

N_SN_O	TREZOR	NOVAC	ČUVA	VAULT	MONEY	PROTECTS
SN	BANKA	NOVAC	ČUVA	BANK	MONEY	PROTECTS
NO	TREZOR	ZARADU	ČUVA	VAULT	SALARY	PROTECTS
N_ON_S	NOVAC	TREZOR	ČUVA	MONEY	VAULT	PROTECTS
NS	NOVAC	BANKA	ČUVA	MONEY	BANK	PROTECTS
ON	ZARADU	TREZOR	ČUVA	SALARY	VAULT	PROTECTS
N_SN_O	KRZNO	TELO	ŠTITI	FUR	BODY	SHIELDS
SN	KOŽA	TELO	ŠTITI	SKIN	BODY	SHIELDS
NO	KRZNO	GLAVU	ŠTITI	FUR	HEAD	SHIELDS
N_ON_S	TELO	KRZNO	ŠTITI	BODY	FUR	SHIELDS
NS	TELO	KOŽA	ŠTITI	BODY	SKIN	SHIELDS
ON	GLAVU	KRZNO	ŠTITI	HEAD	FUR	SHIELDS
N_SN_O	JELO	ŽED	STVARA	DISH	THIRST	PRODUCES
SN	HRANA	ŽED	STVARA	FOOD	THIRST	PRODUCES
NO	JELO	ŽELJU	STVARA	DISH	APPETITE	PRODUCES
N_ON_S	ŽED	JELO	STVARA	THIRST	DISH	PRODUCES
NS	ŽED	HRANA	STVARA	THIRST	FOOD	PRODUCES
ON	ŽELJU	JELO	STVARA	APPETITE	DISH	PRODUCES
N_SN_O	SUNĐER	STAKLO	BRIŠE	SPONGE	GLASS	WIPES
SN	KRPA	STAKLO	BRIŠE	CLOTH	GLASS	WIPES
NO	SUNĐER	KREDU	BRIŠE	SPONGE	CHALK	WIPES
N_ON_S	STAKLO	SUNĐER	BRIŠE	GLASS	SPONGE	WIPES
NS	STAKLO	KRPA	BRIŠE	GLASS	CLOTH	WIPES
ON	KREDU	SUNĐER	BRIŠE	CHALK	SPONGE	WIPES
N_SN_O	RUDNIK	BLAGO	KRIJE	MINE	RICHES	HIDES
SN	JAMA	BLAGO	KRIJE	SHAFT	RICHES	HIDES
NO	RUDNIK	TAJNU	KRIJE	MINE	SECRET	HIDES
N_ON_S	BLAGO	RUDNIK	KRIJE	RICHES	MINE	HIDES
NS	BLAGO	JAMA	KRIJE	RICHES	SHAFT	HIDES
ON	TAJNU	RUDNIK	KRIJE	SECRET	MINE	HIDES

Word Order and Inflection	Serbo-Croatian			English		
N_SN_O	ZVONO	GRAD	BUDI	BELL	TOWN	AWAKENS
SN	VIKA	GRAD	BUDI	SHOUTS	TOWN	AWAKENS
NO	ZVONO	TETKU	BUDI	BELL	AUNT	AWAKENS
N_ON_S	GRAD	ZVONO	BUDI	TOWN	BELL	AWAKENS
NS	GRAD	VIKA	BUDI	TOWN	SHOUTS	AWAKENS
ON	TETKU	ZVONO	BUDI	AUNT	BELL	AWAKENS

For the following, all restrictions could not be satisfied. Different sets were constructed for situations marked in the accusative and situations marked in the nominative

N_SN_O	PRSTEN	PRST	STEŽE	RING	FINGER	SQUEEZES
SN	BURMA	PRST	STEŽE	WEDDING RING	FINGER	SQUEEZES
N_ON_S	PRST	PRSTEN	STEŽE	FINGER	RING	SQUEEZES
NS	PRST	BURMA	STEŽE	FINGER	WEDDING RING	SQUEEZES
N_SN_O	KAIŠ	POJAS	STEŽE	STRAP	WAIST	SQUEEZES
NO	KAIŠ	RUKU	STEŽE	STRAP	ARM	SQUEEZES
N_ON_S	POJAS	KAIŠ	STEŽE	WAIST	STRAP	SQUEEZES
ON	RUKU	KAIŠ	STEŽE	ARM	STRAP	SQUEEZES

N_SN_O	POTOK	PROLAZ	TRAŽI	STREAM	PASSAGE	NEEDS
SN	REKA	PROLAZ	TRAŽI	RIVER	PASSAGE	NEEDS
N_ON_S	PROLAZ	POTOK	TRAŽI	PASSAGE	STREAM	NEEDS
NS	PROLAZ	REKA	TRAŽI	PASSAGE	RIVER	NEEDS
N_SN_O	CVET	SUNCE	TRAŽI	FLOWER	SUN	NEEDS
NO	CVET	VODU	TRAŽI	FLOWER	WATER	NEEDS
N_ON_S	SUNCE	CVET	TRAŽI	SUN	FLOWER	NEEDS
ON	VODU	CVET	TRAŽI	WATER	FLOWER	NEEDS
N_SN_O	DUVAN	ZDRAVLJE	SLABI	TOBACCO	HEALTH	WEAKENS
SN	DROGA	ZDRAVLJE	SLABI	DRUG	HEALTH	WEAKENS
N_ON_S	ZDRAVLJE	DUVAN	SLABI	HEALTH	TOBACCO	WEAKENS
NS	ZDRAVLJE	DROGA	SLABI	HEALTH	DRUG	WEAKENS
N_SN_O	NAROD	CIRKUS	VOLI	PEOPLE	CIRCUS	LOVE
NO	NAROD	PESMU	VOLI	PEOPLE	SONG	LOVE
N_ON_S	CIRKUS	NAROD	VOLI	CIRCUS	PEOPLE	LOVE
ON	PESMU	NAROD	VOLI	SONG	PEOPLE	LOVE